

FISH for the PEOPLE

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It is widely recognized by the Southeast Asian countries that the wealth of the region's aquatic resources which was once assumed as infinite, needs to be properly managed to ensure their sustainable contribution to food security of the region's growing population. Earlier, the introduction of the Exclusive Economic Zones (EEZs) in the 70s and the adoption of the United Nations Convention on the Law of the Sea (UNCLOS) in early 1980s, allowing coastal States to manage and use the resources within their EEZs that extends 200 nautical miles (370 km) from their respective coasts, had been considered significant steps towards marine resources management. Such extended national jurisdiction was a welcome approach at the beginning, but later many coastal States began to experience the consequences of over-exploitation of the resources to obtain maximum benefits from fisheries in their EEZs. By early 1990s when it has become clearer that the fishery resources could no longer sustain the rapid and uncontrolled exploitation and development of fisheries, the earlier approach had been re-structured towards fisheries management that embraces conservation as well as environmental and social considerations. This led to the development and subsequent adoption of the Code of Conduct for Responsible Fisheries (CCRF) in 1995.

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In order to facilitate the implementation of the CCRF in Southeast Asia, SEAFDEC regionalized the CCRF starting in 1998, to take into consideration the specificities of the region's fisheries. With the cooperation and support from the SEAFDEC Member Countries, a series of Regional Guidelines were published by SEAFDEC including the Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fisheries Management which was printed in 2003. This Regional Guidelines was based on Article 7 of the CCRF but with additional provisions that took into consideration the 2001 Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region which were adopted during the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security in the New Millennium: "Fish for the People" in November 2001.

C O N T E N T S

Later in 2006, this particular Regional Guidelines had been substantiated with the Supplementary Guidelines on Co-management Using Group User Rights, Fishery Statistics, Indicators and Fisheries *Refugia* in order to promote innovative fisheries management scheme and achieve sustainable fisheries in the region. Specifically, the Supplementary Guidelines on Co-management Using Group User Rights for Small-scale Fisheries provide elaboration on the importance of delegating fisheries management authorities on coastal fisheries to local fisheries organizations and encouraging small-scale fishers to take part in managing the fishery resources in accordance with the legal frameworks and policies of the respective countries.

The advent of the changing fisheries environment and more stringent requirements in trade of fish and fishery products has prompted the Southeast Asian countries to join hands once again, in collectively promoting sustainable fisheries management for food security in the region. Such endeavor intensified the adoption of the Regional Guidelines which has also been supported by the 2011 Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 adopted in June 2011. More particularly, the countries are now undertaking measures to intensify the adoption of sustainable fisheries practices and management of fishing capacity to combat illegal, unreported and unregulated (IUU) fishing in the region. In this regard, more efforts are now directed by the countries towards developing a regional system of fishing licensing and boats registration, including the promotion of MCS and Port State Measures, and collaborating with the Indonesian-based Regional Plan of Action to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region (RPOA-IUU). In an effort to broaden the coverage of such endeavor to include the whole Southeast Asian region considering the indistinctive and intricate maritime boundaries of the countries, SEAFDEC and its collaborating partners continue to promote sustainable fishery resources management for food security, through sub-regional as well as sub-sub-regional arrangements, as deemed necessary.

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

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Promoting Maritime Security in Southeast Asia through Sustainable Fishery Resources Management

Chumnarn Pongsri

This article is based on the paper presented by Dr. Chumnarn Pongsri on the “Role of SEAFDEC in Promoting Maritime Security in Southeast Asia” during the Second Meeting of the ASEAN Maritime Forum on 17-19 August 2011 in Pattaya, Thailand. The Southeast Asian Fisheries Development Center (SEAFDEC) is an intergovernmental organization established in December 1967 for the purpose of promoting sustainable fisheries development in Southeast Asia. SEAFDEC is mandated to “develop the fisheries potentials in the region by rational utilization of the resources for providing food security and safety to the peoples and alleviating poverty through transfer of technologies as well as research and information dissemination activities”. SEAFDEC has 11 Member Countries, comprising the 10 members states of the ASEAN (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam), and Japan. SEAFDEC undertakes research on appropriate fishery technologies, trains fisheries stakeholders, and disseminates information on fisheries, the major tasks being pursued by the SEAFDEC technical departments, namely: the Training Department (TD) in Samut Prakan, Thailand for marine capture fisheries development and management; Marine Fisheries Research Department (MFRD) in Singapore for the development of fishery post-harvest technologies; Aquaculture Department (AQD) in Iloilo, Philippines for aquaculture research and development; and the Marine Fishery Resources Development and Management Department (MFRDMD) in Terengganu, Malaysia for the management of fishery resources in the Member Countries. Although nowhere is it indicated in its functions and responsibilities that SEAFDEC would be directly involved in addressing issues related to maritime security of the Southeast Asian region, but since SEAFDEC has been conducting R&D activities on the sustainable development and management of the fishery resources of the region, it can offer solutions to certain impending problems related to maritime security by pursuing the advancement of sustainable fisheries development and management for food security and poverty alleviation in the Southeast Asian region.

When maritime safety and security is in place in the Southeast Asian region, countries can pursue not only their efforts related to their maritime interests but also the development and management of marine resources in an ecologically and socially sustainable and peaceful manner in accordance with international laws (Bateman



et al., 2009). The Southeast Asian region is oftentimes engulfed by maritime and food security challenges that continue to confront its peoples especially those engaged in activities that involved the marine waters and boats, in other words the fishers. Although maritime security denotes ensuring the protection of ports and related facilities, as well as the safety of boats/vessels plying the region’s marine waters and that of peoples working on the boats/vessels and facilities, it also conveys the message that navigation in seas and oceans should not create any negative impacts on the environment and biodiversity of the marine resources that leads to the degradation of the region’s fishery resources. In other words, the promotion of maritime security in the region should include the aspects of mitigating marine pollution and preventing illegal fishing activities to ensure the sustainability of the marine resources. The cross-cutting features of maritime security could therefore include enhanced and secured connectivity that boosts the establishment of an integrated ASEAN Economic Community by 2015; strengthened cooperation among all concerned for the safety and security of boats/vessels, fishers and crew; and intensified efforts for the sustainable development and management of the region’s marine resources. It is in the latter that the roles and functions of SEAFDEC could be promoted to attain maritime security in the region.

Food security could be attained when food is available for everybody’s access. In the Southeast Asian region, the fisheries sector has demonstrated its capacity to contribute to food security for its peoples through sustainable fishery

resources management. In order to enhance such capacity and sustain the contribution of fisheries to food security, it is necessary to conserve the natural resources where the fishers had always depended on for their livelihoods and push for environmental sustainability. From this point of view, maritime security in the region could also be promoted by conserving the marine fishery resources with the ultimate goal of attaining food security. When people are food secured, then maritime security could be assured.

Contribution of Fisheries to Food Security in the Southeast Asian Region

Fisheries had been playing an important role in providing food security to peoples at all levels in all corners of the world. In the Southeast Asian region, fisheries had always provided the much needed protein to the region's populace especially those in the rural areas where access to other sources of protein seems remote. Fish is produced in the region from marine and freshwater environments, with total production that had been constantly increasing in terms of quantity and value. From about 23.0 million metric tons valued at US\$ 16.4 billion in 2005, the region's total fisheries production in 2009 increased to 28.9 million metric tons valued at US\$ 29.2 billion, gaining an average annual increase during the five-year period of 5% in terms of quantity and 16% in terms of value (SEAFDEC, 2011).

In terms of quantity, about 49% of the total fisheries production in 2009 was contributed by the marine capture fisheries sub-sector, 8% by inland capture fisheries, and 43% by the aquaculture sub-sector. In terms of value, the marine capture fisheries accounted for 36%, inland capture fisheries 9%, and aquaculture by 55% of the total value of the year's fisheries production. This implies that marine



M.V. SEAFDEC, a 1178 GT purse seiner used for collaborative fishery resources assessment of the Southeast Asian waters as well as for regional shipboard training on fishing technology, marine engineering, navigation, and seamanship, and in the conduct of hydro-acoustic and fishery oceanographic surveys



A 200 GT trawler, the M.V. SEAFDEC 2 is used for research activities on fishery resources assessment, fishery oceanography, environment surveys as well as shipboard training in the aspect of responsible utilization of fishery resources in deep-sea and un-trawlable grounds within the EEZs of respective countries

capture fisheries had been contributing substantially to the total fisheries production of the Southeast Asian region especially in terms of volume although in terms of value aquaculture seems to have exceeded that from marine capture. Additionally, the total fisheries production of the region in 2009 accounted for about 20% of the world's total fisheries production of about 145.1 million metric tons (SEAFDEC, 2012).

With the region's population of 586.0 million in 2008 and average per capita consumption of fish at 26.5 kg/capita/year, it is eminent that the fisheries sector has made significant contribution to the much needed source of protein sufficient enough for the region's populace. However, there are apprehensions backed by scientific evidence that the rapid growth of the region's population at a projected rate of 41% from 2008 to 2025 coupled with the paradigm shift in food consumption, could lead to certain level of food insecurity in the future (Delgado *et al.*, 2003). Such situation could also add pressure to the natural resources and increase the competitiveness of the multiple uses of water resources. This could also reduce the ability of the fisheries sector to continue providing food security to the people especially in the Southeast Asian region which embraces mostly the fish-eating people of the world. Moreover, emerging issues in the changing environment not only in terms of the more stringent requirements for fish trade but also those that are brought about by the impacts of climate change could lead to general livelihood crisis among the fisherfolks. SEAFDEC is therefore, exerting efforts to address such situation.

Since its establishment in 1967, SEAFDEC has been conducting R&D programs and activities in the Southeast Asian region covering the areas of responsible fishing

technologies and practices, sustainable fisheries management, responsible aquaculture development, and fishery post-harvest technologies that ensure the safety and quality of fish and fishery products. In addition, SEAFDEC has also been supporting the ASEAN countries in the formulation of regional fisheries policies to safeguard the interests of the countries. The adoption of the Resolution and Plan of Action in June 2011 therefore paved the way for SEAFDEC to strengthen the development and implementation of programs and activities that support the sustainable development of fisheries in the region.

Specifically, the programs and activities being promoted by SEAFDEC could be grouped into strategies that aim to address the general realms of fisheries issues, such as: enhancing governance in fishery management; promotion of sustainable aquaculture; adoption of ecosystem approach to fisheries; development of post-harvest technologies for the safety of fish and fishery products; addressing emerging trade requirements for fish and fishery products; adaptation and mitigation of the impacts of climate change; improvement of livelihoods in fishing communities and of the prospects of employment in fisheries-related activities; and sustaining food supply from inland fisheries. These areas of concern were also expounded during the Technical Session of the June 2011 ASEAN-SEAFDEC Conference (SEAFDEC, 2011a; SEAFDEC 2012a) in order that SEAFDEC and the ASEAN countries would be able to implement doable programs and activities on the sustainable development of fisheries for food security. Through its programs and activities and with support from collaborating partners and donor countries, SEAFDEC continues to exert efforts to maintain the resources-based equilibrium of the region's fisheries sector through the promotion of well-balanced resource conservation and exploitation. This is meant to satisfy the fish demand of the region's increasing population on the one side, while sustaining fish supply for the export market on the other side to enhance the economies of the countries in the region. Eventually, it is the goal of SEAFDEC that food security in the region is put in place.

Contribution of Fisheries to Maritime Security

The sustainability of fishery resources in the Southeast Asian region is being threatened by the incessant practice of Illegal, Unreported and Unregulated (IUU) fishing by many fishers, creating negative impacts on the economic, social and ecological aspects of fisheries and affecting food security as well as maritime security in the region. This is considering that IUU fishing contributes to over-exploitation of fish stocks impeding all attempts to manage



the fishery resources. SEAFDEC for its part has been collaborating with partner agencies for the establishment of regional and sub-regional arrangements in advancing sustainable fishery resources management by addressing over-fishing capacity and fishing effort, in order that measures to combat IUU fishing could be put in place.

More importantly, SEAFDEC cooperates with the Indonesian-based Regional Plan of Action (RPOA) to Promote Responsible Fishing Including Combating IUU Fishing, for the management of fishing capacity as well as in combating IUU fishing in the region. Parallel with the efforts of the ASEAN Maritime Forum, SEAFDEC is also collaborating with various organizations and agencies in order to sustainably improve energy security as means of boosting the efforts of the countries in the region in addressing maritime-related issues. Specifically, SEAFDEC has embarked on an enhanced engineering technology program for the development of technologies towards energy-efficient fisheries and aquaculture operations in the Southeast Asian region, focusing on the improvement of the design and operations of fishing gears and vessels as well as those of aquaculture facilities and practices. It is envisaged that this program will not only lead to improved energy efficiency and conservation but also contribute to the efforts of reducing carbon footprints from fisheries and aquaculture.

Maritime Security vis-à-vis Food Security in Southeast Asia

Most of the problems in maritime security in Southeast Asia are brought about by several factors that include loose and unclear maritime boundaries in most parts of the region's marine waters. Although EEZs had been defined to extend beyond 200 nautical miles from the countries' shorelines, there are many countries where the EEZs could include contiguous zones and sometimes overlap. Meanwhile, fishers continue to maximize the exploitation

of marine resources resulting in the depletion of most fish stocks. Instead of losing their basic means of livelihood, fishers are often lured into illegal fishing activities, which pose problems among countries in terms of enforcement because of unclear and undefined water boundaries. Nevertheless, many transboundary countries are exerting their efforts to combat illegal fishing to ensure food security in the region through trilateral or bilateral arrangements. For example, Indonesia and the Philippines have entered into an agreement to adopt measures of addressing IUU fishing in their shared waters, while Indonesia, Malaysia and Singapore are regularly conducting collaborative enforcement activities to combat IUU fishing in the Strait of Malacca through the MALSINDO program and the joint air patrol “Eye in the Sky” (Poernomo *et al.*, 2011). These efforts are aimed not only at maintaining maritime security but also ensuring food security from fisheries in the Southeast Asian region.

Nevertheless, the region continued to experience unfavorable incidents in one of its major seas. In the South China Sea recently, territorial tension occurred which could be due to over-aggressiveness and misinterpretations of the measures that address maritime-related issues. Nevertheless, many countries bordering the South China Sea especially the Southeast Asian countries, consider this marine area very significant in view of its rich fishery resources on the one hand and on the other hand, because it is the second most used sea lanes in the world.

Moreover, the South China Sea has also been reported to have considerable quantities of oil reserves as well as natural gas. Many studies also indicated that this body of water holds about one-third of the entire world’s biodiversity especially because it embraces part of the so-called coral triangle which is the global epicenter of marine biodiversity, making the South China Sea which comprises one of the most important seas of the Southeast Asian region, truly a very important area of the world’s marine ecosystem. It can therefore be gleaned from such scenario that several countries could be interested in this body of water and thus, have launched their respective territorial claims over the South China Sea. The disputes that seemed to have escalated risk not only the maritime security in the region but most importantly food security as well.

In any case, food security of the peoples in the Southeast Asian region should be considered the priority and foremost concern because when food security is in place, maritime security could be attained. SEAFDEC therefore supports the efforts of the ASEAN Maritime Forum in addressing the urgent maritime-related issues to ensure maritime and food security in the region. This could mean capturing a clear

picture of the status of the marine environment in the region through intensified sharing of information and collaborative data banking of such information, which could be achieved through bilateral or multi-lateral arrangements or through sub-regional and regional agreements.

Nonetheless, SEAFDEC would continue to promote sustainable fisheries development to address food security in the region in the light also of addressing maritime-related issues that hang like a Damocles sword over the Southeast Asian region. In this regard, SEAFDEC could offer its assistance in the form of capacity building in the areas of fisheries management for food security, safety at sea of small-scale fishing vessels and crew, and information exchange and dissemination on the status of the marine resources through the conduct of joint marine surveys to assess the fisheries potentials of the waters in the Southeast Asian region that could ensure improved livelihoods of the region’s fisheries communities. Considering that SEAFDEC cannot carry out these activities by itself, the cooperation and collaboration of relevant organizations and agencies would be sought.

ASEAN-SEAFDEC Collaborative Mechanism

Under its mandate to undertake a regional approach to program formulation in response to anticipated global threats, SEAFDEC has been coordinating with the ASEAN to establish a working mechanism in order to boost the promotion of sustainable fisheries development in the Southeast Asian region. As a result, the ASEAN-SEAFDEC collaborative mechanism was initiated in 1998 through the constitution of the ASEAN-SEAFDEC Fisheries Consultative Group for the Sustainable Development of Fisheries in Southeast Asia or FCG. In furthering the efforts of the ASEAN and SEAFDEC towards addressing the challenges that impact on the development and management of fisheries in the region and to revitalize the existing collaborative mechanism, the ASEAN-SEAFDEC Strategic Partnership or ASSP was established in 2007. Through such strengthened partnership, a number of programs and activities have been implemented towards the sustainable development of fisheries and upliftment of the economic well-being of the peoples of the Southeast Asian region.

Through the said ASEAN-SEAFDEC collaborative mechanism, the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security in the New Millennium: “Fish for the People” was organized in November 2001, which adopted the 2001 Resolution and Plan of Action to provide the regional policy direction and guiding principle for the development of programs relevant

to the sustainable development of fisheries in the ASEAN region. Ten years later, the sequel ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment” was organized in June 2011 also under the umbrella of the ASEAN-SEAFDEC collaborative mechanism. The latter Conference adopted the revitalized Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 (SEAFDEC, 2011c). SEAFDEC and the ASEAN would continue to join hands in addressing the issues that tend to impede the realization of maritime security as well as food security in the Southeast Asian region.

Way Forward

In order to ensure a bright future, sustainable fisheries development should be guided not only towards a single direction but also towards the cross-cutting facets of socio-ecological circumstances in the whole aspect of resources management. Meanwhile, in anticipation of the establishment of the ASEAN Community, the achievements of the three pillars, *viz*: ASEAN Security Community, ASEAN Economic Community, and ASEAN Socio-Cultural Community, should be boosted.

Specifically for the ASEAN Economic Community, of which regional economic integration is aimed to be completed by 2015, the region would then be characterized by having a single market and production base with free flow of goods, services, capital investment and skilled labor; being a highly competitive economic region with equitable economic development; and being fully integrated into the global economy. This could therefore be an opportune time for the countries of the region to boost the performance of their respective fishery sector by enhancing connectivity in terms of physical infrastructures such as land and marine transportation systems to facilitate the flow of goods like fishery products within and outside the region, and promote cross border trade thereby improving the countries’ respective economies. It is in this aspect that maritime safety and security could also be ensured.

The potentials of fisheries to contribute to food security in the Southeast Asian region also play a major role in attaining maritime security. The peoples in the region are fish-eating, and when food fish is nutritionally adequate in terms of quantity, quality and variety for all peoples at all times, then the peoples are food secured. The root cause of food insecurity is poverty, and those who are most susceptible to food insecurity are the people living in rural areas including the fishers. Therefore, rooting out the main cause of poverty in the fisheries communities should be

pursued in order that the fisheries communities could attain food security. This could be achieved through collaboration among the countries as well as among agencies concerned for the sustainability of the marine resources and thus, attain food security.

