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Towards Effective Fisheries Management: the Ecosystem Approach



Southeast Asian Fisheries Development Center

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In previous issues of the Special Publication *Fish for the People*, the initiatives of the Southeast Asian countries to promote the ecosystem approach to fisheries management (EAFM) in their respective countries had been articulated. SEAFDEC for its part would continue to drive such momentum forward through its programs and activities that place considerable focus on the EAFM concept.

The ASEAN-SEAFDEC Member Countries have recognized the need to *implement effective management of fisheries through an ecosystem approach as well as to accelerate the development of fisheries management plans based on an ecosystem approach as basis for fisheries conservation and management*, while continuing their efforts towards the development of sustainable fisheries, as stipulated in the Resolution and Plan of Action on Sustainable Fisheries for Food Security for the ASEAN Region Towards 2020 adopted by the ASEAN Member States in June 2011. Towards achieving the objectives of this movement, SEAFDEC dovetails its programs and activities to make sure that the countries would be able to effectively implement activities based on the EAFM concept. Thus, regional training courses on EAFM had been developed by SEAFDEC to enhance the capacity of the countries and specifically, strengthen the competence of national fisheries government officers and authorities on the principles and concept of EAFM.

Moreover, the Resolution and Plan of Action also pointed out the need for ASEAN Member States to *develop measures that aim to prevent unauthorized fishing and eliminate the use of illegal fishing practices by building awareness of their adverse impacts, strengthening law enforcement, developing and promoting responsible and selective fishing gears and practices, enforcing*

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C O N T E N T S

regulations, and encouraging alternative means of livelihoods. In order to address the concerns of the ASEAN Member States, the Regional Training Course on Ecosystem Approach for Fisheries Management developed by SEAFDEC intends to achieve strengthened awareness and enhanced knowledge of stakeholders on the impacts of illegal fishing on sustainable fisheries and food security in the ASEAN region; enhanced capacity of the countries on the principles and concept of responsible fishing, ecologically sustainable development, ecosystem approaches for fisheries management and their application in the region; and bolstered up competence of concerned stakeholders in planning and carrying out extension work by focusing on the essential participation of concerned sectors and beneficiaries in ecosystem approach for fisheries management. Such regional training course has been conducted annually by the SEAFDEC Training Department since 2012.

While SEAFDEC continues to promote the EAFM concept in the Southeast Asian region, it would also adjust its bearings toward the so-called “blue economy approach” a new paradigm shift in sustainable development. After SEAFDEC shall have developed its competence, such approach would be mainstreamed in its programs and activities. This would ensure that in promoting the sustainable development of fisheries and aquaculture in the Southeast Asian region, existing and available resources would be utilized in responsible manner leading to balanced social, economic and environmental benefits for all. Meanwhile, SEAFDEC would continue to uphold the efforts of the countries by promoting the results of their efforts in this and in forthcoming issues of the Special Publication *Fish for the People*.

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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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Sustainability of Inland Fishery Resources against the ASEAN Economic Community Backdrop: Challenges and Opportunities

Chumnarn Pongsri

The Southeast Asian Fisheries Development Center (SEAFDEC) has been playing the leading role in promoting sustainable fisheries development for food security in Southeast Asia. In so-doing, SEAFDEC has been implementing programs that aim to “enhance the awareness of stakeholders on the contribution of inland fisheries to food security and sustainable livelihoods”, in accordance with the Resolution on Sustainable Fisheries for Food Security for the ASEAN Region adopted in June 2011. In a Keynote Address delivered by SEAFDEC Secretary-General *Dr. Chumnarn Pongsri* during the 4th International Conference on Inland Capture Fisheries organized in Palembang, Indonesia in September 2014, he spelled out the importance of inland fisheries for local food security in the Southeast Asian region, especially when the ASEAN Economic Community (AEC) shall be unified by 2015. He also recognized the Conference as timely considering the importance which is currently being directed towards the conservation and sustainable utilization of inland water resources for food security. Such direction has paved the way for SEAFDEC to craft programs and activities that would address important emerging issues related to the sustainable development of inland fisheries in the Southeast Asian region.

The effort of the Southeast Asian region to collectively move towards a united and harmonized ASEAN Economic Community by 2015 is an important milestone since the region would then have a single market and production base. However, such development could also have repercussions on the fisheries sector, making it necessary for the sector to adjust to the significant changes as fisheries and aquaculture activities could be severely affected, particularly those activities that are closely linked with economic development and trade. Nevertheless, in the inland fisheries sub-sector more particularly in inland capture fisheries, inland fishers would awaken in 2015 and continue to live normal lives, without even realizing that their activities could, in one or another way, be impacted by the trending developments, particularly the stiff competition among resource users for limited land and water resources. Therefore, national fisheries-related authorities should secure the sustainability of their respective inland fishery resources to ensure that the contribution of inland fisheries to food security, poverty alleviation and economic development could be sustained in the midst of such anticipated challenges.

