

FISH for the PEOPLE

A Special Publication for the Promotion of Sustainable Fisheries for Food Security in the ASEAN Region

Volume 8 Number 2: 2010

Bangkok, Thailand, ISSN: 1685-6546



**Enhancing
the Competitiveness of Fisheries**
in Addressing Food Security



Southeast Asian Fisheries Development Center

Advisory Board

Chumnarn Pongsri, Secretary-General
Kenji Matsumoto, Deputy Secretary-General
Magnus Torell, Senior Advisor
Pouchamarn Wongsanga, Information Program Coordinator
Somnuk Pornpatimakorn, Adm. & Finance Coordinator
Somboon Siriraksophon, Policy & Program Coordinator

Editorial Team

Editor in Chief

Chumnarn Pongsri

Managing Editor

Virgilia T. Sulit, Fishery Technical Officer

Contributing Editors

Yuttana Theparoonrat, SEAFDEC/TD

Yeap Soon Eong, SEAFDEC/MFRD

Mila Castaños/Belen Acosta, SEAFDEC/AQD

Ahmad Adnan Nuruddin, SEAFDEC/MFRDMD

Awwaluddin, RFPN member from Indonesia

Aung Naing Oo, RFPN member from Myanmar

Pierre L. Velasco, RFPN member from Philippines

Piyawan Hussadee, RFPN member from Thailand


Publication Team

Virgilia T. Sulit, Fishery Technical Officer

Nualanong Tongdee, Senior Information Officer

Satana Duangsawasdi, Information Officer

Notice of Copyrights

 is a free publication which cannot be sold or traded in any way. This publication may be reproduced, in whole or in part, without written permission from the copyright holder, as long as proper reference is given to the authors and publication. For further information on the publication, consult the homepage hosted on www.seafdec.org or write to:

Editor in Chief (Fish for the People)



SEAFDEC Secretariat
Kasetsart University Campus
P.O. Box 1046 Kasetsart Post Office,
Bangkok 10903, THAILAND
fish@seafdec.org

Copyright©2010 by SEAFDEC

Editorial

Fish still remains the main source of protein for many people in Southeast Asia. In addition to providing nutrition to the people, fish also contributes to the improvement of the economies of many nations. The fisheries sector, therefore, continues to be the prime mover of the social and economic development of rural communities. It is the most important sector that could significantly contribute to food security. However, a number of issues could impede the sustainable development of fisheries and suppress the contribution of the sector to food security. The world's ever-increasing population makes the demand for fish food escalate exponentially pushing the fishers to intensify operations to the extent of over-fishing and degrading the resources. As a result, it is feared that the marine coastal capture fisheries could no longer supply the demand. Thus, many countries are now racing for the elusive fish in the high seas. The use of modern fishing technologies and fully-equipped fishing vessels operating in offshore areas could intensify fish production, but if not properly managed, such approach could only contribute to the pressure on the fish stocks. Expansion of marine capture fisheries therefore calls for the effective, efficient and equitable management of the fishery resources towards sustainability and food security.

Aquaculture has long been considered as an option to marine capture fisheries considering that it has the potentials to provide the much needed fish for the people. But this would mean efficient balancing between conservation and exploitation of the available resources. Promotion of sustainable aquaculture would therefore require the responsible use of resources and the adoption of good aquaculture practices bearing in mind the need to get out of the fish meal trap, and balance the effective use of the same fishery resources for human consumption and for aquafeeds. Research on the suitable and cost-effective substitutes for fish meals and fishery products in fish diets needs to be aggressively pursued. Sustainability would also require the regionalization and adaption of the ecosystem-based approach to aquaculture or EAA under the FAO initiatives. The guiding principles under the EAA could mitigate the impacts of aquaculture to the environment as well as address social concerns. Furthermore, integrating

C O N T E N T S

aquaculture with other practices such as agro-aquaculture, multi-trophic aquaculture, culture-based fisheries and stock enhancement could also offer more efficient multiple use of water and nutrients.

Meanwhile, the development of the inland fishery resources could be fostered and heightened to achieve a resources-based equilibrium. Advancing the concept of rights-based fisheries and co-management of the resources could facilitate the management of fishing capacity in inland waters. Therefore, adoption of responsible fishing gear and practices coupled with interventions such as enhancement of the habitats would lead to improved production from inland fisheries and eventually in achieving the optimum contribution of inland fisheries to food security.

Given the potentials in the fisheries sector and utilizing such potentials prudently through responsible fisheries management, the competence of fisheries could therefore be boosted. In the Southeast Asian region, where the aforementioned factors are mostly present, there is no question why the competitiveness of fisheries could not be enhanced for the region to move fast forward towards achieving food security.

Special Features

- Children's Drawing Contest for "Fish for the People 2020": Fisheries for Food Security - Adaptation to the Changing Environment 2
- Boosting the Contribution of Fisheries to ASEAN Food Security Towards 2020 4

Regional Initiatives

- Advancing the Promotion of FOVOP in the ASEAN Region: Issues and Challenges for Future Cooperation 11
- Fisheries *Refugia* and Marine Protected Areas: Can They Help Sustain the Contribution of Fisheries towards Food Security in Southeast Asia? 15
- Enhancing Safety at Sea for Small-scale Fishing Boats in Southeast Asia 23

Country Report

- An Assessment of Fishing Gears that Contribute to Increased Sea Turtle Mortalities: A Case Study in Rayong Province, Thailand 32

Special Reports

- Selection of the Appropriate Extension Methods for Small-Scale Fishers 39
- Analyzing the Use of Advanced Information Technology to Boost the Sale of Fishery Products in Japan 42

Calendar of Events 44

 is a special publication produced by the Southeast Asian Fisheries Development Center (SEAFDEC) to promote sustainable fisheries for food security in the ASEAN region.

The contents of this publication does not necessarily reflect the views or policies of SEAFDEC or the editors, nor are they an official record. The designations employed and the presentation do not imply the expression of opinion whatsoever on the part of SEAFDEC concerning the legal status of any country, territory, city, or area of its authorities, or concerning the legal status of fisheries, marine and aquatic resource uses and the delimitation of boundaries.



Children's Drawing Contest for "Fish for the People 2020": Fisheries for Food Security: Adaptation to the Changing Environment

As part of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 or Fish for the People 2020 Conference scheduled from 13 to 17 June 2011 in Bangkok, Thailand, Children's Drawing Contests would be held in the ASEAN-SEAFDEC Member Countries from June 2010 until April 2011. After endorsement by SEAFDEC and the ASEAN, the Member Countries of SEAFDEC and the ASEAN would take full responsibility in the arrangement and conduct of the Drawing Contests (**Box 1**). While the four (4) best drawings from each country would be put up for exhibition during the Conference, these would also be used by the SEAFDEC Secretariat in its activities on the promotion of sustainable fisheries in the ASEAN region.

Box 1. Guidelines for the Children's Drawing Contest for "Fish for the People 2020"

Theme:	Fisheries for Food Security: "Adaptation to the Changing Environment"
Size:	Standard 24 x 30 inches (approximate size)
Medium:	Any drawing/painting media
Submission:	The four (4) best drawings should be submitted by each ASEAN-SEAFDEC Member Country to SEAFDEC Secretariat by 30 April 2011
Age Limit:	Participants in the Contests should be school children below 15 years old
Others:	Each ASEAN-SEAFDEC Member Country should pick out the judges for the Contest from their respective countries' professional artists and other concerned citizens

The main objective of the Children's Drawing Contest is to instill upon the children the need to conserve the fishery resources for the future generations considering the current deteriorating state of the resources as well as the impacts of the changing environment on fisheries. Through the Drawing Contest, it is envisaged that the children would also be able to perceive the need to enhance their resilience to adapt to climate change. With the intention also of gaining a multiplier effect, the Contest targets the school children for their capacity and ability to discuss the topic and related issues with their classmates, playmates, peers as well as with members of their families including their parents.

For many countries in the Southeast Asian region, the fisheries sector has always been one of the most important contributors to food security. However, the deterioration of the fishery resources and the emerging fisheries-related issues during the past decade have made it imperative for the ASEAN and SEAFDEC to organize the ASEAN-SEAFDEC



Conference on Sustainable Fisheries for Food Security Towards 2020, which is expected to address the priority issues that threaten the sustainable contribution of fisheries to food security of the ASEAN region. The Conference is also expected to conclude the next decade resolution and plan of action to serve as revitalized policy framework and guiding principles in achieving sustainable fisheries development for food security for the coming decade.

To take place parallel with the Conference are side events such as the Conference Exhibition and study trips to small-scale fisheries communities near Bangkok, Thailand. For the Exhibition, the ASEAN-SEAFDEC Members Countries as well as the SEAFDEC Technical Departments and interested private sector such as fisheries associations and organizations will display their products and services. The study trips are envisaged to provide the participants with first-hand information on the scope and activities of small-scale fisheries in Thailand.

The technical issues that are lined up for discussion during the Conference include: (1) Enhancing governance in fishery management; (2) Sustainable aquaculture development; (3) Ecosystem-based fisheries management; (4) Post-harvest and safety of fish and fisheries products; (5) Emerging requirements for trade in fisheries product; (6) Climate change adaptation and mitigation towards food security; (7) Livelihood in fishing communities and prospects of employment in fisheries related activities; and (8) Sustaining food supply from inland fisheries. Moreover, world renown experts would also present plenary papers, *i.e.* (1) Outlook of fish supply and demand towards 2020; (2) Vision and scene-setting of ASEAN fisheries in 2020; (3) Fisheries cooperation in the ASEAN region: Vision of cooperation in the region towards 2020; and (4) Adaptations to the changing environment. The outcomes of the panel discussions would be presented in the Plenary Session on the Overview of the Sustainable Fisheries for Food Security Towards 2020.

After the technical session of the Conference, a Meeting of the Senior Officials for fisheries from the ASEAN and SEAFDEC Member Countries will be convened to discuss and consider the next decade Resolution and Plan of Action. This would be followed by the Ministerial Session to adopt the Resolution and Plan of Action. The Conference is expected to draw in participants representing the various fisheries stakeholders including representatives from the government and the private sector as well as those from the civil societies.

It should be recalled that during the 2001 Millennium Conference on Fish for the People, results of the Children's Drawing Contests held by each SEAFDEC-ASEAN Member Country were also displayed. Furthermore, starting with the first issue of the Special Publication Fish for the People in 2003, the best drawings from each country had been used in the back cover of the Special Publication to continue instilling in the minds of the peoples in the Southeast Asian region the need to sustainably conserve and manage fisheries for the future generations. The results therefore of the ongoing Drawing Contests would also be utilized by SEAFDEC for its continued efforts in promoting the sustainable development of fisheries and eventually enhance the contribution of fisheries to food security.

For more information, visit www.ffp2020.org



Exhibition of the best drawings during the 2001 ASEAN-SEAFDEC Conference: "Fish for the People"





Boosting the Contribution of Fisheries to ASEAN Food Security Towards 2020

Chumnarn Pongsri

This article is based on the presentation made during the ASEAN Conference on Food Security: Role of the Private Sector held in Singapore from 16 to 18 June 2010.

Fisheries in the ASEAN region is generally characterized as being small-scale and has been playing the major role of accelerating economic development and generating livelihood opportunities, in many ways, contributing to the region's food security. As defined, food security is attained when food is available for everybody's access, and when people do not go hungry or do not fear of possible starvation. FAO suggested that when all people have physical and economic access to sufficient and safe food at all times then food security is in place. Parallel with this, the US Department of Agriculture identified two main aspects of food security, *viz*: availability of nutritionally adequate and safe food; and assurance of daily accessibility to acceptable foods in a socially acceptable way.

Current Fisheries Scenario in the ASEAN Region

Currently and after going through very rapid development during the past decades, it is feared that fisheries may no longer provide stable livelihood to the fishing communities in the ASEAN due to fishing overcapacity. Ironically, the

ever-increasing large number of small-scale fishers locks them within the vicious cycle of fisheries overcapacity (Kato, 2008). Being dependent on fishing for their livelihoods and with no other alternative sources of income because of limited know-how and insufficient financial resources, the fishers tend to saturate the absorbing capacity of the fisheries sector. Having no way out, the fishers therefore continue to race for the diminishing fisheries resources.

Meanwhile, outside the fishing communities and elsewhere around the globe, the demand for more food fish is on the rise. In an effort to supply the much needed demand for food fish, many fishers continue to maximize the exploitation of the remaining resources, to the extent of resorting to irresponsible means without looking ahead of the possible effects of their actions on the environment and the resources that have already been degraded. The continued practice of irresponsible fishing operations such as the use of dynamite and chemicals as well as over-fishing promotes food security crisis in areas where the degraded fishery resources are further squeezed to the last drop, trapping the fisheries sector in the vicious cycle on resource degradation (Kato, 2008). Thus, food security which seems easy to achieve, may not be possible in the ASEAN region if the resources continue to be heavily degraded and where people's access to food in a socially respectable way is difficult to fulfill.

Moreover, the attempts of many countries in the region to boost foreign exchange earnings and improve their economies, had diverted the low-value fish species that once was valuable source of cheap protein food for the fishing communities, to the fish meal industry. This makes the availability of foodfish for the people getting slimmer contributing to potential food insecurity especially in the fishing communities. Meanwhile, the expansion of the aquaculture sector to supply the foreign market with food fish leads to the drastic increasing demand for aquafeeds. Thus, the maximum exploitation of the low value fishes and even the juveniles of commercially important fishes for utilization as aquafeeds has added pressure to the already degraded fishery resources and exacerbated the conflict between the utilization of fish products for aquafeeds and the use of the same resources for human consumption.

The Impacts of the 2001 Resolution and Plan of Action

SEAFDEC and ASEAN had been exerting efforts to address the issues and concerns in fisheries to enhance the role of fisheries as one of the main driving forces towards attaining food security. Recognizing the importance of sustainable fisheries for food security and livelihoods as well as for the well-being of the ASEAN people, concerned ministers from the ASEAN and SEAFDEC countries adopted the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region during the Fish for the People Millennium Conference in 2001 (SEAFDEC, 2001).

The 2001 Resolution and Plan of Action have since then served as policy framework that steered the ASEAN countries towards enhancing the sustainability of fisheries and its contribution to food security. Using the Resolution and Plan of Action as overall framework, the programs implemented by SEAFDEC in the ASEAN countries have paved the way for the formulation of policies and strategies for sustainable fisheries development with the aim of ensuring food security. Specifically, the programs implemented by SEAFDEC in the ASEAN region through its Training Department in Thailand, Marine Fisheries Research Department in Singapore, Aquaculture Department in the Philippines, Marine Fishery Resources Development and Management Department in Malaysia, included: (1) Sustainable fisheries management; (2) Responsible fishing technologies and practices; (3) Responsible and sustainable aquaculture; (4) Safety and wholesome fishery products; (5) Fishing resources exploration and research; and (6) Resources conservation, management and enhancement.

Sustainable fisheries management

SEAFDEC has been implementing several regional projects and activities in the ASEAN region that include promoting the adoption of the global Code of Conduct for Responsible Fisheries (CCRF). This was achieved through the Regionalization of the CCRF to harmonize policies on sustainable fisheries in the region. The regionalization efforts were followed by the assessment of the implementation of the Regional Guidelines in the ASEAN to further enhance fisheries development and management.

Responsible fishing technologies and practices

Projects on improved fishing technologies to address the critical problems in the region's coastal fisheries have also been carried out by SEAFDEC, taking into consideration the fact that most coastal fishery resources in the region could be over-exploited due to high demand for fishery products and the modernization of fishing technology. Since the region's coastal fisheries are often confronted with conflicts in fishing operations over the decreasing fishery resources, selective fishing gears and practices including the use of by-catch reduction devices (BRDs), *e.g.* juvenile and trash fish excluder devices (JTEDs) have been promoted by SEAFDEC in the region's coastal areas.

Responsible and sustainable aquaculture

SEAFDEC also addresses the concerns brought about by the rapid growth of aquaculture in the region with the objective of making aquaculture a long-term strategy to the region's economic development considering that aquaculture has the great potentials to fill the gap between supply and demand for fish products. The aquaculture projects and activities have been dove-tailed to ensure that the region's aquaculture development should not only be technically feasible and economically viable but also environment-friendly and socially equitable.

Safety and wholesome fishery products

With the view of ensuring that the region's fisheries continue to significantly contribute to food security, SEAFDEC makes sure that post-harvest technologies are improved and the people's needs for safe and nutritious fish products are supplied. SEAFDEC therefore advances the production of safe and wholesome fish and fishery products for human consumption, by way of maximizing the utilization of fish catch and at the same time minimizing wastage of the fishery resources.

Fisheries resources exploration and research

SEAFDEC is always advocating for the fisheries sector in the region to continue playing the vital role of ensuring food security and improving economies, making it necessary to promote the conservation and rehabilitation of the region's fishing grounds and resources. The South China Sea for example, is one of the most important commercial fishery areas in the Southeast Asian region, and is abundant with commercially important pelagic fishes, which are straddling and shared by many countries in the region. This makes it difficult to manage the straddling stocks that led to overfishing and severe over-exploitation of the resources. SEAFDEC has therefore been promoting the sustainable management of the shared stocks at the sub-regional level, and at the same time exploring the offshore areas for commercial fisheries to expand their fishing grounds and developing the most appropriate fishing gears that could be effectively promoted in the offshore areas, taking into consideration the sustainability of the offshore resources.

Resources conservation, management and enhancement

It has been established that the region's fishery resources have generally shown certain levels of degradation. SEAFDEC therefore has been promoting the conservation and management of the fishery resources as options to attain increased fish production and comply with regional and international conservation measures. This resulted in the rectification of fisheries practices and policies in the region towards improved fisheries management. The gradual introduction of decentralized rights-based fisheries and co-management systems, regulation and control of fishing activities, protection and rehabilitation of important aquatic resources and their habitats, and resource and stock

enhancement, have already started to take shape in many countries in Southeast Asia.

Possible Scenario in 2020

The rapid growth of the world's population and the shifting paradigm in the world's food consumption pattern could lead to food insecurity in the future. The same situation could also add pressure to the natural resources and increase the dynamism and competitiveness of the multiple uses of water resources. In addition, the emerging issues such as climate change and the more stringent trade requirements by importing countries could result in the general livelihood crisis in fishing communities. Given the present state of the fishery resources, it might be difficult for fishers in the region to adapt and cope with such impending crisis. Therefore, it is only with improved governance that the fisheries sector in the region would be able to enhance its continued contribution to food security in the region.

Food insecurity

Statistics have shown that the world's total population in mid-2008 was 6,705 million of which the total population of the Southeast Asian countries accounted for about 9% or about 586 million (**Table 1**). It has also been projected that by mid-2025 or after more than 15 years, the world's population could reach about 8,000 million and that of Southeast Asia would be about 709 million (World Population Data Sheet, 2008). The people in the ASEAN region are fish-eating with the average consumption of fish in 1997 reported to be about 23.0 kg/capita/year (Delgado *et al.*, 2003). With a projected annual growth of 1.3% (**Table 2**), the consumption of fish in the region in 2008 could be about 26.5 kg/capita/year. This means that the region's demand for fish in 2008 was about 15.5 million metric tons.

Table 1. Total population of the world and Southeast Asia (in millions)

	Mid-2008	Mid-2025	Mid-2050	Projected Population Change: 2008-2050 (%)
Southeast Asia	586.0	709.0	826.0	41
Brunei Darussalam	0.4	0.5	0.6	67
Cambodia	14.7	20.6	30.5	108
Indonesia	239.9	291.9	343.1	43
Lao PDR	5.9	8.7	12.3	110
Malaysia	27.7	34.6	40.4	46
Myanmar	49.2	55.4	58.7	19
Philippines	90.5	120.2	150.1	66
Singapore	4.8	5.3	5.3	10
Thailand	66.1	70.2	68.9	4
Vietnam	86.2	100.1	112.8	31
World	6,705.0	8,000.0	9,352.00	39

Source: 2008 World Population Data Sheet, Population Reference Bureau, Washington, DC, USA

Table 2. Fish production vs. fish consumption

Production of wild fish for food (1973-1997* and 2008**), in million mt					
	1973	1985	1997	Annual Growth Rate, 1985-1997 (%)	2008
Southeast Asia	5.0	6.9	10.4	3.5	
World	44.5	56.3	64.5	1.1	
Production of fish from aquaculture (1973-1997* and 2008**), in million mt					
	1973	1985	1997	Annual Growth Rate, 1985-1997 (%)	2008
Southeast Asia	0.4	0.9	2.3	7.6	
World	3.1	8.0	28.6	11.2	
Total consumption of fish (kg/capita/year)					
	1973	1985	1997	Annual Growth Rate, 1985-1997 (%)	2008***
Southeast Asia	17.6	19.8	23.0	1.3	26.5
World	11.6	12.8	15.7	1.7	18.9

* Source: Delgado et al. (2003)

** Source: FAO FishStat Plus

*** Calculated

Table 3. Population, fish consumption, fish production and number of fishers: Southeast Asia

Countries	2008 Population* (millions)	Per capita fish consumption** (kg/person/year)	2008 Fish Production** (metric tons)	Estimated number of fishers**
Southeast Asia	586.0		26,817,145	
Brunei Darussalam	0.4	31.46	2,442	5,229
Cambodia	14.7	32.04	471,000	-
Indonesia	239.9	37.70	9,052,127	2,231,967
Lao PDR	5.9	24.86	145,687	99,617
Malaysia	27.7	63.30	1,753,310	140,358
Myanmar	49.2	64.40	3,168,630	3,201,923
Philippines	90.5	54.88	4,966,890	1,786,948
Singapore	4.8	-	5,141	122
Thailand	66.1	40.35	2,667,018	168,140
Vietnam	86.2	53.40	4,584,900	
World	6,705.0		159,089,695***	

* Source: 2008 World Population Data Sheet, Population Reference Bureau, Washington, DC, USA

** Source: Data collected from the ASEAN countries for the compilation of the Fishery Statistics of Southeast Asia by SEAFDEC

*** Source: FAO FishStat Plus

Considering the region's total fish production in 2008 which was about 26,817,145 metric tons (**Table 3**), only about 11.3 million metric tons would be bound for the international fish trade. In the ideal fish supply and demand situation, the world's consumption of fish in 2008 would be about 18.9 kg/capita/year, and the world's demand for fish in 2008 was about 126.7 million metric tons. This is notwithstanding the fact that since significant portion of the total fish catch goes into the fish meal industry, this is no longer available for human consumption. Specifically in the ASEAN region where aquaculture has developed so rapidly, the amount of fish catch transformed into aquafeeds could be significantly

enormous. Considering, therefore, the amount of fish catch being converted to fish meal and the fish food required for human consumption, at certain point in time, the fish supply may not be able to meet the demand, in which case food insecurity could occur.