References

- Bateman, S., J. Ho and J. Chan. 2009. Good Order at Sea in Southeast Asia: RSIS Policy Paper. S. Rajaratman School of International Studies, Nanyang Technological University, Singapore; 52 p
- Delgado, Christopher L., Nikolas Wada, Mark W. Rosegrant, Siet Meijer, and Mahfuzuddin Ahmed. 2003. Outlook for Fish to 2020: Meeting Global Demand. A 2020 Vision for Food, Agriculture, and the Environment Initiative. International Food Policy Research Institute, Washington D.C., USA and WorldFish Center, Penang, Malaysia; 30 p
- Poernomo, A., Purwanto and Ahmadi. 2011. Combating Illegal, Unreported and Unregulated (IUU) Fishing to attain Food Security and Alleviate Poverty. *In*: Fish for the People Vol.9 No.2 (2011): Special Issue. Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp 79-85
- SEAFDEC. 2011. Fishery Statistical Bulletin of Southeast Asia 2009. Southeast Asian Fisheries Development Center; 149 p
- SEAFDEC. 2011a. Proceedings of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment”, 13-17 June 2011, Bangkok, Thailand. Volume I: The Conference Proceedings. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 258 p
- SEAFDEC. 2011c. Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 23 p
- SEAFDEC. 2012. The Southeast Asian State of Fisheries and Aquaculture 2012. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 130 p
- SEAFDEC. 2012a. Proceedings of the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 “Fish for the People 2020: Adaptation to a Changing Environment”, 13-17 June 2011, Bangkok, Thailand. Volume II: Thematic Panel Sessions. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 311 p

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Monitoring, Control and Surveillance (MCS) in Southeast Asia: Review of the Establishment of Regional MCS Network

Joeren S. Yleaña and Pierre Easter L. Velasco

The advent of Illegal, Unreported and Unregulated (IUU) fishing has been widely recognized as deterrent to the sustainable development and utilization of the fisheries resources in the region. The Resolution on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 serves as policy framework for the formulation of national policies to harmonize all efforts in the region. Referring to fisheries management, the Plan of Action specifies the need to take measures to prevent unauthorized fishing and eliminate the use of illegal fishing practices by building the awareness of all stakeholders on the adverse impacts of illegal fishing practices, strengthening law enforcement, developing and promoting responsible and selective fishing gears and practices, enforcing regulations, and encouraging alternative means of livelihoods. Moreover, on marine fisheries, the Plan of Action requires that efforts to combat IUU fishing should as well consider the establishment and strengthening of regional and sub-regional coordination on fisheries management and efforts and should also include the development of regional and sub-regional Monitoring, Control and Surveillance (MCS) Networks. In order to facilitate initial cooperation for the MCS Network, a platform of cooperation must be provided at the sub-regional/ regional level, which should also serve as forum to discuss the perspectives and considerations for the establishment of a Regional MCS Network (e.g. national regulatory framework, understanding limitations of Member Countries, and functions of cooperation).

Fisheries in Southeast Asia have developed rapidly from the 1970s to the early 1990s, the driving force of which had mainly been the increasing accessibility of global markets for fish commodities and the export liberation policies in the region. Fishery resources that include those in the Bay of Bengal, South China Sea and its vicinities, Western Central Pacific and the Indian Ocean are believed to comprise a multitude of marine aquatic species. Although fishing fleets generally fish in their respective EEZs but some also fish in their neighboring EEZs under bilateral agreements. The region's fisheries are dominated by small-scale or artisanal fishers which contribute 60-90% in terms of weight production but only 30-40% in terms of value. Meanwhile, the medium- to large-scale fishers produce mostly shrimps and tuna that are of high value and mostly supplied to export outlets (Martosubroto, 1998). In the midst of this regional fisheries situation and considering the uniqueness and variations of the region's fisheries,

growing concern on Illegal, Unreported and Unregulated (IUU) fishing presses the sector's sustainable management and fair utilization. As widely recognized, IUU fishing contributes to overexploitation of fish stocks and hinders the recovery of fish populations and the ecosystems. In an attempt to determine the losses due to IUU fishing by reviewing the IUU fishing situation in 54 countries and on the high seas, the lower and upper estimates of the current total losses brought about by illegal and unreported fishing worldwide could be between US\$10.0 billion and US\$ 23.5 billion annually, representing 11 to 26 million metric tons of aquatic commodities, where developing countries are considered to be most at risk from illegal fishing. The said figure could represent mostly the countries in the Southeast Asian region where poor governance could not be solely blamed for illegal fishing, but are the most vulnerable to illegal activities of both fishers and vessels from distant water fishing nations (Agnew *et al.*, 2009). The impacts of IUU fishing are beginning to be felt in many countries in the region, which could include reduced economic values, income, and employment (direct and indirect economic losses), and the unsustainability of the stocks of target species and the ecosystem (environmental impacts) as well as reduced livelihood opportunities and uncertain food security (socio-economic impacts).

MCS and Fisheries Management

MCS is a vital and crucial component of fisheries management, where the need for MCS could be easily recognized by assessing the status of fisheries development and management in a country. Fisheries management is bound to the resources, the types of fisheries and the kinds of resource users. In the Southeast Asian region, many factors when taken as a whole, could have significant

Box 1. Elements for the development of sustainable fisheries management

1. **Data Collection and Analysis** - socio-economic aspects, fisheries population, catch and effort, licensing, port-state measures, fish landings, among others (**Monitoring**);
2. **Participatory Management Planning** - fisheries management and strategies, fishing zones and areas which should involve concerned stakeholders/agencies (**Control**);
3. **Legal Instruments** - plans should be supported by appropriate legal instruments to effectively implement such plans (**Control**); and
4. **Implementation** - carrying out the established management measures (**Surveillance**)

implications to the development of fisheries management (Flewwelling, 2001). These factors emanate from the outstanding characteristics of the region's fisheries, such as multi-species resources, multi-gear fisheries and comprising large numbers of fishers. Generally, the development of sustainable fisheries management comprises the various factors as shown in **Box 1**.

Definition of MCS and Elements for a Successful MSC Scheme

FAO organized the Technical Consultation of International Experts in MCS for Fishery Management in 1981 in Rome. The definition of MCS which was agreed upon during the Technical Consultation is shown in **Box 2**. Moreover, the international and legal basis as well as the basic components of an MCS Scheme (**Box 3**) should be well understood. Furthermore, in order to achieve successful MCS scheme, capacity building through appropriate training sessions should be promoted considering that human resources are critical component of any MCS program. MCS staff should become more competent with a high degree of integrity and professionalism, and the same staff should be more proficient as communicators, planners, educators, and implementers of MCS. Information collection, analysis and management are also crucial especially for decision-makers to support their decisions, while effective administration of the information gathered through the MCS system is critical to the success of any MCS scheme. A database of fishery vessels, licenses, catches, and records of infringement should be maintained by agencies, institutes and ministries involved in MCS.

Box 2. Definition of MCS agreed upon during the FAO Technical Consultation in 1981

Monitoring involves the collection, measurement, and analysis of fishing activity data on catch, species composition, effort, discards, area of operations and so on, which is meant to assist fishery managers to arrive at management decisions. This should cover:

- *Monitoring of fish landings and effort data;*
- *Quantities and categories of fish landed;*
- *Monitoring of biological parameters obtained through sampling;*
- *Survey data from research vessels and trawl surveys;*
- *Stock abundance assessments and surveys, spawning, and migrating routes of fish species;*
- *Tagging data; and*
- *Mortality caused by diseases and parasites.*

Control involves the specifications of the terms and conditions under which resources can be harvested, and normally contained in national legislations, and provides basis on which management arrangements are enforced.

Surveillance involves checking and supervision of fishing activity to ensure national legislations and terms of access and management measures are observed. This activity is crucial to ensure that the resources are not overexploited, poaching is minimized and management arrangements are implemented.

Box 3. International and legal basis, and basic components of an MCS Scheme

International and Legal Basis

The international and legal bases for MCS are found in international fisheries instruments such as Article 73 of the United Nations Convention on Law of the Sea (UNCLOS), UN Fish Stock Agreement, FAO Code of Conduct for Responsible Fisheries, and the IPOA-IUU which outline the requirements for States to apply specific MCS-related measures from the start of the fishing activity until landing.

Basic Components of an MCS Scheme

An effective MCS system depends on the capacity of countries to utilize the MCS components depending on their institutional priorities, fisheries and fishing operations of each country, political support for conservation, and the funding available and other factors. FAO recommends that the following framework should be considered in implementing the MCS system:

- *Guided or in observance of the following principles: costs and benefits, symmetry between compliance and deterrence activities, balance between technology and human resources, balance between equity participatory and compulsory approaches, equality and transparency in the treatment of foreign and local fishers, absence of corruption in law enforcement and the MCS processes;*
- *Clear legal framework in accordance with and taking into effect the current international laws while taking into consideration the national and specific needs;*
- *Institutional outline for a cohesive and coordinated MCS operations (Navy, maritime police, airforce, customs);*
- *Guideline of operations and tools for the planning and execution of the MCS;*
- *Information management framework;*
- *Multi-level and comprehensive human resource training and development in all MCS components; and*
- *Periodic evaluation and analysis of the system.*

The abovementioned framework translates to the responsibility of the States to:

- *Enforce legislations and control mechanism;*
- *Establish data collection system (port monitoring, fishery observers, boarding inspections);*
- *Develop a supporting communication system;*
- *Conduct air reconnaissance;*
- *Adopt appropriate technology (VMS, satellite imagery, infra-red-tracking);*
- *Obtain commitment of the industry and fishers;*
- *Promote bilateral, sub regional and regional cooperation with other MCS support systems; and*
- *Employ competent and professional staff to implement above.*

Overview of MCS Programs of Selected Southeast Asian Countries

Box 4 shows the initiatives of some countries in the region to counter IUU fishing. The elements of MCS in these Southeast Asian countries and related activities are also illustrated.

Regional MCS Initiatives in Southeast Asia

Several meetings, workshops and conferences have highlighted the issue on IUU fishing that also raised

much concern among the countries in the Southeast Asian region. In an effort to address such issue, meetings and consultations had been conducted by SEAFDEC with its collaborating partners underscoring MCS as a tool to combat IUU fishing in the region. The ‘First Sub-Regional Meeting on the Gulf of Thailand’ convened in Bangkok, Thailand on 28-29 March 2008 as a follow up of the “RPOA-IUU MCS Meeting in Bali, Indonesia, suggested the establishment of MCS network in the Gulf of Thailand. The importance of developing an MCS network is well recognized to strengthen the MCS function and sustainable fisheries management in the Gulf of Thailand sub-region, but to come up with a regional MCS network would require the development of an “Asian Model” to address

the requirements of the region. Moreover, the specific definition of IUU fishing based on the context of the Gulf of Thailand (**Box 5**) could be used as a reference in the establishment of the regional MCS network. Furthermore, the need to find ways to monitor *non-national* vessels landing catches in neighboring ports was also suggested putting strong emphasis the on need of “Port Monitoring”.

SEAFDEC also organized the ‘Expert Meeting on Fishing Vessel Registration’ in Phuket, Thailand on 30 June-2 July 2008, where it was noted that the system of vessel registration used in by the countries in the Southeast Asian region varies and is unique since in most cases, different authorities/agencies are involved with varying roles/

Box 4. Initiatives of Countries in Southeast Asia to Combat IUU Fishing through Development of MCS Programs

Thailand: The main MCS functions are shared between the Department of Fisheries (DOF) and the Department of Marine and Coastal Resources (DMCR), where DOF maintains and operationalizes its floating assets (patrol boats) for **surveillance**. Both agencies conduct catch, fishing activities, fish stock and ecosystem monitoring. However, for large fishing vessels, registration is undertaken by the Marine Department under the Thai Vessels Act, B.E. 2481. Registration and licensing of small fishing vessels and gears are the responsibility of the Provincial Fisheries Office and reported to DOF annually (**Monitoring**). Conversely, registration of fishers in small-scale fisheries is carried out by the Provincial Office. Likewise, inspections of working conditions of fishery workers onboard fishing vessels, and in harbours and processing plants (waste management) are also carried out by DOF in compliance with the provisions of international conventions and agreements like the IMO and ILO. The Department of Harbours also surveys each vessel annually. As precautionary approach of management, the DOF has ordered the suspension of issuance of new licenses for trawlers and considering the establishment of fishing zones, control on gears and introduction of catch quotas (**Control**).

Indonesia: The key players involved in MCS activities are the Ministry of Marine Affairs and Fisheries (MMAF) through the Director-General of Fisheries, the Navy and Marine Police, and the Air Force. These agencies work not only for the protection and management of the country’s vast waters but also protecting the livelihood of over 5 million fisherfolks as the direct users of the resources. Surveillance activities include the establishment of the Technical Implementation Unit for Fisheries Surveillance (FS-TIU) in areas where rampant fishery violations had been identified. The FS-TIUs were initially established in strategic locations where the Fisheries Surveillance Officers (FSOs) and Fisheries Investigators are stationed. **Control** is implemented in the form of imposition of mesh size control, use of TEDs, banning of trawls, and complying with relevant binding fisheries regulations. Ministerial Decision of Marine Affairs and Fisheries (N. 29/2003) passed the adoption of vessel monitoring system (VMS) in the country (**Monitoring**), which aims at provide real-time information on vessel name, location, activity as well as other relevant and useful fisheries information. The information is compiled in database by MMAF to support the country’s surveillance activities. In addition, the technical cooperation with Australia in MCS resulted in the drastic decrease of illegal fishing activities specifically in Arufara Sea. Likewise, community-based MCS also plays an integral role in fisheries protection, serving as important and economical role in providing information on illegal fishing activities (**Surveillance**) prevalent in their respective localities. At sea surveillance capability has been strengthened through the deployment of Surveillance and Controlling Boats/Crafts and NOMAD light aircrafts for air reconnaissance.

Philippines: MCS is an inter-agency task led by the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (BFAR), where effective functions are carried out in close collaboration with other agencies such as the Philippine Coast Guard (PCG), Philippine Navy, Department of Foreign Affairs, Department of Interior and Local Government, the Maritime Industry Authority, and others. In order to facilitate an effective MCS program, the MCS Coordinating and Operating Center was established at the Navotas Fishport Complex and fifteen (15) Regional Monitoring Centers all over the country (**Monitoring**). The collection of the data on the biological, economic, and social aspect of the fisheries is also vital. The analysis of these data provides the input into the fisheries planning, policy formulation, aid in formulating legislations and basis for decision making. Monitoring tools includes national stock assessments programs (NSAP), resource and ecological studies, hydro-biological studies, fisheries statistics and catch reports, CRM data, issuance of licenses, and HACCP enforcement. (**Control**). The interventions are scientifically based on the data/information generated by the Monitoring Component. The Philippine Fisheries Code of 1998 (Republic Act 8550) provides pertinent laws and concrete basis of fishery rules and regulations. Moreover, the Department of Agriculture through BFAR also passes specific Fisheries Administrative Orders (FAOs) for the management and protection of the country’s fisheries. (**Surveillance**). Effective community-based MCS is carried out by empowering local fishers through law enforcement training and deputizing them under the “Bantay Dagat” (Fish Warden) Program with the active participation of the Fisheries and Aquatic Resource Management Council (FARMC) at the municipal level. Strengthening of law enforcement activities also includes the provision of 118 units Bantay Dagat Patrol Boats, 43 units 24-footer and PL-480 Patrol Boats to priority coastal areas nationwide. The BFAR 14 units MCS Patrol Vessels which are jointly manned and operated by the Philippine Coast Guard (PCG) and BFAR law enforcers, are deployed in offshore waters to deter all forms of illegal fishing activities rampantly recurring in the Country’s EEZ. The research and training vessel, the M.V. DA-BFAR also plays a role in the conduct of surveillance activities. Air reconnaissance capability is carried out in collaboration with the PCG, while a BFAR Fisheries Resource Protection and Law Enforcement Unit Quick Response Team (FRP-LEU QRT) is in place to conduct law enforcement activities. In addition, the VMS system targets the installation of transponders on commercial fishing vessels. An important component of the monitoring activities, the Philippine National Observer Program is well in place, which has been duly certified and authorized by the Regional Observer Programme of the Western and Central Pacific Fisheries Commission (WCPFC).

Box 4. Initiatives of Countries in Southeast Asia to Combat IUU Fishing through Development of MCS Programs (Cont'd)

Malaysia: The country's MCS activities are joint responsibility of the Department of Fisheries (DOF) Malaysia, Fisheries Development Authority of Malaysia (FDAM), and the Department of Environment (DOE). **Monitoring** covers biological and socio-economic aspects of fisheries which includes catch, fishing activities, port monitoring, trade, fish stock, and environmental health monitoring (through the Fisheries Management Information System). The Resource Management Branch on the other hand translates data into plans, policies and regulations. **Control** is supported by effective legislation that includes zoning, catch quotas, fishing units control, and mandatory reporting. Registration and licensing of boats, gear, and people are the responsibility of the DOF, while the identification and listing of important habitats is both under the function of DOF and the Department of Marine Parks (DOMP). **Surveillance** activities are collaborative effort involving various stakeholders (*i.e.* DOF, DOMP, Marine Police, Navy, and the Malaysian Maritime Enforcement Agency), whose tasks include joint seaborne operations, air and sea patrols, and fishing vessel inspection. VMS is in place and operational, which has been supported with 100 patrol vessels and 3 Boston whalers for offshore patrolling.

Vietnam: MCS activities in Vietnam are supervised by the Department of Capture Fisheries and Resources Protection (DECAFIREP). Although surveillance capability may be minimal but the National Network for Fishery Conservation was established to manage and protect the fishery resources. In 2009, an MCS Center was established by DECAFIREP in close collaboration with its local coastal branches to establish a system for statistics collection, and data and information analysis. This activity mainly focuses on capacity building mechanism, organizing training and guiding local officers in setting up plans and analysis methods. Fishing vessel monitoring activities started in the late 1980s in some local provinces and the function was delegated in all coastal provinces in the country in 1995. The monitoring activities/missions were carried out either direct monitoring (on-site through the controlling activities of fisheries enforcers) or indirect monitoring (through the installation of equipment and intermediaries, which could be a form of vessel monitoring).

Cambodia. The Fisheries Administration (FiA) of the Ministry of Agriculture, Forestry and Fisheries is in charge of developing research and drafting laws and policies on fisheries (and aquaculture) and is also vested with inspecting powers. At the local level, fisheries management is a function of the Provincial-Urban Fishery Authorities, which have the necessary powers to ensure compliance with the laws, in the area under their jurisdictions. The concept of MCS as management tool is yet to be developed in Cambodia and human capacity building is found crucial for such development. The country has adopted various fisheries management tools such as control of fishing pressure by issuance of fishing permits/licenses for commercial fishing (foreign and local), gear type and size restrictions, trawling prohibitions (<20 m. water depth) but enforcement of these measures is still considered weak. However, efforts for community-based management had been developed and applied in some coastal communities in recent years.