Characteristics of Inland Capture Fisheries of Southeast Asia

The region’s inland capture fisheries could be considered very unique in a way that it is different from the other fisheries sub-sectors due to various reasons (Chumnarn, 2014). Firstly, the inland capture fisheries sub-sector comprises large number of small-scale fishers, who are mostly subsistent and engaged in only part-time fishing activities. Most of those engaged in fishing activities are doing other occupations like farming or perhaps livestock-raising, and as such, many of them could not be categorized as fishers as they prefer to be called mainly as farmers. Secondly, most activities related to inland capture fisheries are highly seasonal, which could peak during flood receding periods or at the end of the rainy season, the period when fish growing in floodplains would usually move back to rivers and streams, enhancing the fish stocks but risking to be caught by readily-installed stationery fishing gears. Thirdly, production from inland capture fisheries is highly diversified, where most of the catch although large in number and quantity, could be small in size and with high species diversity. In addition to fish, other aquatic animals could also be caught, like frogs, turtles, mollusks, and others, which are also utilized as food. Fourthly, in rural areas, there are no designated fishing ports, especially for non-commercial activities. Thus, inland fishery resources are not only freely accessed at any time but production could also be landed anywhere without any recording. Finally, inland fisheries production goes to various channels, although a large portion is meant for household



Table 1. Production from inland capture fisheries (2008-2012) in metric tons (MT)

Southeast Asian countries	2008	2009	2010	2011	2012
Brunei Darussalam	-	-	-	-	-
Cambodia	430,600	390,000	405,000	445,000	528,000
Indonesia	497,740	494,630	344,972	368,542	393,552
Lao PDR	29,200	30,000	30,900	34,000	34,105
Malaysia	4,353	4,469	4,545	5,695	5,042
Myanmar	814,740	899,430	1,002,430	1,163,159	1,246,460
Philippines	179,491	188,444	185,406	193,698	195,804
Singapore	-	-	-	-	-
Thailand	228,600	245,500	209,800	228,500	222,500
Viet Nam	114,800	144,800	194,200	202,500	194,500
TOTAL for SEA Countries*	2,329,524	2,397,273	2,377,253	2,641,094	2,819,963
Total World Production**	10,250,225	10,476,205	11,271,565	11,124,401	11,630,320

* Source: Fishery Statistical Bulletin of Southeast Asia 2012 (SEAFDEC, 2014)

** Source: Fishery and Aquaculture Statistics, FAO Yearbook 2012 (FAO, 2014)

consumption either in fresh form or preserved in ice or brine, the remaining fish is sometimes sold in local markets. Some countries are able to export fish products from their large-scale inland fisheries activities, but market of such products could be limited mainly within the Southeast Asian region.

Production from Inland Capture Fisheries of Southeast Asia

The total production from inland capture fisheries of the Southeast Asian region as of 2012 of about 2.8 million metric tons (SEAFDEC, 2014) accounted for more than 7% of the region's total fisheries production from all sectors and about 16% of its total production from capture fisheries (Table 1). As a matter of fact, the region's production from inland capture fisheries in 2012 (Fig. 1 and Fig. 2) contributed nearly a quarter of world's production from inland capture fisheries of about 11.6 million metric tons. This data signifies the importance and significance of inland fisheries for the food security of peoples in the Southeast Asian region.

As shown in Table 1, the region's top-producing country in 2012 was Myanmar followed by Cambodia and Indonesia but the other countries had also been closing in, such as Thailand, Viet Nam, and the Philippines that also consistently produced considerable amount of inland fisheries products during the past five years. For Lao PDR, the region's only landlocked country, its production data needs to be reconciled with field data considering that such production is mainly derived from the inland fisheries sub-sector. Nonetheless, inadequacy in the compilation and reporting of production data from inland capture fisheries

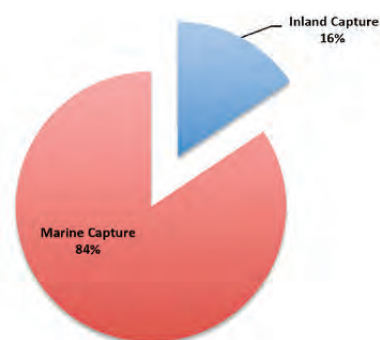


Fig. 1. Contribution of inland capture fisheries to total capture fisheries production of Southeast Asia in 2012

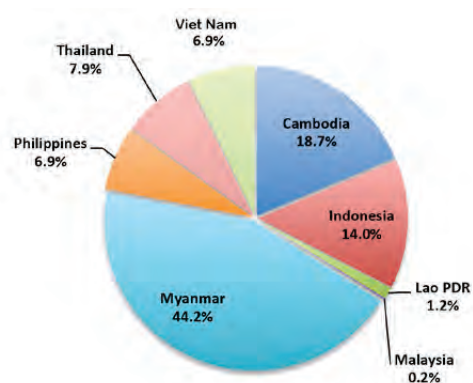


Fig. 2. Contribution of Southeast Asian countries to the region's total production from inland capture fisheries in 2012

has been widely recognized and thus should be improved, not only in terms of quantity but also in species composition of the catch. For example, in the case of Lao PDR, the country has been seeking assistance from concerned agencies and organizations for the improvement of its fisheries statistics collection and compilation systems in order to come up with the real picture of its fisheries sector.