Paradigm shift in food consumption

Man's dietary pattern could be influenced by many factors, e.g. economic (income, prices of food), cultural (beliefs, customs and traditions), social (individual preferences and health concerns), environmental (food availability).

Recently, a shift in the worldwide consumption pattern has been widely noted. Economically, the developed countries are now consuming more high value fish products than the developing countries due to the increased incomes of the people in developed countries. Socially and due to health concerns, more people around the world are now consuming more fish protein than other animal protein in view of the omega-3 contents in food fish. Omega-3 found in fish oils is known to prevent heart disease and maintain optimum blood pressure and cholesterol levels, making fish products more attractive for people who are conscious of their health conditions. This paradigm shift in food consumption is therefore expected to continue, and this implies the need for more supply of fish to meet the increasing demand.

Increased pressure to natural resources

The escalating demand for fish and the enhanced status of fish as high value food commodity for health reasons coupled with the persistent attitude of fishers to chase after the dwindling fishery resources would increase the pressure to the natural resources. In such situation, fishing operations would not only capture the commercial-sized fish but also the other small food fishes and juveniles of commercially important fishes that could be used as aquafeeds. Such irresponsible practices continue to deplete the natural resources up to the point of no recovery.

Complex dynamism and competitiveness of multiple water resource use

Many water bodies in the region, *i.e.* the inland and near-shore water bodies are now being used for fisheries and aquaculture to sustain food fish supply for the increasing demand of the growing population. However, the same water bodies are also being used for other purposes such as power generation, tourism, irrigation, urban and industrial water supply, and waste disposal. The wastes discharged from increased urbanization and massive tourism development carried through the waterways had been found to pollute the coastal waters and contribute to the further degradation of the natural resources. The competition for the various uses of the water resource becomes so complex that it could affect the sustainability of fisheries and could contribute to food insecurity in the future.

Climate change

Climate change has greatly affected the ASEAN region more than any other regions in the world. Increasing frequency and intensity of extreme weather occurrences with huge consequences has already been observed, *i.e.* flooding and seawater rises, change of water temperature and salinity,

change in aquatic species composition and distribution, coral bleaching, increasing occurrences of storms and cyclones. The region is one of the most vulnerable regions in the world, to climate change due to its long coastlines, high concentration of population and economic activity in coastal areas as well as the heavy reliance on fisheries. Climate change therefore affects the sustainability of fisheries and aquaculture in the ASEAN region.

More stringent trade requirements

During the past decade, the fisheries sector has seen some dramatic changes in terms of requirements to guarantee good quality of fish and fish products that are healthy and safe for human consumption. Recently, there had been increasing demand from consumers with regards to production of fish and the methods used in the manufacture of fish products. Now, producers are required to certify that all steps in the production line comply with the acceptable environmental standards. Added to these are the calls for combating IUU fisheries, adoption of the legally binding Port State Measures and the EU requirements for catch documentation. Considering that the trends and emerging requirements are aimed not only at ensuring quality and environmental sustainability but also certifying fair trade standards as well as social and labor standards, compliance by the countries of such requirements should be promoted for the benefit of the region's fisheries industry.

Governance in fisheries

There is a need to appropriately address the deteriorating state of the fishery resources and the emerging fisheries-related issues in order to achieve sustainable fisheries development and food security. The involvement of government agencies in solving such problems is very crucial. Considering that fishery resources are common resources that belong to nobody, government agencies must accept the custodianship authority over such resources including management responsibilities. This would imply improving governance in fisheries in order to aggressively address overfishing and resource degradation in the region. The participation of the communities in fisheries management should also be enhanced for the effective accountability of the resources by the users.

Way Forward

The world's ever increasing population would need additional amounts of food fish for their nutritional requirements. Such recognized need could not be addressed if the fishery resources keep on declining. In consideration of such conditions, it would be necessary to maintain a

resources-based equilibrium with fish demand on one side and fish supply on the other. This means balancing conservation and exploitation of the resources, to satisfy the demand and at the same time sustain the supply.

As an unlimited gift of nature, fishery resources should be considered as food bank for the future generations. Since the fishery resources had been earning interests in terms of the harvestable aquatic species, it should be left to flourish and allowed to continue providing mankind with great benefits. While before, it has always been a common perception that fishery resources are renewable, such scenario had already changed. Now, the fishery resources have been viewed as no longer infinite. Thus, there is a need to properly manage the fishery resources as food bank in order to ensure their sustainable contribution to food security for the future generations. However, since fisheries continue to become a market-driven sector, it is feared that the resources could no longer sustain the rapid and uncontrolled exploitation unless proper management is put in place.

Additionally, for the promotion of sustainable fisheries management, the other aspect on the need to enhance the incomes of fishers should also be addressed to maintain the resources-based equilibrium. This could be achieved through the promotion of sustainable use of the fishery resources that the fishers always depended on for their subsistence. In this connection, SEAFDEC would advance the concept of “limited access regimes” through the promotion of rights-based fisheries to facilitate the management of fishing capacity as well as on the adoption of responsible fishing gear and practices. Implementation of resources-based activities, which deal greatly with the practice of responsible fisheries coupled with interventions such as enhancement of the habitats, would be intensified in order to improve fisheries production and food security. SEAFDEC would also continue to work towards striking the balance between improving the health of the ecosystems and satisfying the essentials for the existence of human beings. Projects relevant to alternative livelihood promotion as well as habitat rehabilitation and conservation through responsible fisheries operations had been pursued under the framework of the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region which was adopted in 2001. For the next decade, SEAFDEC would continue to strive for attaining food security in the region in the midst of the new and emerging concerns that threaten the sustainability of fisheries.

Moreover, various approaches have been fostered and adopted by the ASEAN countries to promote sustainable fisheries management for food security. As a matter of fact, measures have been advanced by the countries in the

region to enhance their fishery resources which include the deployment of artificial reefs, installation of fish aggregating devices as well as fish enhancing devices, promotion of stock enhancement, and development of fish refugias and marine protected areas. Specifically, the creation of fish refugias has been recognized as a strategy in areas where the natural refuges no longer exist.

In a broader sense, SEAFDEC would continue to intensify its activities in the ASEAN countries in order to maintain the resources-based equilibrium in the region. With much optimism that once the supply and demand for food fish is well-balanced, SEAFDEC strongly believes that fisheries would be one sector that could also take care of food security for the region’s future generations.

Fish for the People 2020 Conference

After more than a decade of intensified collaboration between SEAFDEC and the ASEAN, significant progress has been attained by the ASEAN countries in promoting sustainable fisheries and in improving the people’s livelihood for food security. The existing fisheries collaborative mechanism is being advanced for long-term sustainability and food security. In order to sustain such momentum, the ASEAN and SEAFDEC planned to organize the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 in June 2011. Dubbed as Fish for the People 2020, the Conference is envisaged to pave the way for the development of ways and means of addressing the issues that would possibly impede the efforts of SEAFDEC and the ASEAN towards maximizing the contribution of responsible fisheries to food security.

The discussions during the Conference would aim to address the concerns that had emerged and could emerge during the next decade. As envisaged, such issues to could include: (1) Enhancing governance in fishery management; (2) Sustainable aquaculture development; (3) Ecosystem considerations: Managing the relationship between fisheries and the environment; (4) Post-harvest and safety of fish and fisheries products; (5) Emerging requirements for trade of 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.

The changing global economic scenario and the deteriorating state of the region’s fishery resources during the past decade necessitated SEAFDEC and the ASEAN to assess the progress and achievements in the implementation of programs in the ASEAN region under the framework of the

2001 Resolution and Plan of Action as well as to develop the next decade regional direction. The Fish for the People 2020 Conference is therefore intended to come up with the new Decade “Resolution” and “Plan of Action” on Sustainable Fisheries for Food Security in the ASEAN Region (Towards 2020) to be used as renewed policy principles in achieving sustainable fisheries for food security in the coming decades.

References

Delgado, Christopher L., Nikolas Wada, Mark W. Rosegrant, Siet Meijer, and Mahfuzuddin Ahmed. 2003. Outlook for Fish to 2020: Meeting Global Demand. International Food Policy Research Institute and WorldFish Center, Penang, Malaysia; 30 p

Kato, Yasuhisa. 2008. Considerations for mitigating poverty in rural communities of Southeast Asia through fisheries interventions. *In: Fish for the People Volume 6 Number 3: 2008*. Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp 4-10

SEAFDEC. 2000. Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fishing Operations. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 71 p

SEAFDEC. 2001. Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 7 p

SEAFDEC. 2003. Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fisheries Management. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 69 p

SEAFDEC. 2005. Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fishing Aquaculture (2nd ed). Southeast Asian Fisheries Development Center, Bangkok, Thailand; 42 p

SEAFDEC. 2005. Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Post-harvest Practices and Trade. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 58 p

SEAFDEC. 2006. Regional Guidelines for Responsible Fisheries in Southeast Asia: Supplementary Guidelines on Co-management using Group User Rights, Fishery Statistics, Indicators, and Fisheries Refugia. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 84 p

World Population Data Sheet. 2008. Population Reference Bureau, Washington, DC, USA

About the Author

Dr. Chumnarn Pongsri is the Secretary-General of SEAFDEC and concurrently the Chief of SEAFDEC Training Department. For more information contact: sg@seafdec.org.



Advancing the Promotion of FOVOP in the ASEAN Region: *Issues and Challenges for Future Cooperation*

Pouchamarn Wongsanga and Suriyan Vichitlekarn

This Policy Brief which was developed during the Second Regional Technical Consultation on the Promotion of “One Village, One Fisheries Product (FOVOP)” in the ASEAN Region held in Chiang Mai, Thailand on 22-26 March 2010, is intended to be used as reference for relevant planning and policy development in the fisheries sector of the ASEAN countries. As envisaged, this Policy Brief is also intended to strengthen the capability of SEAFDEC in promoting the need for improved livelihood in the fishing communities and for the sustainable development of the fishing industry in the ASEAN region.

Micro, small and medium enterprises (MSMEs) form the backbone of the economy in the ASEAN countries, and are the largest source of the people’s livelihoods and domestic employment across all economic sectors including fisheries. Through the MSMEs, the women and youth could be provided with opportunities to participate in the economic development activities of the countries in order to contribute to the improvement of the region’s economies. Considering that a robust, dynamic and efficient MSME could ensure sustainable social and economic development, the promotion of competitive and innovative MSMEs is critical in boosting greater economic growth of the ASEAN region.

The over-exploitation and decline of aquatic resources coupled with the lack of alternative and/or supplementary livelihoods in the fishing communities have constrained the sustainable development of fisheries in the ASEAN region, trapping the fishing communities in the never-ending cycle of rural poverty. Many countries have exerted efforts in exploring ways and approaches to minimize further deterioration of the economic conditions of their respective fishing communities. Activating and improving rural economy with the view of improving the fishers’ livelihoods, alleviating poverty and contributing to the overall sustainable socio-economic development, had been the most common approach pursued by the countries. However, the fisheries MSME sector, particularly the subsistent and marginal as well as the self-sufficient and small surplus sub-sectors, is being confronted with wide-ranging issues and challenges. These include the limited access to technology, micro-credit and local financial services as well as to domestic markets. The insufficient entrepreneurial spirit and managerial skills, compounded by the scarcity of information, restrained

compliance to standards and certification, and the absence of an environment conducive to various business ventures, have also complicated the situation of the fishers. Such scenario continues to ensnare the fishing communities in the rural poverty cycle with almost no possible way of getting out.

The ASEAN Member Countries in collaboration with SEAFDEC and the ASEAN Secretariat with funding support from the ASEAN Foundation through the Japan-ASEAN Solidarity Fund, had initiated and implemented the Project on the Promotion of “One Village, One Fisheries Product (FOVOP)” System to Improve the Livelihood of the Fisheries Communities in the ASEAN Region (2007-2010). The 30-month Project introduced and adapted the “One Village, One Product (OVOP)” concept which originated from Oita Prefecture in Japan, under the context of the ASEAN region’s fisheries scenario (Wongsanga and Sulit, 2010). Through the experiences and lessons learnt from the Project as well as other on-going OVOP-like initiatives in the ASEAN region, FOVOP has been identified as a potential approach which could contribute to the region’s efforts in providing alternative and supplementary livelihoods to fishers and their communities through enhanced rural economy and abated poverty (Kato, 2006). Thus through FOVOP, the fishers and their communities would be empowered in order to be actively engaged in long-term fisheries development and management processes. Moreover, the cooperation of the key supporting agencies is crucial in further promoting the FOVOP approach in the ASEAN region.



Promotion of FOVOP in the ASEAN Region

The results of the case studies which were conducted from April 2009 until January 2010 under the FOVOP Project included the confirmed localized and unique potential products as well as the potential post-project activities as means that could provide alternative and supplementary livelihoods to fishing communities. In addition, the issue on gender and development had been embedded in the various Project activities. All these factors had facilitated the development of the regional guidelines for the promotion of FOVOP in the ASEAN (SEAFDEC, 2010), **Box 1**.

Contribution of FOVOP to Sustainable Fisheries and Rural Economy

As envisaged, the approach developed by SEAFDEC under the FOVOP Project could be used by government agencies in providing the enabling support for the rural fishing communities in adopting ways and means to address sustainable fisheries development, thereby alleviating poverty in the process. With the FOVOP initiative focusing on the small-scale fishers, promoting such initiatives could be conducted through: (1) the implementation of FOVOP

as part of national packages of sustainable fisheries management and poverty alleviation programs; (2) the promotion of FOVOP based on the Regional Guidelines for Responsible Fisheries in the Southeast Asian Region; and (3) the promotion of habitats, biodiversity, and environmental conservation, specifically through the following six approaches:

Policy Framework and Enabling Support

An appropriate national policy framework for the promotion of FOVOP is necessary as an important initial step towards the successful adoption of the FOVOP initiative. Such policy framework should be formulated and strengthened as part of the national poverty alleviation policy and programs as well as that of national fisheries development framework. The responsible institutions to be involved and the delegation of the functions and responsibilities from the national to local levels should also be clarified under the respective national policy framework.

Moreover, the target beneficiaries for the promotion of FOVOP should also be specified. While noting that most ASEAN countries have in place national policies and

Box 1: The Regional Guidelines for the Promotion of FOVOP in the ASEAN Region

The Regional Guidelines for the Promotion of FOVOP in the ASEAN Region has the overall objective of providing a common framework for the countries in the region in promoting the FOVOP approach and subsequently promoting cooperation between SEAFDEC and the ASEAN countries. In addition, the Regional Guidelines could also be used by concerned government agencies in providing the enabling support for the rural people to adopt the FOVOP approach in their respective communities.

Structure, Purpose and Potential Usage of the Regional Guidelines

The Regional Guidelines is also envisaged to substantiate the national efforts of addressing the issues related to poverty alleviation and food security. Relevant provisions in the Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fisheries Management; and Responsible Post-harvest Practices and Trade, have also been elaborated on, given focus and form part in the corresponding sub-articles of the FOVOP Regional Guidelines.



The Guidelines consist of 12 sections:

- I. Objectives
- II. Target Beneficiaries
- III. General Principles
- IV. Policy and Institutional Framework
- V. Prioritization of the FOVOP Communities and their Products and Services
- VI. Institutional Building and Group Organization
- VII. Products and Services Development and Improvement
- VIII. Credit and Financial Services and Facilities
- IX. Marketing Development and Products and Services Promotion
- X. Human Resources and Entrepreneurial Capacity Development
- XI. Collaboration among ASEAN Countries and Regional/International Organizations
- XII. Follow-up Actions to Promote the Implementation of the Regional Guidelines

Based on the outcomes of the pilot processes in the ASEAN Countries, it could be gleaned that the readiness and enabling environment of the countries in the region to facilitate the creation, development and promotion of FOVOP, varied to certain extent. These have been specifically observed in the available relevant government policies, administrative structures, existing institutions and available human resources, technical and financial support, among others. However, considering the nature of the Regional Guidelines that contain generalized issues in broader contexts rather than on specific national situation, in the actual application of the Guidelines, appropriate adjustments could be made as deemed necessary in order to fit into the national or local specifics in terms of geo-political, social, economic and legal situations.

programs supporting MSME development including those in the fisheries sector, the target beneficiaries should be the small-scale fishers specifically from the fishing households and family units pursuing various economic activities. Promotion of the FOVOP initiative should therefore be anchored on such target beneficiaries to ensure that their interests and commitments as well as sense of ownership are directed while the policy and enabling support provided by the government is enhanced through the consultative processes.

Since enabling policy support is essential to foster the implementation of any FOVOP initiative, such policy support could include the integration of FOVOP into the value-chain and market systems, micro-credit and financial services, regulatory and control on product/service standards and certifications, education and capacity building on various aspects that are relevant to the FOVOP implementation, and public investment in products/services research and development. Inter-agency coordination among the fisheries line agencies and agencies working in support of rural development and poverty alleviation at various levels should also be established and/or enhanced and promoted.

Institutional Building with Emphasis on Women's Groups and the Youth

Institutional set-up of fishers' groups or organizations is an important social process of the FOVOP initiative, where women's groups and the youth should be encouraged to take part in the process. Local mechanisms to strengthen the capability of the institutions in sustaining the FOVOP initiative should also be ensured. Regular conduct of capacity building activities, including visits and exchange programs on various aspects such as technology development and innovations, management skills as well as basic accounting and bookkeeping, among others, could certainly help in the promotion of FOVOP.

Product Development and Improvement with Emphasis on Value-added Products/Services

FOVOP works well when the products/services are identified and prioritized based on uniqueness, comparative advantages of the communities as well as products/services marketability. Consideration should be made on the sources and supply of raw materials, marketability of products/services as well as on product quality and safety standards and assurance, packaging and labeling. The need to develop the national guidelines and supporting systems could aptly support these requirements.

Credit and Financial Services and Facilities

As the development and implementation of FOVOP requires certain amount of capital and investment costs, the possibility of establishing micro-credit and financial services and facilities should be explored. These could include among others the establishment of community or group savings to serve as accessible source of investments and also as source of counterpart funds or as form of collateral for soft loans with commercial banks or as counterpart funds for grants or financial assistance from governments, non-government and international organizations, co-funding source among the existing groups, organizations or associations to strengthen the financial status and position of the communities in order to be able to obtain as groups, grants such as soft loans and other forms of financial assistance.

Marketing Development and Products/Services Promotion

A system of marketing and distributing the products/services should be built-in the FOVOP initiative to support easy access to domestic markets and local value-chain. Market support systems could be linked to the existing national MSME marketing campaigns. Finally, capacity building for fishers and fishers' institutions should be conducted to enable them gain access to the markets.

Human Resources and Entrepreneurial Capacity Development

Capacity building for the target beneficiaries should be established to support the FOVOP initiative. Such development activities should, among others, include products/services development, management skills for FOVOP development, rural leadership, which could be carried out through training, exchanging of experiences and networking.

Way Forward for Future Cooperation

The Regional Guidelines on the Promotion of FOVOP in the ASEAN Region (SEAFDEC, 2010) could be used as regional reference in the national implementation of the FOVOP initiative as well as in planning for regional supporting programs. In order to promote the adoption of the FOVOP approach in the ASEAN region, the ASEAN member countries should investigate the applicability of the Regional Guidelines and be responsible for the implementation of the Regional Guidelines. Where appropriate, the ASEAN countries could make the necessary adjustments in the Regional Guidelines that fit the nature and requirements as well as the locality and specificity of their respective countries. In summary, the promotion

of “One Village, One Fisheries Product (FOVOP)” in the ASEAN Region could be undertaken through the following strategies:

1. Raising awareness and understanding on the FOVOP initiative on the part of the policy-makers of the ASEAN (*i.e.* the ASEAN Sectoral Working Groups – Fisheries, Agricultural Cooperatives, MSMEs Development) and the SEAFDEC Council to obtain their support and ensure that the ASEAN countries implement the Regional Guidelines in their respective localities, and promote the adoption of the FOVOP approach in the region;
2. Mainstreaming the FOVOP initiative into the regional policy and cooperation framework. Regional cooperation among the ASEAN countries and international/regional organizations could foster the future development of the FOVOP initiatives in the region. Specifically, mainstreaming FOVOP as an approach supporting development and integration of the fisheries sector as part of the ASEAN Community building process could be considered; and
3. Formulating the regional supporting program similar to the FOVOP movement for future promotion and implementation could be facilitated with possible support from the ASEAN and its dialogue partners.

Proposed Inputs for the ASEAN-SEAFDEC “Fish for the People 2020” Conference

Considering that the ASEAN and SEAFDEC would organize the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020: “Fish for the People 2020” in June 2011, and since the issue and concern on poverty alleviation would be discussed during the said Conference, it is therefore proposed that the FOVOP approach be included in the new decade Resolution and Plan of Action that would be adopted during the Conference (**Box 2**).