Myanmar: As with the other countries in the region, Myanmar is yet to develop its MCS system to start with integration of legal framework to support the M, C and S functions. Presently, the Department of Fisheries of Myanmar through its Director-General is responsible for controlling and authorizing fishing vessels to conduct fishing activities, and establishing checkpoints for fishing vessels. On the other hand, fishery inspectors had been designated and authorized to accompany, stop, inspect, board, arrest, and prosecute fishery violators. Infrastructure, manning and other supports to strengthen the activities have been considered and deemed necessary.

responsibilities as provided in the agencies' legal mandates and jurisdiction. The subsequent 'Second Sub-Regional Meeting on the Gulf of Thailand' in Bangkok, Thailand on 24-26 February 2009 proposed to utilize/employ "Monitor, Record and Control", "vessel records and inventory" and "Port Monitoring" to assess and record the status of fisheries in the region and enhance effective management.

Box 5. Elements for Definition of IUU Fishing (First Sub-Regional Meeting on the Gulf of Thailand, 28-29 March 2008)

- Fishing is conducted by national or foreign fishing vessels in waters under the jurisdiction of a State, without the permission of that State, or in contravention of its laws and regulations.
- Fishing activity is in violation of national laws or [relevant international obligation].
- Catch has not been reported, or has been misreported, to the relevant national authority, in contravention of national laws or regulations.
- Fishing is in areas or for fish stocks in relation to which there are no applicable conservation or management measures (and where such fishing activities are conducted in a manner or inconsistent with State responsibilities for the conservation of living marine resources under international laws.

The 'Workshop on Fishing Vessel Record and Inventory in Satun Province, Thailand on 27-29 July 2009 organized by SEAFDEC with funding support from the Swedish International Development Agency (Sida), followed up the recommendations of the 2008 Expert Meeting on Fishing Vessel Registration regarding the possibility of information sharing in the region on records and/or registers of fishing vessels. Thus, the draft "Fishing Vessel Record and Inventory Forms" was agreed upon in order to build up a regional "vessel record and inventory" with the longer term objective of improving registration of fishing vessels and enhancing the regional cooperation on information sharing in the region.

The SEAFDEC-Sida project also organized the 'First Meeting of the Andaman Sea Sub-region' on 20-22 October 2009 in Phuket, Thailand, which encouraged the countries look at the usefulness of agreements established in the region as basis for sub-regional arrangements. Furthermore, the key issues of regional concern, such as addressing fishing capacity, IUU fishing, and vessel registration were also discussed in the context of the Andaman Sea area, and where items and recommendations identified during the March 2008 Gulf of Thailand Meeting could be used

as reference in initiating the Andaman Sea Process for continuing the activities at sub-regional level.

The ‘Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia’ convened in September 2010 in Bangkok, Thailand, highlighted the importance of regional approaches to in the development of agreements at sub-regional level including the development of MCS networks. This was further underlined by the need to develop a common understanding of the new “requirements” to combat IUU fishing. The need to follow up with the requirements of RPOA on the inclusion of countries to be involved in established sub-regional groupings was highlighted, including considerations to establish more “sub-regions” where there are common needs to implement MCS-networks among concerned countries such as the area around South West South China Sea and Southern Malacca Straits.

In terms of regional, sub-regional and bilateral cooperative MCS activities, a number of initiatives exist in the region. These initiatives may be categorised into joint patrolling and sharing of information which contribute largely to capacity-building in MCS. Countries like Indonesia, Malaysia and the Philippines for example, are involved in the regional initiatives or tri-lateral agreements to combat IUU fishing in the Sulu-Sulawesi Sea Marine Eco-region Programme of the WWF as well as in the RPOA to promote responsible fishing. Bilateral agreements have also been forged to adopt collaborative measures to combat IUU fishing. In addition, Indonesia, Malaysia, and Singapore (tri-lateral agreements) have regular collaborative seaborne patrol activities under the MALSINDO program and the joint “eye in the sky” air reconnaissance to combat IUU fishing in Malacca Strait (Poernomo *et al.*, 2011).

Gearing towards a Regional MCS System

Several issues have been identified which should be addressed in initialization MCS network in the region. The MCS capacity in the region varies among the countries, while some countries may have advance MCS technology or system but others may have no MCS program at all. Some countries may just utilize other forms of fishery law enforcement with various effectiveness and strength. The high cost of maintenance of surveillance facilities is another factor that should be considered in the development of regional MCS system. The countries also have different legal mandates or systems which make it difficult to harmonize policies and legislations in fisheries. Data collection systems and research levels also differ making it difficult for managers to monitor the status of the fishery resources. Nevertheless, the RPOA-IUU provides a framework for cooperation among countries in the region

to collaborate in the implementation of MCS measures. In order to strengthen the MCS capabilities/systems in the region, the RPOA-IUU also requires the development of a regional network to quickly share information on vessels name, ports used (home and unloading port), target species, and other relevant information and encourages member countries to: enter into appropriate sub-regional MCS arrangements/collaborations to eliminate IUU fishing activities; develop a regional MCS network for sharing information and coordinate collaborative regional activities to enhance sustainable fisheries management to combat IUU fishing; promote knowledge and understanding among neighbouring countries; develop or strengthen existing observers program in compliance with regional and international requirements and adhere to inspection requirements of fishery management organizations (FMOs).

Way Forward

The establishment of a regional MCS network is crucial to strengthen MCS capabilities in participating countries through coordination and cooperation with the goal of deterring, reducing, and eliminating IUU fishing and other destructive activities that affect the sustainability of the marine resources. The network should therefore be designed to satisfy obligations arising from international agreements and their national responsibilities in performing MCS functions. Regional cooperation in adopting MCS is



BFAR Bantay Dagat Patrol Boat (above); and BFAR 30-meter MCS Patrol Vessel (below)

imperative for effective fisheries management particularly of shared stocks. Bilateral, sub-regional and regional cooperation on MCS can yield the exchange of fisheries data for MCS for fisheries management purposes, and thus, should be pursued. In the establishment of a regional MCS system it would be necessary to harmonize legislations and extradition agreements, as this would result in cost saving and increased negotiating power especially in the implementation of flag and port State control agreements, and combined measures to address IUU fishing.

References and Further Readings

- Achmad Poernomo, Purwanto and Ahmadi. 2011. Combating Illegal, Unreported and Unregulated (IUU) Fishing to Attain Food Security and Alleviate Poverty. *In: Fish for the People*, Vol. 9 No. 2:2011, SEAFDEC, Bangkok, Thailand, pp79-85
- Agnew D.J., J. Pearce, G. Pramod, T. Peatman, R. Watson. 2009. Estimating the Worldwide Extent of Illegal Fishing. *PLoS ONE* 4(2): e4570. doi:10.1371/journal.pone.0004570. www.plosone.org/article/info:doi/10.1371/journal.pone.0004570
- Everett, G. V. 1998. Overview of issues of concern to fisheries monitoring control and surveillance in south and Southeast Asia. FAO/Norway Government Cooperative Programme – GCP/INT/648/NOR17 Regional Workshop on Fisheries Monitoring, Control and Surveillance. Kuala Lumpur and Kuala Terengganu, Malaysia, 29 June – 3 July 1998
- Flewelling, P. 2001. Fisheries Management and MCS in South Asia: Comparative analysis. Food and Agriculture Organization of the United Nations Rome, January 2001
- International MCS Network. International Monitoring, Control, and Surveillance Network for Fisheries Related Activities. <http://www.imcsnet.org/imcs/iuu.shtml>
- Lymer, D., S. Funge-Smith and W. Miao. 2010. Status and potential of fisheries and aquaculture in Asia and the Pacific 2010. FAO Regional Office for Asia and the Pacific. RAP Publication 2010/17
- Martosubroto, Purwito. 1998. Marine Fisheries of South and Southeast Asia: A review of the resources and the need for monitoring control and surveillance. FAO/Norway Government Cooperative Programme – GCP/INT/648/NOR19. Regional Workshop on Fisheries Monitoring, Control and Surveillance. Kuala Lumpur and Kuala Terengganu, Malaysia, 29 June – 3 July 1998
- MRAG. 2005. Review of Impacts of Illegal, Unreported and Unregulated Fishing on Developing Countries. Report to DFID. 176 p
- SEAFDEC. 2008 and 2009. Report of the First and Second Sub-Regional Meeting on the Gulf of Thailand, Bangkok, Thailand, 28-29 March 2008 and 24-26 February 2009, respectively, Bangkok, Thailand

- SEAFDEC. 2009. Report of the Workshop on Fishing Vessel Record and Inventory, Satun Province, Thailand, 27-29 July 2009, Bangkok, Thailand
- SEAFDEC. 2010. Report of the Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia, September 2010, Bangkok, Thailand
- Technical Terms of Reference. 2001. International Network for the Cooperation and Coordination of Fisheries-Related Monitoring Control and Surveillance Activities Australian National Center for Ocean Resources and Security (ANCORS). 2008. Monitoring, Control and Surveillance Regional Issues and Needs. Background Paper for the RPOA MCS Workshop, Bali, Indonesia, 4-6 March 2008



BFAR Research Vessel M.V. DA-BFAR (above); and BFAR staff conducting measurement of fish sizes using a Fish Ruler (below)

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Port State Measures and Port Monitoring in Southeast Asia

Pirochana Saikliang, Nopparat Nasuchon and Magnus Torell

The demand for fish and fishery commodities around the world has been increasing. In order to meet such demand, active fishing vessels have been growing in terms of number and efficiency, resulting in overcapacity in most fishing areas of the world with the fishery resources becoming over-exploited. According to FAO, the world's decreasing fishery production from marine capture fisheries over the last two decades brought about worldwide concern on the effectiveness of fisheries management, enforcement of restrictions and regulations, and long-term sustainability at optimal levels of utilization of fishery products. Illegal, Unreported and Unregulated (IUU) fishing has been recognized as one of the detrimental factors that affect the health of fish stocks and marine ecosystems, as well as the livelihood of legitimate fishers. In this regard, Port State Measures had been considered as an efficient tool to regulate fishing activities at landing ports and combat IUU fishing. This report provides information on the Port State Measures Agreement and the experience of some countries in Southeast Asia, in initiating efforts to adopt the Agreement which the other countries could use as reference in preparing for the eventual implementation of the Port State Measures Agreement in the Southeast Asian region.

A number of key international instruments have been developed and agreed upon globally providing guidance to countries in undertaking measures and in complying with regulations to achieve sustainability in fishery resources utilization. Among the important conventions and other instruments which are binding and non-binding, include the 1982 UN Law of the Sea Convention (UNCLOS 1982), the United Nations Fish Stocks Agreement (UNFSA), FAO Compliance Agreement 1993, and the FAO Code of Conduct for Responsible Fisheries (CCRF). The common element of such instruments emphasized on the need to manage fishing capacity and to ensure that fishing effort does not exceed the available resources while at the same time aim to reduce destructive and illegal fishing. The extent of "Illegal, Unreported and Unregulated (IUU) fishing" has been gradually recognized in many regions, and sustainable fisheries management has been the basis for promoting international efforts to combat IUU fishing.

IUU fishing has been considered as one of the important factors that obstruct all efforts to conserve and maintain the fish stocks. MRAG (2009) estimated that the global economic impact in terms of losses due to IUU fishing is between US\$ 10.0 billion and US\$ 24.0 billion annually

involving about 11 and 26 million metric tons of fish. Specifically, IUU fishing also threatens the sustainability of the fishery resources as expressed by developed countries including large fleets from Eastern Europe. This could be due to the fact that over the last decades, fishing vessels from developing countries including those from Asian countries have significantly increased and many Asian and Southeast Asian countries became the top 10 to 20 fishing nations. Eventually, attention on the need to combat IUU fishing was growing stronger.

As provided for in the CCRF, member countries of FAO have called for ways to combat IUU fishing. Thus, the FAO Committee on Fisheries (COFI) adopted in March 2001 the International Plan of Action to Prevent, Deter and Eliminate IUU Fishing (IPOA-IUU) which was a voluntary instrument. The IPOA-IUU encourages the use of Port State Measures to combat IUU fishing, but the main responsibility to enforce measures to combat IUU fishing rested with the flag States (**Box 1**). In spite of the increasing efforts and global recognition on the need to combat IUU fishing, a concern was focused on existing management efforts for compliance by the flag States. In this regard, the need to strengthen the role and functions of

Box 1. Coastal State, flag State, and port State defined

The term "coastal State" is generally understood to mean a State bordering a marine area. The term "flag State" is generally understood to mean a State in whose territory a vessel is registered and whose flag a vessel is entitled to fly. The term "port State" is generally understood to mean a State in whose port a vessel is seeking or has obtained access, and for the purpose of the IPOA-IUU, ports also include offshore terminals.



Fish landed at Songkhla Fishing Port, Songkhla, Southern Thailand

the port States became apparent through the enforcement of necessary regulations.

Development of the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing

At the beginning of this millennium, FAO initiated the development of some standards and model of control measures to be implemented in fishing ports. In 2005, COFI endorsed the Model Scheme on Port State Measures (PSM) to Combat IUU Fishing, which came with it the international minimum standards for PSM, and the required appropriate implementation of the PSM at regional or national levels. However, the model scheme was intended to be applied on a voluntary basis. Following the requirements for more stringent measures, COFI endorsed the initiative to develop a binding agreement on port State measures based on the Model Scheme and the IPOA-IUU.

Thus, the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSM Agreement) was approved during the Thirty-sixth Session of the FAO Conference on 22 November 2009. The Agreement which is binding to all parties, aims



Fishing boats at Songkhla Fishing Port, Songkhla, Southern Thailand

to prevent illegally caught fish from entering international markets through ports and address the role of a port State to prevent IUU fishing at landing sites, in ports and on transshipment vessels (being considered the first “port”). Basically, the PSM Agreement strengthens the roles and functions of the port State by establishing binding requirements for inspections and monitoring of the legal status of catches (by foreign vessels) to be landed (including “landings” at transshipment vessels) in national ports and landing sites by control of catch documentation and other supporting documents (e.g. registration, crew lists). The responsibility of ensuring that all needed documents are available and reliable is placed on the flag State (**Box 2**).

Upon the adoption of the PSM Agreement in November 2009, it was open for signature until 21 November 2010 and supposed to be enforced 30 days after the deposit of the Agreement with the FAO, as an instrument that had been ratified, accepted, approved, and acceded. As of 15 August 2011 however, only 23 states have signed with Indonesia as the only country from the ASEAN. Specifically, one state (Norway) has ratified the PSM Agreement, one state or “regional economic integration organization” (European Union) indicated approval of the PSM Agreement while two states (Myanmar and Sri Lanka) have acceded to the PSM Agreement according to the FAO Legal Office.

Port State Measures Agreement

The PSM Agreement defines the roles of port States and flag States, including the measures to take in connection with landings of catches by fishing vessels. The PSM Agreement highlights on the *role of the port State* in the adoption of effective measures through effective port monitoring and stringent inspections as needed from time to time to control the legality of catches being landed, and

Box 2. Key requirements identified in the PSM Agreement

1. Foreign fishing vessel wishing to enter a port to land its catch (or part of the catch) should notify the desired port in advance to obtain to land the catch. The notification should include information on fishing gear used, fishing area and the species/species groups of fish on-board;
2. Port States should, in designated ports, ensure that regular inspections are undertaken based on (internationally) recognized standards established for the purpose of port inspections;
3. Port State inspectors should control the papers of the vessel (registration, licenses, crew documents, etc), survey of fishing gear on board, examination of catch and the catch documents, and other information and records related to the vessels;
4. States party to the PSM Agreement must ensure that port inspectors are adequately equipped and trained (building upon the “guidelines for training of port inspectors” that is annexed to the PSM Agreement);
5. When a vessel is denied access to a port, the port State should publicize the information and the port State should inform relevant authorities of the flag State of the vessel for the flag State to take appropriate follow-up action;
6. Port State should create an information sharing network to exchange information on IUU associated and listed vessels; and
7. Parties to the convention should provide assistance to developing countries to be able to meet with the obligations and requirement for implementation of the PSM Agreement.

promote the sustainable use and long-term conservation of living marine resources and combat IUU fishing. It has also been recognised that measures to combat illegal, unreported and unregulated fishing should build upon the *primary responsibility of flag States* (SEAFDEC, 2010).

Prior to the adoption and entry into force of the PSM Agreement, some states and/or “regional management organizations”, and/or “regional economic integration organizations” have already developed national laws and regulations based on the principles of the PSM Agreement with a common objective of combating IUU fishing. Subsequently, an important step was taken by the European Union (EU) when on 29 September 2008, the EU adopted the Council Regulation (EC) No 1005/2008 “establishing a community system to prevent, deter and eliminate illegal, unreported and unregulated fishing”. The EC Regulation which came into force on 1 January 2010 is an example of how the principles of the PSM Agreement could be incorporated in national legislations. The EC Regulation specifies that all marine fishery products exported to the EU as well as marine fishery products exported within the EU should have proper catch documents attached which could be used to validate and confirm that the fishery products are not from any IUU fishing activity. Such traceability requirements make it always possible to track the products all the way starting from the actual fishing grounds. Moreover, the Regulation requires that the validity of the catch documents should be verified at fishing ports.

During the 29th Session of COFI on 31 January-4 February 2011, the FAO member countries were encouraged to ratify, accept, approve or accede to the PSM Agreement and to make extra-budgetary contributions to support capacity development for the implementation of the Agreement. While assessing the progress made with regards to measures taken against IUU fishing including the implementation of port State measures and market State measures, COFI also reviewed the performance of flag States as well as the status of the development of “Comprehensive Global Record of Fishing Vessels, Refrigerated Transport Vessels and Supply Vessels”.

Southeast Asia: A Major Trading Partner in Fishery Products

Southeast Asia is one of the major fish producing regions in the world and through the international trading of fishery products the region has been remarkably supporting the fish requirements of the peoples around the world. Fish and fishery products form dominant parts of the food items being exported from (and within) Southeast Asia. From the region’s total fisheries production of about 25 million metric tons in 2007, about 14 million metric tons or about

56% was exported (SEAFDEC, 2010). Moreover, the value of the fishery products exported by the Southeast Asian countries in 2007 was about US\$ 24 billion where the main markets included the U.S.A., EU, East and Southeast Asia, China, and other countries.

The importance of the EU as target market for fishery products from Southeast Asia provides a strong motivation for the countries in the region to improve the management of fishing capacity and combat IUU fishing, establish traceable routines for catch documentation, and improve port monitoring and port inspection. Under such circumstance, the 43rd Meeting of the SEAFDEC Council in April 2011 agreed that routines and standards for fish trade among the ASEAN countries should be upgraded, considering that fishery products from one country might be processed and re-exported to international markets from another country. While eventually implementing such measures, the status and standards of the fishery products from the region should be improved to maintain the reliability of Southeast Asian fisheries. Furthermore, improving trade within the ASEAN and strengthening efforts to combat IUU fishing in the region had also been a top priority in the ASEAN Community building which is envisaged to be completed by 2020, and thus, had been emphasized in the 2011 Resolution and Plan of Action adopted during the ASEAN-SEAFDEC Fish for the People Conference in June 2011 (SEAFDEC, 2011).