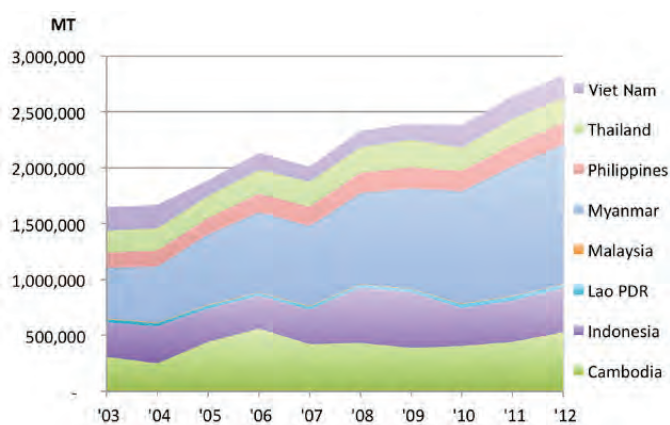


Fig. 3. Production trend of inland capture fisheries in Southeast Asian countries (2003-2012)

In spite of the impressive production figures from inland capture fisheries, there is still inadequate recognition of the value of inland capture fisheries because of its very nature where large numbers of part-time fishers including subsistent fishers are involved, and the high diversity of catch without proper landing ports. Such scenario leads to inadequate monitoring system of inland fisheries production and as a result, production data might have been under-estimated and under-represented in most of national statistics or other records. Although the graphs might have shown increasing trend of production from inland capture fisheries (Fig. 3), these do not give concrete reasons to

believe that actual production had actually increased or efforts had been made to improve data collection.

Linkage between Inland Capture Fisheries and Other Sectors

Exploiting the water resources through inland capture fisheries is not a stand-alone activity, as it has close linkage with activities of other sectors that share the same resources, leading to competition among the resource users. Therefore, national planners and policy makers should try to strike a balance of the various development activities that exploit the same inland water resources so that the benefits gained by all stakeholders could be maximized, especially on the food security of small-scale fishers. It is a fact that major economic and development activities that also exploit the inland water resources of the region could create severe impacts on inland fisheries as elucidated in **Box 1**.

Based on the aforementioned premises, high-level policy interventions would be necessary to ensure the sustainability of inland fishery resources and for the effective promotion of inland capture fisheries. With the ASEAN Economic Community in the offing, competition for the inland fishery resources could become more serious in the near future. It is therefore important that mitigation measures are developed

Box 1. Impacts of other sectors' activities on inland capture fisheries

Irrigation and agriculture require large amount of water for their agricultural activities in order to generate products that are necessary for food security as well as for the countries' economies, but such activities clearly compete with inland capture fisheries for the same water resource. In addition, since most of their activities make use of chemicals, such practices could create negative impacts to the natural fish population especially in inland water bodies.

Inland aquaculture operations reduce the availability of water in natural habitats since considerable volumes of water are required for culture activities, affecting inland capture fisheries operations. Since inland aquaculture also discharges wastewater as outputs from its activities to inland water bodies, the poor quality of the water discharged could result in deterioration of the quality of the water and abundance of natural fishery resources in aquatic habitats. The cultured aquatic species that include both indigenous and non-indigenous species, could also impact on natural biodiversity and genetic diversity of the natural fish populations in inland water bodies.

The current trend of **hydropower development and operations** could also affect the inland fishery resources, as construction of hydropower dams could create cross-river obstacles between upstream and downstream waters, affecting the aquatic species that require upstream or downstream migration as part of their life cycles, and resulting in changes of the biodiversity or even extinction of some aquatic species. The construction of fish passages is not mandatory by law for most countries in Southeast Asia, while some existing fish passages might have been designed and operated without taking into consideration the behavior and requirements of indigenous migratory fish in affected areas. Moreover, the operation of most hydropower dams usually does not consider the possible negative impacts of dams to the natural fishery resources. For example, hydropower generation is operated mainly during the peak of electricity demand discharging large volume of water to downstream rivers, while on the contrary, during low peak periods, downstream rivers could be drained. Furthermore, hydropower generation uses water from deep layers of the upstream water column, where at such depths, the water has very low level of dissolved oxygen with accumulated toxic substrates. Therefore, the fluctuation of water levels coupled with unfavorable water quality, could affect the ability of fish to survive in downstream ecosystems.