Supporting References

- ASEAN Economic Community (AEC) Blueprint (A6. Priority Integration Sectors, A7. Food, Agriculture and Forestry, and C1. SME Development)
- ASEAN Policy Blueprint for SME Development (APBSD) (2004-2014)
- ASEAN Strategic Action Plan for SME Development (2010-2015)
- ASEAN Strategic Plan of Action for Food, Agriculture and Forestry (2006-2010)
- Pouchamarn Wongsanga and Virgilia T. Sulit. 2010. One Village, One Fisheries Product – for Food Security and Poverty Alleviation. *In: Fish for the People*, Vol. 8 No. 1 (2010). Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp. 4-7

Box 2: Proposed Inputs for the “Fish for the People 2020” Conference in June 2011

Inputs for the Resolution

- “Providing alternative/supplementary livelihoods to fishers and their communities through enhanced rural economy, alleviating poverty, and empowering fishers to be actively engaged in long-term fisheries development and management processes by mobilizing the “One Village, One Fisheries Product (FOVOP) approach”.

Inputs for the Plan of Action

- Mainstreaming FOVOP initiative into national poverty alleviation program
- Mainstreaming FOVOP initiative into national fisheries policy and strategy for implementation in the ASEAN Countries
- Mainstreaming FOVOP initiative into regional policy and cooperation framework
- Developing Regional Support Program to support the promotion of FOVOP in the ASEAN Region.

Inputs for the Regional Program Supporting the Implementation of the New Resolution and Plan of Action

The following are the priority areas of activity necessary to support the implementation of the new Resolution and Plan of Action:

- Awareness and capacity building, and networking with relevant stakeholders and target beneficiaries within and among countries as well as between countries and international/regional organizations by exploring the establishment of sharing mechanisms in terms of expertise, experience and lessons learned to ensure the success in the promotion and implementation of FOVOP in the ASEAN Region.
- Monitoring the progress of the FOVOP promotion and implementation in respective ASEAN countries through coordination and collaboration among the networking partners at national and regional levels.
- Facilitating the development of Supplementary Guidelines on specific areas/issues that require substantive direction and guidance for the promotion and implementation of FOVOP in the ASEAN Region.

SEAFDEC. 2010. Regional Guidelines for the Promotion of “One Village, One Fisheries Product (FOVOP)” in the ASEAN Region. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 31 p

Yasuhisa Kato. 2006. One Village, One Fisheries Product (FOVOP): Seeking “Only One, not Number One”. *In: Fish for the People*, Vol. 4 No. 2 (2006). Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp. 2-7

About the Authors

Ms. Pouchamarn Wongsanga is the Information Program Coordinator of SEAFDEC based at the SEAFDEC Secretariat in Bangkok, Thailand. She is also the Manager of the ASEAN Foundation-funded Project on the Promotion of “One Village, One Fisheries Product (FOVOP)” in the ASEAN Region.

Mr. Suriyan Vichitlekarn is Assistant Director and Head of Agriculture Industries and Natural Resources Division of the ASEAN Secretariat in Jakarta, Indonesia.

Fisheries *Refugia* and Marine Protected Areas: Can they help sustain the contribution of fisheries towards food security in Southeast Asia?

John C. Pernetta, Christopher J. Paterson and Somboon Siriraksophon

Originally prepared for the SEAFDEC Regional Advisory Committee for Fisheries Management in Southeast Asia (RAC) in support of the continuing activities of the regional fisheries *refugia* initiative, this article compares and contrasts the concepts of fisheries *refugia* and marine protected areas. Specifically, the potential benefits to fisheries associated with the use of both management tools in the Southeast Asian region, are also evaluated.

Fish stocks in the South China Sea and Gulf of Thailand are subject to high levels of fishing effort, such that stocks of most economically important species are considered to be fully fished or overexploited. The increasing global demand for fisheries products and the dependence of coastal communities on fish for food and income result in continued increase in fishing effort, which led to “fishing down the marine food chain” and the growing dependence on small pelagic stocks due to the decline in demersal species. It is the declining fishery resources that drove the fishers to use destructive fishing methods in order to maintain fish catch and increase incomes in the short-term. Many reports have suggested that the trends of production from capture fisheries would decline over the coming years unless total fishing effort and capacity are reduced. However, an obvious problem in the reduction of fishing capacity continues to persist since most fisheries in the Southeast Asian region are small-scale with the majority of the fishers being highly dependent on fisheries for income, food and well-being (Paterson *et al.*, 2006).

Moreover, while actions aimed at reducing the rate of loss of coastal habitats that are significant to fisheries have been implemented by the countries bordering the South China Sea, the decadal rates of loss of such habitats reported by UNEP (2007) remain high, *e.g.* seagrass beds (30%), mangroves (16%), and coral reefs (16%). The increasing levels of fishing effort coupled with continued decline in the total area of habitats critical to the life cycles of most aquatic species, have therefore raised serious concerns for the long-term sustainability of small-scale fisheries in the region.

With fish production being intrinsically linked to the quality and expanse of habitats, and recognizing the heightened dependence of coastal communities on fish

for food and income, emphasis over the past decade has been placed on the need to improve the integration of fish habitat considerations and fisheries management. As a matter of fact, the need for integrated fisheries and habitat management received high-level international recognition during the 2001 Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem and the 2002 World Summit on Sustainable Development. Additionally, such need had also been emphasized in the FAO Technical Guidelines for Responsible Fisheries (FAO, 1995) dealing specifically with the ecosystem approach to fisheries, and the Regional Guidelines for Responsible Fisheries in Southeast Asia (SEAFDEC, 2003 and 2006). The dilemma for the fisheries and environment sectors is that conservation of habitat does not necessarily result in increased fish stocks while lowering the fishing effort does not necessarily result in improved habitat conditions. Given the complexity of the key threats to fish stocks, fish habitats, and associated biodiversity in Southeast Asia, it is becoming increasingly important for fisheries and environment departments in the region to ensure that adequate cross sectoral consultation and coordination are in place, particularly in terms of the identification and designation of priority areas for fisheries and habitat management.

Marine Protected Areas

The term Marine Protected Area (MPA) is widely used around the world and consequently its meaning in any one country or region may be quite different from that of the others. There are many terms related to MPA, *i.e.* SPA (Specially Protected Area), SCA (Special Conservation Area), MCZ (Marine Conservation Zones - a type of MPA in English waters), MR (Marine Reserve), MP (Marine Park), NTZ (No Take Zone) or closed area in fisheries management, or ASCC (Area of Special Conservation Concern). Each of these terms has specific types of restrictions associated with them as defined by the laws of the countries concerned. In the international arena, there has been the development of a comparable plethora of concepts including “Particularly Sensitive Sea Areas” and Special Areas. For example, the World Summit on Sustainable Development in 2002 called for “*the establishment of marine protected areas consistent with international laws and based on scientific information, including representative networks by 2012*”, while the

Durban Action Plan developed in 2003, called for regional actions and targets to establish a network of protected areas by 2010 within the jurisdiction of regional environmental protocols. This Action Plan recommended the establishment of protected areas for 20 to 30% of the world's oceans by the goal date of 2012.

On the other hand, the Convention on Biological Diversity recommended that nations should set up marine parks that are controlled by a national central organization before integrating them into regional systems. In this connection, Decision VII/28 of the UN laid out the following deadlines:

- By 2006: complete area system gap analysis at national and regional levels.
- By 2008: take action to address the under-represented marine ecosystems in existing national and regional systems of protected areas, taking into account marine ecosystems beyond areas of national jurisdiction in accordance with applicable international laws.
- By 2009: designate the protected areas identified through the gap analysis.
- By 2012: complete the establishment of comprehensive and ecologically representative national and regional systems of Marine Protected Areas.

Later, the UN also endorsed Decision VII/15 in 2006 that called for *“Effective conservation of 10% of each of the world’s ecological regions by 2010”*.

A common point of concern is over terminology. What exactly is a Marine Protected Area? One general definition indicated that it is a marine area that meets the definition of a “Protected Area” as initially defined by the World Conservation Union (IUCN, International Union for the Conservation of Nature) (**Box 1**).

Therefore, the term “Marine Protected Area” can cover generically any area that meets the IUCN’s definition, regardless of shape, size, purposes and management approaches. Due to the diverse terminology and confusion surrounding the term MPA, the World Conservation Monitoring Centre produced in 1994 a table of six categories of MPAs that was endorsed in 2004 by the United Nations Framework Convention on Climate Change (**Box 2**).

Hence, these definitions and their implicit purposes suggest that the over-riding goal of MPAs is to protect and maintain biological diversity and the ecosystem processes that result in the provision of ecological services and the dynamic stability of natural systems. The emphasis of all these definitions is on “protection” rather than “sustainable use” which is unfortunate in the light of the emphasis on sustainable use as indicated in the outcomes of the World Summit on Sustainable Development in 2002. Another

Box 1: Definitions of Marine Protected Area

The International Union for the Conservation of Nature or IUCN defined MPA as: *A clearly defined geographical space, recognized, dedicated, and managed, through legal or effective means, to achieve the long-term conservation of nature with associated ecosystem service and cultural value.*

The Convention on Biological Diversity, meanwhile, has adopted a slightly different definition of MPA as: *A geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives.*

Both of these definitions require that the site must be set aside principally for conservation in order to be designated a Marine Protected Area. More specifically, the World Conservation Union also went further and defined a **Marine Protected Area** as: *Any area of intertidal or sub-tidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all enclosed environment.*

The Convention on Biological Diversity attempted to solve the definitional problems of a marine protected area that include adjacent land by defining the broader term of **“Marine and Coastal Protected Area”** (MCPA, for short) as being: *Any defined area within or adjacent to the marine environment, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by legislation or other effective means, including customs, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings.*

Box 2: MPA Categories of the World Conservation Monitoring Centre

Category	Created mainly for:
I	Scientific purposes or as a strict nature reserve; wilderness protection
II	Ecosystem protection and recreation (often National Park)
III	Conservation of specific natural features (often National Monument)
IV	Conservation through close management and monitoring of species
V	Landscape/seascape conservation and recreation (no protection assigned)
VI	Sustainable use of natural ecosystem

further difficulty could arise if most fishing communities and local fisheries officers continue to widely understand MPAs as areas that are closed to fishing. In addressing this concern, the Marine Protected Areas Sustainable Fisheries Programme of the Marine Programme of the IUCN World Commission on Protected Areas was developed. Focusing on the Southeast Asian region, the Programme aims to encourage the establishment of regional action plans for identifying, establishing, and networking no-take

ecological reserves and facilitating access to funding for these activities.

Additionally, the Programme also serves as guide for fisheries managers in Southeast Asia on the promotion and enhancing of regional and national-level no-take activities to replenish fish stocks, and preservation of marine biodiversity¹. Experience in the region suggests that attempting to completely close areas to fishing is not only difficult but is a futile task. The Philippines for example, attempted to promote the use of no-take areas in fisheries or fish sanctuaries. However, due to problems with compliance and community acceptance in a number of areas, the term “fish sanctuary” had to be redefined putting emphasis on sustainable use rather than on prohibition. Section 32 of the Philippine Fisheries Code therefore defined a fish sanctuary as “*a protected water area where fish are able to spawn, feed and grow undisturbed and where fishing and other activities are absolutely prohibited*”. This example presents the importance of focusing on the concepts of sustainable use and fishery-critical habitat linkages in communicating with government officials and coastal communities in Southeast Asia about spatial fisheries management tools, because these are more easily understood at the fishery level than the science of no-take areas and the concept of biodiversity and its conservation.

It is also worth noting that in the 1960s and 70s, there was a clear distinction between establishing marine parks and protected areas for the protection of biodiversity and establishing fisheries management areas to protect fish stocks. This distinction became blurred recently when the benefits of MPAs were presented both in terms of biodiversity protection and potential enhanced fish catch outside the MPAs. This was complicated further when an objective review of the various MPA definitions suggested that the entire Exclusive Economic Zones (EEZs) of Southeast Asian countries are technically MPAs, because fishing in the EEZs is restricted through conventional and long-standing fisheries management measures.

Benefits of MPAs to Fisheries

In order to achieve the maximum benefits, selection of areas as MPAs must give adequate consideration to the links between specific locations and the life-cycle of important species. Currently, these linkages are not given adequate consideration in the selection of sites for MPA systems, despite the promotion of these systems on the basis of their purported benefits. It is unfortunate that the establishment of MPAs always emphasize on the benefits to the fisheries

of such areas. In reality, traditionally established MPAs are frequently associated with increased abundance, biomass and sizes of both focal and other species **within the no-take areas of an MPA**. It is debatable however, whether such systems as currently designed, actually result in any economic benefits from increased fish capture outside the area. At least in the short-term, the reverse tends to be the case, because the catch per unit of effort declines due to the increased effort of the fishers who had been displaced due to the establishment of the MPA.

In addition, it has been recognized that the establishment of an MPA can enhance catch per unit effort (CPUE) in adjacent areas through the export of juveniles and adults (Yamasaki and Kawahara, 1990; Russ and Alcalal, 1996; Roberts *et al.*, 2001). However, regional examples of increased abundance and catch of fish adjacent to MPAs following their establishment, are few and far between. The Nha Trang Marine Reserve in Vietnam, for example has shown little evidence of benefits either to fish stocks or to fishing communities outside the protected area. While it is indisputable that biomass in strictly enforced no-take MPAs may increase over time, but with limited information available it may be unwise to anticipate increased production across the entire geographic range of the fisheries as a result of the establishment of such areas. It is important to note that in effect, the displaced fishers may intensify their fishing efforts in areas adjacent to the MPAs following their establishment, and that this often results in a decline in the CPUE.

Hilburn *et al.* (2006) noted that MPA establishment is expected to increase yields when fishing effort cannot be controlled and stocks would otherwise be overfished but is unlikely to improve yields in lightly fished fisheries, and reduce inter-annual variability in catch in the face of stochastic events such as recruitment failure and make fisheries less sensitive to uncertainty in fishing mortalities. However, the effect of MPAs on enhanced yields could be a reflection of the movement of adult fish species that have high rates of movement and require greater reserve areas than those with low rates of movement. Conversely, species with low rates of movement rarely move outside the reserve and consequently the MPA cannot contribute to increased fisheries catch.

Hilburn *et al.* (2006) also attempted to demonstrate by modelling the effect of an MPA which is designated either within a regulated, single species fishery with a defined Total Allowable Catch (TAC) based on Maximum Sustainable Yield (MSY), the outcome of which was a decrease in catch. The results of the modelling showed that in a poorly regulated fishery where the stock is over-harvested

¹ <http://www.iucn.org/themes/wcpa/biome/marine/programme.htm>

and heading towards extinction, the establishment of an MPA can result in increased fish abundance and catch.

However, in such cases **the catch and abundance will be much lower than in a well regulated fishery** where harvest level is maintained at MSY. If an MPA is established within a well regulated fishery then the overall effects will be a slightly lower catch and lower abundance. Such outcomes suggest that simply establishing an MPA without consideration of the ecology and population characteristics, particularly the adult dispersal rates of the target species, is likely to be ineffective in enhancing the fish catch. Consequently, in small-scale fisheries such as those targeting the demersal stocks of the Southeast Asian waters, the establishment of MPAs is unlikely to receive support from the fishing communities.

Natural Refugia and Fisheries Refugia

Pauly (1997) suggested that even very low rates of fishing mortality may be unsustainable in long-lived demersal stocks unless a sizable fraction of the spawning adults are made completely inaccessible to fishing activities owing to some natural refuge (underwater canyons, large boulders, etc.). Such contention was based on the fact that many



Provincial fisheries and border army officers working at-sea with fishers and staff of Kien Giang's Department of Environment to map fisheries *refugia* at the Phu Quoc Archipelago in Viet Nam (Photo by Christopher Paterson)



Surveying distributions of fisheries habitats off the coast of Ham Ninh Commune, Phu Quoc Archipelago (Photo by Christopher Paterson)

demersal species in temperate waters and large predators on coral reefs are long-lived with natural mortalities of 0.1-0.2 year⁻¹, implying that sustainable fishing could not extract more than about 10% of the stock biomass per year. However, he also explained that such exploitation rates quickly remove the accumulations of large and old females that are the source of most eggs and subsequent recruitment to stocks of long-lived fishes. In addition, he also suggested that the relationship between fish size and fecundity is highly non-linear with large females being far more fecund than an equivalent weight of small individuals. As an example, he cited the case of the red snapper (*Lutjanus campechanus*) in which a single female (61 cm and 12.5 kg) contained the same number of eggs (9,300,000) as 212 females (42 cm and 1.1 kg each).

As fishing technology has developed and the size of fishing fleets has increased, the extent of natural *refugia* for fish stocks has declined, particularly in Southeast Asia where destructive fishing practices such as trawling and push netting have seriously disturbed large areas of soft bottom habitats. On the other hand, the degradation and loss of coastal habitats such as mangrove forests, as a consequence of coastal infrastructure development, have dramatically reduced the expanse of habitats that have important nursery functions for commercial and subsistence species.

Box 3: Definition of Fisheries Refugia

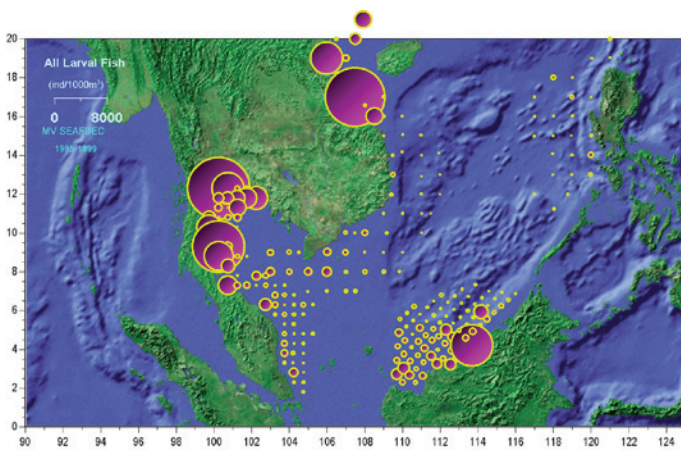
"Spatially and geographically defined, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical stages of their life cycle, for their sustainable use."

Thus, fisheries *refugia* should:

- not be simply "no-take zones"
- have the objective of sustainable use for the benefit of present and future generations
- provide for some areas within refugia to be closed due to their critical importance [essential contribution] to the life cycle of a species or group of species
- focus on areas of critical importance in the life cycle of fished species, including spawning, and nursery grounds, or areas of habitat required for the maintenance of broodstock
- have different characteristics according to their purposes and the species or species groups for which they are established and within which different management measures will apply
- have management plans

Management measures that may be applied within fisheries *refugia* may be drawn from the following [non-exhaustive] list of classical fisheries management actions:

- exclusion of a fishing method (e.g. light luring, purse seine fishing)
- restricted gears (e.g. mesh size)
- prohibited gears (e.g. push nets, demersal trawls)
- vessel size/engine capacity
- seasonal closures during critical periods of fish life cycles
- seasonal restrictions (e.g. use of specific gear that may trap larvae)
- limited access and use of rights-based approaches in small-scale fisheries



Distribution and abundance of fish larvae (all species combined) in the South China Sea and Gulf of Thailand during the post-northeast monsoon periods from 1996 to 2000 (Illustration by Dr. Somboon Siriraksophon)

Against this background of widespread over-exploitation of fish stocks in the Gulf of Thailand and South China Sea as well as the lack of sound empirical evidence for the value of MPAs in enhancing fish stocks and catch in the region, the UNEP/GEF project on “*Reversing environmental degradation trends in the South China Sea and Gulf of Thailand*” through the Regional Working Group on Fisheries (RWG-F) developed the initial concept of fisheries *refugia* (Box 3). Over the period from 2002 to 2008 in collaboration with SEAFDEC and its Member Countries, the Project refined this concept and further developed a framework for the establishment and operation of a regional system of fisheries *refugia*, targeting priority transboundary, demersal fish and non-fish resources (UNEP, 2007).

This concept focuses on sustainable use and clearly states that *refugia* will not simply be no-use areas, *refugia* cannot be substituted for permanent closures or no-take MPAs and *vice versa*. The concept of fisheries *refugia* is based on recognition of the fact that specific habitats and areas are of critical importance to different stages of the life-cycle of each species. This means that areas located outside fishing grounds for a given species, which are critical to



Fishing community consultation on the identification and establishment of fisheries *refugia* at Masinloc in the Philippines (Photo by Mr. Noel Barut)

the life-cycle for that species, might need to be managed as fisheries *refugia*. Such management for example, may include interventions aimed at reducing the impacts of the incidental capture of juveniles of a given species by another fishery operating in areas critical as inshore nursery *refugia* for that particular species.

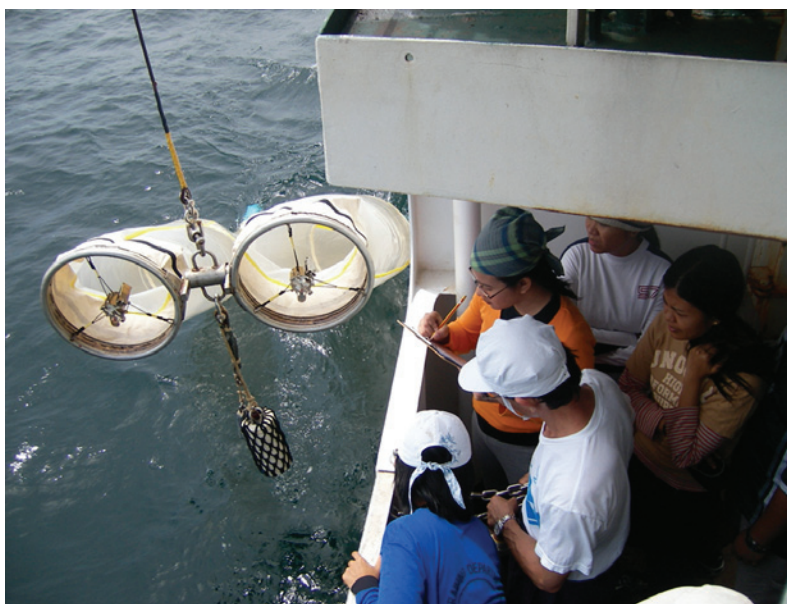
Such management could also include interventions to provide habitat protection, to ensure that areas important for egg deposition are not disturbed, and/or to safeguard habitats that provide protection for juveniles from predators, such as mangroves and seagrass beds. In developing the framework for a regional system of fisheries *refugia* in the South China Sea and Gulf of Thailand, the RWG-F recognized the need for two separate but related sets of goals and objectives as shown in Table 1. The first is related to the resource (fish stock) itself and the second to the institutional framework under which management is brought about.