Moreover, the significance of implementing the PSM Agreement as means to undertake measures to combat IUU fishing had also been recognized by regional fisheries management organizations (RFMOs) such as the Indian Ocean Tuna Commission (IOTC). During the 14th session of the IOTC in March 2010 in Busan, Korea, the IOTC member countries which include some countries in Southeast Asia, adopted Resolution 10/11 on “Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing” which came into force on 1 March 2011. The Resolution specified that IOTC member countries and cooperating non-contracting parties (CPCs) are required to provide information relevant to combating IUU fishing to the IOTC Secretariat. Such information should include a list of designated ports, “prior notification periods” established by each CPCs, and the “designated competent authority” appointed in each of the port States among the CPCs.

Port Monitoring in Southeast Asia and Collaboration on Port Monitoring in Sub-regions

In Southeast Asia, fisheries and consequently the trade of fishery products are among the most important sources

of employment and income that improve the region's economies. Even more significant is the fact that countries in the region are among the world's top trading nations of fishery products. Nevertheless, there is still the need to develop the means of verifying the legal status of fishery products being landed in many ports of the region, as well as the practices and procedures for port monitoring and port inspections to be able to comply with international standards. This would also contribute to fulfilling the ambition of the ASEAN Community building and the development of the ASEAN Economic Community by 2015, by which time trading among the ASEAN countries is expected to increase. Thus, the need to have efficient and reliable port monitoring and inspection system to ensure the sustainable utilization and exploitation of the marine resources, and maintain sustainable trade and combat IUU fishing, is well recognized by the Southeast Asian countries.

In a broader sense, "port monitoring" includes monitoring of all activities in the ports and landing sites of each country. The PSM Agreement focuses on monitoring and inspection of landings by foreign vessels, national vessels that fished outside of national EEZs, "domestic" landings by national vessels intended for export, landing through transshipment vessels including landing across boundaries by neighboring states, and other landings across boundaries. This implies that through monitoring and inspection, the data and documentation of fishing activities (gear, fishing ground), information on vessels and crew, catch documentation, current status of fish stocks if available, trade flow and market could be compiled and reviewed. Moreover, this could also enhance monitoring of "domestic" catches from all types of fisheries under national laws as applicable in accordance with the legal requirements of each country. More importantly, the requirements of the PSM Agreement would also be applied for domestic landings especially if the catch is intended for export. Furthermore, in establishing and enhancing port monitoring mechanisms, it is necessary to establish good cooperation among all relevant sectors and institutions, as well as among countries bordering the region and sub-regions. It should be recognized that during port monitoring, local and foreign vessels are also monitored to be able to validate and support the increasing requirements for catch traceability and other documentations.

In order to facilitate the process that could support the countries in transforming an existing well-managed port into a model for the country, protocols on how to manage fishing ports in support of efforts to combat IUU fishing should be established in accordance with the laws and regulations of each country. In addition, as indicated in the PSM Agreement landings by vessels in neighboring ports require special consideration especially in the process of

validation of the legal status of landed catches, especially with regards to artisanal fisheries. Such effort could already be initiated considering the cross-boundary relationships that had been established among concerned countries such as those bordering the Gulf of Thailand, namely: Cambodia and Vietnam, Cambodia and Thailand and in the area between Malaysia and Thailand. Similar efforts could also be undertaken for countries bordering the Andaman Sea such as Myanmar and Thailand and Indonesia, Malaysia and Thailand in the southern area of the Andaman Sea.

During the Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia convened by SEAFDEC in September 2010, the need to develop relevant training programs was emphasized, by building upon the "guidelines for training of port inspectors (inspectors, information collection on resource evaluation)" stipulated in the PSM Agreement. Such training programs should aim to improve the capacity of personnel including port inspectors working at key fishing ports in the region, such efforts are also in line with the provisions in the PSM Agreement and in the EC Regulation on the need to assist developing countries in enhancing their capacities. Moreover, in order to strengthen institutional capacity, a mechanism or set of regional standards for port inspection and port monitoring should be developed to clarify the measures that port States should undertake, and on how such measures would relate to the functions that the flag States of the region have to carry out in order to combat IUU fishing (SEAFDEC, 2010).

Sub-regional Collaboration on Port Monitoring: Gulf of Thailand and the Andaman Sea Sub-regions

The need to establish closer cooperation among countries in the Southeast Asian region and around sub-regional seas such as the Gulf of Thailand and the Andaman Sea where bordering countries share common interest in sustaining the benefits derived from productive fisheries, is necessary to effectively combat IUU fishing in the region. In the sub-regions, the bordering countries recognize the need to address similar problems such as illegal and destructive fishing, and over-fishing capacity. Thus, the implementation of cooperative efforts to combat IUU fishing could be effectively pursued. Through similar initiatives, cooperation to combat IUU fishing could also be established for the other sub-regions such as in the Sulu-Sulawesi Seas and Arafura-Timor Seas, taking into consideration the established Model Scheme in the region and sub-regions of the Gulf of Thailand and Andaman Sea.

Likewise, countries bordering the sub-regions should develop systems of sharing information in a more systematic

way. It is also equally important that the knowledge and capacity of officers and personnel in agencies responsible for management of fishing capacity (e.g. registration, licensing) as well as other relevant institutions, on port monitoring and inspection are enhanced to meet higher expectations including the ability to cooperate with other institutions and across boundaries. SEAFDEC has continued to play an important role in supporting such capacity building through regional training courses, regional consultations and on-site events in countries around the identified sub-regions.

With support from the SEAFDEC-Sida Project, SEAFDEC initiated in 2008 a process of promoting sub-regional cooperation in the sub-regional seas of the Gulf of Thailand and the Andaman Sea by organizing a sequence of sub-regional Meetings that brought together countries bordering these two sub-regions. These events aimed to allow the countries to discuss matters of mutual concern in relevant fields of interest, like the integration of fisheries and habitat management and the need to manage fishing capacity to combat IUU fishing. In such sub-regional meetings, the participants put emphasis on the development of port monitoring. More particularly, the countries bordering the Gulf of Thailand and Andaman Sea indicated that the common practice of landing catches in fishing ports in neighboring countries should be given special attention and appropriately addressed by countries around the sub-regions.

Meetings of Gulf of Thailand Sub-region

The first meeting was convened in Bangkok on 28-29 March 2008 and the second also in Bangkok on 24-26 February 2009. Attended by representatives from Vietnam, Cambodia, Thailand and Malaysia together with resource persons from international organizations and the UNEP/GEF South China Sea Project, in both meetings emphasis was made on the “need to have good port monitoring”. Furthermore, while it was considered that cooperation mechanism for port monitoring among the countries around the Gulf of Thailand should be established, such mechanism should also aim to monitor and address landings of “neighbouring country vessels” and landings across boundaries. The initiative of establishing a reliable port monitoring based on meaningful sub-regional cooperation, aims to prepare the countries in complying with increasing demands on traceability, catch documentation, and to combat IUU fishing in Southeast Asia.

Meetings of Andaman Sea Sub-region

The first meeting was convened in Phuket, Thailand on 20-22 October 2009 attended by representatives from

Thailand, Malaysia, Indonesia, Myanmar, and India through a collaborative arrangement with the Bay of Bengal Large Marine Ecosystem (BOBLME) project. While referring to the sub-regional meetings of the Gulf of Thailand which promoted sub-regional management arrangements, the Meeting agreed on the need to establish suitable fisheries management for the Andaman Sea Sub-region. In so-doing, focus would be given to key issues of regional concern such as fisheries/habitat management, fishing capacity, IUU fisheries, vessel registration, port monitoring, among others, thus building upon opportunities to implement an “ecosystems approach to fisheries (EAF)”. The countries around the Andaman Sea Sub-region had a common understanding on the need to consider “port monitoring” with increasing priority in accordance with the “final” version of the requirements of the PSM Agreement and the EU requirements for catch documentation, and in the local scene, the practice of fish landings in “neighbouring countries”.

Ideally, all fishing ports and landing sites whether district or provincial, should be included in the port monitoring considering that the places where catches are landed are important and critical control points. Good port monitoring and port inspection for that matter is therefore important not only to combat IUU fishing but also needed for controlling the quality of fishery products that pass through such ports. It has also become necessary that the environmental standards of the ports be given more emphasis as it is at these ports and landing sites where appropriate authorities, through the catch and landing documents, can assess the amount of taxes and other revenues that could be derived for the country’s coffers. Presently, port monitoring in the region is basically or primarily done with the objective of monitoring the management of the ports and landing sites. As such, it does not focus on systematic monitoring and validation of catch documents and documents linked to the operation of the fishing vessels (e.g. registration, licenses, crew, and documents) as required under the PSM Agreement.

Nevertheless, validating the legal status of catches from traditional small-scale fisheries is one special challenge while verifying the origin of landings at border fishing ports for the small-scale fishing boats with limited monitoring and no records of their catch is even more challenging. However, one possible solution could be by exploring the application of “cluster arrangements” whereby the authorities at a landing site can verify and validate the combined landings from a “cluster” of small boats, as having been fished in accordance with national laws and in a sustainable manner. As a matter of fact, cluster arrangement could also be an option to certify products from small-scale aquaculture, as also suggested as by

Box 3. Port Inspection Procedures (Annex B of PSM Agreement)

Inspector shall:

- a) Verify, to the extent possible, that the vessel identification documentation onboard and information relating to the owner of the vessel is true, complete and correct, including through appropriate contacts with the flag State or international records of vessels if necessary;
- b) Verify that the vessel's flag and markings (e.g. name, external registration number, International Maritime Organization (IMO) ship identification number, international radio call sign and other markings, main dimensions) are consistent with information contained in the documentation;
- c) Verify, to the extent possible, that the authorizations for fishing and fishing related activities are true, complete, correct and consistent with the information provided in accordance with Annex A;
- d) Review all other relevant documentation and records held onboard, including, to the extent possible, those in electronic format and vessel monitoring system (VMS) data from the flag State or relevant regional fisheries management organizations (RFMOs). Relevant documentation may include logbooks, catch, transshipment and trade documents, crew lists, stowage plans and drawings, descriptions of fish holds, and documents required pursuant to the Convention on International Trade in Endangered Species of Wild Fauna and Flora;
- e) Examine, to the extent possible, all relevant fishing gear onboard, including any gear stowed out of sight as well as related devices, and to the extent possible, verify that they are in conformity with the conditions of the authorizations. The fishing gear shall, to the extent possible, also be checked to ensure that features such as the mesh and twine size, devices and attachments, dimensions and configurations of nets, pots, dredges, hook sizes and numbers are in conformity with applicable regulations and that the marking correspond to those authorized;
- f) Determine, to the extent possible, whether the fish on board was harvested in accordance with the applicable authorizations;
- g) Examine the fish, including by sampling, to determine its quantity and composition. In doing so, inspectors may open containers where the fish has been pre-packed and move the catch or containers to ascertain the integrity of fish holds. Such examination may include inspections of product type and determination of nominal weight;
- h) Evaluate whether there is clear evidence for believing that a vessel has engaged in IUU fishing or fishing related activities in support of such fishing;
- i) Provide the master of the vessel with the report containing the result of the inspection, including possible measures that could be taken, to be signed by the inspector and the master. The master's signature on the report shall serve only as acknowledgment of the receipt of a copy of the report. The master shall be given the opportunity to add any comments or objection to the report, and, as appropriate, to contact the relevant authorities of the flag State in particular where the master has serious difficulties in understanding the content of the report. A copy of the report shall be provided to the master; and
- j) Arrange, where necessary and possible, for translation of relevant documentation.

Box 4. Guidelines for Training of Inspectors (Annex E of PSM Agreement)

Annex E of the PSM Agreement states the "Each Party shall ensure that its inspectors are properly trained taking into account the **guidelines for the training of inspectors in Annex E**. Parties shall seek to cooperate in this regard". The elements of a training programme for port State inspectors should include at least the following areas:

1. Ethics;
2. Health, safety and security issues;
3. Applicable national laws and regulations, areas of competence and conservation and management measures of relevant RFMOs, and applicable international law;
4. Collection, evaluation and preservation of evidence;
5. General inspection procedures such as report writing and interview techniques;
6. Analysis of information, such as logbooks, electronic documentation and vessel history (name, ownership and flag State), required for the validation of information given by the master of the vessel;
7. Vessel boarding and inspection, including hold inspections and calculation of vessel hold volumes;
8. Verification and validation of information related to landings, transshipments, processing and fish remaining onboard, including utilizing conversion factors for the various species and products;
9. Identification of fish species, and the measurement of length/weight, stock status and other necessary biological parameters;
10. Identification of vessels and gear, and supporting facilities or fishing techniques for the inspection and measurement of gear;
11. Equipment and operation of VMS and other electronic tracking systems; and
12. Actions to be taken following an inspection.

representatives from the EU during the 2008 Meeting in Bangkok. As for artisanal landings across boundaries, the PSM Agreement provides some guidance, particularly in Article 3, Paragraph Part b which states that "Each Party shall, in its capacity as a port State, apply this Agreement in respect of vessels not entitled to fly its flag that are seeking entry to its ports or are in one of its ports, except for (a) vessels of a neighbouring State that are engaged in artisanal fishing for subsistence, provided that the port State and the flag State cooperate to ensure that such vessels do not engage in IUU fishing or related activities that support IUU fishing". Moreover, validating the legality of catches in areas where fishing vessels have two flags and double registration to enable them to operate in two countries could be another challenging task as no record of their production is provided or only the catches conveniently recorded for the day (best price) are provided. Nonetheless, institutional structures actually obstruct all attempts to implement good port monitoring. The number of agencies involved with fish landing and the lack of cooperation in sharing information among agencies involved hinder any attempts to adequately carry out enforcements.

Since the adoption of the PSM Agreement in November 2009, only Myanmar among the ASEAN countries had acceded to the PSM Agreement on 22 November 2010. Meanwhile, Indonesia had signed the PSM Agreement on 22 November 2009, and also indicated its intention to ratify the PSM Agreement. During the discussions in regional and sub-regional events organized since 2008, the need to develop a mechanism or set of standards for port inspection and port monitoring that would clarify the measures for port States to undertake, had been repeatedly emphasized, including how such measures should relate to the measures of flag States to combat IUU fishing, in accordance with the “Port inspections procedures” specified in the PSM Agreement (**Box 3**). The development of regional guidelines on port monitoring/port inspection was also considered.

Inadequate training and skills of personnel is one of the problems that led to the deficiency in the national capacity to improve port management including port inspections. Thus, the need to develop relevant training programs based on the “guidelines for training of port inspectors” in the PSM Agreement has been emphasized (**Box 4**), as this could contribute to improving the capacity of personnel including port inspectors, working at key fishing ports in the region.

Way Forward

At present, the implementation on port State measures in some countries of the region is slowly progressing, in spite of the fact that the PSM Agreement is still not in full force. Nonetheless, the Southeast Asian region still lacks control of the fishing ports especially at the border areas, where catches are landed from small-scale fishing boats and at borders where owners of fishing boats are not identified. For the long-term sustainability and utilization of marine resources, it would be crucial for the countries in the region to ratify the PSM Agreement. During the 2nd Meeting of the Gulf of Thailand, the participating countries agreed to share information on port State measures and flag State measures, as well as on market State measures. It has also become imperative that a system and mechanism for sharing information is immediately established in the region to facilitate monitoring and control, and eventually prevent IUU fishing considering the presence of many illegal fishing boats. Training programs should also be developed and implemented at all levels, following the indications provided in the guidelines for training of port inspectors of the PSM Agreement, to help countries in building up their capacity to follow and implement the requirements of the PSM Agreement. Furthermore, efforts should be made to strengthen regional and sub-regional cooperation in order to combat IUU in the whole region and sub-regions more efficiently.

References and Further Readings

- FAO website: http://www.fao.org/figis/servlet/SQServlet?file=/usr/local/tomcat/FI/5.5.23/figis/webapps/figis/temp/hqp_11498.xml&outtype=html, Accessed 7 July 2011
- MRAG. 2009. Illegal, Unregulated and Unreported fishing, Policy Brief 8. Available in website: http://www.mrag.co.uk/Documents/PolicyBrief8_IUU.pdf
- SEAFDEC. 2009. Report of the 12th meeting of the Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership (RCE/ASSP), Kota Kinabulu, Sabah, Malaysia, 19-20 November 2009. SEAFDEC/PCM33/REF05
- Official Journal of the European Union. 2008. Regulations: Council Regulation (EC) No.1005/2008 of 29 September 2008. Available in website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:286:0001:0032:EN:PDF>. Accessed on 4 July 2011
- COFI. 2011. Committee on Fisheries, 29th Session, Rome, Italy, 31 January-4 February 2011, COFI/2011/5
- FAO. 2011. Global capture production. Available in website: <http://www.fao.org/fishery/statistics/global-capture-production/query/en>, accessed on 19 July 2011
- FAO. Fishery Commodities Global Production and Trade, Available in website: <http://www.fao.org/fishery/statistics/global-commodities-production/query/en>, Accessed on 19 July 2011
- IOTC. 2011. Implementation of IOTC Port State Measures Resolution. Available in website: www.iotc.org/files/circulars/2011/35-11%5BE%5D.pdf, Accessed on 4 July 2011
- SEAFDEC. 2010a. ASEAN-SEAFDEC Expert Consultation on Managing Fishing Capacity to Combat IUU Fishing in Southeast Asia, September 2010
- SEAFDEC. 2010. Fishery Statistical Bulletin for the South China Sea Area 2007. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 165 p
- SEAFDEC. 2011. Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 23 p

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Devil Ray Resources in Bohol Sea, Philippines

Joseph Christopher C. Rayos, Mudjekeewis D. Santos and Noel C. Barut

A rapid resource assessment (RRA) of manta rays also known as devil rays or Mobulas, was conducted in Bohol Sea, Philippines from March to May 2010. Comparing with the catch data in a 2002-2003, results of the RRA showed that there was no decline in catch of the Mobulas amidst a maintained Mobula fishing effort. This suggested that the species is not yet overfished apparently because Mobula fishing is seasonal in the fishing area. Of the recorded Mobulas caught, 11% were identified to be immature based on the disc width. In addition, with a newly-born *Mobula thurstoni* among the catch in Bohol Sea, this fishing area could be a spawning ground for this Mobula species.

Devil rays (Family Mobulidae) comprise nine living species measuring from 1 to about 4 m of disc width (DW), and distributed worldwide in warm temperate and tropical seas (Notarbartolo-di-Scaria, 1987; Last and Stevens, 1994). Four species of this genus have been reported in the Philippines (Compagno *et al.*, 2005). As with sharks except for the piked dogfish *Squalus acanthus*, rays have also been generally considered by-catch of some major fisheries, especially from the late 1960s to early 1980s (Barut and Zartiga, 1997).