The sustainability of inland fishery resources could also be affected by other development activities, such as infrastructure construction, urbanization, and water transportation. The construction of infrastructures such as roads and freeways, and the expansion of towns could create obstacles that would not allow the free flow of water or flooding required for natural reproduction and larval dispersion of several aquatic species. Since such developments do not necessarily require appropriate planning and effective mitigation measures, the natural population of many aquatic species could be drastically destroyed resulting in diminishing production in the long term. Moreover, the destruction of stationary fishing gears operated by fishers in water bodies by water transportation systems also creates conflict between water transportation and fishing activities that eventually affects inland fisheries. In addition, some accidents could happen in water bodies impacting on the inland resources, especially during the transport of goods in rivers. The incident that happened a few years ago in Chao Praya River of Thailand, when a boat carrying large shipment of sugar capsized, is only one example. Such incident had resulted in mass mortalities of various aquatic species in the River's ecosystem which could take certain period of time to recover.

in order to minimize the impacts of other development activities on the inland fishery resources and allow the inland fishery habitats and resources to generate products that could sustain food security and provide livelihoods for peoples relying on such resources.

Challenges in the Sustainable Development of Inland Capture Fisheries of Southeast Asia

Based on the aforementioned characteristics of the region's inland fishery resources, it has become imperative for countries and concerned agencies to address the various challenges emanating from economic and development activities in order that sustainability of inland capture fisheries could be attained.

Low Priority Given to Inland Fishery Resources

Timely data and information are necessary to enhance awareness on the importance of inland fisheries, particularly its contribution to food security and livelihoods creation. In many countries in the Southeast Asian region, planners and policy makers seem not to give much attention to inland fishery resources in view of the inadequacy of data and other relevant information on inland fisheries. Currently, the statistics on production from inland capture fisheries are derived through traditional or conventional data collection systems, where data on fish catches are collected from sampling sites and then converted to statistical figures. In order to come up with reliable data, it is necessary that this method and practice should be rectified and improved. However, considerable amount of resources would be necessary to improve data collection, which is quite unlikely to happen in the region where the nature of inland fishing activities and ecosystems is dispersed while large portions of catch go directly to household consumption or to other channels without proper recording.

Improvement of Data Collection and Compilation System for Inland Fisheries

The most important issue that confronts the inland fisheries sub-sector is the inadequacy of data and information that could be used to convince national planners and policy makers on the importance and contribution of inland fisheries to peoples' livelihoods, and the non-cash value of inland fishery resources in terms of biodiversity functions that balance the ecosystems including controlling widespread occurrence of pests, as well as the nutritional and health benefits of micro-nutrients that could be derived from consuming small fishes, among others. Therefore, the development of non-conventional data collection and model for inland ecosystem valuation should be considered making use of various types of existing data and



information, and interpreting these into figures that would illustrate the importance of inland fisheries. This could include for example, the number of households dependent on inland fishery resources, the livelihoods generated through the utilization of inland fishery resources, and the contribution of inland fisheries to food security.

Moreover, data available from various sources, such as censuses and statistical records, results of relevant research studies, local/traditional knowledge, and so on, should be integrated and analyzed to generate meaningful information related to inland fishery resources. Such information should be packaged and made available for planners and policy makers to enhance their awareness on the importance of inland fisheries, and help them in making fair decisions in implementing development projects that create positive impacts on the sustainability of inland fisheries.

Measures to Address Major Challenges in Inland Fisheries of Southeast Asia

The region's inland fisheries sector is also being confronted by management issues more particularly on the application of the ecosystem approach to fisheries management, considering that in most cases, ecosystem boundaries are different from management areas. Although "*catchment approach*" for particular inland water bodies could be applied, the level of management at local, national or



regional levels depends on the boundary of the ecosystems. Nevertheless, the “*holistic approach*” could also be considered since several sectors are involved in a related ecosystem and are sharing the same resources. In any case, information on the importance of inland fisheries should be collected and made available to other sectors including planners and policy makers for their decision-making processes, especially in trading-off between development projects and the need to maintain ecosystem functions to secure the contribution of inland fishery resources to food security and livelihoods, as well as to biodiversity and ecological functions.

R&D on mitigation measures should be conducted to secure ecosystem functions. Development projects, for example, construction of hydropower and water regulation dams, roads, and rural development infrastructures, could affect the ecosystem and its functions, but such developments could not be prevented for economic reasons. Nonetheless, measures should be developed to mitigate the impacts of such development projects, which could come in the form of appropriate design and integration of suitable fish passages in dam constructions, proper schemes for operating dams, implementation of stock enhancement programs, construction of roads with sufficient underpasses that would allow water and fish larvae to drift across and enter floodplains, inundated forests, and the like.

Maximum utilization of inland fishery resources involves the development of fishing gears and practices that *enhance gear selectivity* as well as boost ecological sustainability by *controlling top predator species and improving the utilization of harvested fish*. Considering that fish in inland ecosystems are multi-species, where small fishes with short life cycle could be abundant, harvested and fully utilized before reaching their natural mortalities, selective fishing gear(s) should be developed to target these small fish species. Moreover, in order to enhance ecological sustainability and diversity of low trophic species, gear(s)

should also be developed to harvest these particular top predator species as their excessive presence could have negative impacts to the sustainability of inland fisheries. Therefore, the contribution of fisheries to food security and economic returns should be maximized and year-round availability of fish for consumption ensured. This is very important for inland fisheries where production is very highly seasonal and where large quantities of fish could be available only in certain short periods of time. It is in this aspect that fish harvested during high season should be preserved for all year-round consumption. Although traditional preservation methods are already practiced in fishing communities, there is a need to improve such methods especially in terms of post-harvest handling processes to ensure quality, hygiene and safety of the fish products, and to promote the development of other value-added products as necessary.