Overall, the resource related goal is to enhance the resilience of regional fish stocks to the effects of fishing. Meanwhile, the institutional goal is to integrate fisheries and habitat management at the national level, a task which is formidable given the past history of interaction between fisheries and environmental managers in most countries in the region. The former is generally focussed on the individual stocks and management of fishing effort on a sectoral basis while the latter is on biological diversity and ecosystem protection to the exclusion of sustainable use.

Consideration of these goals and objectives would enable one to evaluate whether or not areas subject to seasonal closures and fisheries management zones within multiple-use MPAs can be classified as fisheries *refugia* and form part of a regional *refugia* system. For instance, short term closures (or spot closures) are often implemented to redirect fishing effort from areas containing concentrations of juvenile fish or specific age classes of fish. Similarly, closed seasons are often implemented to safeguard the spawning fish or reduce the levels of fishing effort at times when pre-recruits are migrating to the fishing grounds. Such actions would form part of the suite of available management actions that could be used within a designated *refugia* management regime but the designated area or “place” (Pauly, 1997) is the *refugia* itself.

Discussions and Conclusion

The similarities and differences between MPAs and fisheries *refugia* (Table 2) are worthwhile considering. In the case of MPAs, the objectives are often broadly focussed at the ecosystem level rather than on species of importance to local fisheries, while the sites are selected on the basis of biodiversity criteria rather than on their significance to the

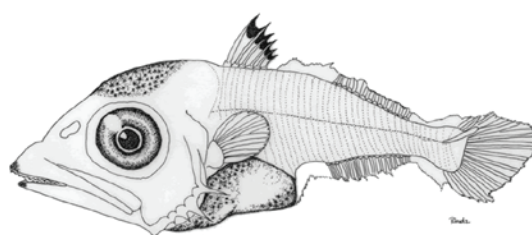
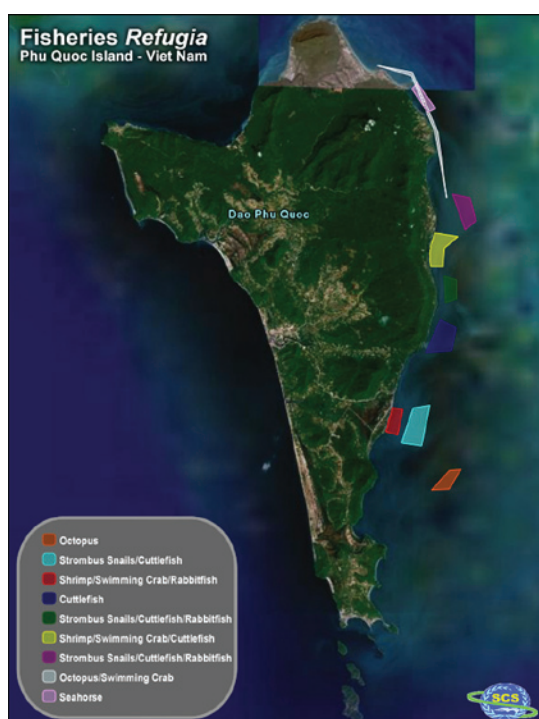


Above: Larval specimen of *Scomberoides* spp. collected from the South China Sea as part of the fisheries *refugia* training program (Photo by Dr. Yoshinobu Konishi)

Left: Staff of national fisheries departments participating in at-sea training on the conduct of fish egg and larvae surveys in the upper Gulf of Thailand in May 2007 (Photo by SEAFDEC Training Department)

Table 1. Goals and objectives for a regional system of fisheries *refugia*

Resource-Related Goal - Increased Resilience of Regional Fish Stocks to the Effects of Fishing	Institutional-Related Goal - Fisheries and Habitat Management Conducted in an Integrated Manner
<p>Longer-Term Objectives</p> <ul style="list-style-type: none"> • Increased average size of important species • Increased egg production of important species • Increased recruitment of important species • Increased biomass of important fish species 	<p>Longer-Term Objectives</p> <ul style="list-style-type: none"> • Community-based management of fisheries <i>refugia</i> for integrated fisheries and habitat management • National and regional level commitments for integrated fisheries and ecosystem management • Appropriately represented fisheries agenda in broader multiple-use marine planning initiatives
<p>Shorter-Term Objectives</p> <ul style="list-style-type: none"> • Safeguarding of natural <i>refugia</i> • Reduced capture of juveniles and pre-recruits of important species in critical fisheries habitats • Reduced targeting and capture of important species when forming spawning aggregations • Reduced targeting and capture of migrating fish 	<p>Shorter-Term Objectives</p> <ul style="list-style-type: none"> • Community-based management of fisheries <i>refugia</i> for fisheries management • Understanding among fishing communities of critical habitats and fish life-cycle linkages • Enhanced capacity of fisheries departments/ministries to engage in meaningful dialogue with the environment sector



Above: Larval specimen of yellowfin tuna (*Thunnus albacares*) from the South China Sea (Drawn by a participant in the fisheries *refugia* training program)

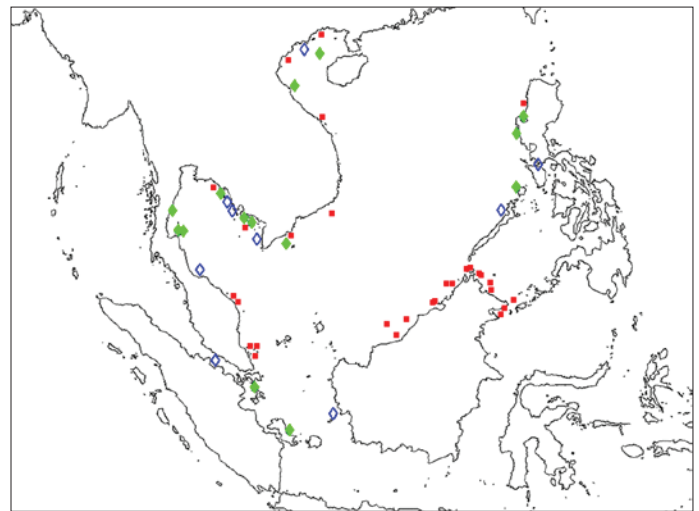
Left: Spawning/nursery areas for rabbitfish and various invertebrate species of subsistence and commercial importance in the seagrass beds of Phu Quoc Island, Viet Nam (Photo by Christopher Paterson)

life cycle of the species concerned. Similarly, the focus on protection rather than sustainable use has made the MPAs generally less acceptable than *refugia* at the level of the primary stakeholders (fisherfolk and local government officers).

In the Southeast Asian region, since the focus of fisheries *refugia* is on the benefits to fisheries rather than the benefits to biological diversity, this has resulted in a wide acceptance of establishing such areas. Subsequently, the guidelines for the establishment of fisheries *refugia* as part of the ASEAN-SEAFDEC Regional Guidelines for Responsible Fisheries in the Southeast Asian Region (SEAFDEC, 2006), have been accepted inter-governmentally. More particularly, the concept of *refugia* has been used successfully to assist the Philippines in resolving long running fisheries conflicts in the Visayan Sea. It has also been used to facilitate the cross-sectorial co-ordination required between the environment and fisheries sectors at both the provincial and local levels, to integrate fisheries and habitat management at the Phu Quoc Archipelago in Viet Nam (UNEP, 2008).

A question that often arises would be on whether “MPAs qualify as fisheries *refugia*”. A simple answer is no, especially if the MPA promotes the no-take concept in relation to fisheries. MPAs are implemented to limit human activity throughout a designated area of the ocean, which are mostly aimed at achieving the goals and objectives of biodiversity conservation. The criteria for the identification of MPA sites usually relate to concepts of representativeness, comprehensiveness, and uniqueness. Thus, a particular MPA cannot qualify as a fisheries *refugia* if the site has been selected using these criteria. Parts of multiple-use MPAs, such as fisheries management zones, may however, qualify as a fisheries *refugia* if such zones promote the concept of sustainable use rather than prohibition of fishing, and selection of the zone had been based on criteria relating to the critical linkage between the area/habitat and the life-cycle of the species for which the area is managed.

However, if the site for a multiple-use MPA had been identified using criteria that did not relate to fish life-cycle and critical habitat linkages, then it is unlikely that the



Location of: known spawning and nursery areas of transboundary fish species [■]; initial sites selected for inclusion in the regional system of refugia [□]; sites of high priority for inclusion in the regional system once the initial set are established [◇] (Illustration by Christopher Paterson).

MPA will result in definite benefits to the fisheries sector. Similarly, poorly designed fisheries management zones within multiple-use MPAs may lead to loss of community support for spatial approaches to fisheries management, as well as to the re-direction of fishing effort towards areas that are more important in terms of critical habitat linkages and consequently have a reverse effect to the one which it has been intended for. Another question which could arise is whether “Marine Protected Areas could be the right conduit for achieving acceptance among fishing communities with specific locations used for fisheries and habitat management in Southeast Asia”.

The immediate response is also no considering that it would be unwise to completely dismiss the idea of multiple-use of marine protected areas and fisheries working well together in the region. Specifically, although MPAs are often established under the umbrella of “improving the state of fisheries”, the

Table 2. Comparison between the objectives, benefits, site selection criteria, use and acceptability of traditional MPAs and fisheries *refugia*

	Marine Protected Areas	Fisheries <i>Refugia</i>
Strategic Objectives	Protection of biodiversity Tourism Increased fish production	Improved management of fish stock and habitat links Increased resilience of stocks
Purported Fisheries Benefits	Enhanced stock in MPA leads to bigger catches outside	Safeguarding fish in places and at times critical to their life-cycle will reduce growth and recruitment over-fishing
Site Selection Criteria	Species diversity/richness Uniqueness of the site Site’s representativeness	Importance to the life-cycle of economically important spp. Likelihood to improve stocks
Use Status	Strict protection-multiple use (typically no-take fisheries zones in SCS)	Based on sustainable use rather than prohibition of fishing
Acceptability to communities	Concern that costs outweigh benefits Enforcement is costly	Objectives and scientific basis well accepted by fishing communities and local officials

Box 4: Goals of the development of regional system of fisheries *refugia*

- Build the resilience of Southeast Asian fisheries to the effects of high and increasing levels of fishing effort,
- Improve the understanding amongst stakeholders, including fisher folk, scientists, policy-makers, and fisheries managers, of ecosystem and fishery linkages, as a basis for integrated fisheries and ecosystem/habitat management,
- Build the capacity of fisheries departments/ministries to engage in meaningful dialogue with the environment sector regarding how broader, multiple use planning (in whatever form) can best contribute to improving the state of fisheries in areas of the South China Sea and the Gulf of Thailand.

criteria for the selection of MPA sites is typically related to the achievement of objectives for biodiversity conservation or political gain rather than fisheries management. In this regard, the RWG-F developed a regional system of fisheries *refugia* (Box 4). The RWG-F comprised representatives from the capture fisheries and research divisions of the Departments of Fisheries of Cambodia, Indonesia, Malaysia, Philippines, Thailand and Viet Nam, together with regional experts and members from the SCS Project Co-ordinating Unit, FAO and SEAFDEC with periodic participation of representatives from IUCN.

Empirical evidence of an overall increase in fishery benefits following the establishment of an MPA is still controversial since increased catches frequently do not compensate for the decreasing expanse of fishing grounds. In addition, MPA models have shown that, the effects on fisheries yield are highly dependent on a number of factors, *i.e.* dispersal in the larval, juvenile and adult stages; configuration of the reserve; and status of the fishery. In conclusion, it appears that traditional marine protected areas are unlikely to enhance fish stocks and catch since they are directed towards achieving other wider objectives and their selection rarely

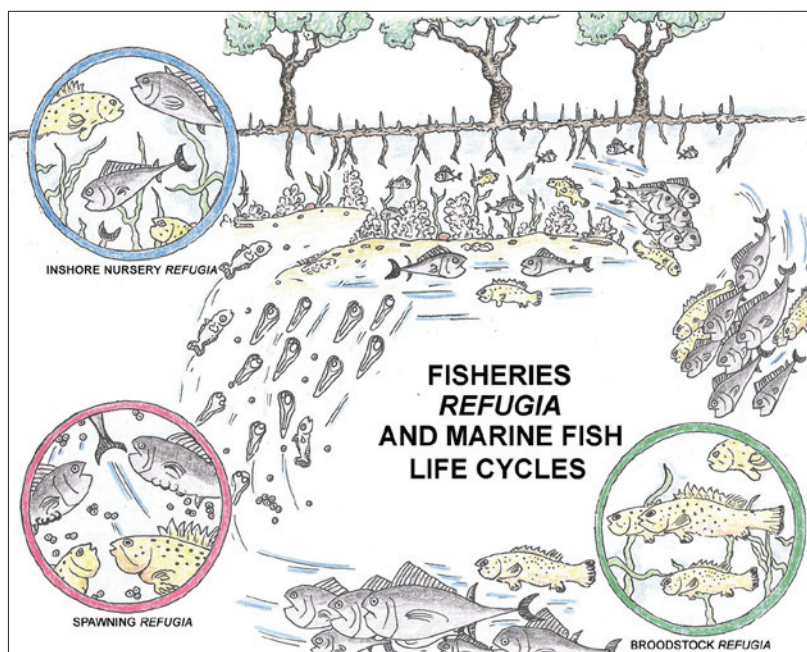
takes into consideration the life history and population dynamics of fishery species. Since the fisheries *refugia* concept has been developed to redress this imbalance, such approaches may potentially bring greater benefits to the fisheries sector.

Acknowledgements

The development of the concept of fisheries *refugia* was a targeted outcome of the fisheries component of the UNEP/GEF Project on Reversing environmental degradation trends in the South China Sea and the Gulf of Thailand. This project including the activities relating to the development of the fisheries *refugia* concept, was financially supported by the Global Environment Facility (GEF) and co-financed by the governments of the participating countries, namely: Cambodia, China, Indonesia, Malaysia, Philippines, Thailand and Viet Nam, although China did not participate in the fisheries and coral reef components of the UNEP/GEF South China Sea Project. The development of the concept owes much to the intellectual inputs of the government representatives and regional fisheries experts who participated in the annual meetings of the Regional Working Group on Fisheries between 2002 and 2008, together with the staff of the South China Sea Project Co-ordinating Unit, SEAFDEC, the FAO Regional Office for Asia and the Pacific, and IUCN.

References

- Hilburn, R., F. Micheli, and G.A. De Leo. 2006. Integrating marine protected areas with catch regulation. *Can. J. Fish. Aquat. Sci.* 63:642-649
<http://www.iucn.org/themes/wcpa/biome/marine/programme.htm>



The *refugia* types prioritized by the RWG-F in relation to the generalized life cycle of demersal marine fishes

http://www.unepscs.org/South_China_Sea_Knowledge/Lessons_Learned/SCS_Lessons_Learned.html

Paterson, C., Try, I., Tambunan, P., Barut, N., Saikliang, P., Dao, M.S., and Chullasorn, S. 2006. Establishing a Regional System of Fisheries *Refugia*. Fish for the People, 4(1): pp 22-27

Pauly, D. 1997. Points of View: Putting fisheries management back in places. Reviews in Fish Biol. and Fisheries, 7:125-127

Roberts, C.M., Bohnsack, J.A., Gell, F., Hawkins, J.P., and Goodrich, R. 2001. Fishing and the impact of marine reserves in a variable environment; Science 61. 2053-2068

Russ, G. and Alcalal, A. 1996. Marine reserves: rates and patterns of recovery and decline of large predatory fish. Ecol. Appl. 6:947-961

SEAFDEC. 2006. Regional Guidelines for Responsible Fisheries in Southeast Asia: Supplementary Guidelines on Co-management using Group User Rights, Fishery Statistics, Indicators and Fisheries *Refugia*. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 84 pp

UNEP. 2007. Procedure for Establishing a Regional System of Fisheries *Refugia* in the South China Sea and Gulf of Thailand in the context of the UNEP/GEF project entitled: "Reversing Environmental Degradation Trends in the South China Sea and Gulf of Thailand". South China Sea Knowledge Document No. 4. UNEP/GEF/SCS/Inf.4

UNEP. 2008. Fisheries *Refugia* as a Tool for Integrated Fisheries and Habitat Management at Phu Quoc Archipelago, Viet Nam. South China Sea Lesson Learned Note No. 3

UNEP/GEF South China Sea Project at <http://www.unepscs.org>

Yamasaki, A. and Kawahara, A. 1990. Preserved area to affect recovery of overfished Zuwai crab stocks off Kyoto Prefecture. In: Proceedings of the International Symposium on King and Tanner Crabs. November 1989. Alaska Sea Grant College Program, University of Alaska, Anchorage, Alaska

About the Authors

Mr. John C. Pernetta, now a free-lance fisheries management consultant and ecologist, was the former Director of the UNEP/GEF Project on Reversing Environmental Degradation Trends in the South China Sea and the Gulf of Thailand. After his retirement from the Project, he continues to provide technical assistance to the SEAFDEC Regional Advisory Committee for Fisheries Management in Southeast Asia (RAC).

Mr. Christopher J. Paterson is currently working with the Pacific Islands Applied Geoscience Commission (SOPAC) on the implementation of a UNDP/UNEP/GEF project in the Pacific. He was also part of the Project Coordinating Unit for the Project on Reversing Environmental Degradation Trends in the South China Sea and the Gulf of Thailand.

Dr. Somboon Siriraksophon is the Policy and Program Coordinator of SEAFDEC based at the SEAFDEC Secretariat in Bangkok, Thailand.



Enhancing Safety at Sea for Small-scale Fishing Boats in Southeast Asia

Bundit Chokesanguan, Sutee Rajruchithong and Worawit Wanchana

The Southeast Asian Fisheries Development Center (SEAFDEC) has been implementing activities on Safety at Sea for small-scale fishing boats in conjunction with the global Code of Conduct for Responsible Fisheries (CCRF) which prescribed that: (8.1.5) "*States should ensure that health and safety standards are adopted for everyone employed in fishing operations. Such standards should not be less than the minimum requirements of relevant international agreements on conditions of work and services*". Taking into consideration such article of the CCRF, the Regional Guidelines for Responsible Fishing Operations in Southeast Asia (SEAFDEC, 2000) specifically stipulated that: (8.1.5 (1)) "*since the minimum requirement in relevant international agreements including SOLAS and IMO is only applicable to vessels larger than 24 m LOA, and considering that majority of the fishing boats in the region is smaller than this size, States should be encouraged to elaborate special safety standards and policies with emphasis on smaller boats. The FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels (1980) may be used as reference.*" In addition, the Regional Guidelines also indicated that: (8.1.5 (2)) "*Regional organizations including SEAFDEC should support the States to urgently formulate such standards for smaller fishing vessels in the region.*"

Thus, activities on Safety at Sea targeting the Southeast Asian region had been conducted as part of the project on Responsible Fishing Technology and Practices implemented by SEAFDEC Training Department (SEAFDEC/TD) and

Box 1: Recommendations on Safety at Sea for Small Fishing Boats in Southeast Asia (SEAFDEC, 2003)

We, ASEAN Technical Officers related to the safety at sea for small fishing boats, met in Bangkok, Thailand from 17 to 19 December 2003 for the Workshop on Safety at Sea for Small Fishing Boats, and agreed on the following recommendations as basis for formulating comprehensive framework on the program to promote the issue of safety at sea for small fishing boats.

1. Leave the definition of 'small fishing boats' and 'operational range' to individual countries
2. Promote the registration of small fishing boats
3. Promote coordination between concerned authorities on monitoring and control of small scale fishing boats' safety as well as on socio-economic considerations
4. Strengthen local authorities and promote policies of safety at sea within the coastal communities
5. Promote technical and financial support from authorities, including subsidies, at all levels for issues of safety at sea
6. Identify and promote basic requirements for safety at sea in the areas of:
 - research on the design and construction of small fishing boats including the modification of traditional-type boats
 - safety equipment including fire fighting and life-saving appliances
 - regular boat inspection systems
7. Implement training & education programs for all stakeholders including fishers and boat builders, for the basic requirements of:
 - boat design and construction
 - equipment and its correct use
 - search and rescue
 - occupational health and safety awareness, including the avoidance of dangerous fishing practices
 - awareness of environmental factors
8. Develop and promote the use of appropriate communication systems for:
 - weather forecasting information
 - search and rescue systems
9. Development of appropriate incident reporting and investigation systems for the purpose of improving safety at sea.

supported by the Government of Japan Trust Fund Program for SEAFDEC. Among the major activities conducted where the Regional Workshop on Safety at Sea for Small Fishing Boats in December 2003, and the sequel Second Regional Workshop in April 2010. The first Regional Workshop on Safety at Sea for Small Fishing Boats held at SEAFDEC/TD in Samutprakarn, Thailand from 17 to 19 December 2003 (SEAFDEC, 2003) reviewed the current situation of Safety at Sea in most countries in Southeast Asia as well as in other parts of the world. The first Regional Workshop came up with recommendations (**Box 1**) which had been applied for most of the Southeast Asian countries for enhancing their respective comprehensive frameworks to promote the issue of Safety at Sea for small fishing boats.

Almost seven years later on 20-23 April 2010, SEAFDEC/TD again convened the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats in response to the recommendation at the first Regional Workshop, viz.: "Considering that Safety at Sea is a

serious problem in developing countries, the progress of the initiatives of the respective Southeast Asian countries in improving Safety at Sea for small fishing boats should be reviewed taking into account the international and regional initiatives on Safety at Sea". As an added objective, the second Regional Workshop (SEAFDEC, 2010) also gave special focus on the establishment of a mechanism for recording the accidents at sea of fishing boats, and on the need to improve the living conditions of fishers on fishing boats in the Southeast Asian region.