As a precautionary measure to ensure the sustainability and conservation of the Mobula species in the Philippines, Fisheries Administrative Order 193 (FAO 193) or the “Ban on taking or catching, selling, purchasing and processing, transporting and exporting of whale sharks and manta rays” was issued by the Philippine Bureau of Fisheries and Aquatic Resources (BFAR) in April 1998. Moreover, as part of the measure and as requested by various communities and NGOs, rapid resource assessment (RRA) of the manta or devil rays in Philippine waters, particularly in Bohol Sea in Central Philippines, was conducted from April 2002 to March 2003. The results of the RRA suggested that the exploitation ratio (proportion of fishing mortality over the total mortality) of the rays has reached the critical level of 0.52. Of the total Mobulas caught during the study period, manta rays (*Manta birostris*) comprised 6% of the catch while the other species that include the bentfin devil ray (*Mobula thurstoni*), longfin devil ray, (*Mobula eregoodootenke*), and shortfin devil ray (*Mobula khulii*) comprise the remaining 94% (unpublished report).

Status of Devil Rays in the Study Site

Manta or devil rays are locally known as “sanga” or “pagi” (Ganaden and Gonzales 1999) in the Philippines while the rest of the members of the Family Mobulidae are called “*pantihan*”. Manta rays and the other Mobulid species are difficult to differentiate morphologically even by a shark and ray specialist. In such a situation, all Mobulid species had been included in the ban under the aforementioned BFAR FAO 193. In 2010, the landed catch and effort of the Mobulid species in Bohol Sea as well as some aspects of the biology of the species were collected, analyzed and compared with the study made in 2002-2003 to assess whether the issuance of BFAR FAO 193 is warranted. The results suggested that the population of Mobulids other than the manta rays appears to be in good condition apparently due to the very seasonal nature of the fishery and the fishing methods employed, considering that the area has also been established as a spawning ground of such species. In order to carry out the RRA, interview and landing surveys were conducted the Bunga Mar Fishport in Barangay Jagna, which is about 67 kilometers east of Tagbilaran City in Bohol, Central Philippines (**Fig. 1**).



Fig. 1. Site of Mobula study in Bohol, Central Philippines

For several generations, devil rays have been historically recorded and fished in Bohol Sea, Philippines (Alava *et al.*, 2002). Bohol Sea which is part of the Mindanao Sea, is located between Visayas and Mindanao, and connects the Philippine Sea through the Surigao Strait to the Camotes Sea through the Canigao Channel and Cebu Strait, and to the Sulu Sea through the strait between Negros Island and Zamboanga Peninsula. It is an ecologically-linked ecosystem and one of the major fishing grounds of the Philippines. The traditional way of catching rays in the country is through the use of a gaff hook locally known as “*pamilak*”. Nowadays, fishers use gill net as the main and primary gear in catching the Mobulas.

In order to obtain data on catch production of the devil rays in the study site, an interview survey was conducted with fisherfolks and financiers from March to May 2010 to obtain information on fishing practices, as well as the historical data on catch and utilization of Mobulas. Landing survey was also conducted and identification of the landed rays was based on published distinguishing characteristics (**Box 1**). The specimens were likewise measured for disc width (DW), weighed (by fishers) and properly recorded. All samples were photographed using a Canon Power shot A480. The sex of the surveyed Mobula species were identified and their gonadal maturity determined. Claspers were also used as primary indicators to determine the sex of the devil rays.

Utilization and Market of Mobulas

Normally, Mobula meat is consumed either fresh or dried. Mobulas had been fished in Jagna, Bohol Province for food starting in mid 1900s. The selling price for the fresh meat in Jagna is from PhP 80 to PhP 120/kg while the dried meat sells from PhP 300-400/kg (PhP 40.00 = US\$1.00). Some of the local recipes for Mobulas include “ginataang sanga” (Mobula meat cooked with coconut milk), “kilawin”



A gillnet boat (municipal type) in Jagna used for catching Mobulas in Bohol Sea

Box 1. Morphological characters used to differentiate *Mobula* spp.

<i>Mobula thurstoni</i> (bentfin devil ray or smoothtail devil ray: local name “pantihan”)	<ul style="list-style-type: none"> • spiracles - small, sub-circular, slightly below plane of pectoral disc • small species (1.0-1.8 m in width) • dorsal fin with white spot on the apex • cephalic fins short (less than 16% of disc width (DW)) • concave pectoral anterior margin • tail base depressed • tail, shorter than disc, with no spines • top: dark blue to black, bottom: white, with silvery pectoral fin tips
<i>Mobula eregoodootenke</i> (longfin devil ray or pygmy devil ray: local name “pantihan”)	<ul style="list-style-type: none"> • spiracle - small, sub-circular, slightly below plane of pectoral disc • small species (1.0-1.8 m in width) • long cephalic fins (16% of DW) • dorsal fin present • brownish-gray above, whitish below
<i>Manta birostris</i> (Manta ray: local name “sanga”)	<ul style="list-style-type: none"> • extremely broad head with long head fins, and a terminal mouth • upper surface of disc covered with denticles • tail usually without a spine • blackish above, sometimes with white shoulder patches • white below, with grey edging on disc • tail is whiplike but short

(fresh meat in vinegar), and “*inihaw*” (grilled meat). These Mobula recipes are usually sold in eateries near the public market of Jagna which is several kilometers away from the landing area in Bunga Mar Fishport. On the other hand, the tail is saved as it is thought to be aphrodisiac and also a lucky charm for houses and boats.

Catch and Effort

During the study period from March to May 2010, a total of 132 Mobulas were landed (**Table 1**), of which 128 were identified as bentfin devil ray (*Mobula thurstoni*) and 1 was identified as longfin devil ray (*Mobula eregoodootenke*). Surprisingly, 3 manta rays (*Manta birostris*) were landed during of the survey period in spite of the ban (BFAR FAO 193). About 15 to 20 municipal type of fishing boats are still actively fishing for Mobulas in Bohol Sea, using gillnet with an average mesh size of 24 inches, which is the main fishing gear used for catching Mobulas in the fishing area

According to Alava *et al.* (2002), the usual size of gill nets used in mobulid fisheries are 700 to 1000 m long and 35 m high, which are still being used until the present based on the respondents’ perceptions during the interview. The usual fishing operation starts at noon when fishing boats leave Bunga Mar and return the following morning at 0500-0630 hrs. Fishing for Mobulas is seasonal and usually occurs during summer (March to May) and again

Table 1. Mobulid species landed in various landing sites in Bohol Sea

Species	Month	Year		Total
		2002	2010	
<i>Manta birostris</i>	March	1	1	2
	April	5	1	6
	May	8	1	9
	Subtotal	14	3	17
<i>Mobula thurstoni</i>	March	10	98	108
	April	32	26	58
	May	5	4	9
	Subtotal	47	128	175
<i>Mobula eregoodootenke</i>	March	0	0	0
	April	4	1	5
	May	0	0	0
	Subtotal	4	1	5
Total		65	132	

* In 2002: total enumeration while in 2010: one week/month

in November-February (peak season). Once the fishing season for Mobulas is over, the fishers shift to flying fish fishing. The seasonality of Mobula fisheries is attributed to the annual cyclical weather patterns in the area.

In a previous study on rays conducted in 2002, several fishing boats from Pamilacan Island were known to catch devil rays from Bohol Sea. However, based on the latest study in 2010, fishers from Pamilacan Island no longer fish for rays in the area. Fishers and traders from the Island just buy rays from other fishers who land their catch in Bunga Mar, Jagna. The recorded catch (**Table 1**) seemed to indicate that the catch in 2010 (132 individuals) was significantly more than the 2002-2003 survey (unpublished report). The fishing effort also appeared to be constant since the early 2000. Taken together, such situation suggests that Mobulid stock in the area is still not yet overfished.



Gillnet for catching Mobulids in Bohol Sea



Mobula chopped upon landing and sold in Bunga Mar, Jagna, Bohol

Biological Information

Of the 128 *M. thurstoni* landed, 73 were females, 39 were males and 16 could not be identified because these were already chopped. The known length at first maturity for *M. thurstoni* is within the range of 150-154 cm DW. Based on this information, 15 of the 128 individuals or 11% were immature while the rest which measured at an average of 165 cm DW could be mature. Last and Stevens (1994) described that *M. thurstoni* has an average disc width of 100-180 cm with a maximum recorded at 220 cm (Eschmeyer *et al.*, 1983). From the results of the survey, 2 individuals (measuring 182 cm and 181.5 cm) had exceeded the maximum of 180 cm DW.

The presence of an immature *M. thurstoni* in the landed catch, one of which measured 82 cm DW suggested that Bohol Sea could be a spawning ground for this species. Notarbartolo-di-Sciara (1988) reported that a newly born *M. thurstoni* usually measure 65 to 85 cm DW. According to the fishers, it is not common to have immature *M. thurstoni* included in the landed catch since small-sized rays are usually thrown back into the sea by fishers when these are caught in their nets.

Way Forward

From the results of the survey, it can be concluded that Mobula fisheries still exist in Bohol Sea and that the fishery resource appears to be not overfished as yet due to the seasonal nature of fisheries. However, further studies should be undertaken, *i.e.* time-series stock assessment to verify such findings. Moreover, considering that Bohol Sea is likely a spawning ground for the species, appropriate

habitat conservation and management measures should be promoted in this area.

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References

- Alava, M.N.R., Dolumbaló, E.R.Z., Yaptinchay, A.A. and Trono, R.B. 2002. Fishery and trade of whale sharks and manta rays in the Bohol Sea Philippines. *In:* Fowler, S.L., Reed, T.M., Dipper, F.A. (Eds), Elasmobranch biodiversity, conservation and management: Proceedings of the international seminar and workshop. Sabah, Malaysia, July 1997. Occasional paper of the IUCN Species Survival Commission No. 25, pp. 132–148
- Barut N.C and J.S Zartiga 1997. Shark Fisheries in the Philippines. Elasmobranch biodiversity, conservation and management: Proceedings of the international seminar and workshop. Sabah, Malaysia, July 1997
- Compagno, L.J.V., Last, P.R., Stevens, J.D. and Alava, M.N.R. 2005. Checklist of Philippine chondrichthyes. CSIRO Marine Laboratories Report 243
- Ganaden, S. R. and Gonzales, F.L. 1999. Common and local names of marine fishes of the Philippines. Bureau of Fisheries and Aquatic Resources
- Last, P.R. and Stevens, J.D. 1994. Sharks and rays of Australia. CSIRO Australia; 513 p
- Notarbartolo-di-sciara, G., 1987. A revisionary study of genus *Mobula* Rafinesque, 1810 (Chondrichthyes: mobulidae) with the description of a new species). *Zoological Journal of the Linnean Society* 91:1-91
- Notarbartolo di Sciara G. and Serena, F. 1988. Term embryo of *Mobula mobular* Bonnaterre, 1788) from the Northern Tyrrhenian Sea. *Atti della Società Italiana di Scienze Naturali edel Museo Cívico di Storia Naturale di Milano* 129:396-400
- Schmeyer, W.N., Herald, E.S. and Hammann, H. 1983. A field guide to Pacific coast fishes of North America. Houghton Mifflin Company, Boston, U.S.A. 336 p



Juvenile M. thurstoni caught in Bohol Sea

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Alternative Livelihoods for Small Coastal Fishers to Reduce Near-shore Fishing Pressure in Nha Trang Bay, Vietnam

Kim Anh Thi Nguyen, Tram Anh Thi Nguyen and Hao Van Tran

Monitoring near-shore fishing activities in Vietnam and enforcing the corresponding fishery regulations had been among the most alarming concerns in the country's fisheries, considering that uncontrolled near-shore fishing activities had impeded all efforts in balancing the utilization and protection of coastal resources. Such concern emerged when the productivity of near-shore capture fisheries had considerably reduced not only in terms of catch per unit effort but also the decreasing average size of fish caught. With few or no other livelihood options available for coastal fishers, the benefits that they had always derived from coastal fisheries became unsustainable. Therefore, the country adopted measures to address such concern emphasizing on the concept of "learning by doing", which had been promoted at significant scale based on replicable good practices, while at the same time selective geographic and thematic approaches were also adopted which included pilot innovative schemes. Such measures had served as opportunities for moving the fishers away from the waters. Using the Participatory Rural Appraisal (PRA) method, important information were gathered from fishers in the Nha Trang Bay Marine Protected Area, whose livelihoods had shifted from near-shore fishing to other activities.

Although generally small-scale and seemed scattered along the coasts of Vietnam, near-shore capture fisheries had been traditionally practiced by many of the country's fishers. Near-shore capture fisheries had always been an indispensable part of the fishers' lives serving as their means for subsistence that had been passed on from generation to generation. Although changing the occupation of fishers was accepted, it was with great reluctance even if the fishers welcomed other job opportunities especially those related to fisheries. Many fishers had expressed their apprehension because in some alternative occupations, most fishers do not have the least knowledge, skills and experience.

Located in Khanh Hoa Province of Vietnam, the Nha Trang Bay Marine Protected Area (MPA) is the first comprehensively developed and managed MPA in Vietnam. The establishment of this MPA was aimed at protecting the marine biodiversity of the Bay while enabling the local island communities to improve their livelihoods. In partnership with other stakeholders, the MPA in Nha Trang Bay was specifically envisaged to serve as a model for the

development of collaborative MPA management in other areas of Vietnam.

The Nha Trang Bay MPA is about 13,000 ha comprising many important habitats including coral reefs, sea grass and mangrove areas. In view of the value of its biodiversity, Nha Trang Bay had been considered by the Government of Vietnam as an "area of highest national priority" for marine conservation and coastal tourism. The implementation of the MPA Pilot Project in Nha Trang Bay was supported by the Global Environmental Facility (GEF) through the World Bank, the Danish International Development Agency (DANIDA) of the Government of Denmark, the International Union for the Conservation of Nature (IUCN), and the Government of Vietnam, and implemented by the Ministry of Fisheries in collaboration with the IUCN.



Map of Vietnam showing Nha Trang Bay

In Vietnam, the total number of mechanized marine fishing boats was reported to have increased from 44,000 in 1991 to 91,000 in 2005 (Hung, 2010), while the total capacity of the fishing boats had also gone up from 824,000 Hp to 5,317,000 Hp. Although this led to increased production from marine capture fisheries, which was 730,420 mt in 1991 to 1,809,700 mt in 2005, the average CPUE had decreased from 0.89 mt/Hp to 0.34 mt/Hp in 1991 and 2005, respectively.

Fishing boats <45 Hp accounted for about 72% of the country's total mechanized fishing boats, and are small-sized operating mainly in coastal areas. Moreover, over 80% of the boats <45 Hp operate in near-shore areas causing high pressure on the near-shore fishery resources and bringing about potential threats to the marine and coastal resources, and more particularly to the ecosystem. This aspect was compounded by the impacts of illegal, unreported and unregulated (IUU) fishing, the rampant use of destructive fishing methods resulting in the loss of essential fish habitats, and the increased quantities of by-catch and trash fish that included the juveniles of species which are of highly economic importance.

Promotion of Alternative Livelihoods for Near-shore Fishers

While near-shore capture fisheries in Vietnam continued to present a gloomy picture, efforts were made by the Government to implement measures that would relocate the livelihoods of the coastal fishers away from the waters. However, various constraints had impeded the continuing process of implementing such measures. Therefore, a case study was conducted at the Nha Trang Bay MPA in order to analyze the factors that would facilitate the promotion of alternative livelihoods for near-shore fishers. Various options that would encourage fishers to shift from near-shore fishing to other potential occupations had been promoted such as shifting to offshore fisheries, aquaculture, other occupations such as ecotourism-related activities, and other fisheries-related activities.

Nevertheless, based on the results of the case study which indicated that the educational level of most fishers was predictably low, without doubt, this inhibited the fishers from finding better suitable jobs. It was very common to find fishers in the study area who only finished elementary and high school levels while many were even unschooled at 41%, 37% and 7% of the total number of fishers, respectively (Chien *et al.*, 2009). In this regard, it was highly deemed necessary to provide vocational training to the fishers especially the younger generation to enable

them to engage in jobs available in other sectors such as in development industries and tourism-related activities. Moreover, since the shifting process had often been confronted with financial constraints, a sound policy should be developed which could help the fishers in their new jobs by providing them channels for easy access to loans.

Furthermore, considering that each province possesses specific characteristics of near-shore fisheries as well as particular conditions for sustainable fisheries development, alternative livelihood options to be provided to fishers should be based on the natural-economic-cultural-social characteristics of the area. This approach could reduce the pressure on coastal resources since the enabling conditions could be met. Thus, varied orientations should be conducted in different provinces and areas rather than applying the same approaches everywhere, especially when it comes to local application of the measures.

Moreover, flexibility is essentially required as this would allow different solutions to be adopted in particular areas

Box 1. Summary of requirements for fishers' alternative livelihoods

- Alternative livelihoods for fishers must bring sustainability and efficiency, reduce near-shore fishing pressure and cause no damage to coastal resources and ecosystems.
- New jobs should be comprehensible and accessible for fishers.
- Small initial investment appropriate for the economic conditions of fishers could be provided.
- New jobs should yield higher or at least equal, income compared with what the fishers used to earn from traditional fisheries.
- New occupations that can reuse old fishing facilities and implements (e.g. fishing gears, vessels, machines) should be considered as a priority during the promotion of alternative livelihoods.



Catching high-value commodities as option to near-shore fisheries

along with cross checks. From the analysis of the case study, the characteristics of the alternative livelihoods for coastal fishers were summarized as shown in **Box 1**.

The results of the case study also suggested that the promotion of alternative livelihoods for fishers should be conducted in stages and done according to the plans with significant scale based on replicable good practices. The implementation should also go along with proper adjustments based on the experience of the fishers. Concurrently, the alternative occupations should be analyzed and assessed in terms of their feasibility, sustainability and socio-economic efficiency.

Alternative Livelihood Options for Vietnamese Fishers

Vietnam has a coastline that extends to about 3,444 km and embraces the country's major fishing grounds that include the Gulf of Tonkin which the country shares with China, the marine waters in central and southeastern Vietnam, and the waters in southwestern Vietnam which is part of the Gulf of Thailand and shared with Cambodia and Thailand. In 2009, production from marine capture fisheries of Vietnam contributed 44% to the country's total fisheries production of 4,782 thousand mt which had decreased from 46% in 2007 (SEAFDEC, 2011), which was attributed to the degrading coastal fishery resources of the country. The country's marine capture fisheries production had been largely derived from the marine waters in central and southeastern Vietnam where most of the marine fisheries are concentrated especially the waters near Khanh Hoa to Ca Mau. In order to reduce the pressure on the coastal fishery resources and at the same time sustain the livelihood of near-shore fishers, various measures had been promoted that would enable the fishers to shift their occupations from near-shore fisheries to other relevant occupations.