Adaptation of Inland Capture Fisheries to Climate Change

Climate change would definitely create impacts to inland water bodies and to the consistent availability of inland aquatic species for utilization by fishing communities. Looking at the impacts of climate change in a rather big picture, the effect of climate change on the changes in the overall human activities, land and water usage, and the like is very clear, which would also eventually affect inland fishery activities. Nevertheless, “precautionary approach” should be promoted as part of the measures in adapting to climate change to enable affected stakeholders to act decisively in the absence of certainty. It is therefore necessary to enhance the preparedness of fishing communities in responding to the anticipated changes and variability of the climate.

Way Forward

Fishery Resources Enhancement Programs for Inland Fishery Resources

Another equally crucial challenge in the sustainable development of inland fisheries is the implementation of various fishery resource enhancement programs, which might have been designed for different and varying objectives. In the first place, resource enhancement programs should aim for enhanced production and yield, with hatchery-bred seeds stocked in closed ecosystem to enhance the yield from inland capture fisheries. Since releasing of hatchery-bred seeds into natural open habitats could result in loss of biodiversity of various natural species or loss of genetic variation within one species, the species to be stocked should be carefully selected focusing on low trophic species that give maximum yields from stocking

activities but with minimum impacts to other species sharing the same ecosystems. The use of indigenous species could be considered for stocking activities, but should exotic species be introduced, risk assessment on their potential impacts to the biodiversity and the ecosystems should be carefully conducted as their impacts could be irreversible.

Secondly, resource enhancement programs should also target species conservation. Stock enhancement is necessary for species where their natural reproduction might no longer occur, such as those species that could not possibly migrate due to construction of cross-river obstacles or when their mature brooders are no longer available in natural habitats. In this case, indigenous species should be used for stock enhancement and conservation purposes using seeds that are produced specifically for the purpose of stock enhancement, as well as those species with high diversity and genetic variation.

Thirdly, stock enhancement programs should also aim for habitat conservation and improvement. In this case, the habitats should be made favorable for fish to enhance the availability of their stocks and promote natural reproduction. Lastly, it is necessary to develop indicators for evaluating the success of resource enhancement programs in order to justify the cost efficiency and effectiveness of the activities.

Enhanced Cooperation and Collaboration for the Sustainable Development of Inland Fisheries

Addressing the aforementioned challenges seem too gigantic to tackle with, and surely could not be done by one country or one entity acting alone. Cooperation and collaboration among countries, agencies and organizations concerned, is necessary. Considering that sustainable development of inland fisheries could be visualized in various levels depending on the boundary of particular ecosystem, therefore cooperation should be promoted at the local, sub-regional within a country, national, or even at regional levels. Thus, sub-regional or regional



intervention would be necessary in crafting programs and activities related to the development and management of inland fisheries.

For example, activities that utilize the ecosystems shared by more than one country such as the Mekong River Basin which is shared by Thailand, Lao PDR in the upper part, and Cambodia and Viet Nam in the lower part, should be jointly planned and implemented by the concerned riparian countries. These could include those activities undertaken in upstream countries which could affect downstream countries, such as hydropower dam construction and operation in upstream countries. Since this could impact on the downstream countries, close consultation and collaboration among the concerned countries should be promoted to address the relevant issues and concerns.

Another example is the responsible utilization of aquatic species that are trans-boundary in nature, specifically those species that require upstream or downstream migration to sustain their life cycles. The Mekong giant catfish that moves across the upper and lower parts of the Mekong River shared by several countries, for example, would require joint conservation measures for the sustainability of its stock. The giant freshwater prawn *Macrobrachium rosenbergii*, which requires brackishwater conditions during its larval stages could be affected by the construction of cross-river obstacles resulting in possible subsequent diminishing of the species in the entire river system.

In the case of the Anguillid eels that are trans-boundary in water resources shared by several countries but migrate across marine, brackish and freshwaters in their life cycle, unsustainable fishing activities undertaken in certain countries could affect the availability of the natural population of such species as a whole. The aforementioned are only some of the examples of areas that require possible regional cooperation in inland fisheries-related activities.

Several organizations and institutions in the Southeast Asian region are working on inland fisheries development and management, such as the Mekong River Commission or MRC, which has been conducting researches and has collected valuable information specifically for the Lower Mekong Basin. MRC has also come up with several materials that could be applied by the Southeast Asian countries. Other national research agencies and institutions have also conducted relevant studies, the results of which could be shared among the countries. Recently, FAO had also conducted extensive works on inland fisheries development and published relevant results in technical reports and journals which could also be accessed through their website.