Improving Safety at Sea Conditions: Initiatives in Southeast Asia

The countries in the Southeast Asian region have been exerting efforts to improve safety at sea conditions considering the significant number of accidents that happened at sea especially during fishing operations. As reported during the 2003 Regional Workshop on Safety at Sea and the sequel 2010 Regional Technical Workshop, some countries in the Southeast Asian region have already advanced their respective programs and activities with the compilation of data on accidents and fatalities at sea during fishing operations and enhancing the adoption of preventive measures. Indonesia for example, has translated the FAO publication on Safety Practices Related to Small Fishing Vessel Stability into Bahasa Indonesia and used as awareness-raising material throughout the whole country. Myanmar had also ratified the 1995 IMO Convention on Standards of Training, Certification and Watch-keeping for Fishing Vessel Personnel (STCW-F). In general, most countries have also initiated the registration of fishing boats, gears and fishers with Malaysia already leading the way. The initiative of Thailand to replace about 5,000 wooden boats that were lost during the 2004 Asian Tsunami by FRP (fiberglass reinforced plastics) boats was considered noteworthy since there have been recent campaigns to reduce footprints from fisheries. The need to find a replacement of wood as material for boat construction (e.g. FRP) is necessary as wooden boats had been found to increase footprints in fisheries. The status and progress of the countries' initiatives in improving safety at sea conditions are summarized in **Box 2**.

Moreover, recognizing that the Southeast Asian region has recently been confronted with extreme changes in weather patterns which greatly affect the coastal fishing communities, SEAFDEC in collaboration with the Swedish International Development Cooperation Agency (Sida) has implemented a project that emphasized on the need to record the number of all fishing boats in the region (small and large) to be able to regulate their fishing activities when and where necessary. Furthermore, the SEAFDEC-Sida Project also promotes the establishment of a regional fishing vessel record and

Box 2: Status and progress of activities related to safety at sea in Southeast Asia

Brunei Darussalam

For manning small fishing boats of the country which mostly operate in zone 1 (0-3 nautical miles offshore and zone 2 (3-20 nautical miles offshore), each seagoing fisher must undertake training and certification in seamanship and navigation considering that most boat captains are not formally trained. In addition, all small fishing boats must be registered with proper authorities for safety reasons. Commercial fishing boats are inspected and certified by the Marine Department of Brunei Darussalam for safety requirements such as navigational lights, life jackets and navigational instruments and electronics (Suru, 2010). The Fisheries Department requires all fishing boats to carry onboard functional radar, echo sounder, GPS, VHF radio as well as proper navigational lights prior to issuance of fishing license. Some problems have however, been encountered in the implementation of the regulations which include the fact that most skippers or boat captains are foreign workers, who might be experienced but are not licensed to bring the vessels to sea. In general, all navigation and communication equipment installed onboard fishing boats should comply with the level of the SOLAS regulations and that fishing vessel owners should also provide onboard occupational safety and health awareness training.

Cambodia

Information on small fishing boat accidents in Cambodia are very limited since there is no mechanism for collecting accidents at sea because the country's National Committee for Disaster focuses their efforts in inland waters (Chhea, 2010). Generally, the country's fishing boats use navigational lights, compass, and some are equipped with GPS. However, certain incidents of sea accidents had been reported such as capsizing of boats that resulted in losses of lives of fishers due to inadequate safety equipment carried onboard, as most of small fishing boats are not equipped with life jackets and life buoys as well as fire extinguisher, although most fishing boats use communication systems at sea such as radio (AM, FM) and mobile phones. The Ministry of Water Resources and Meteorology provides information on weather forecast although the information on marine weather is limited so that most fishers had been using the weather forecast provided by Thailand and Vietnam authorities. The country's Proclamation on Technical Management of Fishing Boats actually requires that all fishing boats must follow the regulation on technical management of fishing boat to ensure safety of boats and crew, which includes technical requirements for fishing conditions, *i.e.* putting the national flag, registration plate number, light and other signs of identity; equipping with radio communications, firefighting equipment, life jackets, lifebuoy, binocular, compass, emergency medicines; and assuring good quality of engine and boat. Moreover, the Fisheries Administration of Cambodia with support from FAO is now developing measures to improve safety at sea and reduce vulnerability for fishers in Cambodia, through a 4-year project that started in 2010.

Indonesia

The responsibilities of Indonesian competent authorities in ensuring safety at sea include among others, the conduct of safety and health training, imposing minimum requirements for fishing vessel personnel, development of manning regulations based on size and type of fishing vessel, conduct of fishing vessels inspection, promotion of health and safety management, improvement of access to insurance, and establishment of report and investigation system (Suharyanto, 2010). A preliminary study on Safety at Sea in Indonesia was conducted through random sampling of 66 fishing vessels comprising the tegal (Danish seiner), pekalongan (Purse seiner), and cilacap (mini long-liner, gill-netter). The results showed that 68 persons died due to accidents at sea, such as boat capsized (46%), man got overboard (27%), sick and fatigue (20%), and fishing operation (7%). The accidents during fishing operation could be due to inadequate fishing competence, insufficient information and absence of emergency drills, and limited lightings during night fishing. Of the number of boats capsized, cilacap accounted for 81% and tegal 19%, mainly due to rough seas and stability of the boats. Considering that stability of the fishing vessel has been considered one of the major causes of frequent capsizing of fishing boats leading to fatal accidents at sea, the FAO publication on Safety Practices Related to Small Fishing Vessel Stability (Gudmundsson, 2009) which includes the basic principles of stability and provides simple guidance for vessel crew to maintain adequate stability of their vessels, has been translated into Bahasa Indonesia and disseminated nationwide as awareness raising material.

Lao PDR

The fishing boats in Lao PDR are not registered and without safety equipment onboard, fishing is not licensed and fishers are not registered since no certification is required (Akhane, 2010). Moreover, there are no full time fishers in Lao PDR considering that during the rainy season, the people devote their time in cultivating rice and it is only during the hot season that the people would go fishing. With inland waters that comprise the Mekong River and its tributaries, and two reservoirs, a plan is being developed to improve the safety at sea aspects in Lao PDR that includes conducting HRD for fishers, creating awareness on safety in inland waters, establishing of registration system for fishing boats, setting up of reporting network, and establishing a system of recording fishers even if they are part-time fishers only. The Outline for Best Practices for Safety at Sea in the Fisheries Sector which was developed during the FAO Expert Consultation on in November 2008 (FAO, 2009) would also be used as guide in developing the country's programs on the promotion of safety aspects in the inland waters, considering that the word "sea" in "safety at sea" includes oceans, seas, bays, sounds, estuaries, rivers and lakes as well as the aquaculture environment.

Malaysia

Malaysia has already advanced its efforts by registering all fishing boats and fishers as well as maintaining standards of boats and crews. Thus, all fishing boats in Malaysia must be registered and would be identified through various markings such as the fixed registration number corresponding to the state and carved on both sides of the fore part of the hull of the boat, code zone to be painted on both sides of the wheelhouse in white with black background, color of the wheel house (for inboard powered boats) which should correspond to the color specified for the state (Noorliza, 2010). The fishing vessel registration system is solely under the responsibility of the Department of Fisheries Malaysia in accordance with the Fisheries (Maritime) Licensing of Local Fishing Vessel Regulations 1985. In the renewal of the license of fishing boats, one of the requirements is the availability of sufficient safety equipment onboard as well as the vessel condition in terms of sea worthiness. A plastic Vessel Number is issued out each year upon renewing the fishing license for enforcement purpose, with the Fisheries Officer monitoring the validity of the license in Malaysian waters. In addition to the Department of Fisheries Malaysia, the other agencies also responsible for Safety at Sea include the Fisheries Development Authority of Malaysia (LKIM) and the Malaysian Maritime Enforcement Agency (MMEA).

Box 2: Status and progress of activities related to safety at sea in Southeast Asia (cont'd)

Myanmar

The country has put in place a data recording system mainly with the Department of Fisheries in coordination with other competent authorities in the country, which also collects information on accidents related to fishing operation (Sann and Htwe, 2010). Under this system, the detailed causes of some accidents and casualties in the industry had been analyzed and the countermeasures identified. Some of the measures on safety at sea include: compilation of check-in and check-out system; daily reporting of weather conditions; using locally made floating equipment for life saving; using traditional medicine for emergencies; communication equipment on board (although still very limited). Strict law enforcement on fishing activities is carried out by the country's Department of Fisheries (DOF), Navy, Coast Guard, Customs Department, and Police Force. The DOF is responsible for data recording, analysis and feedback mechanism as well as other agencies such as the Navy, Coast Guard and Police Force. All concerned agencies have their respective team to take charge of collecting and analyzing data, but there is a need to synchronize all data collected. The country's statistics data showed that from 2003 to 2009, the total number of accidents related to fishing operation was 24/year on the average, indicating a great need to improve safety in the fishing industry. The training provisions in the 1995 STCW-F Convention (IMO, 1995) had been implemented in Myanmar which led to the reduction of accidents at sea to only 6 in 2009-2010.

Philippines

The common accidents involving small boats in the Philippines include capsizing and sinking mainly due to poor stability, this is in spite of the installation of outriggers in small boats used in the country. In addition, the other causes also include drifting due to bad engine installation and maintenance, lack of fuel and inadequate knowledge of crew in troubleshooting; collision due to the limited navigational lights, tired crew and bad weather conditions; fire because of bad engine installation and poor cooking facilities; and work-related causes brought about by slippery deck, unprotected machinery and tired crew (Eleserio, 2010). In an effort to improve the safety of small boats, registration of small boats had been initiated and relevant regulations strictly enforced (e.g. safety regulations, issue boatbuilding/boatyard certification, conduct relevant training programs). Under the Republic Act No. 8550 or the Philippine Fisheries Code of 1998, Article 1 (Municipal Fisheries), Section 19 specifies that the Local Government Units (LGUs) with the assistance of the Fisheries and Aquatic Resource Management Council (FARMC) should maintain a registry of municipal fisherfolk and registry of fishing vessels by type of gear and other boat particulars which should be updated annually. In addition to the Bureau of Fisheries and Aquatic Resources (BFAR), the other agencies responsible for Safety at Sea in the Philippines include the FARMC, LGUs, Maritime Industry Authority (MARINA), the Philippine Coast Guard, and the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAG-ASA), the country's national weather bureau.

Thailand

In Thailand, Safety at Sea has been considered from the point of view of fisheries management, as such the initiatives undertaken by the Department of Fisheries (DOF) include vessel registration and licensing, enforcement of closed area and closed season, promotion of offshore fisheries and joint ventures, and employment of foreign labor and crew (Kanit Chuapan, 2010). However, natural disasters had affected the safety of fishing boats and fishers, such as Typhoon Gay in November 1989 where about 200 fishing boats and more than 600 crew members were reported missing. During the Asian Tsunami in December 2004, more than 5,000 boats were damaged and more than 700 fishers died. Efforts had been made by the DOF to replace the lost boats during the Asian Tsunami with fiberglass fishing boats, which have been designed with maximum safety in mind and easy to construct than the wooden boats. Moreover, based on the initiatives of His Majesty the King, experiments on installation of sails in the fiberglass boats have been conducted to reduce fuel consumption. The DOF also prescribed that commercial fishing boats should use fishing logbook for reporting their operations and that small-scale fisheries should maintain their fishing vessel record to facilitate implementation of Safety at Sea measures throughout the country. Moreover, the Thai Maritime Enforcement Coordinating Center (Thai-MECC) or "SORNCHON" also promotes Safety at Sea in coordination with other maritime authorities in the country such as the Royal Thai Navy, Marine Police, Customs Department, Marine Department, and Department of Marine and Coastal Resources (Apichai Sompolgrunk, 2010). With well-trained personnel and efficient communication network, SORNCHON has been involved in the effective search and rescue (SAR) operations. A case study on safety at sea of trawlers and purse seiners in Thailand was conducted by SEAFDEC/TD to assess the current situation of their safety at sea for effective fisheries management (Bundit Chokesanguan, *et al.*, 2010). The study focused on the fishing boat conditions, navigation and safety equipment, crew and their competence, etc. The results indicated that most trawlers and purse seiners in Thailand do not meet the standard of safety at sea as stipulated in the regulations set by the country's Marine Department and the Department of Fisheries.

During the National Workshop on Registration and Data Collection on Safety at Sea in Thailand conducted by the Department of Fisheries (DOF) on 28 October 2008, the most critical problem on safety at sea was on the non-compliance of most fishing boats with the IMO regulations while boat accidents and death of crew of fishing boats are not reported. The workshop therefore recommended that guidelines on equipment and safety at sea for small and large fishing boats should be developed, knowledge and understanding of crew on the safety issue should be enhanced, and that concerned organizations and agencies should compile and record the fishers and crew before going out to sea.

On the other hand, the Workshop on Reporting Accident Records of Fishing Boats in Thailand conducted by the SEAFDEC/TD on 4 March 2010 came up with recommendations to reduce accidents on boats and promote safety at sea for fishers and related persons, which include: (1) knowledge on safety at sea should be promoted to target groups; (2) owners of fishing boats should take care of their crew; (3) owners of fishing boats should immediately report to concerned government offices in cases of accidents; (4) owners and crew should conduct regular check and maintenance of boats; (5) concerned agencies should conduct regular training on safety at sea; and (6) SEAFDEC should intensify its campaign on safety at sea in collaboration with DOF Thailand, with SEAFDEC providing technical support and promoting coordination with relevant organizations.

Box 2: Status and progress of activities related to safety at sea in Southeast Asia (cont'd)

Vietnam

In the past, the Ministry of Fisheries issued a number of technical standards for construction of fishing boats with engine capacities of 50 HP or more. However, for boats with less than 50 HP engines, the technical standards have not yet been developed. Although most fishing fleets comprise small boats, the fleet usually goes to fishing grounds 50-70 km from the shore. The equipment onboard are simple and usually with only the minimum safety standards being complied with. Considering also that most fishing boats are old and have been used for a long time, safety at sea could not be assured. In fact, many accidents occurred because the hulls are either too old or are already decaying and became absorbent or the engines are old which had been purchased second hand. Most accidents also happened because of mistakes of fishers which could be due to insufficient experience and knowledge on marine safety, inadequate safety equipment onboard, and extreme changes in weather conditions. Recently, the Ministry of Agriculture and Rural Development (MARD) conducted training on standard of fishing boat crew for all fishing boats with engine power of more than 20 HP. However, Vietnamese fishers are traditionally superstitious and taking safety equipment onboard would be understood as inviting danger while fishing. The MARD through the Department of Capture Fisheries and Resources Protection (DECAFIREP) is responsible for the management of safety at sea assurance for humans and fishing boats in Vietnam, and has planned to register all fishing boats and fishers very soon (Tran Van Luan, 2010).

inventory as a means of improving the management of fishing capacity in the Southeast Asian region. It should also be noted that the SEAFDEC-Sida Project addresses the concerns on safety at sea, as an important element in the promotion of the sustainability of fisheries in the region (SEAFDEC-Sida, 2010).

Initiatives in Improving Safety at Sea Conditions: Japan Experience

Japan has set the Safety and Standard of Fishing Boats with the corresponding responsible agencies for inspection. For example, boats less than 20 GT are under the responsibility of Japan Craft Inspection Organization, and over 20 GT by the Ministry of Land, Infrastructure, Transport and Tourism. The publication on Standard of Fishing Boats contains 14 chapters, *i.e.*: (1) General Provision; (2) Hull; (3) Machinery Installation; (4) Drain System; (5) Rudder, Mooring and Anchor Systems; (6) Life-saving

Equipment; (7) Fire Protection; (8) Crew Accommodation; (9) Navigation Equipment; (10) Electrical Installation; (11) Special Installation; (12) Stability; (13) Maneuvering; and (14) Others. Japan has also prescribed the Standard for Crew which includes licensing of Small Boat Skipper, grouped into: (1) First Class – no limit in terms of sea area; (2) Second Class for flat water or less than 5 nautical miles from the shore; and (3) Special Class for personal water crafts. The license of the Skipper is valid for 5 years and renewable, but requires medical and physical examinations including eye tests and color-blind tests. The agencies responsible for safety at sea conduct lecture classes and publish information materials (*e.g.*, pamphlets, booklets, posters) on safety at sea. Lecture classes are also conducted by some fishers' cooperatives for their respective members (Matsuda, 2010). Moreover, the National Research Institute of Fisheries Engineering (NRIFE) of the Fisheries Research Agency of Japan conducts modeling experiments of boat capsizing. The experiments are carried out by the Fishing Vessel and Machinery Research Group of NRIFE, which comprises the Safety and Stability Research Team, Fishing Vessel Performance Research Team, and the Engine and Machinery Research Team (Miyoshi, 2010).

The Fisheries Agency of Japan through the National Fisheries University in collaboration with some Fisheries Cooperatives also conducted a project to improve the safety of fishers in coastal fisheries. The project focused on how to: (1) reduce the number of accidents and sea disasters of coastal fishing boats; and (2) rescue fishers from accidents, mainly man-overboard (Kawasaki, 2010). Japan through the Tokyo University of Marine Science and Technology (TUMSAT) has also conducted a study on Fishing Boat Safety Engineering aimed at improving the safety of small fishing boats in ship-congested areas (Takeda, 2010).

The 2007 statistics on marine accidents in Japan showed that there had been 1,085 cases of collisions of which 921 (85%) involved fishing boats. However, during the period from 2003 to 2007, accidents involving fishing boats had been reduced from 1293 in 2003, 1203 in 2004, 1023 in



2005, 931 in 2006, and 921 in 2007. Collisions of fishing boats were mainly caused by insufficient lookout (76%). The study also evaluated the various factors that affect the safety of small fishing boats, *i.e.* stability, strength, fishing methods and operations, machinery maintenance, life saving equipment, seaworthiness, and relation with other ships and vessels. Moreover, ship congestion in most waters in Japan has also contributed to the number of collisions. Tokyo Bay, Ise Bay, Seto Inland Sea, Kammon Straits, etc., are active fishing grounds and are known for traffic congestions. It is therefore necessary to look out for other ships and vessels during fishing operations.

In a questionnaire survey conducted under such study, navigation officers were asked to indicate the distance between boats in the fishing grounds, and 17 answered “little bit near but nothing to worry about”, 11 said “the distance is safe enough” while 10 said “nothing to worry about”. However, the fishers had different answers as 18 said they were “worried about the close distance”, and 9 said they were “worried about possible collision”. As for the maneuverability of very large crude carriers (VLCC) which are also present in the aforementioned fishing grounds, 15 fishers said “it is poor”, 11 said it is “bad”, and 6 said “not so poor”. In order to maintain safety for small fishing boats especially in ship-congested areas, the study recommended the following approaches for mutual harmony and benefit: (1) cooperative operation; (2) good communication; (3) giving way for other crafts; (4) mutual understanding; and (5) early information on intention to sail in an area.

Initiatives in Improving Safety at Sea Conditions: South Asian Regional Initiatives

The Bay of Bengal, which embraces the sea waters of India, Bangladesh, Sri Lanka and Maldives, is one of the most productive waters in the world supporting a large population of small-scale fishers and contributing to the socio-economic well-being of the coastal communities. Although marine capture fishery is one of the most risky occupations ever known, the issue on safety at sea has not been given much importance in fisheries management in the South Asian region (Yadava, 2010). Towards this end, the Bay of Bengal Programme (BOBP) has been focusing its activities in safety at sea, specifically on fishing crafts (*e.g.* engines, engine installations, sails and beach hauling devices) with the main objective of making the crafts safer, sturdier and more comfortable.

In 2001, the BOBP held a regional workshop that discussed various issues concerning fishing crafts as well as on the integration of safety at sea issues into the Bay of Bengal fisheries management framework. The outcome of the

workshop was the Chennai Declaration on Sea Safety for Artisanal and Small-scale Fishers. Moreover in 2007, FAO partnered with the BOBP-Inter-Governmental Organization (BOBP-IGO) to implement a global project on Safety at Sea for Small-scale Fisheries with funding support from Sida. Furthermore, the National Institute of Occupational Safety and Health (NIOSH) of the U.S.A. also worked with BOBP-IGO in improving the surveillance and monitoring of fishing-related injuries and fatalities in the South Asian region.

The Safety at Sea project of the BOBP-IGO focused on: (1) provision and analysis of data to identify the cause of accidents; (2) education and training of trainers, extension workers, fishers and inspectors in safety requirements and good working conditions in fisheries; and (3) awareness building and outreach programs to build a culture of sea-safety within small-scale fishing communities. In its awareness campaign, training and information materials had been produced and disseminated, *i.e.* posters, leaflets, guidelines, video films on engine maintenance, video films on general safety at sea situation, accident reporting form, etc.

Initiatives in Improving Safety at Sea Conditions: Pacific Island Region

The Pacific Island region comprises 22 countries and territories in the Western and Central Pacific Ocean with a population of more than 9 million. Although the region has limited land area (550,000 km²), it has very large EEZs (50 times greater than the land area of about 30 million km²), thus safety at sea is of utmost importance. Fishing operations in the Pacific Island region are of two major types, *i.e.* coastal and offshore fishing, with the latter accounting for large volume of catch at 2 million mt/year or about 50% of the global tuna catch, which is important to the region's economies. The region has one of the highest rates of sea accidents in the world but government agencies have limited involvement with safety at sea issues (Blanc, 2010). Efforts to improve sea safety record in the region included activities by UN agencies and other regional organizations. In a survey conducted by FAO in 1991 involving 16 Pacific Island countries, the results indicated that: (1) offshore tuna trawling in small outboard powered skiffs is the most risky activity; (2) many accidents occur on small boats used for both fishing and inter-island transport; (3) main causes include mechanical breakdowns, limited availability of spare parts, cost of life-saving equipment; (4) there is a need for education and training for improving sea safety.