Shifting from small-scale near-shore fisheries to sustainable and efficient offshore fisheries

One of the approaches that would encourage fishers to shift from small-scale near-shore fisheries to offshore fisheries is for them to organize into fishing vessel teams or voluntary fishing cooperatives where their fisheries production could be combined with logistic services thus, ensuring safety net from fisheries. Since 1997, the Government of Vietnam has been developing the country's offshore fisheries as means to reduce fishing pressure on the coastal resources. Therefore, offshore fisheries could be seen as an advantage and favorable option for fishers to possibly shift from small-scale near-shore fisheries to offshore fishing. The results of the case study suggested that fishers should be encouraged to seek partners and cooperate or co-invest

Box 2. Objectives, principles and implementation strategies for the shift from near-shore to offshore fisheries

Objectives

- To reduce fishing pressure on the near-shore and coastal resources
- To minimize transportation costs, increase offshore time and fishing productivity of vessels, participating in the teams/ fishing cooperatives, and eventually enhance the living standards of small-scale coastal fishers
- To improve fishery products in terms of quality and competitiveness in domestic as well as international markets
- To professionalize offshore fishing cooperatives step by step

Principles

- Participation of fishers in organized fishing cooperatives should be voluntary but with condition that fishers should be able to carry out self-management and provide certain amount of capital contributions. Fishers should also be able to share with the cooperatives some information such as fishing grounds, weather forecast, fish prices as well as willing to provide mutual help and support under harsh circumstances.
- Fishers using the same fishing gears, working in the same fishing grounds or having close relationship with other members should be organized into fishing cooperatives in order for them to acquire better working environment.

Implementation strategies

- Conduct research on the real status of near-shore and small-scale fisheries, especially focusing on the inefficient, resource destructive, non-selective or poorly selective fisheries. In this regard, a quantitative analysis or cost-benefit analysis should be carried out to determine the economic benefits as well as the number of vessels and fishers working on these types of fisheries. Therefore, databases on these types of near-shore fisheries especially information on stocks, allowable catch volumes, number of vessels, gear types, production by species are necessary and should be compiled.
- Promote the specific and appropriate offshore fisheries for each province or area according to their fishing gears. A quantitative analysis should also be carried out to identify the number of vessels and fishers capable of switching to the locally potential offshore fisheries.
- Establish fishing cooperatives and call upon transparent capital contributions among fishers. Meanwhile, support from related parties/stakeholders should also be encouraged to help fishers shift to offshore fisheries.
- Establish offshore fishing cooperatives based on the potential natural resources and the socio-economic characteristics of fishers. Each locally strong fishery should be encouraged to have one team, where each team could occasionally include 3 groups with 5-7 members each to initiate the cooperation, self-awareness and self-management.
- Assess and analyze the socio-economic efficiency of each vessel team, and make adjustments step by step in accordance with the production realities.
- Multiply the effective and efficient fishing vessel teams, as this would support efforts in benchmarking the good practices that could serve as reference points and for the purpose of peer learning.

in purchasing larger vessels and fishing gears to operate in offshore waters while support should be provided to fishers who opt to engage in fishery logistic services and

activities. In order to facilitate the implementation of this alternative option, the Government should facilitate and create favorable conditions for fishers to get access to loans at special interest rates or provide assistance in terms of initial funding for the purchase or repair of vessels, fishing gears, machines and safety equipments such as transceivers, GPS, fish detectors or to certain extent promote a “boat retirement” purchase scheme. These incentives could help the fishers in keeping their minds totally focused in their alternative jobs.

Experienced fishers are easy to adapt to changes in terms of their occupations especially if such options are quite similar to their previous occupations. Therefore, in available livelihood options fishers should be assured that they would still be able to utilize their previously used implements and facilities such as machines, electric generators, boats, and gears among others. Therefore, establishing voluntary offshore fishing cooperatives or voluntary fishing vessel teams along with provisions for safety at sea, could play a realistic role not only among the fishers but also with government authorities, as this is very much in line with the strategic orientation of the fisheries sector of Vietnam. Based on the results of the case study, the objectives, principles and implementation strategies for encouraging the fishers to shift from near-shore fishing to offshore fisheries should be focused, as suggested in **Box 2**. Some examples of effective and efficient fishing cooperative models in Vietnam are shown in **Box 3**.

In addition, lessons have been learned from the implementation of offshore fishing models, which could be considered as good practices of cooperation among the offshore fishing fleets in some provinces of Vietnam. Specifically, several lessons on the formulation and establishment of offshore fishing models could also be gleaned from such experiences.

Crews of fleets often have close relationships with each other. Normally the crews are related by blood (*i.e.* father, brother, sibling), making them willing to honestly share information about fishing grounds, weather and fishing experience, fish price and provide help for each other.

Fishers’ voluntary participation is required for the establishment of offshore fishing fleets. In this regard, emphasis should be placed on fairness and transparency in the initial capital contributions for the purchase of boats and fishing gears (fixed capital), costs of production (fuel, ice and other supplies), and working capital as well as in the development of ways for profit allocation among members within a vessel and among the fleets.

Box 3. Examples of particularly efficient and effective fishing cooperative models in Vietnam

- Since 2006, seven (7) fishing vessel teams and one state-owned fishing company had been organized in Ben Tre Province. Most of the teams have operated with high efficiency resulting in increased revenues by about 5%-20% on the average, which had been attained because of mutual cooperation at sea. With decreased freezing time, fish products were fresher that command higher prices and eventually leading to higher profits estimated at VND 25 million (about US\$1,300) per trip. Over the period, despite expensive fuel cost and intense competition for fishing grounds, the fishers still remained attached to the sea and continued to show efficiency in their performance (Kim Anh Nguyen *et al.*, 2010).
- Thanh Hoa Province has 129 fishing teams with 935 vessels and 8,396 laborers who continued to achieve the desired results (Thanh Hoa Department of Capture Fisheries and Resources Protection, 2010).
- In Cua Lo, Nghe An Province, over 20 fishing teams had been established, most of which are in Nghi Hai, Nghi Thuy and Nghi Tan. Each team has at least 3 and no more than 5 vessels that are efficiently operated (Minh Quang, 2008).
- Moreover, on a voluntary basis and linked to agreed fishing teams could also be found in other places such as Rach Gia in Kien Giang Province with 30 fishing teams. Hoai Nhon in Binh Dinh Province had 9 teams while several other teams had also been organized in Khanh Hoa and Phu Yen Provinces. These fleets have made good profits during the past years (Kim Anh Nguyen *et al.*, 2006, 2007 and 2010).

Each team should have three groups each comprising of 5-7 vessels. This would enable the fishers to enhance solidarity, honesty and intimacy among the members of the team, which in turn could develop and promote the strength of each team.

Shifting from near-shore fisheries to sustainable aquaculture

Vietnam possesses enormous potentials for aquaculture specifically in terms of areas in its coastal provinces and aquatic species that could be cultured. The development of the country’s brackishwater and marine aquaculture had been contributing significantly to the coastal economy and played an indispensable role in meeting the future demand for seafood products by sustaining or improving the production level in the country’s fisheries sector (Kim, 2008). The Government had also been playing an important role in developing capture fisheries in general and aquaculture in particular. The principles and implementation strategies for shifting from near-shore fisheries to aquaculture are shown in **Box 4**.

Aquaculture has always been considered by fishers as the second most popular occupation after marine fisheries. As a matter of fact, many fishers had been engaged in both capture fisheries and aquaculture at the same time as they

Box 4. Principles and strategies to promote the shift from near-shore fisheries to aquaculture

Principles

- Shifting from near-shore fisheries to aquaculture should promote and develop sustainable and responsible marine and brackishwater aquaculture models that could lead to improved yield and product quality as well promote risk management.
- In the development of marine aquaculture, the use of industrial feed instead of marine trash fish should be encouraged in order to reduce near-shore fishing pressure.
- The adoption of sustainable and multi-species aquaculture on the same volume of water should be promoted to optimize the aquaculture areas as well as reduce feed and labor costs.

Strategies

- Specific and detailed plans for sustainable aquaculture development in each coastal province should be established, based on which upgrading of public infrastructures should also be planned, e.g. irrigation and drainage systems, waste water management facilities, traffic system, an early warning system for emergency detection of and spread of diseases, and where qualified hatcheries should aim to produce high quality and more diversified seeds.
- Support should be extended to aquaculture diversification, through the promotion of new initiatives for species diversification in brackishwater areas especially the species with lower risk of culturing options (seaweeds, clam, blood cockle, blue mussels, among others).
- Training on sustainable aquaculture practices should be provided to management staff, technicians and farmers.
- Fish farmers should be encouraged to reduce the use of marine trash fish as aquaculture feeds.
- Support should be provided in the areas of marketing and disease research for new products.
- The socio-economic and environmental efficiency of the aquaculture diversification should be assessed and analyzed, in order to possibly replicate such approach later on a larger scale and used as one as of the adaptive approaches for promoting the shift from near-shore fisheries to aquaculture.

could take advantage of low-quality marine fish and trash fish as feeds for aquaculture. Aquaculture is therefore not a new knowledge for the fishers, where their production systems range from extensive to semi-intensive/intensive while culturing a diversity of aquatic species. However, it has been noted that most coastal provinces still lack the strategies for sustainable aquaculture development. With low academic level, most fish farmers still depend on experience and are reluctant to apply new technologies and modern aquaculture models.

The Government also fell short in terms of management capability, of effectively addressing the demand and serious lack of managers, scientists and skilled workers for sustainable aquaculture development, which could have served as models and guide for the shifting fishers. This could have been attributed to poor planning and poor

quality of some aquaculture infrastructures. Zones for safety and hygiene production have yet received particular attention and concern in order to meet the market needs as well as reduce the risks and damage of the ecosystem from aquaculture. Moreover, there is a need for aquaculture to adapt to the impacts of climate change and volatile market conditions, and comply with the increasing international standards and requirements for food safety and traceability.

In Vietnam, some good practices on shifting from near-shore fisheries to aquaculture had been reported which could be considered as models for other fishers, although such shifting pattern would need the development of appropriate policies (**Box 5**). For example, in Dien Kim Commune of Dien Chau District in Nghe An Province, some near-shore fishers had shifted to clam farming utilizing a 10.5 ha intertidal zone. Until 2010, about 28 clam farmers have gained an average income which ranged from VND 15.4 to 28.9 million/farmer/crop (Chien *et al.*, 2009). In Thoi Thuan commune of Binh Dai District in Ben Tre Province, the promotion of blood cockle (*Anadara granosa*) farming resulted in the successful shift of 7 fishers from near-shore fishing to blood cockle culture in over 3,000 m² of alluvial areas. Using the blood cockle culture model, the fishers were able to produce more than 1.5 metric tons of cockle seeds and after more than six months, their average income was about VND 23.5 million/farmer/crop (Chien *et al.*, 2009).

In another case, near-shore fishers in Phuoc Thuan Commune of Tuy Phuoc District in Binh Dinh Province had been engaged in aquaculture using some species and culture diversification in about 13.9 ha area in Thi Nai Lagoon. The model has enabled 10 fishers to shift to aquaculture and as a result, earning an average income that ranged from VND 8.6 to 24.7 million/farmer/crop (Chien *et al.*, 2009).



Fish cage culture as option to near-shore fisheries

Box 5. Policy recommendations for the advancement of marine aquaculture

- Research should be conducted on production of industrial feeds for each cultured species and each stage of development of species that can better support marine aquaculture and reduce the use of trash fish as feeds.
- The culture of species with high economic value such as lobsters, snails, grouper, and cobia (*Rachycentron canadum* or black kingfish) should be promoted. It is also essential to apply modern marine aquaculture technologies at large scale for tuna, cuttlefish, pomfret, grouper, and cobia.
- Market studies should be conducted for marine products at large scale/huge production.
- Fisheries auction markets should be established while traders/middlemen should be prevented from dictating farmers to reduce fish prices and that the capacity of farmers should be enhanced to enable them to participate in management.
- Activities should be concentrated on high quality seed production, seed selection (laboratories should be established for seed quality testing), disease control (investment for an early warning system to detect the emergency and spread of diseases should be made) and public infrastructures should be upgraded in order to better support marine aquaculture.
- Fishers should be provided with easy access to loans with preferential interest rates for marine aquaculture development.
- Marine aquaculture should be integrated with marine capture fisheries, eco-tourism and recreational fisheries in policy development and implementation of plans.

In another development, the small-scale aquaculture co-management model in Giao Xuan Commune of Giao Thuy District in Nam Dinh Province has been implemented in early 2008 by the Marine Conservation and Community Development Center (MCD). Clam seeds (*Meretrix lyrata*, Sowerby 1851) from Ben Tre Province had been raised in 4 ha area. In the beginning, the model had 10 farmers upon whom the “core team” and the “sustainable clam growing team” have been established. After two years, membership in the model had expanded to 170 fishers from the commune and surrounding areas, turning themselves into clam farmers. Under the model, Co-management Board was established together with its operation regulations. In addition, the MCD has also supported the conversion of 30 near-shore fishers into sustainable and environment-friendly aquaculturists (MCD, 2009).

Shifting from near-shore fishing to tourism and coastal transportation services

This shift could take advantage of old fishing boats to avoid spending much money for building new boats by just re-decorating the boats that could be used for travel or transportation services. Since the life of fishers is always with their boats, therefore they could easily get adjusted to

new jobs such as those offered in tourism-related activities or carrying goods onboard their old but enhanced boats. Since fishers had always been used to their old life-styles, certain period of time might be necessary to enable them to adapt to new job styles. However, the knowledge and skills of fishers in tourism-related activities could still be very low thus efforts should be made to address this concern through the conduct of appropriate vocational training and the like. The strategies suggested during the case study for promoting effective shift from near-shore fishing to tourism and coastal transportation services are shown in **Box 6**.

Shifting models for alternative livelihoods outside capture fisheries had been promoted at Nha Trang Bay Marine Protected Area, specifically the Hon Mun MPA project where in 2001 it was reported that the models had contributed greatly in supporting the alternative livelihoods of fishers who depended entirely on marine and coastal resources in the Bay. The project has facilitated the promotion of 20 shifting models of which 15 models produced good results. The salient features of the successful shifting models in Nha Trang Bay included the integration



Box 6. Strategies for effective shift from near-shore fishing to tourism and coastal transportation services

- Investigating the economic performance of near-shore fishing vessels (including the number of fishing boats, types of fishing gear, number of fishers)
- Conduct of research on tourism development in each coastal province in order to determine the potentials of this occupation (especially in coming up with figures on how many fishers and small fishing boats could be moved into tourism-related services and activities)
- Establishment of shifting models and monitoring system by supervising the activities of fishers in a one-year operation (during the peak season) and make the necessary adjustments
- Evaluating the effectiveness and efficiency of the shifting models, and comparing the economic benefits of near-shore fishing with those of tourism-related services and activities

of marine aquaculture with eco-tourism and production hand-made handicrafts, and the co-management of coral reef resources for tourism development (e.g. scuba-diving or coral reefs viewing using glass-bottom boats). The shifting models had successfully provided stable income for 136 members (127 of whom were females) and their new jobs do not cause harm to the marine resources and the environment (www.nhatrangbaympa.vnn.vn).

Shifting from near-shore fishing to other activities related to fisheries

In addition to aquaculture which is a popular option, many fishers could also shift to other activities related to fisheries, such as in fishery logistic services, transportation of aquatic products, small-scale seafood semi-processing (e.g. smoking, drying, salting, frying), fish sauce production, and animal-feed production from by-products of seafood processing industry (e.g. fish head, fins). Moreover, the shift in labor structure could provide the younger generation of fishers with opportunities to work in processing and frozen seafood factories, which is also a long-term orientation for the shifting of activities.

Policies and Institutional Solutions to Support of Sustainable Alternative Livelihoods for Fishers

With the long-lasting characteristics of fisheries being open-access, management of marine and coastal resources in the context of sustainable fisheries is considered weak. Inadequacy in both quantity and quality of enforcement and monitoring capacity in the central and local levels, had affected the effective implementation and transformative changes at all levels. Meanwhile, the coastal resources continue to be under threat of increasing pressure and further deterioration. Vietnam had over 40 legal documents on policies and regulations including the Fisheries Laws 2003, decrees, decisions and circulars that are relevant to management and protection of the country's fisheries resources.

Promoting co-management or community rights-based management

The current fisheries management authorities of the country could not effectively govern the fisheries sector especially with the emerging more complex problems in the marine and coastal resources management, particularly the coastal resources in view of the varying objectives and subjective reasons. Therefore, co-management or community rights-based management are approaches to be considered as these could create synergy among the communities and

relevant stakeholders involved in the management of coastal resources and eventually result in the sustainable development of coastal fisheries.

Co-management is an approach that could provide incentives and rights for fishers to manage their respective coastal resources by protecting the fishery habitats and limiting the entry of new comers in their areas of responsibility. Vietnam should consider promoting the co-management approach widely, when and where appropriate, to support the sustainable development of fisheries (Kim *et al.*, 2004, 2006, 2009). So far, a number of successful co-management models/good practices had been reported in Vietnam, which the Ministry of Agriculture and Rural Development could use as basis for its technical and legal support for the co-managed areas to receive official recognition. In addition, to co-management rights-based management of fisheries should also be mainstreamed with suitable fisheries policies in accordance with the present trend of regional integration (Kim *et al.*, 2010).

Spatial planning and allocating fishing grounds

The country's fishing grounds should be re-defined and reflected on the map of the marine waters of Vietnam, where fishing routes (onshore and offshore) should be delimited while geographic partitions (*i.e.* by province, region, area) should be enhanced and enforced. Marking buoys and signage should be installed in the delineated fishing grounds and restricted areas. Regular monitoring should also be conducted while strict punishment should be imposed for cases of violations. Furthermore, specific areas could be assigned where fishing is allowed but not permanently (conservation areas), where fishing is prohibited during a certain period of the year, where seasonal ban on fishing could be imposed, and other zones. This would require the identification of essential habitats and key areas for protection as well as the targeted activities necessary for longer term sustainability of the fisheries sector. Establishment of few additional Marine Protected Areas (MPAs) for both biodiversity protection and enhancement of fisheries could also be promoted (Quach *et al.*, 2009).

Strengthening enforcement and monitoring capacity both at central and provincial levels

For the sustainability of fisheries, enforcement of regulations for fishing vessels registration and licensing should be strengthened, while legal provisions for submission of fishing vessel logbooks, and infrastructures and technical assistance should be enhanced. In addition, inspection activities at landing sites should be enforced and strengthened, and the capacity of inspection officers

to be enhanced. Development of an onboard observers program, upgrading patrol vessel capacity, and promoting vessel registration system are also among the immediate needs at all levels. Scientific studies in advanced fishing, high selective technologies, and improved fishing grounds forecast should also be promoted.

Advocacy and continuous awareness-raising of fishers on the management of the coastal resources

Along with the enormous efforts of the government to provide alternative livelihoods for fishers, advocacy and education to raise the awareness of fishers on the need to protect the marine and coastal resources must be emphasized and constantly pursued. Considering that coastal resources are protected only in the sense of protection by the fishers, therefore management authorities should implement more communication methods, and make innovations on the contents of the advocacy programs and approaches for using the various types of media on public information, education and communication. Moreover, strict punishments for illegal, unreported and unregulated operators should be enforced by the concerned government agencies.