Capacity Building for the Inland Fisheries Sub-sector

Since certain technologies on inland fisheries are available in some countries in the region, sharing of knowledge and experiences on the activities that had been successfully undertaken in some settings could be facilitated through regional consultations based on agreed collaboration. Such technologies including successful application of management approaches and development of effective data collection system that gives meaningful results could be adopted in other areas in the region with similar conditions and circumstances.

SEAFDEC had conducted activities on inland fisheries but these had been rather minimal due to its limited capacity in terms of resources especially expertise in inland fisheries. The proposed establishment of the Inland Fishery Resources Development and Management Department or IFRDMD under the SEAFDEC framework which was announced by the Minister of Marine Affairs and Fisheries of Indonesia during the ASEAN-SEAFDEC Conference in 2011 was a welcome development. The launching of IFRDMD and its operationalization which was concretized during the 4th International Conference on Inland Capture Fisheries in September 2014, therefore paved the way for SEAFDEC to formulate programs and activities that focus on inland fisheries and inland fishery resources conservation and management from the regional point of view. In all these aspects, SEAFDEC would enhance cooperation and collaboration with other organizations within and outside the region that are working towards the same goal of promoting sustainable inland fisheries.

While strongly recognizing the importance of inland fisheries in view of its contribution to peoples' food security

and livelihood creation, SEAFDEC foresees that inland fisheries could be considered a safety net for many people with no other livelihood opportunities. Moreover, while acknowledging the need to conserve the inland fishery resources of the region for the benefit of future generations, SEAFDEC has drawn up several recommendations during the 4th International Conference on Inland Capture Fisheries in September 2014 for the sustainability of this small but meaningful sub-sector (Chumnarn, 2014), and for its sustained development in the future for the benefit of the rural fishing communities, especially when the "borderless" ASEAN Economic Community would be fulfilled starting in 2015.

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Sustained Promotion of Responsible Fisheries to Secure the Competitiveness of ASEAN Fish and Fishery Products in Intra- and Inter-regional Trade: SEAFDEC Initiative

Hajime Kawamura and Somboon Siriraksophon

Since its establishment in December 1967, the Southeast Asian Fisheries Development Center (SEAFDEC) has continued to advance the development of sustainable fisheries and aquaculture for food security and poverty alleviation in the Southeast Asian region. In the span of 48 years of its existence, SEAFDEC can indeed boast of enormous technical advancements that had shifted the course of development of the region's fisheries and aquaculture towards sustainability, based on its proactive mandate *"to develop and manage the fisheries potential of the region by rational utilization of the resources for providing food security and safety of the people and alleviating poverty through transfer of new technologies, research and information dissemination activities"*. Along line with such mandate, SEAFDEC has been developing and implementing countermeasures to combat illegal, unreported and unregulated (IUU) fishing in the Southeast Asian region considering that IUU fishing activities obstruct all efforts of the Southeast Asian countries to achieve sustainability in fisheries. The progress of such endeavor by SEAFDEC was summarized in a Keynote Remarks delivered by the author *Mr. Hajime Kawamura* during the Third Meeting of the ASEAN Public-Private Taskforce for Sustainable Fisheries and Aquaculture in Penang, Malaysia on 20-21 October 2014.

As an autonomous inter-governmental body, SEAFDEC has 11 Member Countries comprising 10 ASEAN Member States and Japan, and operates through its Bangkok-based Secretariat and five Technical Departments. These are: the Training Department (TD) in Thailand, Marine Fisheries Research Department (MFRD) in Singapore, Aquaculture Department (AQD) in the Philippines, Marine Fishery Resources Development and Management Department (MFRDMD) in Malaysia, and the very recently established Inland Fishery Resources Development and Management Department (IFRDMD) in Indonesia. It is mainly through these Departments and coordination made by its Secretariat that SEAFDEC has sustained the promotion of responsible fisheries and aquaculture for sustainable development and food security in the Southeast Asian region. Since illegal, unreported and unregulated (IUU) fishing has remained uncurbed in the region impeding the efforts of many countries to attain sustainability in fisheries and aquaculture, countermeasures have been crafted

by SEAFDEC to combat IUU fishing activities while good aquaculture practices and responsible processing technologies have been advocated to ensure that the ASEAN fish and fishery products would secure its niche in the regional and international trading arena.

Sustainable Development of Fisheries and Aquaculture

To name a few, the initiatives of SEAFDEC that are directed towards sustainable development of fisheries and aquaculture in the region include: (1) improvement of marine capture fisheries by promoting responsible fishing practices and enhancing the capabilities of the ASEAN Member States (AMS) in marine fisheries management; (2) promotion of integrated coastal management concepts through the implementation of community-based fisheries management for sustainable utilization of resources; (3) development of good quality seeds for aquaculture to ensure reliability of supply of seed stocks; (4) utilization of sustainable protein sources for aquafeeds to reduce pressure on capture fisheries and reduce ecological footprints; (5) promotion of responsible fish health management by addressing emerging issues on fish diseases; (6) maximum utilization of fishery resources for value-added fish products through responsible processing technologies; (7) promotion of quality and safety of fish and fishery products for human consumption by advocating to the region's fish processing industry the application of quality and assurance systems; (8) compilation of scientific-based information



for the sustainable management of pelagic fisheries as well as for other economically important aquatic species; (9) development of countermeasures to combat IUU fishing; (10) generation and dissemination of information materials for sustainable development and management of fisheries and aquaculture.