The Secretariat of the Pacific Community (SPC) has been conducting sea safety activities in the region since 1995, specifically addressing the concerns raised during the

Box 3: Recommendations on Safety at Sea for Small Fishing Boats in the Southeast Asian Region (SEAFDEC, 2010)

1. Develop the appropriate incident reporting and investigation systems for the purpose of improving safety at sea, taking into account the following considerations:
 - The draft Guidelines to Competent Authorities in Implementing an Accident Reporting and Analysis System for Small Fishing Vessels currently being developed by FAO;
 - The possible establishment of incentives for fishers, indemnity programs, registration systems for fishing vessels, MCS systems and subsidies to the fishing industry; and
 - The objective of the systems should be appropriate to the size of vessels and types of fishing operations or facilities onboard.
2. Promote the registration of small fishing boats.
3. Promote and ensure that safety aspects, including considerations on the 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 scale fishing vessels.
4. Strengthen local authorities and local organizations and promote the application of safety at sea standards among the coastal communities.
5. Promote technical and financial support from authorities, including subsidies, at all levels for issues of safety at sea, including considerations on working conditions and socio-economic development.
6. 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.
7. Implement training and education programs for all stakeholders including the fishers, family members, boat builders and others, for 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 the environmental factors.
8. Promote awareness among policy makers, central authorities and the broader public on the safety hazards facing 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 impacts of climate change); and
 - Raise political will to address safety at sea and in strengthening the local organizations.
9. Develop and promote the use of appropriate communication systems for:
 - weather forecasting information; and
 - search and rescue systems.
10. For definition of 'small fishing boats' and 'operational range', reference should be made on the respective rules and laws of individual countries.

Box 4: Proposed Inputs for the "Fish for the People 2020" Conference in June 2011

Inputs for the Resolution

- "Promote the adoption of safety standards for small fishing boats and for everyone engaged in fishing operations, which should not be less than the requirements of relevant international agreements, guidelines and protocols".

Inputs for the Plan of Action

- Mainstream safety at sea into national fisheries management program
- Promote the registration of small fishing boats and fishers, and fishing licenses
- Integrate safety at sea measures into fisheries management plans

Box 5: Inputs for the Regional Program Supporting the Implementation of the New Resolution and Plan of Action

The following are the proposed priority areas or activities on Safety at Sea that could support the implementation of the new Resolution and Plan of Action:

- Develop health and safety standards for everyone in the fisheries sector based on the ILO standards for labor in the fisheries industries
- Develop safety standards and policies for small fishing boats taking into consideration the IMO guidelines on safety of life, boats and equipment at sea
- Develop the appropriate incident reporting and investigation systems for the purpose of improving safety at sea
- Strengthen local authorities and local organizations and promote the application of safety at sea standards among the coastal communities
- Implement training and education programs on safety at sea for all stakeholders including the fishers, family members, boat builders and others
- Promote awareness among policy makers, central authorities and the broader public on the safety hazards facing people involved in fisheries
- Develop and promote the use of appropriate communication systems for weather forecasting information, and search and rescue systems
- Promote the registration of small fishing boats and fishers, and fishing licenses
- Integrate safety at sea into fisheries management plans and programs in order to attain sustainability in fisheries development considering that sustainable fisheries could lead to reduction of vulnerability of coastal fisheries.

1991 FAO survey by intensifying sea safety awareness campaigns and training. While working with FAO on safety at sea issues, the SPC/FAO expert consultation on sea safety in small fishing vessels in February 2004 developed the guidelines for the development and implementation of coordinated national strategies which included: (1) establishment of national sea safety coordinating group comprising motivated people (the "drivers"); (2) generating political will to address small boat safety; (3) development of national sea accident databases; (3) appropriate legislation of small fishing vessels; (4) development of construction standards for fiberglass skiffs; and (5) conduct of formal and informal training directed at fishing communities and government staff. In the FAO study on the relationship between tuna fisheries management and sea safety in the

region in 2009, the results showed that the link between fisheries management and sea safety has been weak or absent in most countries as the objective of fisheries management has been limited to biological and economic issues.

In the case of tuna fishery in Samoa, the “alia” catamaran is the main fishing craft. In mid-90s, the “alia” fleet had been expanded with the development of the export market for albacore tuna. Considering that the fishery had recorded high accidents involving 24 fatalities in 1996-1997, measures to improve sea safety were adopted that included legislation of small fishing vessels, mandatory safety requirements as part of licensing, statutory safety training for vessel crew, “big stick” enforcement, VHF network and 24-hour monitoring, sea safety consultative committee, and compilation and analysis of sea accident records. In a survey of 200 boats and 1000 fishers in 1998, safety records showed improvement in tuna fishery where the fatalities were down from 17 in 1997 to 0 in 2002.

Way Forward

Although the countries in Southeast Asia, South Asia and Pacific Island region have been implementing measures to improve the safety of fishing boats and fishers, there is still a need to generate political will in order that such efforts could be further enhanced. This would therefore call for the need to mainstream the safety issues into the national policies in order that safety at sea could be integrated in the overall fisheries management.

The collaborative effort of FAO, ILO and IMO had produced a number of guidelines that could be used in the advancement of safety at sea measures in the Southeast Asian region. Specifically, the STCW-F, together with the FAO/ILO/IMO Document for Guidance on Training and Certification of Fishing Vessel Personnel, could be used as reference and guide for the formulation of training programs for the crew and personnel of fishing boats in the Southeast Asian region. Gudmundsson (2010) summarized the collaborative effort of FAO with the International Labour Organization (ILO) and the International Maritime Organization (IMO) on the safety of fishing vessels and fishers, which led to the development of several standards on the safety for fishing vessels such as the Code of Safety for Fishers and Fishing Vessels, comprising Part A for the skippers and crew which contains provisions for operational and occupational requirements, and Part B for the shipbuilders and owners which specifies the requirements for the construction and equipment of fishing vessels 24 m in length and above as well as the Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, which applies for decked fishing vessels of 12 m in length and over but less than 24 m in length. The most recent FAO/ILO/IMO safety

standard for fishing vessels is the Safety recommendations for decked fishing vessels of less than 12 m in length and undecked fishing vessels, the development of which is currently being finalized. Recent developments regarding international safety standards include the 1993 Torremolinos Protocol for fishing vessels of 24 m in length and above, and the International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel (STCW-F Convention).

During the Second Regional Technical Workshop in April 2010, the recommendations from the December 2003 Workshop were enhanced to come up with the over-all recommendations on Safety at Sea for Small Fishing Boats in the Southeast Asian Region (**Box 3**). Since these recommendations could be considered as the over-all framework, further formulation of appropriate programs on Safety at Sea by the Southeast Asian countries would be necessary. Thus, the issues and concerns on safety at sea would be included in the inputs for discussion during the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020: “Fish for the People 2020” in June 2011. In this regard, safety at sea should be incorporated in the new decade Resolution and Plan of Action that would be adopted during the Conference (**Box 4** and **Box 5**).

References

- Akhane Phomsouvanh, 2010. The Current Situation of Safety at Sea for Small Fishing Vessels in Lao PDR. Country Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Apichai Sompolgrunk. 2010. Initiatives related to safety for small fishing boats. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Blanc, Michel. 2010. Review of Issues and Initiatives Related to Small Fishing Vessels’ Safety in the Pacific Island Region. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Bundit Chokesanguan, Sutee Rajruchithong, Panitnard Taladon and Anurak Loogon. 2010. Safety at Sea of Trawlers and Purse Seiners in Thailand. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Chhea, Chhuon Kim. 2010. The Current Situation of Safety at Sea of Small Fishing Vessels of Cambodia. Country Paper presented during the Second Regional Technical

- Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Eleserio, Filenor. 2010. Progress on Improvement of Safety at Sea for Small Fishing Boats in the Philippines. Country Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- FAO. 2009. Report of the Expert Consultation on Best Practices for Safety at Sea in the Fisheries Sector. Rome, 10–13 November 2008. FAO Fisheries and Aquaculture Report. No. 888. FAO, Rome, Italy. 2009. 40p
- Gudmundsson, Ari. 2009. Safety practices related to small fishing vessel stability. FAO Fisheries and Aquaculture Technical Paper No. 517. FAO, Rome, Italy. 2009. 54 p
- Gudmundsson, Ari. 2010. Review on International Initiatives related to Safety at Sea for Small Fishing Boats. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- IMO. 1995. International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel. IMO. July 1995
- Kanit Chuapan. 2010. Safety of Small Fishing Vessels in Thailand. Country Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Kawasaki, Junji. 2010. Safety of fishers in fishing boat operations. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Matsuda, Akihiko. 2010. Progress of Japan on Improvement of Safety at Sea for Small Fishing Boats. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Miyoshi, Jun. 2010. Modeling experiments of capsizing vessels. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Noorliza binti Ramli. 2010. Progress on Improvement of Safety at Sea for Small Fishing Boats in Malaysia. Country Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Nyunt Sann and Tin Thant Htwe. 2010. Safety of Small Fishing Boat in Myanmar. Country Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- SEAFDEC. 2000. Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fishing Operations. Southeast Asian Fisheries Development Center, Bangkok, Thailand. November 2000; 71 p
- SEAFDEC. 2003. Report of the Regional Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 17-19 December 2003
- SEAFDEC. 2010. Report of the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- SEAFDEC-Sida. 2010. Experience and lessons learned by SEAFDEC-Sida Project on safety at sea for fishing boats in the Gulf of Thailand and Andaman Sea. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Suharyanto, 2010. Progress on Improvement of Safety at Sea for Small Fishing Vessels in Indonesia. Country Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Suru, Bidin. 2010. Brunei Darussalam Initiatives on Safety at Sea for Small Fishing Boats. Country Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Takeda, Seiichi. 2010. How can we improve safety of small fishing boats in ship-congested areas? Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Tran Van Luan. 2010. Current Situation of Safety at Sea of Small Fishing Boats in Vietnam. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010
- Yadava, Yugraj Singh. 2010. South Asian Regional Initiatives Related to Safety at Sea: A Review. Paper presented during the Second Regional Technical Workshop on Safety at Sea for Small Fishing Boats, SEAFDEC Training Department, Samutprakarn, Thailand, 20-23 April 2010

About the Authors

Mr. Bundit Chokesanguan is a Fishing Gear Technologist and Head of the Information and Training Division of SEAFDEC Training Department in Samutprakarn, Thailand.

Mr. Sutee Rajruchithong is the Head of Ship Division of SEAFDEC Training Department in Samutprakarn, Thailand.

Dr. Worawit Wanchana is the Head of the Capture Fisheries Technology Division of SEAFDEC Training Department in Samutprakarn, Thailand.

An Assessment of Fishing Gears that Contribute to Increased Sea Turtle Mortalities: A Case Study in Rayong Province, Thailand

Isara Chanrachkij, Suppachai Ananpongsuk and Worawit Wanchana

Since early 1996, all species of sea turtles have been considered endangered in the Red List of Threatened Animals by the World Conservation Union (WCU, formerly the International Union for the Conservation of Nature and Natural Resources (IUCN)). Thus, the Southeast Asian Fisheries Development Center (SEAFDEC) in collaboration with its Members Countries has been conducting projects to conserve the sea turtles, specifically by evaluating the commonly-used fishing gears that could incidentally capture sea turtles as by-catch, compiling and disseminating information on the conservation and management of the sea turtles, and establishing a mechanism for regional collaboration and research on conservation of sea turtles. Along this vein, the Department of Fisheries (DOF) of Thailand collaborated with SEAFDEC Training Department (SEAFDEC/TD) to conduct activities that aim to minimize if not avoid sea turtles as by-catch from trawl fisheries and promoted the mitigation of sea turtle mortalities from trawl fisheries. Given such mission, the DOF invented the Thai Turtle Free Device (TTFD) which had been assembled with the trawl nets as a tool to release the sea turtles from trawl nets during fishing operations. The efforts of Thailand had been strengthened when experts from Southeast Asia confirmed during the Regional Workshop on the Impact of Fishing in Coastal and Sea Environment in the Southeast Asian Waters organized by SEAFDEC/TD in January 2009, that certain fishing gears adopted by the region's fishing industry, continue to increase sea turtle mortalities, *e.g.* gillnet, trawl, longline, etc.

As a means of addressing the dramatic decline of sea turtles population, the DOF of Thailand through a Ministerial Decree, had been authorized to implement Article 32 (7) of the country's Ministerial Decree on Wild Animal Reservation and Protection Act, B.E. 2535 (1992) which prohibits sea turtle fisheries and imposes a certain fine and/or imprisonment for offenders. This is also in conjunction with the IUCN Red List of Threatened Species accessed by the Convention on International Trade in Endangered Species (CITES), which the Government of Thailand had ratified in 1983. Nevertheless, in spite of the particular regulations to protect sea turtles, stranding of turtle carcasses had been observed along the coasts of the Gulf of Thailand

as well as in the Andaman Sea. Many Thai scientists have observed that mortality of sea turtles could be due to a number of causes, *e.g.* collision with sea vessels, swallowing of plastic bags and other trash, irresponsible fishing activities, etc. Moreover, the scientists also confirmed that stranding occurrences of sea turtles in the coasts of Thailand (Andaman Sea and Gulf of Thailand) had been caused by fishing operations that employ such fishing gears as gillnet, trawl, bamboo stake traps, etc., and that the observed lower stranding record of sea turtles along the coast of the Gulf of Thailand could be due to the presence of a conservation center for sea turtles at Man-nai Island in the eastern part of the Gulf of Thailand.

Nevertheless, many fishers operating various fishing gears along the coast of the Gulf of Thailand also confirmed that the statistical data on stranding occurrences of sea turtles are quite scattered and difficult to compile. Information gathered through the interviews conducted with fishers, fisheries officers, NGOs and other concerned stakeholders, suggested that the use of large-mesh bottom gillnet (also known as sting-ray bottom gillnet) and sting-ray bottom longline could have contributed to increased sea turtle mortalities in the coast of Rayong Province and its adjacent areas. Since the fishing grounds for such fishing gears are also located near the sea turtle conservation center of the Province, such fishing gears could pose high potentials in increasing the mortality of sea turtles. In the absence of results of relevant fishing experiments as of the present, this study was conducted to collect relevant secondary data on the aforementioned fishing gears considering that sea turtles have been reported as by-catch from fishing operations employing such gears (Isara Chanrachkij *et al.*, 2010). The study was also envisaged to pursue an initial process of ascertaining that future operations of such gears should aim to mitigate sea turtle mortalities.

The survey conducted in December 2009 by Isara Chanrachkij *et al.* (2010) attempted to assess the construction of the aforementioned fishing gears and the practices adopted by the small-scale fishers along the coast of Rayong Province in Thailand, where it has been reported that a number of sea turtles have been captured as by-catch. Located along

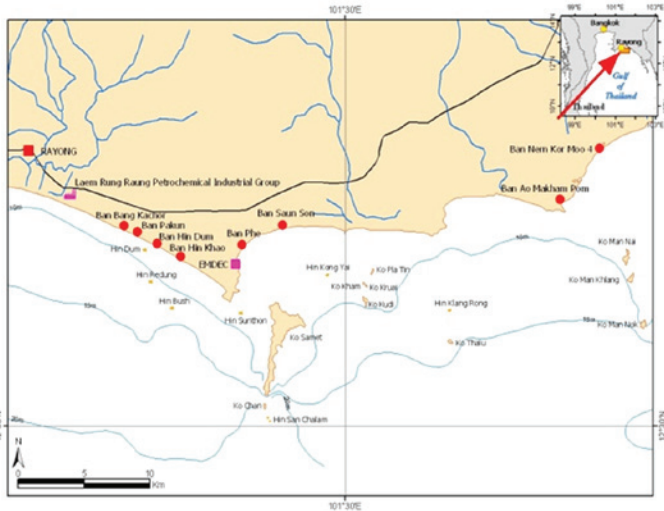


Fig. 1. Survey area of small-scale fishing communities along the coast of Rayong Province, Eastern part of Gulf of Thailand (Illustrated by Siriporn Pangsonn)

the coast of Rayong Province in the eastern part of the Gulf of Thailand, the survey area involved six (6) main fishing communities, namely: 1) Ao Makhampom fishing port, 2) Crab Bank of Ban Moo 4, 8 and 9 at Nern-klor Sub District, 3) Laem Rung-raung fishing community, 4) Hard Mae Rumphueng Beach fishing communities, 5) Suan Son beach, and 6) fishing area near the Eastern Marine Fisheries Development Center (EMDEC). The location of the fishing communities in the survey area is shown in Fig. 1.

Design and Construction of the Relevant Fishing Gears

The results of the survey revealed that two types of fishing gears which target the sting-rays and being operated around the coast of Rayong Province may have direct impact on the mortality of sea turtles, *i.e.* the large-mesh bottom gillnet or sting-ray bottom gillnet and the barbless sting-ray bottom longline. These gears are operated by artisanal fishers using boats 5-8 m LOA (length over all) which are usually equipped with inboard engine 18-24 HP or outboard (long-tail model) with 5-8 HP engine.

Large-mesh Bottom Gillnet (Sting-ray Bottom Gillnet)

As observed during the survey, the large-mesh bottom gillnet (Fig. 2) had been used in Par Khun (or Ek-ka-nek) of Hard Mae Rumphueng Beach fishing communities as well as in the fishing area near the EMDEC of the DOF, and in the area near the Ban-phe and Ao Makhampom fishing ports.

The respondents reported that the large-mesh bottom gillnet had been used in Trat Province since the last decade. However, after observing that incidental catch of the gear included a number of dugongs, the local fishers and the communities around the coast of Trat Province agreed to stop using such fishing gear. This resulted in the complete banning of the use of the large-mesh bottom gillnet or sting-ray bottom gillnet in the coast of Trat Province. On the other hand, the fishers also reported that the large-mesh bottom gillnet or sting-ray bottom gillnet had been used by some fishers in the survey area for the past few years. Most fishers believed that the original net was first introduced in Jao-loaw fishing community in Chantaburi Province as a modified gear of the giant catfish (*Pangasinodon gigas*) gillnet used in the Mekong River in the northeastern part of Thailand. Moreover, construction of the large-mesh bottom gillnet and the materials used in the construction varied according to the fishing communities, but the most common specifications of the large-mesh bottom gillnet or sting-ray bottom gillnet used in Rayong Province, are shown in Table 1.

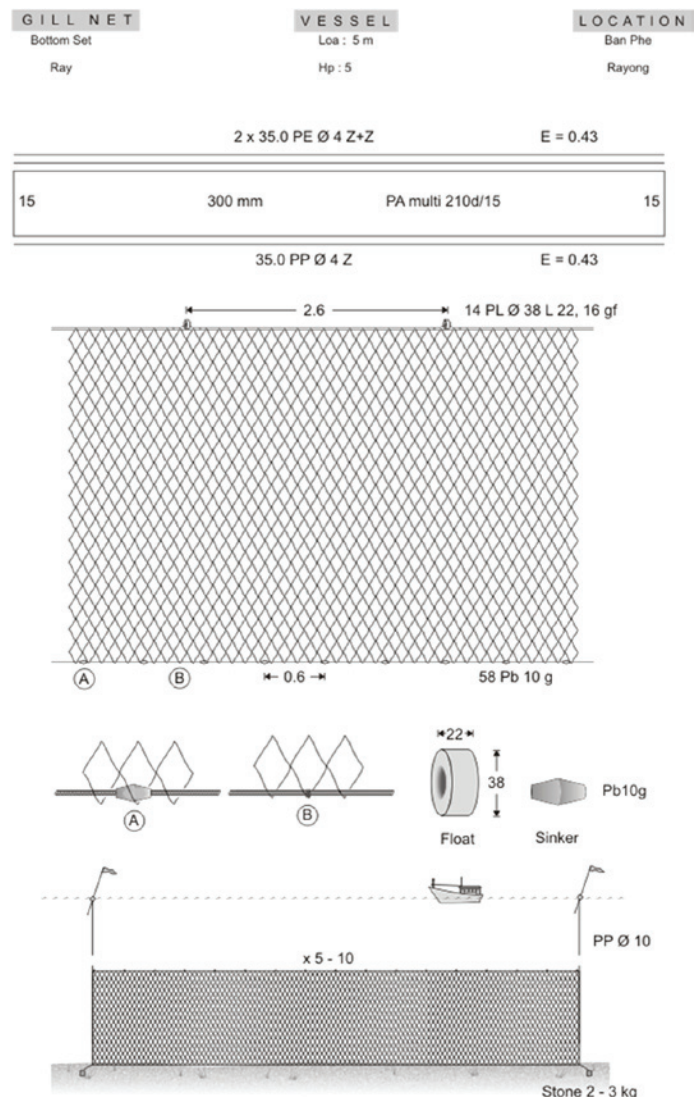


Fig. 2. Large-mesh bottom gillnet observed at the vicinity of Ban Phe, Rayong Province (Illustrated by Nakaret Yasook, 2009)

Table 1. Specifications of the large mesh bottom gillnet used in Rayong Province

Name	Material	Twine Size/ Mesh Size	Remarks
Net panel	Nylon multifilament	210d/15 Mesh size: 300 mm 15 meshes (depth) 270 meshes (length)	5-10 net panels/set
Float rope	Polypropylene (PP) Z twisted	Dia.: 4 mm, 2 pcs. Length: 35 m	Hanging Ratio: 0.43
Float	Plastic Cylindrical shape	38 × 22 mm (Ø x length) Buoyancy: 16 gf	Interval: 260 cm Total: 14 floats
Sinker	Lead	20 mm (length) Weight: 10 g	Interval: 50 cm Total: 58 sinkers
Sinker rope	Polypropylene (PP) Z twisted	Dia.: 3 mm, 1 pc. Length: 35 m	

Source: Isara Chanrachkij *et al.* (2010)

The target catch of the large-mesh bottom gillnet is mainly all sizes of sting-rays. The capturing mechanism starts with the entangling of the sting-rays' caudal spine with the net panels finally entangling the whole fish. During the fishing operations, some by-catch could also be captured such as sea turtles that swim in the sea bottom, where the sting-ray fishing operation is taking place.