References

- Chien Thai Ngoc and his research team. 2009. Synthesis Research Report: Study on Solutions for Sustainable Development of Coastal Fishing in Vietnam
- Hung Nguyen Le Tran. 2010. A Draft Document on National Action Plan on the Management of Fishing Capacity. Report at the workshop on Strengthening the Management of Fishing Capacity of Vietnam, Nha Trang, May 2010
- Kim Anh Thi Nguyen. 2004. Community Rights Based Fisheries Management – A Responsible and Sustainable Approach to Fisheries Management. Journal of Fisheries Science and Technology, Nha Trang University, Special Volume, 2004
- Kim Anh Thi Nguyen, Tram Anh Thi Nguyen and My Hao Diep. 2006. A Comparison between Fisheries Co-management and Community Rights Based Fisheries Management. Journal of Vietnam Fisheries, Volume 9, 2006
- Kim Anh Thi Nguyen, Tuan Nguyen, Ola Flaaten, Dung Thi Phan and Tram Anh Thi Nguyen. 2006. A Study on Costs and Earnings of Gillnet Vessels in Nha Trang, Vietnam. Journal of Fisheries Science and Technology, Nha Trang University, Volume 3, 2006
- Kim Anh Thi Nguyen, Tam Ngoc Dang and Ola Flaaten. 2007. Costs and Earnings from Offshore Tuna Long-Line Fishery in Nha Trang, Vietnam. Journal of Vietnam Fisheries, Volume 2, 2007
- Kim Anh Thi Nguyen, Nguyen Xuan Truong and Nguyen Van Hieu. 2009. The Conditions to Apply Co-Management in Vietnam: A Case Study of Thanh Phong Commune, Thanh Phu District, Ben Tre Province, Vietnam. Journal of Fisheries Science and Technology, Nha Trang University, Special Volume, 2009
- Kim Anh Thi Nguyen and Nguyen Van Dien. 2010. The Economic Performance of Offshore Vessels in Ben Tre, Vietnam. Vietnam Journal of Economics and Development, Volume 151, 2010
- Kim Anh Thi Nguyen. 2008. Achieving a Sustainable Future: Managing Aquaculture and Development in Coastal Provinces of Vietnam. Paper in Proceedings of 2008 FFTC – NFRDI International Workshop on Integrated Coastal Zone Management for Sustainable Aquaculture, August 2008, Busan, Korea
- Marine Conservation and Community Development Center (MCD). 2009. Co-management Approach in Aquaculture: A case study in Giao Xuan Commune, Giao Thuy District, Nam Dinh Province. Report at the workshop on Co-management, Danang, October 2009
- Minh Quang. 2008. www.khuyennongvn.gov.vn/h-dhtientien/binh-111inh-111oi-tau-chup-muc-mo-hinh-to-111oan-ke-khai-thac-hai-san/view (Accessed in July 2010)
- Quach Khanh Ngoc, Ola Flaaten and Kim Anh Nguyen. 2009. Efficiency of Fishing Vessels Affected by a Marine Protected Area – The Case of Small- Scale Trawlers and The Marine Protected Area in Nha Trang Bay, Vietnam. Chapter 15 in Integrated Coastal Zone Management, Wiley Blackwell, USA
- SEAFDEC. 2011. Fishery Statistical Bulletin of Southeast Asia 2009. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 149 p
- Thanh Hoa Department of Capture Fisheries and Resources Protection. 2010 www.snnptnt.thanhhoa.gov.vn/SNNPTNT/default.aspx?NewsID=213 (Accessed in July 2010)
- http://www.nhatrangbaympa.vnn.vn/intro/07Supportinglocal_yn.htm (Accessed in September 2010)

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Great Transformations on a Great Lake

Uffe Wilken

Tonle Sap Great Lake in Cambodia is a natural flood reservoir of the Mekong River that runs across the country and supports Cambodia's major inland capture fisheries. Records have shown that during the flood season, the Lake could have water area of about 10,000 km² and depth of 10-14 m and during the dry season the area is reduced to about 3,000 km² with depth of less than 1.0 m. During the monsoon season, the Great Lake expands to about 6,000 km² inside inundated forest creating an enormous ground for breeding, spawning, nursing, and feeding of various freshwater aquatic species (Serywath and Vann, 2009).

Cambodia covers an area of 181,035 km², 30% of which is seasonally flooded making freshwater and fisheries among the dominant features of the country. The Mekong River watershed of Cambodia includes the Tone Sap Great Lake which is considered one of the largest floodplain lakes and most productive inland ecosystems in the world (Try and Sitha, 2011). Fish production from inland capture fisheries of Cambodia in 2009 was about 390,000 metric tons accounting for about 16% of the inland capture fishery production of the Southeast Asian region (SEAFDEC, 2011). About 75% of the country's protein requirement which is estimated at 67 kg/person/year is provided by freshwater fishes 60% of which is produced from the Great Lake. Try and Sitha (2011) also reported that between one and three million people depend directly on Tonle Sap fisheries for their livelihood and food security.

Impacts of Climate Change on Inland Capture Fisheries of Cambodia

Yusuf and Francisco (2009) concluded in an IDRC Report on Climate Vulnerability Mapping in Southeast Asia that Cambodia being one of the most vulnerable areas in Southeast Asia would be hard hit by the consequences of climate change. Not so much because of the actual physical impacts, but more because the country has relatively low adaptive capacity to mitigate the changes. Taking into consideration the case of Cambodia in the IDRC mapping report, many questions cropped up regarding the sustainability of inland capture fisheries in the country. Specifically, on how the fisherfolks around the Tonle Sap Great Lake regard their future; and on their adaptive capacity not only with regards to climate change but also to the prospects of the construction of dams in the Mekong River region.

In order to hear the voices of the fisherfolks, a survey was made by interviewing small-scale fishers in and aquafarmers near Tonle Sap Great Lake to get their insights of the future with changes in the climate as well as massive increase in hydroelectrical dams looming in the not so far distance. Interviews with resource persons from NGOs and authorities were also made to put the fisherfolks' voices in perspective. This study was carried out in 2011 and was partly funded through a travel grant from the Danish International Development Agency (DANIDA).

One respondent, Mr. Thoun, is a fisherman on Cambodia's Tonle Sap Great Lake. One could almost believe that the poor fisherman had read the IDRC Report because his words mirrored the contents of the said Report. When asked how he considers the weather lately, Mr. Thoun's thoughts and the IDRC report's conclusions are the same, *i.e.* great changes are under way.

In the stilted village of Kampong Phhluk on the northeastern part of the lake two generations speak about the changes. Mr. Thoun and his 71-year old mother-in-law both agreed that before there were less frequent and not so violent storms. Now not only has that changed but the seasons have also become unpredictable. The weather is hotter and drier, and more people are getting sick with dengue-fever, malaria and stomach-related disorders. However, Mr. Thoun thought that the dwindling fish catch from the lake has anything to do with climate change. He sees it more as a problem with illegal fishing.



Map of Cambodia showing the Tonle Sap Lake



Most people in the stilted village of Kampong Phhluk make a living in fishing, but a little house-gardening supplements their income



Mr. Thoun and his wife look into an uncertain future as fishers on the Tonle Sap Great Lake

Short-term Adaptation Strategies

A research analyst with the WorldFish Center in Phnom Penh, Cambodia, Mam Kosal elaborated a bit on the present and the future of the Lake and its people. He stated that ‘with climate change you will see changes in the

ecosystems as flooding seems to be less predictable with the time and level of flood. It will affect everything, especially fishing, farming and irrigation. There are other problems as well. The famous flooded forest is shrinking and as the natural forest is degraded, invasive species like the mimosa will out-compete the forest. The fishery itself is becoming smaller maybe because of changes in the ecology, fishing efforts and practices. Illegal fishing still persists as many claims that if they followed the restrictions stated in the law it would not allow them to fish enough for their survival. Destructive fishing is also practiced and enforcement of rules is difficult as the area is large and accessibility of many places is difficult. Fishers have reported that 14 different government agencies are involved in different kinds of enforcement and thus create a kind of competition’.

On the matter of adaptation, Mam Kosal explained that ‘the people in the communities are aware of the changes and that they will have to change their ways of living in the future. They compare the situation now with earlier times. They cannot say it is the effect of climate change – they even do not know what climate change is – but they know what they see. When it comes to adapting to the new conditions, livelihood adaptation strategies are not very effective. The people look only at the short-term - if they know how to deal with it at all. The poorest has not much incentive to participate as they have to fish which makes it difficult to engage them. They encourage their children to go to school, but for the poorer this is a dilemma as they still need them to help out with the fishing’.

Uncertain Answers

About 1.2 million people live on the Tonle Sap floodplain of which 25% live on floating villages. Out on the lake is the floating village of Kampong Loung where one of the local fishers was a bit more confident about the future than Mr. Thoun. Unlike Mr. Thoun, this fisher is not a full-time





Good business: To fish on the lake and to farm fish is not such a bad combination as this fisherman makes a decent living

fisherman as he also rears fish in cages. However, when he fishes he always goes to the lake. What he catches he puts in floating cages. He feeds his fish with feeds bought from Vietnam, and fattens the fish for three months before they are sold at the local market. For such reason, although the water level of Tonle Sap Great Lake in the beginning of 2011 was very low, this did not mean anything for his business. The same positive attitude to business is found with another fisher. Her family catches tigerfish and snakehead fish, after which she salts and dries them. Although the price was low in the beginning of 2011, it was still a good business for her family.



After being salted and dried the fish could be sold for 15.000 Riel/kg or approximately US\$ 3.80

When asked if they have heard about climate change, most fisherfolk did not understand the question – or rather the term. In the Khmer language one term translates both as ‘climate’ and ‘weather’. In that respect they are opposite compared to most other Cambodians. In a study about the Cambodians’ perceptions on climate change from January 2011, which was financed by DANIDA, UNDP and Oxfam (BBC World Service Trust and Ministry of Environment, 2011), almost all respondents recognized at least one of the terms ‘climate change’ and ‘global warming’.

However, when it comes to understanding the causes of climate change most people connect the changes in weather that they have experienced with the deforestation of Cambodia. Back in the shade of the stilted houses in Kampong Phhluk, Mr. Thoun was asked about his and his five children’s future. The fisherman hesitates a bit before answering - then says that it will be difficult to live from fishing and that it will be hard for his children’s generation. When asked about what he plans to do if there are no fish, Mr. Thoun had not got an answer to that question. What lies ahead are just uncertainties.

References

- Arief Anshory Yusuf and Herminia Francisco. 2009. Climate Change Vulnerability Mapping for Southeast Asia. International Development Research Centre, Canada, January 2009; 32 p
- BBC World Service Trust and Ministry of Environment, Climate Change Department. 2011. Understanding public perceptions of climate change in Cambodia. January 2011
- Ing Try and Hort Sitha. 2011. Promoting Effective Fisheries Co-management through Community Fisheries in Cambodia. *In:* Fish for the People Vol. 9 No. 2 (2011). Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp 73-78
- SEAFDEC. 2011. Fishery Statistical Bulletin of Southeast Asia 2009. Southeast Asian Fisheries Development Center, Bangkok, Thailand; 149 p
- Suy Serywath and Leng Sy Vann. 2009. Enhancing Fisheries Management for Poverty Alleviation and Resources Conservation: The Community Fisheries of Cambodia. *In:* Fish for the People Vol. 7 No. 1 (2009). Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp 31-36

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Regional Cooperation in Sustainable Fisheries Sciences: Fostering Young and Female Researchers from Southeast Asia

Junichiro Okamoto, Katsutoshi Arai and Virgilia T. Sulit

This article is based on the Report of the Wrap-up Workshop of the Fellowship Program “Advanced Program to Foster Young and Female Researchers from Southeast Asia in Sustainable Fisheries Sciences in 2011” organized in Bangkok, Thailand on 13 December 2011. The Workshop which was sponsored by the “Invitation Program for East Asian Young Researchers” of the Japan Society for the Promotion of Science (JSPS) through the Faculty of Fisheries Sciences of Hokkaido University in Japan, was attended by the 2011 Southeast Asian research fellows as well as officers and representatives from the Faculty of Fisheries of Kasetsart University in Bangkok, Thailand; Asian Institute of Technology (AIT), Thailand; School of Agricultural Technology of Walailak University, Nakhon Si Thammarat, Thailand; and the Southeast Asian Fisheries Development Center (SEAFDEC) in Bangkok, Thailand.

In 2009-2010, the “Fostering Program for Young and Female Researchers in Sustainable Fisheries Sciences in Southeast Asia” under the Japan-East Asia Network of Exchange for Students and Youths (JENESYS) Programme, was successfully implemented by the Hokkaido University Faculty of Fisheries Sciences (HUFFS) of Japan (Okamoto *et al.*, 2010) with funding support from the Japan Society for the Promotion of Science (JSPS). Subsequently, two programs were approved for implementation by HUFFS starting in 2011, namely: Asia-Africa Science Platform Program for 2011-2013, which aims to create high potential research hubs in selected fields within the Asian and African regions while fostering the next generation of leading researchers; and the 2011 Invitation Program for East Asian Young Researchers under the JENESYS Programme to create regional cooperation among Asian countries through exchange of next generation researchers.

Invitation Program for East Asian Young Researchers: 2011

Following the feat of the 2009-2010 Fostering Program, the 2011 Invitation Program invited 15 young researchers as exchange fellows for short-term cooperative research at HUFFS in Japan in 2011. The research fellows came from Kasetsart University, AIT, SEAFDEC Aquaculture Department (Philippines), Walailak University (Thailand), and Sam Ratulangi University (Indonesia).

The Program has been structured in such a way that after selection, the exchange fellows would have to conduct research on special topics at HUFFS, where they would join study tours and excursions, take part in lectures given by young researchers to Japanese students in English, attend lectures by visiting researchers, and participate in the international workshop at Hokkaido University as well as the wrap-up workshop in Bangkok, Thailand. The 2011 Invitation Program gave more focus on female researchers considering that in many countries in the Asian region including Japan, the number of female researchers involved in fisheries sciences is very limited. Therefore, it has become necessary to bring together female researchers especially from Southeast Asia in order to learn about their activities as well as enhance their capabilities. Thus, from



Prof. Dr. Katsutoshi Arai from Hokkaido University, explaining the coverage of the 2011 Invitation Program for East Asian Young Researchers



Participants of the Wrap-up Workshop: 2011 Invitation Program for East Asian Young Researchers

Box 1. Research studies conducted by the 2011 exchange fellows

<p>(1) Identification of DNA markers associated with WSSV resistance in <i>Penaeus monodon</i> by Ms. Opor Siwasutham (Walailak University)</p> <p>The study aimed to detect the DNA markers associated with WSSV resistance in the black tiger shrimp <i>Penaeus monodon</i> which could respond more efficiently to marker assisted selection than to phenotypic selection. This is considering that selection for immune response could lead to improved general disease resistance. The results of the study would be useful for the application of DNA marker assisted selection in breeding of WSSV resistant strain of <i>P. monodon</i>.</p>
<p>(2) Control of white feces disease of white shrimp (<i>Litopenaeus vannamei</i>) by feeding <i>Lactobacillus casei</i> and <i>Saccharomyces cerevisiae</i> by Ms. Supanee Suwanpakdee (Walailak University)</p> <p>The study aimed to determine the efficiency of <i>Lactobacillus casei</i> and <i>Saccharomyces cerevisiae</i>, most widely used probiotics in aquaculture, in controlling white feces disease and immune gene expression of the white-leg shrimp (<i>L. vannamei</i>). The results indicated that using <i>L. casei</i> which can grow in wide range of pH and salinity could be an alternative means of controlling white feces disease in shrimp culture.</p>
<p>(3) Some aspects of Japanese policy and fishery cooperative association by Mr. Pichet Plaipetch (AIT)</p> <p>The study mainly aimed to know the reasons why Japanese fishers have high level of achievements in fishery and resources management, based on the information gathered from two fisheries cooperative associations in Shiruichi and Usujiri, Hokkaido Prefecture. In spite of the nature of fisheries in Southeast Asia which is multi-species and multi-gear which is quite different from that of Japan, countries in the region could secure sustainable fishery and resources management through systemic establishment of fishery associations and decentralization of authority of fishery management to the fishers, which should be appropriately supported by laws and legal schemes of the respective countries.</p>
<p>(4) Kuril harbor seal and coastal fishery conflict by Ms. Supanuth Chuerattanakul (AIT)</p> <p>Kuril harbor seals and humans compete for the same source of food which comprises mostly salmon, leading to the conflict between the seals and coastal fisheries especially in Cape Erimo in Southern Hokkaido. The seals have been killed as they cause damages to fishing gears and to the salmon catch of the fishers, resulting in the decreasing population of the seals. To mitigate this concern, fishers applied various methods to scare the seals away from the coastal fishing areas but these were effective only in the beginning because the seals became smarter as time goes by. In this regard, better gears should be developed to release the seals from the nets and thus, create a harmonious co-existence between the seals and the fishers. In the Southeast Asian region, the said gear is still to be developed especially for the release of dugongs from fishing gears, but such effort could be expensive unless co-management is implemented between government and coastal fishing communities, where the government would provide the financial resources and technology while the communities would implement the said innovation.</p>
<p>(5) Seasonal variation of marine phytoplankton in Oshoro Bay, Hakodate, Japan by Dr. Yaowaluk Monthum (Kasetsart University)</p> <p>The study aimed to determine the abundance of marine phytoplanktons in Oshoro Bay considering that phytoplanktons are important in marine ecology, although a disadvantage could be the impact of overpopulation of certain phytoplanktons such as the occurrence of red tide phenomenon. Phytoplanktons were collected from the Bay in January to represent winter season, in April for the spring season, and in August for the summer season. The results showed that the dominant genus in spring and summer seasons was <i>Chaetoceros</i> spp. while <i>Skeletonema</i> sp. was dominant in the winter season. The study may be continued to estimate the productivity of the Bay.</p>
<p>(6) Study of fishing gears and fishing operations of octopus trap in Aomori Prefecture, Japan by Dr. Charuay Sukhsangchan (Kasetsart University)</p> <p>Information gathered from two fisheries cooperatives in Aomori Prefecture, namely: Sai Fisheries Cooperative (Isoya Branch) and Ishimochi Fisheries Cooperative, indicated that five types of gears have been used to catch octopus (common and giant octopus) in the said prefecture, these are: long line, box, trap, floating barrel, and spear, although before the use of gastropod shell was common but the shell has become too expensive for fishers. Since these gear types are selective, no by-catch and environment-friendly, efforts should be made to modify them for possible application in the octopus fisheries in the Southeast Asian countries especially in Thailand.</p>
<p>(7) Localisation of follicle-stimulating hormone receptor (<i>fshr</i>) transcripts in Nile tilapia (<i>Oreochromis niloticus</i>) female gonads by Dr. Nichanun Phochanakul (Kasetsart University)</p> <p>Nile tilapia is considered as an excellent model for studying the gonad differentiation in aquatic animals because of its well-known stable XX/XY system and availability of all-male and all-female populations. In an ongoing study, real-time RT-PCR was used to determine the precise timing of gene expression during the early stages of undifferentiated gonads of the fish, while the expression profiles between males and females had been compared. The number of genes potentially involved in tilapia gonad differentiation was established which included the follicle-stimulating hormone receptor (<i>fshr</i>) which produces receptors of follicle-stimulating hormone. This particular study aimed to visually localize the <i>fshr</i> transcripts in tilapia female gonads using <i>in-situ</i> hybridization (ISH) to learn more about the <i>fshr</i>. However, due to limited time for the study and considering that it was the first attempt to conduct ISH, no conclusion could be derived, although efforts are being made to continue the study by University students. Nevertheless, the study could improve tilapia production without harming the environment since the use of hormones in production is eliminated.</p>
<p>(8) General histology of Corallimorpharian (<i>Actinodiscus</i> sp.) by Mr. Sahabhop Dokkaew (Kasetsart University)</p> <p>The study made use of histology technique to describe the general tissue of mushroom corals, corallimorpharian (<i>Actinodiscus</i> sp.) which was observed by cross and longitudinal section. Through such technique, the organelle and types of layer were identified. The structure of corallimorpharian could be used as basis for studying the development of tissue culture and the technique could be used as model for tissue degeneration of species that could be cut into small pieces and still can grow completely, and thus could be used as basis for cell development by micro-propagation. The mechanism could also be applied to other invertebrates such as soft coral and sea anemone but could not be applied for jellyfish.</p>

Box 1. Research studies conducted by the 2011 exchange fellows (Cont'd)

(9) **Training in molecular biological laboratory techniques and preliminary study on molecular phylogeny of Arcidae (Bivalvia: Pteriomorphia) in Thailand** by Mr. Teerapong Duangdee (Kasetsart University)

The activity involved training in various molecular biology laboratory techniques, PCR techniques for the thermocline profiles, and sequence analysis using automatic DNA sequencer. Ark shell, Arcidae specimens collected from the Gulf of Thailand and Andaman Sea were used to study the molecular phylogeny of Arcidae in Thailand. The ark shell specimens were identified through the morphological characters of the shell as *Anadara antiquata*, *A. cuneata*, *A. granosa*, *A. nodifera*, *A. trocheli*, *Arca ventricosa*, *Barbatia foliata*, *B. fusca*, *Scapharca cornea*, and *S. inaequalis*. With very close morphological characteristics it would be very difficult to distinguish the various species but with the use of DNA analysis and sequencing, species identification could be done.