Countermeasures to Combat IUU Fishing

The growing domestic and international demand for fish and fishery products has led to overexploitation of aquatic resources all over the world including in the Southeast Asian region. Such increasing demand has compelled fishers to catch more and more fish by any means and practices including IUU fishing operations, unconscious of the impacts that their actions would bring about that could lead to environmental degradations. If IUU fishing activities remain unchecked, this could lead not only to the overexploitation of fish stocks but also impede the recovery of fish populations that had been overfished impacting on the health of the ecosystems. The results could then be damaged and degraded aquatic environments leading to increased competition among resource users, severely



affecting the economic and social well-being of fishing communities in many developing countries, especially those extremely dependent on the natural resources.

At the global scale, IUU fishing is even difficult to quantify as it can occur in virtually any fishery from the coastal to inland waters up to the offshore areas. Such situation is very common in the Southeast Asian countries where fisheries management strategies need to be strengthened and advocated, and where resources are limited to enforce regulations such as landing controls, vessel inspections, and deployment of adequate number of patrol vessels. For such reasons, SEAFDEC has strengthened its collaborative mechanism with the ASEAN through the ASEAN-SEAFDEC Strategic Partnership (ASSP) and with the Fisheries Agency of Japan through the Japanese Trust Fund, to enable it to initiate activities aimed at improving fisheries management, managing fishing capacity, and combating IUU fishing in the Southeast Asian region (Kawamura, 2014).



Moreover, it has been becoming very obvious that the main driver of IUU fishing is personal economic benefit since a vessel which is fishing illegally is able to minimize operating costs in terms of licensing, registration, use of vessel monitoring systems, and documentation while the flag state receives the least economic benefits from such fishing activities. In order to contribute to regional efforts of combating IUU fishing, SEAFDEC with the collaboration of the ASEAN Member States (AMS) and with funding support from the Japanese Trust Fund, has developed various countermeasures that include the establishment of the Regional Fishing Vessel Record for fishing vessels 24 meters in length and over in the AMS (SEAFDEC/TD, 2014), development of the ASEAN Guidelines Preventing the Entry of Fish and Fishery Products from IUU Fishing Activities into the Supply Chain (SEAFDEC/MFRDMD, 2014a), and crafting of an ASEAN Catch Documentation

Box 1. Countermeasures Developed by SEAFDEC for Combating IUU Fishing in Southeast Asia

Regional Fishing Vessel Record

SEAFDEC has initiated the compilation of a Regional Fishing Vessel Record (RFVR) for fishing vessels 24 meters in length and over, with the intention of extending the record for fishing vessels below 24 meters in the near future. With strong belief that together with refined licensing systems, the RFVR could be used as a tool to combat IUU fishing in the Southeast Asian region. The SEAFDEC Council of Directors during its 45th Meeting in April 2013 approved the said compilation and subsequently, the Special Senior Officials Meeting of the Thirty-Fourth Meeting of the ASEAN Ministers on Agriculture and Forestry (Special SOM-34th AMAF) also supported the establishment of the RFVR. Since the establishment of the RFVR could not be realized without inputs from the AMS, a series of technical workshops had been convened to exchange national data and information among the AMS as well as for the development and management of the database for the RFVR. Through such fora, the understanding of the countries had been enhanced, especially on the rationale of compiling, sharing and utilizing information in the RFVR database, as this could serve as means of managing fishing capacity and combating IUU fishing in the region.

In the development of the RFVR for vessels 24 meters in length and over, the AMS committed to provide basic information that would go into the database comprising 26 items, namely: (1) Name of Vessel; (2) Vessel Registration Number; (3) Owner's Name; (4) Type of Fishing Method/Gear; (5) Port of Registry; (6) Gross Tonnage (GRT/GT); (7) Length (L); (8) Breadth (B); (9) Depth (D); (10) Engine Power; (11) Shipyard/Ship Builder; (12) Date of Vessel Launching; (13) International Radio Call Sign; (14) Engine Brand; (15) Serial Number of Engine; (16) Hull Material; (17) Date of Registration; (18) Area (Country) of Fishing Operation; (19) Nationality of Vessel (Flag); (20) Previous Name (if any); (21) Previous Flag (if any); (22) Name of Captain/Master; (23) Nationality of Captain/Master; (24) Number of Crew (maximum/minimum); (25) Nationality of Crew; and (26) IMO Number (if available). As envisioned and agreed upon by the AMS, uploading of information from the AMS into the RFVR database system by SEAFDEC should be completed by the end of October 2014 in order that online trials could be made by the AMS in November 2014. Formal launching of the RFVR for vessels 24 meters in length and over is planned during the 47th Meeting of the SEAFDEC Council of Directors in April 2015.