In Rayong Province, the fishing ground of the large-mesh bottom gillnet could expand from Ao Rayong Bay to the western part of Ko Man Island (**Fig. 1**), particularly in water depths ranging from 2 to 20 m. The fishing grounds of sting-rays although far from the fishing village or about 3-5 nm from Ao Rayong, fishing operations are conducted around the artificial reefs off Hin sun cha Iarm Rock beyond Ko Samet Island. Fishing operation is done manually without any hauling device and daily from the evening for around 30 minutes and hauling the net the following morning for around two (2) hours. It was also noted that, the fishing gear could be operated during the whole year from the southwest to the northeast monsoon. However, different fishing seasons had been reported in the Province by fishers from different fishing communities, *e.g.* the southwest monsoon as the marked fishing season for the fishers in Suan-son, while the fishers in Hin-Dum in Hard Mae Rumphueng Beach fishing communities reported that the marked fishing season is during the northeast monsoon. The fishers from Ao Makhampom fishing community, however, have ceased the use of large-mesh bottom gillnet around Ko Man Archipelago as they have been requested by the Department of Marine and Coastal Resources (DMCR) Office in Paknam Pra-sae to stop such fishing operation around the area due to the fact that some sting-ray bottom gillnets have been found to also ensnare the sea turtles.

Meanwhile, the fishers near the EMDEC fishing pier and in Hin-Dum area have already stopped operating the large-mesh bottom gillnet for the same reason. Thus, only the fishers from Par Khun (or Ek-ka-nek) community have continued to operate this type of bottom gillnet. During the survey, some 22 sets of nets were still noted in the aforesaid community, and each set was believed to consist of 5-7 net pieces. The fishers at Par Khun explained that they continue to operate the sting-ray bottom gillnet because the population of sea turtles around their fishing ground is almost nil and that they operate their bottom gillnets away from the Ko Man Archipelago, considered as one of the main habitats of sea turtles in the Gulf of Thailand.

Sting-ray Bottom Longline

During the survey, a sting-ray bottom longline was observed at EMDEC fishing pier, indicating that some fishers still continue to operate this type of fishing gear as observed also at the Ao Makhampom fishing port. There was also an evidence that fishers in Ao Rayong still operate the sting-ray bottom longline as well because some hooks of sting-ray bottom longline had remained entangled with bottom gillnets observed at the Par Khun (or Ek-ka-nek) of Hard Mae Rumphueng Beach fishing communities. The fishers reports that the original sting-ray bottom longline was introduced from Petchburi and Trat Provinces at the Upper Gulf of Thailand. The specifications of the sting-ray bottom longline, observed from the area near the EMDEC fishing pier, are given in **Table 2** and **Fig. 3**. Fishing operation of the sting-ray bottom longline is done without bait, and the gear is set at the sea bottom by obstructing the sting-ray/fish migratory pathways. The fishing operation could be carried out manually without any line haulers. Fishing is operated on a daily trip basis with only 2-3 fishers participating. The gear is set in the evening and hauled in the morning of the next day.

Table 2. Specifications of the sting-ray bottom longline operated in Rayong Province

Name	Material	Size/Number	Remarks
Mainline	Polyethylene (PE) Z twisted	Dia.: 4 mm Length: 90 m/set	10-15 set/operation
Branch line	Polyethylene (PE)	380d/60 (Dia.: 2 mm) 30 cm length	Interval: 30 cm
Hook	Iron wire	Dia.: 3.0 mm Shrank: 5.0 cm Gap: 1.6 cm	Barbless hook Total hooks: 300 hooks/set
Float	Synthetic rubber Cylindrical shape	Dimension: 35×10 mm (Ø x length) Total: 75 floats	Interval: 1.20 m
Sinker	Stone	2 pcs.	

Source: Isara Chanrachkij *et al.* (2010)

Although its fishing season was not definitely described, sting-ray bottom longline is operated throughout the year with the best fishing season during the southwest monsoon from July to August. The main criterion used by fishers to determine the fishing season is when abundant sting-rays are sighted in the fishing ground.

The fishing ground for the sting-ray bottom longline expands from Ao Rayong Bay to the western part of the Ko Man Archipelago. The depth of the waters ranged from 7 to

12 m. Meanwhile, the fishing ground of sting-rays is around Ko Samet Island and near artificial reef areas. However, some fishers at Ao Makham Pom fishing community are presumed to be catching sting-rays around the Ko Man Archipelago using the bottom longline because four (4) big sting-rays were noted during the survey. Nevertheless, the fishers have already been requested by the DMCR Office in Paknam Pra-sae since 2009, to stop operating around the Ko Man Archipelago in order to avoid the capture of sea turtles during the fishing operations.

Following the request of DMCR, fishers near the EMDEC fishing pier and Hin-Dum area have already stopped operating the sting-ray bottom longline. A fisher at the EMDEC fishing pier described and reported that sea turtles are usually caught when these are hooked around the origin of their pectoral flippers. Moreover, if few branch lines of the gear are cut from the mainline, the swimming sea turtles could also get strangled.

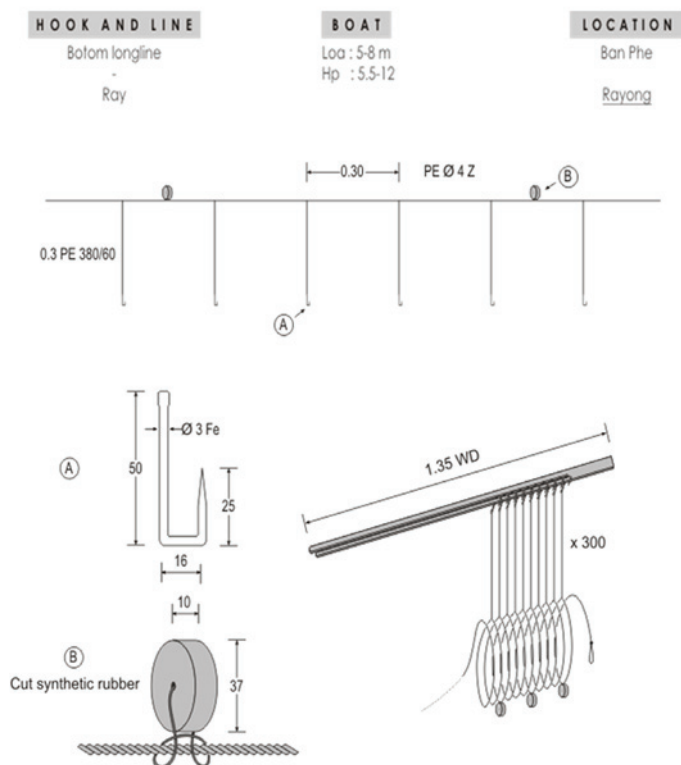


Fig. 3. Specifications of sting-ray longline observed at the vicinity of Ban Phe, Rayong Province (Illustrated by: Nakaret Yasook, 2009)





Sting-ray hooks entangled with a local fishers' gillnet at Par Khun fishing community (left) and complete set of sting-ray longline (right)

Discussions

In the survey area, two (2) types of small-scale fishing gears, *i.e.* large-mesh bottom gillnet (sting-ray bottom gillnet) and sting-ray bottom longline, have been found to also capture sea turtles resulting in mortalities. It was noted that while before large-mesh drift gillnet was used to catch the sting-rays as reported by DOF (1969), this kind of gillnet is no longer used in most Thai fishing activities as indicated in the results of the fishing gear survey conducted by SEAFDEC (1986, 2004).

Large-Mesh Bottom Gillnet (Sting-ray Bottom Gillnet)

The fishers confirmed that the operation of the large-mesh bottom gillnet in the coastal areas of Rayong Province originated from the former fishing practices of Chantaburi and Trat Provinces. Nonetheless, there had been an unclear evidence that the origin of the large-mesh bottom gillnet in Thailand came from Malaysia as referred to in the Malaysian fishing gear information, which indicated that there are two (2) types of fishing gears targeting sting-rays, although the same information was also provided by Thai fishers (SEAFDEC, 1989 and 2002). The construction of the bottom gillnet with 30 cm mesh size, and sting-ray bottom longline without bait in Malaysia (SEAFDEC, 2002), appeared to be similar to the fishing gear construction in Thailand. Additionally, the large-mesh bottom gillnet being operated in the coast of Rayong Province may have also originated from Trat Province as a modified version of the freshwater gillnet in Mekong River of the northeastern part of Thailand. On the other hand, considering also that some Thai purse seiners operating in Malaysian waters have their fishing bases in Rayong, it is possible that the large-mesh bottom gillnet fishing techniques might have been transferred from Malaysia to Thailand particularly through Rayong Province.

Nevertheless, the fact is sting-ray bottom gillnet or large-mesh bottom gillnet fisheries still remain in operation in Rayong, Chantaburi, Prachub Kirikarn and Nakhon Si Thammarat, and Phuket Provinces (SEAFDEC, 2004).

Sting-ray Bottom Longline

Sting-ray bottom longline is also widely operated in the coastal areas of Thailand. There has been a very long history of this fishing gear as described in the survey conducted by then Division of Fisheries (1935) of Thailand. This kind of longline has not been significantly modified from its original design for a long period of time, but in the current practice the number of deployed hooks in one operation has been recently changed. The use of this fishing gear is reported to have spread well to the neighboring countries of Thailand (SEAFDEC, 2007).

Conclusion and Recommendations

In spite of the fact that sting-ray is the target species of the aforementioned fishing gears, some sea turtles are incidentally caught during the fishing operations using such gears. From the economic point of view, sting-ray is one of the fishery resources utilized for direct human consumption or as raw materials in fishery products processing. In fact, large sting-rays could command a good price of 30-40 Baht/kg. Thus, if sting-ray fishers can catch 1 or 2 sting-rays/trip/day, they can earn an additional income of 900-1200 Baht/trip/day. The additional income from catching sting-rays has in fact been the mobilizing factor that pushes the local fishers to continue operating the large-mesh bottom gillnet fishing gear. The fishers also reported that they usually operate such gears while the population of sting-rays appears abundant while during off sting-ray fishing season they change to crab or fish bottom gillnet.

However, the DMCR Office in Paknam Pra-sae has continued to encourage the fishers to mitigate the impacts of using the large-mesh bottom gillnet on the sea turtles that are captured as by-catch. The DMCR has already convinced some fishers operating in the fishing ground around the Man-nai Archipelago and adjacent areas, to stop using the large-mesh bottom gillnet. Even though such measure initiated by the DMCR is not legally binding, almost all fishers have agreed to comply with such regulation. During the survey, it was found that only the fishers in Par Khun (or Ek-kanek) of Mae Rum Paung Beach fishing community have continued to use such gear for the reason that they can only catch few fishes using the other kinds of gillnets, *i.e.* various fish gillnet, crab gillnet and large-meshed bottom gillnet.

It is important to note that the practice of the using the large-mesh bottom gillnet and sting-ray bottom longline has already changed. Currently, the number of fishers using the sting-ray bottom longline is much less than those adopting the sting-ray bottom gillnet, even considering that bottom longline fishing targeting the sting-rays has a very long history in Thai fisheries (Division of Fisheries, 1935). Thus, it can be said that the campaign initiated by the DMCR Office at Paknam Pra-sae aimed at mitigating the impacts of the sting-ray bottom longline and the large-mesh bottom gillnet on the sea turtles, may have fallen on some deaf ears as this has not been very successful.

It is the long history of sting-ray longline operations in Rayong Province that could have resulted in some form of hesitance on the part of some fishers from cooperating with the DMCR and complying with the implementation of the DMCR policy. In this connection, the information gathered from studies conducted on the distribution and abundance of sea turtles in the coastal areas of Rayong Province, *i.e.* in 1) Rayong Bay from Koh Samae-sarn Island to Cape of Kao Laem Ya, 2) Around Samet Island and Ao Phe, 3) From Samet Island to Talu Island, 4) Around Talu Island, Kudi Island and Plateen Island, 5) Around Koh Man Archipelago, and 6) Chantaburi waters, could be useful in developing measures prohibiting the fishing operations of the sting-ray bottom gillnet and sting-ray bottom longline fisheries near the habitats of sea turtles in the future. In fact, such information could also be used as basis for possible zoning of the coastal areas as a measure to conserve the sea turtles in the Gulf of Thailand. This does not necessarily mean an outright restriction of the use of the aforementioned fishing gears in the coast of Rayong Province as this could lead to thorough prohibition of such gears in all fishing grounds, which could affect the livelihood of the artisanal fishers.

In addition, studies on the classification, biology and distribution of large sting-rays targeted by the sting-ray bottom gillnet and sting-ray bottom longline, should be conducted since the targeted sting-rays caught by such fishing gears could be very large (10-40 kg/fish), leading to the overfishing of a single species, particularly the sting-ray parental stocks. Furthermore, for conservation and management purposes of other by-catch especially the group of endangered species *e.g.* sharks, dolphins, dugong, etc., close surveillance especially in terms of frequency and the areas where such incidentally caught species had been reported is also very crucial. Even though the attitude of fishers around the survey area has been positive towards the conservation measures for the sea turtles and other by-catch species, study on the attitude of the fishers' in other fishing communities around eastern part of the Gulf of Thailand, *i.e.* Chonburi, Rayong, Chantaburi and Trat Provinces, on sea turtles conservation should also be conducted in order to assess the perceptions of the fishers.

As noted in Trat Province, the prohibition of endangered fishing gears to catch the vulnerable sea species, *i.e.* dugong, sea turtles, and dolphins has been successfully adhered to by the local communities. A study should therefore be conducted on the collection of basic information on various conservation measures adopted elsewhere in the country and in the Southeast Asian region, to increase the awareness of local fishers throughout the country on the significance of protecting and conserving the endangered sea species.

Finally, actual fishing trials/experiments or direct observation onboard local fishing boats should be carried out in order to fully understand the capturing mechanism of the aforementioned fishing gears. Based on the information gathered from such experiments, fishing gear technologists should develop the most appropriate fishing techniques for adoption in other parts of the country in particular, and in the Southeast Asian region in general, in order to finally mitigate the mortality risks of sea turtles from various fishing gear operations.

References

- Boorlert Parsook. 1987. Fisheries in Thai Waters (in Thai). Paper presented at the Seminar on "Future of Thai Fisheries", 4-6 June 2530. Southeast Asian Fisheries Development Center/Training Department (SEAFDEC/TD), Samutprakarn, Thailand
- Department of Fisheries. 1969. Figures of Marine Fishing Gear of Thailand (in Thai). Department of Fisheries, Bangkok, Thailand
- Department of Fisheries. 1969. Marine Fishing Gear of Thailand (in Thai). Department of Fisheries, Bangkok, Thailand

Department of Fisheries. 1997. Definition and classification of fishing gear in Thailand. Department of Fisheries, Bangkok, Thailand

Division of Fisheries. 1935. Fishing Gear in of Siam (in Thai). Department of Agriculture and Fisheries, Bangkok, Thailand

Flewelling P. and G. Hosch. 2004. Review of the state of world marine capture fisheries management: Pacific Ocean. FAO, Rome, Italy

<http://www.iucnredlist.org/apps/redlist/search> accessed on 28 December 2009)

Isara Chanrachkij, Nakaret Yasook, Suppachai Ananpongsuk, Prasert Petrasatien, and Worawit Wanchana. 2010. Survey of Small-Scale Fishing Gear and Practices Contributing to Sea Turtle Mortalities along the Coast of Rayong Province, Eastern Gulf of Thailand. TD/RES/___, May 2010. SEAFDEC Training Department, Sanut Prakarn, Thailand; 55 p

Mutsuoka T. 1997. Methodology to Estimate By-catch and Discards. *In* Proceedings of the Regional Workshop for Responsible Fishing TD/RP/41. Southeast Asian Fisheries Development Center/Training Department (SEAFDEC/TD), Samutprakarn, Thailand

SEAFDEC. 1986. Fishing Gear and Methods in Southeast Asia: I Thailand; TD/RES/9. Southeast Asian Fisheries Development Center/Training Department (SEAFDEC/TD), Samutprakarn, Thailand

SEAFDEC. 1989. Fishing Gear and Methods in Southeast Asia: II Malaysia; TD/RES24. Southeast Asian Fisheries Development Center/Training Department (SEAFDEC/TD), Samutprakarn, Thailand

SEAFDEC. 2000. Regional Guidelines for Responsible Fisheries in Southeast Asia: Fishing Operations; TD/SP21. Southeast Asian Fisheries Development Center/Training Department (SEAFDEC/TD), Samutprakarn, Thailand

SEAFDEC. 2002. Fishing Gear and Methods in Southeast Asia: II Malaysia (Revised Edition); TD/RES24. Southeast Asian Fisheries Development Center/Training Department (SEAFDEC/TD), Samutprakarn, Thailand

SEAFDEC. 2003. Regional Guidelines for Responsible Fisheries in Southeast Asia: Fisheries Management; MFRDMD/SP3. Southeast Asian Fisheries Development Center/Marine Fishery Resources Development and Management Department (SEAFDEC/MFRDMD), Terengganu, Malaysia

SEAFDEC. 2004. Fishing Gear and Methods in Southeast Asia: I Thailand (Revised Edition); TD/RES/9. Southeast Asian Fisheries Development Center/Training Department (SEAFDEC/TD), Samutprakarn, Thailand

SEAFDEC. 2007. Fishing Gear and Methods in Southeast Asia: VI Cambodia; TD/RES/106. Southeast Asian Fisheries Development Center/Training Department (SEAFDEC/TD), Samutprakarn, Thailand

Somchai Monanunsap and Kongkiet Kittiwattanawong. (2009). Fisheries interaction of sea turtles in Thailand. Paper presented at the Regional Workshop on the Impact of Fishing in Coastal and Marine Environment in the Southeast Asian Waters, 12-15 January 2009, SEAFDEC/TD, Samutprakarn, Thailand

Swarnng Charernpol. 1953. Marine Fishing Gear in Gulf of Thailand (in Thai). Department of Fisheries, Bangkok, Thailand

Syed Abdullah. (2009). Overview on Fishing Activities in the Inter-nesting Habitat of Sea Turtles in the Southeast Asia. Paper presented at the Regional Workshop on the Impact of Fishing in Coastal and Marine Environment in the Southeast Asian Waters, 12-15 January 2009, SEAFDEC/TD, Samutprakarn, Thailand



Map of Thailand showing the Provinces relevant to the study as well as the Gulf of Thailand and Andaman Sea

About the Authors

Mr. Isara Chanrachkij is Fishing Gear Technologist working under the Capture Fisheries Technology Division of SEAFDEC Training Department in Samutprakarn, Thailand.

Mr. Suppachai Ananpongsuk, a Fishery Biologist is the Head of the Administration Division of SEAFDEC Training Department in Samutprakarn, Thailand.

Dr. Worawit Wanchana is the Head of the Capture Fisheries Technology Division of SEAFDEC Training Department in Samutprakarn, Thailand.

Selection of the Appropriate Extension Methods for Small-Scale Fishers

Savitree Rangsihaht, Supaporn Thaipakdee and Panitnard Weerawat

In an attempt to develop a model for selecting appropriate extension methods that could work well with small-scale fishers, the 17 participants from 12 countries in the International Training Course on Coastal Fisheries Management and Extension Methodology organized by the SEAFDEC Training Department (SEAFDEC/TD) from 24 November to 17 December 2009, were asked about their opinions on the appropriate extension methods and the reasons why, and also on the problems that they had encountered during the implementation of the various extension methods. The average age of the participants was 35.9 years old and eight of them have completed their Bachelor's degrees. The participants were holding fishery officials' positions, had been working for an average of 7.6 years in their present job, and on the average, have had handled about 8.9 extension programs. The participants also had experience in adopting the individual, group and mass extension methodologies.

Small-scale coastal fisheries had been widely recognized for their importance in ensuring food security for people, more particularly in the Southeast Asian region. However, the sustainability of coastal fisheries could not be ensured due to various underlying problems of over-fishing, environmental degradation and habitat destruction. Responsible coastal fisheries management is one component of integrated coastal management with extension methodology that has been promoted in relevant human resource development (HRD) activities. Such HRD activities are envisaged to ensure that fisheries extension officials would be able to expand their knowledge and skills in the concepts and methods of fisheries management and work effectively with small-scale fishers, briefly defined by SEAFDEC (2000 and 2003) as fishers using small boats, fishing gear and equipment.

In this regard, SEAFDEC/TD conducted the International Training Course on Coastal Fisheries Management and Extension Methodology from 24 November to 17 December 2009 to strengthen the capability of extension workers in the principles, concepts and methods of coastal fisheries management and methodologies in extension, communication and media production. Seventeen trainees involved in fisheries extension work from 12 countries attended the training which was aimed at ensuring that the change towards co-management in fisheries would be applied in their respective works after the training program.

During the training, the researchers who served as the resource persons in fishery extension had the opportunity to discuss with the participants their experiences in extension methods. The participants' views and ideas were gathered through a survey questionnaire which was conducted during the training.

The questionnaire consisted of closed- and open-ended questions that focused on three main issues, namely: the kind of extension methods used while working with small-scale fishers in rural fishing communities; the appropriate methods based on the feedbacks and the reasons why; and the mode of implementation used for the selected extension methods. The population used in the survey was the 17 participants in the training course, representing 12 countries, namely: Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Maldives, Myanmar, Philippines, Sri Lanka, Thailand, and Vietnam. The collected information was confirmed through focus group discussions and the survey results are reported in this paper, in descriptive form and expressed through percentages and means.

Characteristics of the Respondents

The participant-respondents were between 20 to 54 years of age (average 35.9 years old), 47% received Bachelor's degrees, while the rest received either vocational certificate (29%) or diploma (6%) or Master's degree (12%). The current positions of the participant-respondents varied from assistant extension officer to fisheries officer, assistant



Discussion with participants in the International Training Course on Coastal Fisheries Management and Extension Methodology about the type of extension methods used in their respective countries

director, fisheries HRD staff, fisheries biologist, project evaluation officer or training specialist. Most of the participants (70%) had worked in their current positions for 1-8 years while the remaining 30% had worked for more than 8 years, the maximum being 22 years and the minimum is one (1) year. Moreover, 65% had been involved in fisheries extension program while 35% were working with related programs. During their respective period of assignment, 53% were involved in 1-8 extension programs while the rest were involved in other related programs except for one who was responsible for the implementation of almost 100 programs.