(10) **Chemical characterization of lipid extracts from brown seaweeds in Thailand** by Dr. Praiboon Jantana (Kasetsart University)

Eight species of brown seaweeds, *i.e.* *Sargassum sp.*, *Turbinaria decurrens*, *T. conoides* (TCT), *T. conoides* (TCC), *Dictyota cervicornis*, *Dictyota sp.*, *Padina australis*, and *Colpomenia sinuosa*, were investigated for their lipid contents, considering that fucoxanthin as lipid component found in brown seaweeds offers several health benefits. The results of the analysis showed that the fucoxanthin contents in *T. conoides* (TCT), *D. cervicornis*, and *P. australis* were relatively high. Moreover, the analysis of the fatty acid composition indicated that palmitic acid which is the most common saturated fatty acids in animals and plants, was mostly found in all species of the seaweeds examined, while the highest level of Vitamin E in the forms of α -tocopherol and δ -tocopherol was found in *P. australis* with *D. cervicornis* having the highest content of γ -tocopherol. Furthermore, the highest content of polyphenol, an antioxidant was found in *T. conoides* and *Dictyota sp.* These results seem to suggest that brown seaweeds have the potentials to be used as ingredients for the production of nutraceuticals and novel functional formulations.

(11) **Techniques for detection of Myosin denaturation** by Dr. Jirawan Maneerote (Kasetsart University)

The study aimed to master the biotechnical techniques for quantitatively detecting myosin denaturation in fish fillet, using the *Tilapia* myofibrils, which included analysis of the ATPase enzyme activity, salt-solubility and chymotrypsin digestion. Based on the results of the analysis, myosin denaturation was sensitively detected in the fish fillet, suggesting that changes in the biochemical function or structural changes of the myosin which are also known as denaturation could be effectively used for the quality of muscle-based specimens and thus, could be used for examining the quality of frozen shrimps from aquaculture.

the fifteen research fellows in 2011, only five were male researchers.

Wrap-up Workshop of the 2011 Invitation Program

For one reason or another, only 11 fellows were able to take part in the Wrap-up Workshop which was conducted in Bangkok, Thailand on 13 December 2011, and presented the results of their research studies (**Box 1**). While one fellow from Indonesia sent a Poster of the results of her study, two fellows from the Philippines presented the results of their research studies in a separate workshop held at the

SEAFDEC Aquaculture Department in Iloilo, Philippines. The Wrap-up Workshop was sponsored by the "Invitation Program for East Asian Young Researchers" of the JSPS through the HUFFS in collaboration with the Faculty of Fisheries of Kasetsart University (Bangkok, Thailand), AIT (Thailand), School of Agricultural Technology of Walailak University (Nakhon Si Thammarat, Thailand), and SEAFDEC (Bangkok, Thailand).

A group discussion which focused on the ways and means of improving education and training in fisheries by universities and inter-governmental organizations for the promotion of sustainable fisheries in Southeast Asia was a new component and very important feature of the 2011 Wrap-up Workshop. The topics brought forward for discussion included fisheries and policy, aquaculture and the environment, and food science and utilization. The discussion was designed in such a way that the main outputs would include design of program to include priority areas and target groups, program implementation to include activities and topics to be covered, and evaluation plan that could be used to assess the effectiveness of the proposed programs (**Box 2**).

It should be noted that the specific recommendations included the need to: improve curricula and training courses to cover the important topics suggested; deliver the programs to the right target groups and evaluate the programs using appropriate indicators; and consider



Prof. Dr. Katsutoshi Arai from Hokkaido University, explaining the guidelines for the Group Discussion during the Wrap-up Workshop: 2011 Invitation Program for East Asian Young Researchers

Box 2. Summary of outputs of the group discussion

1. Fisheries and Policy						
Programs	Implementation Activities		Target Groups		Evaluation Plan	
1.1 Fisheries management	Training and workshops		GOs, NGOs, researchers, fishers, students		Questionnaire survey	
1.2 Fishery policy-making process	Training and workshops		GOs, NGOs, fishers,		Questionnaire survey	
1.3 International fisheries-related issues	Training and workshops		GOs, NGOs, researchers, fishers, students		Questionnaire survey	
1.4 Fisheries technology	Training and workshops		GOs, NGOs, researchers, fishers, students		Questionnaire survey	
1.5 Fisheries livelihood	Training and workshops		Students, fishers, researchers		Questionnaire survey	
2. Aquaculture and the Environment						
Programs	Implementation Activities		Target Groups		Evaluation Plan	
	Degree	Non-degree	Degree	Non-degree	Degree	Non-degree
2.1 Coastal aquaculture	Lectures, seminars, study tours, training and workshops, exhibitions, exchange programs	Lectures, seminars, study tours, training and workshops, exhibitions	GOs, students (graduate, undergraduate), policy makers	GOs, NGOs, fish farmers, students (graduate, undergraduate), policy makers, other stakeholders	Satisfaction of students, employability of graduates, types of jobs (staff vs managerial), satisfaction of employers	Immediate applicability of acquired skills, satisfaction of trainees, output (increased production), no increase in pollution, acceptability of products, reduced ecological footprints
2.2 Inland aquaculture	Lectures, seminars, study tours, training and workshops, exhibitions, exchange programs	Lectures, seminars, study tours, training and workshops, exhibitions	GOs, students (graduate, undergraduate), policy makers	GOs, NGOs, fish farmers, students (graduate, undergraduate), policy makers, other stakeholders	Satisfaction of students, employability of graduates, types of jobs (staff vs managerial), satisfaction of employers	Immediate applicability of acquired skills, satisfaction of trainees, output (increased production), no increase in pollution, acceptability of products, reduced ecological footprints
3. Food Science and Utilization						
Programs	Implementation Activities		Target Groups		Evaluation Plan	
3.1 Waste utilization	Research and training, use of multi-media		Companies, undergraduate students		Project report of companies, reports of students	
3.2 Innovations	Research and training, use of multi-media		Companies, undergraduate students		Project report of companies, reports of students, survey, questionnaire	

improvements based on the results of the evaluation (HUFFS, 2011). To cap the Workshop, representatives from the collaborating institutions, namely: Asian Institute of Technology, Kasetsart University, Southeast Asian Fisheries Development Center, and Walailak University summarized their observations and comments on the Invitation Program (**Box 3**).

References

Okamoto, J., K. Arai and S. Chamsai. 2010. Boosting the Capacity of Young and Female Researchers for Achieving Sustainable Fisheries in Southeast Asia: Initiative of Hokkaido University, Japan. *In*: Fish for the People Vol 8 No 3 (2010). Southeast Asian Fisheries Development Center, Bangkok, Thailand; pp 37-43

Box 3. Observations and comments on the Invitation Program

1. Structure of program gives good opportunities of fellows in experiencing life in Japan as well as cultural exchange between Japan and participating countries.
2. Program presented solid step towards developing research in fisheries science.
3. Knowledge gained by fellows from HUFFS complements and supplements with what they learned from their base institutions.
4. Two-way learning is boosted, where fellows maximize learning from each other's expertise, not only among research fellows but also to the students of HUFFS.
5. Capacity building of researchers is timely for the promotion of sustainable fisheries under the roadmap of fisheries integration which will be realized upon the establishment of the ASEAN Economic Community in 2015.
6. Program should be sustained and continued to enhance cooperation in fisheries research and to "shine the light" on deserving young and female researchers in the Southeast Asian region.

HUFFS. 2011. Proceedings of the Wrap-up Workshop 2011: Advanced Program to Foster Young and Female Researchers for Southeast Asia in Sustainable Fisheries Sciences-Interuniversity Exchange Program of Hokkaido University. Bangkok, Thailand, 13 December 2011. JSPS Invitation Program for East Asian Young Researchers 2011 of the Faculty of Fisheries Sciences, Hokkaido University, Hakodate, Japan (*in press*)

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CALENDAR OF EVENTS

Date	Venue	Title	Organizer
2012			
23-27 January	Philippines	Training Course on Tilapia Hatchery & Grow-out Operations	SEAFDEC/AQD
30 Jan-1 Feb	Bangkok, Thailand	FAO, BOBLME and SEAFDEC workshop on Putting into Practice the FAO Technical Guideline on Marine Protected Areas (MPAs)	SEAFDEC/TD
2-3 February	Bangkok, Thailand	Regional Workshop on Promotion of Strategic Implementation of Fisheries Co-management and Right-based Fisheries for Enhancing Good Governance in Coastal and Inland Fisheries Management	SEAFDEC/TD
13-14 February	Pursat, Cambodia	National Workshop on Compilation of Fishery Information and Statistics on Inland Fisheries	SEAFDEC/TD
20-24 February	Hyderabad, India	13 th Session of FAO Sub-Committee on Fish Trade	FAO
20 Feb-2 Mar	AQD	Training Course on Freshwater Prawn Hatchery & Pond Grow-out Operations	SEAFDEC/AQD
21 February	Bangkok, Thailand	International Seminar: JSPS Asia-Africa Science Platform Program -- Marine Fisheries Policy and Higher Education in Fisheries in Southeast Asia	Hokkaido University
27-29 February	Binh Dinh, Vietnam	National Training on Improvement of Data Collection for Tuna Gillnet and Purse Seine Fisheries in Vietnam	SEAFDEC/TD
1-2 March	Iloilo, Philippines	International Workshop on Fish Health Management "Accelerating Awareness and Capacity Building"	SEAFDEC/AQD
5-16 March	Samut Prakan, Thailand	Regional Training Course and Practical Workshop on Monitoring Control and Surveillance (MCS) in Combating IUU fishing in Southeast Asia Region	SEAFDEC/TD
5-19 March	On-line	Training Course on Fish Health Management	SEAFDEC/AQD
12-15 March	Philippines	Trainers' Training on Mangrove Conservation, Management & Rehabilitation	SEAFDEC/AQD
12-16 March	Hanoi, Vietnam	31 st Regional Conference for Asia and the Pacific (APRC)	APFIC
13-14 March	Bangkok, Thailand	Sub-regional Consultative Meeting of Northern Andaman Sea (Myanmar, Thailand)	SEAFDEC-Sida
13-15 March	Sabah, Malaysia	Fishing Trial and Demonstration to Promote the Use of Circle-hook in Line Fishing	SEAFDEC/TD
15-20 March	Geneva, Switzerland	26 th Meeting of the Animals Committee of CITES	CITES
18-29 March	Samut Prakan, Thailand	Regional Training Course on Identification of Critical Fishing Grounds and Habitat Rehabilitation and Management Approach	SEAFDEC/TD
19-23 March	Philippines	Training Course on Carp Hatchery & Grow-out Operations	SEAFDEC/AQD
26-30 March	South Africa, Cape Town	6 th Session of FAO Sub-Committee on Aquaculture	FAO
27-29 March	Bangkok, Thailand	End-of-Project Meeting on Cetacean Research in Southeast Asian Waters: Cetacean Sighting Program	SEAFDEC/TD
25-26 March	Yangon, Myanmar	Local Workshop on Compilation of Fisheries Information and Statistics on Inland Fisheries	SEAFDEC/TD
2-6 April	Nay Pyi Taw, Myanmar	44 th Meeting of the SEAFDEC Council	Secretariat
11-25 April	Philippines	Training Course on Sea Cucumber Production and Management	SEAFDEC/AQD
22-26 April	Kuala Terengganu	Regional Workshop on Taxonomy and Identification of Sharks and Rays in Southeast Asia	SEAFDEC/MFRDMD
23-27 April	Bangkok, Thailand	FAO/APFIC Regional workshop to Support the Implementation of the 2009 FAO Port State Measures Agreement	FAO/APFIC
23-27 April	Philippines	Training Course on Catfish Hatchery and Grow-out Operations	SEAFDEC/AQD
30 April	Bangkok, Thailand	Round Table Discussion for the REBYC-II CTI Project	SEAFDEC/TD
1-4 May	Bangkok, Thailand	REBYC-II-CTI Inception Meeting	SEAFDEC/TD
2-22 May	Philippines	Training Course on Abalone Hatchery and Grow-out	SEAFDEC/AQD
21 May-8 Jun	Philippines	Training Course on Freshwater Aquaculture	SEAFDEC/AQD
25-29 Jun	Samut Prakan, Thailand	Expert Group Meeting on Fishing License and Boats Registration in Southeast Asia	SEAFDEC/TD

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 and manage 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 Thrusts

- 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



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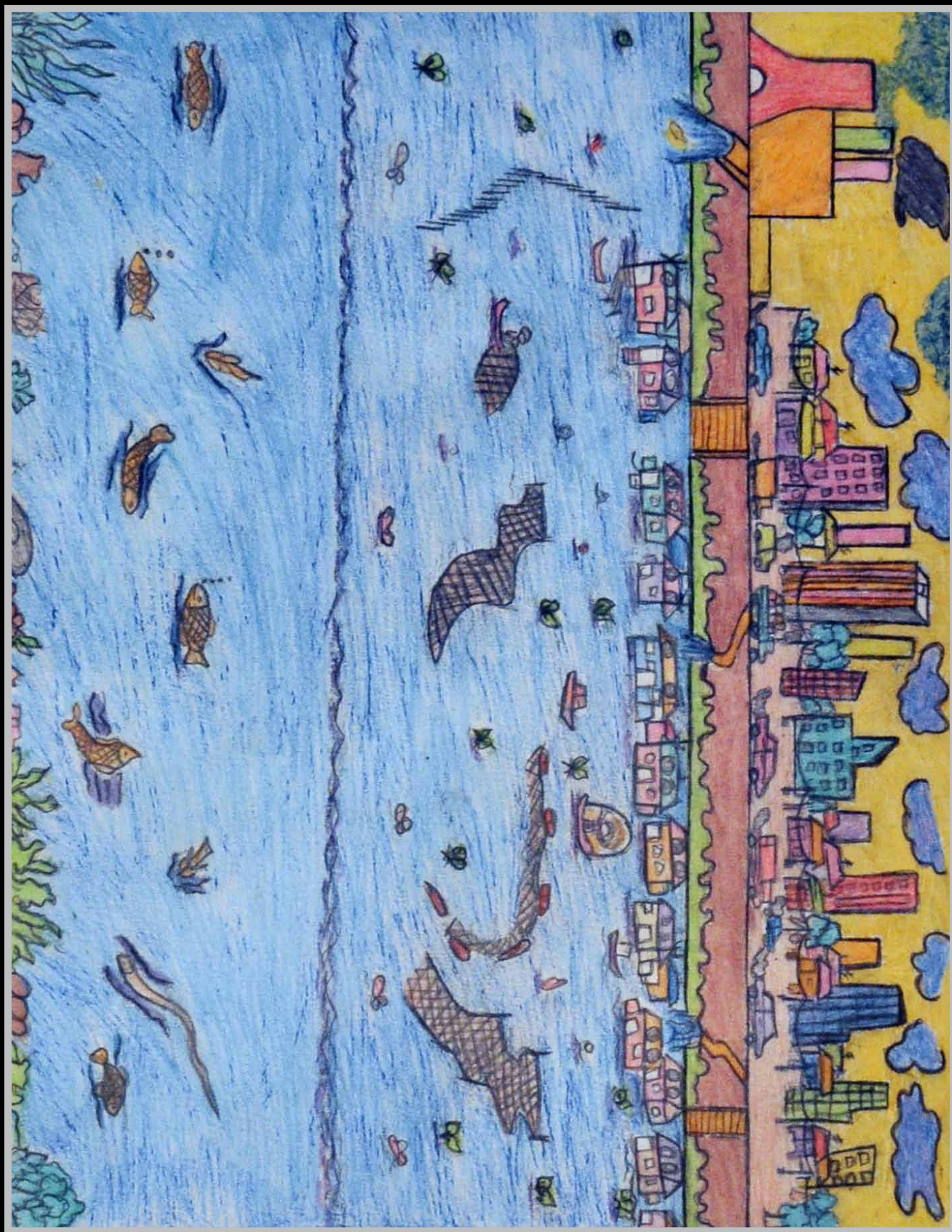
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The first prize drawing winner from the national drawing contest in Cambodia

National Drawing Contests were organized in all ASEAN-SEAFDEC Member Countries as part of the preparatory process for the ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security Towards 2020 "Fish for the People 2020: Adaptation to a Changing Environment" held by ASEAN and SEAFDEC in June 2011 in Bangkok, Thailand, in order to create awareness on the importance of fisheries for food security and well-being of people in the region.