Extension Methods Commonly Used in Rural Fishing Communities

In rural fishing communities, three extension methods, *i.e.* individual, group and mass methods are popularly used by extension workers, where extension methodologies refer to the teaching and learning approaches that extension workers adopt while working with their target clients. **“Individual method”** refers to the method where face-to-face contact between an extension worker and client is involved, *e.g.* farm and home visits, office visits, telephone calls, informal discussions and discussion through the internet and e-mail. Individual method could help in planning an extension program especially when the direct involvement of an extension agent is required. **“Group method”** refers to the activity where an extension agent and group of clients (*e.g.* fishers) could meet and discuss about common issues of

interest, *e.g.* training, group meetings, field demonstrations, study tours, and field days. The group method would be useful when there is a need for local people to directly seek audience with government authorities. **“Mass method”** refers to the channel of communication and information dissemination that would enable the extension worker to communicate with large number of target audience, *i.e.* fishers, the same information at the same time through sound, moving pictures and printed materials. Such channels could include the radio and television, VCD, computer and internet, publications, newsletters, campaigns, exhibitions, and displays (Behrens and Evans, 1984; Severs *et al.*, 1997; Rangsiaphat, 2009).

Based on the results of the questionnaire survey and confirmed during the focus group discussions, the most commonly used extension method is the group method as it could serve a large number of fishers at certain given time. In addition, the concerns of the fishers could also be drawn out through the group discussions especially those related to their needs and requirements, problems, resource availability, socio-economic conditions, ways of life and livelihoods, and even the methods of fishing and fishing gear used. Through the group method, the unity of the farmers and establishment of a local farmers’ association could also be promoted. However, prior to the selection of the appropriate extension method, it is necessary to analyze the geographic conditions of the area and the available resources of the target audience (**Fig. 1**), and also to evaluate the advantages and disadvantages of the method

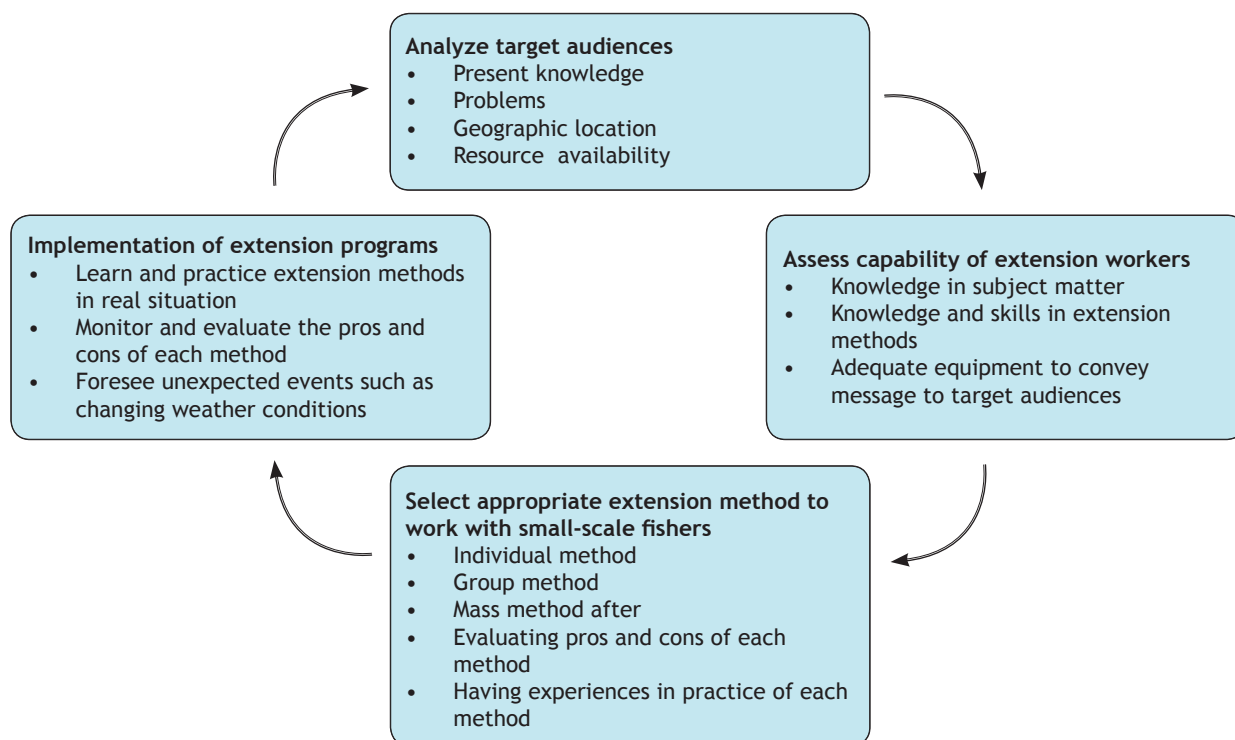


Fig. 1. Model on selection of appropriate extension methods to work with small-scale fishers

that would be applied as well as examine the problems of the clients or those of the fishers, as the case may be. In the process of implementing the extension method, the participant-respondents cited that the most common problems encountered were lack of appropriate equipment and learning materials, *e.g.* audio-visual and multi-media aids that could convey the intended messages to the target audience. The other problems identified were: inadequate knowledge and skills on the part of some extension agents in understanding the extension method, inability to foresee changes of the weather conditions, and insufficient skills in increasing the awareness of the fishers in issues and concerns related to sustainability of fisheries.

Moreover, in selecting the particular extension methods, the participant-respondents also cited the need to assess the characteristics of fishers, their socio-economic background, type of fishing gears and geographic location of fisherfolk and their family, conforming to the findings of the study conducted by Ingle (1974) on “Communication Media and Technology: A look at their role in Non-formal Education Campaign”. The study emphasized that the use of extension methods depend on the purpose of the learning activities, target audiences, existing conditions of the areas and availability of resources. Thus, the respondents indicated that the group method was the most appropriate extension method to work with small-scale fishers. These findings could be further explained by the TDRI (2009) findings that most developing countries conduct training programs that are designed to help the rural communities improve their standard of living, and that the main objective of the extension work is to help the target audience in helping themselves. After the extension workers leave the communities, it is important that the stakeholders should be able to follow up and go on with the program on their own.

Implementation of the Group Method

For the implementation of the group method, the extension workers usually collaborate with concerned agencies or other stakeholders interested in fisheries, after which the needs and the potentials of the fishers are identified. The extension program is then developed which could comprise lectures, demonstrations and field visits. The program should also include monitoring and evaluation to determine the changes in knowledge, skills and attitude before and after the implementation of the program. An example of the best practice of a training program, demonstrated by the participant-respondents was the one organized by the Regional Fisheries Training Center (RFTC) of the Philippine Bureau of Fisheries and Aquatic Resources (BFAR), which focused in improving the skills and livelihood, providing employment opportunities, and ensuring food security for

fishers. In the implementation of such program, the RFTC worked closely with Local Government Units (LGU) in the planning and implementation as well as in monitoring and evaluation of the programs. In 2009 for instance, the RFTC conducted a program on Small-Scale Fish Processing (BFAR-RFTC, 2009) in the RFTCs in Palawan, Tabaco (Albay), Catbalogan (Samar), and Panabo (Davao) for bangus deboning, drying and bottling; tilapia lamayo/fillet; and other viable fishery products involving a total of 332 participants. The results was the production of more than 5,600 kg of processed products (bangus, tilapia and others), which generated an income of more than P669,600.00 for the concerned fisherfolk.

Conclusion and Recommendations

Although the respondents described that individual, group and mass methods are necessary to assist small-scale fishers in rural fishing communities, the group method is considered the most appropriate. The model of selecting the appropriate extension methods illustrates the necessity to analyze the target audience and the capability of the extension workers, and then select the appropriate extension method and implement the extension programs. The respondents suggested that learning the extension methods should also be coupled with practicing them in the real situation. Moreover, it was also deemed necessary to conduct regular HRD workshops on extension methodologies and that monitoring and evaluation of the impacts of the extension method used in the rural fishing communities should also be regularly conducted.

Furthermore, it would also be necessary that extension officers should be able to understand and practice each of the extension method, which are introduced and explained in details during the International Training Course in Coastal Fisheries Management and Extension Methodology



organized by SEAFDEC/TD. Under the training course, practical work on the organization of a training program or plans for the conduct of a training program integrating all experiences learned should be given more emphasis and that workshop on audio-visual equipments should also be given more focus considering that use of audio-visual aids is very crucial for the effective the implementation of program trainings.

References

- Behrens, J.H. and J.F. Evans. 1984. Using Mass Media for Extension Teaching. In B.E. Swanson (Ed). Agricultural Extension. A Reference Manual. Rome. Food Agricultural Organization of the United Nations
- Bureau of Fisheries and Aquatic Resources, Regional Fisheries Training Center (BFAR-RFTC). 2009. Framework of Training Collaboration. (Pamphlet)
- Ingle, T. 1974. Communication Media and Technology: A Look at Their Role in Non-formal Education Campaign. Information Bulletin No. 5 the Clearing House on Development Communication. Academy for Educational Development, Inc., Washington, D.C., U.S.A.
- SeEVERS, B., D. Graham, J. Gamon, and N. Conklin. 1997. Education through Cooperative Extension. Albany: Delmar Publishers
- SEAFDEC. 2000. Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fishing Operations. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 71 p
- SEAFDEC. 2003. Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fisheries Management. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 69 p
- Tropical Development and Research Institution (TDRI). 2009. Fish Handling, Preservation and Processing in the Tropics: Part 2 (NRI), Training in the Field (Online). www.cd3wd.com/CD3WD-40/CD3WD/FOODPROC/NR15FE/EN/B724_...,Nov24,2009

About the Authors

Dr. Savitree Rangsihaht is from the Department of Agricultural Extension and Communication, Faculty of Agriculture, Kasetsart University, Bangkok Campus, Bangkok 10900, Thailand. Corresponding author, e-mail: agrstr@ku.ac.th

Dr. Supaporn Thaipakdee is from the Department of Agricultural Extension and Communication, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University, Kamphaeng Saen Campus, Nakhon Pathom 73140, Thailand

Ms. Panitnard Weerawat is from the Southeast Asian Fisheries Development Center, Training Department (SEAFDEC/TD), P.O. Box 97 Phrasamutchedi, Samut Prakan 10290, Thailand

Analyzing the Use of Advanced Information Technology to Boost the Sale of Fishery Products in Japan

Satana Duangsawasdi

An analysis of the Konbu Owner's Website was made during the training of the author under the project of Prof. Dr. Akira Nagano at the Future University of Hakodate in Hokkaido, Japan in November 2009. The result indicated that using advanced information technology such as the Konbu Owner's Website introduced here, there would be a possibility to increase the income of fishers and constantly supply fish products to the consumers.

Value adding of fishery products by fishers and direct selling through the use of information technology can raise the income of fishers as well as reduce the purchasing costs on the part of consumers because no middlemen are involved in this form of marketing system. In Japan, the young fishers group at Minamikayabe, Hakodate City, Hokkaido has been efficiently promoting the direct sale of fishery products by establishing a website. Known as the "Konbu Owner's Website", the main objective of this website is to increase the sale of Konbu.

Kelp or "Konbu" in Japanese is the edible seaweed *Saccharina japonica* (*Laminaria japonica*) of the family *Laminariaceae* which is widely eaten in East Asia. Konbu is usually cultivated on ropes in the seas of China, Japan and Korea. In Japan, Konbu from Hakkodate is very well known to be the best in terms of quality and taste.

Introduced via various types of promotional materials, the "Konbu Owner's Website" (**Box 1**) has been used and utilized by many fishers to advertise their products, facilitate



Drying, processing, and packaging of Konbu in Japan (clockwise)



Box 1. The Konbu Owner's Website



The URL of the “Konbu Owner’s Website” (above) is <http://www.konbu-info.com>. The CMS (content management system) program is used to manage the contents in the website. CMS is the software developed to manage the contents of any website. The contents could be in the form of texts or documents, photos, music, video and other media. The major advantage of using the CMS is on the fact that it does not require technical skills and knowledge to develop a website.



Prof. Dr. Akira Nagano (right) of Future University provides guidance on the analysis of the Konbu Owner’s Website to trainee Satana Duangsawasdi (left)

customers registration system and provide information on production procedures to give the target audience and consumers general information about Konbu. After paying certain fees to the Konbu owners, customers can access the website and can track via the website the progress of their Konbu especially on how the kelps are grown.

In the study conducted at the Future University of Hakodate, Hokkaido, Japan under the project of Prof. Dr. Akira

Box 2. Indicators of accesses to the Konbu Owner’s Website

Using internet tools such as Google Analytics and Alexa, the number of accesses to the website can be estimated and analyzed. While Google Analytics track the number of the accesses, Alexa could rank how popular the website is. In addition, these tools can also be used to analyze the interest of the people who access the internet specifically on the issues which they are most interested in. In addition, the factors which might help in increasing the number of accesses especially to the Konbu Owner Website had been identified.

Nagano, the Konbu Owner’s Website was analyzed. The result showed that the most important factor that increased the sale of Konbu is the increasing number of accesses to the Website (Box 2). Formal launching of promotional materials and intensified advertisement of Konbu products in fishery related events also contribute to the increasing number of accesses to the website as well. In fact, there is a probability that the number of accesses would further increase if the Konbu site is linked with other popular websites in Japan. Another interesting concern observed during the training is the management of IT in Japan when harmful rumors occurred. When there is a rumor in Japan that a certain virus has contaminated some fishery products, such rumor largely affects the Japanese fishers because their fishery products could no longer be sold. The consumers are afraid to eat fishery products that are alleged to be contaminated with certain virus.

It is a fact that more people are now likely to read the news on the internet than in newspapers and other media. This is because the internet can provide much updated information to the target audience. Specifically in Japan, it has been reported that the number of accesses to most popular websites is usually very high whenever unfavorable rumors on fishery products occur. For example, when Japanese consumers learned about a news or rumor, they are likely to find the facts through the internet and access to the various relevant websites. Therefore, the most effective IT management in Japan to prevent the spread of harmful rumors about any fishery products is to provide correct information through the popular and reliable websites.

Acknowledgement

Prof. Dr. Akira Nagano of Future University in Hakodate, Hokkaido, Japan was in charge of the short-term training course in Hokkaido, Japan from 7 to 24 November 2009. Conducted through the Human Resource Development Program of SEAFDEC with the cooperation of Marino 21 based in Tokyo, Japan, the training course would have not been possible and successful without the assistance of Dr. Nagano. Much gratitude therefore goes to Dr. Nagano and also to a number of persons in Hakodate who provided the participant with valuable information and suggestions.

About the Author

Mr. Satana Duangsawasdi is Information Officer of the SEAFDEC Secretariat in Bangkok, Thailand. He is a member of the Production Team for *Fish for the People*. He attended the collaborative training at the Future University in Hakodate, Hokkaido, Japan in November 2009.

CALENDAR OF EVENTS

Date	Venue	Title	Organizer
2010			
17 May-4 June	Binangonan, Philippines	Training Course on Freshwater Aquaculture	SEAFDEC/AQD
25 May-18 June	Samut Prakan, Thailand	International Training Course on Coastal Fisheries Management and Extension Methodology	SEAFDEC/TD
26 May-1 July	Tigbauan, Iloilo, Philippines	Training Course on Marine Fish Hatchery	SEAFDEC/AQD
16 July	Bangkok, Thailand	Second Press Conference for the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020	SEAFDEC Secretariat
20-22 July	Singapore	Regional Technical Consultation on Issues Related to Post-harvest and Safety of Fish and Fishery Products	SEAFDEC/MFRD
17-19 August	Bangkok, Thailand	2 nd ASEAN-SEAFDEC Regional Technical Consultation on Human Resources Development for Poverty Alleviation and Food Security by Fisheries Intervention in the ASEAN Region	SEAFDEC Secretariat
31 Aug -2 Sept	Bangkok, Thailand	Expert Meeting on Deep-sea Fishing and Its Impact to Marine Environment	TD
1-4 September	Jeju, Korea	3 rd APFIC Regional Consultative Forum Meeting	APFIC
6-8 September	Jeju, Korea	31 st Session of the Asia-Pacific Fishery Commission (APFIC)	APFIC
13-14 September	Bangkok, Thailand	Tuna Conference 2010	INFOFISH
15-17 September	Bangkok, Thailand	Regional Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing	SEAFDEC-Sida
22-25 September	Phuket, Thailand	Global Conference on Aquaculture	FAO
27 Sep-1 Oct	Phuket, Thailand	5 th Session of the COFI Sub-Committee on Aquaculture	FAO
12-15 October	Samut Prakan, Thailand	1 st Regional Technical Consultation on Sustainable Fisheries Management	SEAFDEC/TD
16-20 October	Samut Prakan, Thailand	Training Workshop on Research Methodologies for Study on Impact of Fishing on Deep-sea Ecosystem	SEAFDEC/TD
17-22 October	Bangkok, Thailand	5 th Coastal Zone Asia-Pacific Conference (CZAP2010)	CZAP
18-22 October	Bangkok, Thailand	World Small-scale Fisheries Congress (WSFC)	CDC
1-4 November	Bangkok, Thailand	Regional Technical Consultation on Adaptation to the Changing of Environment	SEAFDEC Secretariat
October (tentative)	Thailand	3 rd Meeting of the Gulf of Thailand Sub-region	SEAFDEC-Sida
October (tentative)	Thailand	On-site Training and Awareness Raising on the Integration of Fisheries and Habitat Management and the Management of Fishing Capacity in Andaman Sea Countries	SEAFDEC-Sida
October (tentative)	Samut Prakan, Thailand	Regional Training Course on Right-based fisheries and Co-management for Coastal Fisheries Management	SEAFDEC/TD
17-21 November	Khon Kaen, Thailand	International Conference on Wetland Ecosystem Services	Khon Kaen University
2-26 November	Samut Prakan, Thailand	International Training Course on Coastal Fisheries Management and Extension Methodology	SEAFDEC/TD
30 Nov-2 Dec	Thailand	33 rd Meeting of SEAFDEC Program Committee	SEAFDEC
November (tentative)	Thailand	Workshop/Expert Consultation on Identification of Critical Fishing Grounds and on Regional Habitat Rehabilitation and Management Approach	SEAFDEC/TD
3-4 December	Thailand	13 th Meeting of Fisheries Consultative Group (FCG) of the ASEAN-SEAFDEC Strategic Partnership (ASSP)	ASEAN-SEAFDEC
3 rd Quarter of 2010 (tentative)	Singapore	Regional Technical Consultation on Traceability Systems for Aquaculture Products in the Region	SEAFDEC/MFRD
2011			
10-12 January (tentative)	Bangkok, Thailand	3 rd Meeting of the Regional Advisory Committee on Fisheries Management (RAC) in Southeast Asia	SEAFDEC Secretariat
13-17 June	Bangkok, Thailand	ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020	ASEAN-SEAFDEC

Southeast Asian Fisheries Development Center (SEAFDEC)

What is SEAFDEC?

SEAFDEC is an autonomous intergovernmental body established as a regional treaty organization in 1967 to promote sustainable fisheries development in Southeast Asia.

Mandate

To develop the fisheries potential of the region by rational utilization of the resources for providing food security and safety to the people and alleviating poverty through transfer of new technologies, research and information dissemination activities

Objectives

- To promote rational and sustainable use of fisheries resources in the region
- To enhance the capability of fisheries sector to address emerging international issues and for greater access to international trade
- To alleviate poverty among the fisheries communities in Southeast Asia
- To enhance the contribution of fisheries to food security and livelihood in the region

SEAFDEC Program Thrust

- Developing and promoting responsible fisheries for poverty alleviation
- Enhancing capacity and competitiveness to facilitate international and intra-regional trade
- Improving management concepts and approaches for sustainable fisheries
- Providing policy and advisory services for planning and executing management of fisheries
- Addressing international fisheries related issues from a regional perspective



SEAFDEC Addresses

Secretariat

P.O. Box 1046
Kasetsart Post Office
Bangkok 10903
Thailand
Tel:(66-2)940-6326
Fax: (66-2)940-6336
E-mail:secretariat@seafdec.org
<http://www.seafdec.org>

Training Department (TD)

P.O.Box 97
Phrasamutchedi
Samut Prakan 10290
Thailand
Tel:(66-2)425-6100
Fax:(66-2)425-6110 to 11
E-mail:td@seafdec.org
<http://www.seafdec.or.th>

Marine Fisheries Research Department (MFRD)

2 Perahu Road
off Lim Chu Kang Road
Singapore 718915
Tel: (65)6790-7973
Fax: (65)6861-3196
E-mail: yeap_soon_eong@ava.gov.sg
<http://www.seafdec.org>

Aquaculture Department (AQD)

Main Office: Tigbauan,
5021 Iloilo, Philippines
Tel: +63 33 511 9171
Fax: +63 33 511 8709, 511 9170
Manila Office: Rm 102 G/F
Philippine Social Science Center (PSSC)
Commonwealth Avenue, Diliman
Quezon City 1101 Philippines
Tel & Fax : (63-2) 927-7825
E-mail: aqdchief@seafdec.org.ph
<http://www.seafdec.org.ph>

Marine Fishery Resources Development and Management Department (MFRDMD)

Taman Perikanan Chendering,
21080 Kuala Terengganu, Malaysia
Tel: (609)616-3150
Fax:(609)617-5136
E-mail: seafdec@seafdec.org.my
<http://www.seafdec.org.my>



In the occasion of the Millennium Conference, a drawing contest was organized for the children among ASEAN-SEAFDEC Member Countries, on the theme of "Fish and the Culture". This is the drawing from Cambodia.