ASEAN Guidelines Preventing the Entry of Fish and Fishery Products from IUU Fishing into the Supply Chain

Various forms of IUU fishing activities have been encountered and experienced by many ASEAN Member States, but the major forms of IUU fishing activities occurring in the Southeast Asian region could be grouped into five (5) types: (1) illegal fishing activities within a country such as fishing without valid license or registration document, vessel with specifications different from those indicated in the fishing license, double flagging, fishing in waters outside the permitted or designated fishing areas, operating prohibited fishing gears and methods, landing of fish in unauthorized ports, transferring of catch at sea, and unreporting or misreporting of catch; (2) unauthorized transshipment and landing of fish/catch across borders, especially for fishing vessels operating in a country but transshipping or landing their fish/catch across borders without authorization; (3) poaching in the EEZs of other countries usually carried out by foreign fishing vessels illegally fishing in another country's waters; (4) illegal fishing and trading practices of live reef food fish, reef-based ornamentals and endangered aquatic species, including the practice of using chemicals and other unregulated practices to collect and trade live reef food fish, as well as reef-based ornamentals and endangered aquatic species for consumption and for the aquarium industry; and (5) IUU fishing in the high seas and RFMO areas including a range of illicit activities, such as fishing without permission or during out-of-season, using outlawed types of fishing gears, disregarding catch quotas, unreporting and misreporting catch volumes and species.

For the development of the ASEAN Guidelines, the AMS have been encouraged to: (1) **Manage Fishing Activities within a Country** by controlling fishing access through proper registration and licensing system of fishing vessels and gears including their accurate specifications, updating related laws and regulations as well as systems of reporting catch and compiling appropriate logbook information, and monitoring of all fishing vessels by maintaining records and their performance with respect to compliance with their national laws and regulations including current owners and operators authorized to undertake fishing activities at designated fishing areas; (2) **Regulate Transshipment and Landing of Fish/Catch across Borders** by establishing formal arrangements with respect to landings between bordering countries, conducting regular bilateral/multi-lateral meetings to discuss mutual agreements on licensing system, data recording, and sharing of information on licensing system, regulations, and other relevant information, and strengthening measures to regulate fishing vessels accessing their ports for transshipping and/or landing catch and collect and exchange relevant data including origin of catch among neighboring countries; (3) **Prevent Poaching in the EEZs of Other Countries** by taking appropriate actions against fishing vessels operating illegally beyond their designated areas, strengthening cooperation in the compilation of lists of vessels reported to have been illegally operating (poaching) beyond their respective EEZs, and sharing such lists among relevant countries, and supporting the regular updating of information for the Regional Fishing Vessels Record (RFVR); (4) **Control Illegal Fishing and Trading Practices of Live Reef Food Fish (LRFF), Reef-based Ornamentals, and Endangered Aquatic Species** by conducting regular inter- and intra- meetings among relevant authorities (including customs departments) and exporting companies for mutual agreements on harvesting practices and data reporting of live reef food fish, reef-based ornamentals, and endangered aquatic species; adopting appropriate mechanisms for the monitoring and data collection of live reef food fish and reef-based ornamentals trades; preventing the export of endangered aquatic species, except for research and experimental purposes for which such export should be accompanied by appropriate documents; and engaging the participation of small-scale/artisanal fishers, who account for majority of LRFF production, in co-management to enhance their awareness of the impacts of illegal fishing and trading of such aquatic species; and (5) **Strengthen the Management of Fishing in the High Seas and RFMO Areas** by strengthening respective port state measures including control of port entry, use of port services, requirements for pre-port entry notification and designation of ports for fishing vessels, implementing where appropriate observer programs in accordance with relevant national, regional or international regulations with respect to high seas fisheries; and cooperating with the relevant RFMOs in complying with their Catch Document Schemes to prevent the landing of fish and fishery products from IUU fishing activities in the RFMO areas.

During the series of Technical Consultations, the AMS agreed that the ASEAN Guidelines could serve as basis for the AMS in formulating relevant policies and provide an enabling environment for a clear direction and understanding of the need to prevent the entry of IUU fish and fishery products into the supply chain. The AMS also considered developing and/or strengthening their respective strategies and measures based on the Guidelines, which is expected to be implemented in the region as soon as possible.

Box 1. Countermeasures Developed by SEAFDEC for Combating IUU Fishing in Southeast Asia (Cont'd)

ASEAN Catch Documentation Scheme

Considering that IUU fishing activities remained active around the world, the international community has enhanced cognizance of the value of the legally-binding instrument on port state measures, and the market-driven measure known as the “EC Regulation 1005/2008” to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing, which requires that countries exporting fish and fishery products to the EU must adopt such EC Regulation. Meanwhile, many Regional Fishery Management Organizations (RFMOs) have also developed their respective Catch Documentation Schemes as means of discouraging IUU fishing activities in the RFMOs’ areas and/or in the high seas with the objectives of tracking fish catch being traded in their management areas and minimizing the opportunities for fish products acquired through illegal, unreported or unregulated (IUU) fishing from reaching the markets. Under such measure, countries that are parties to tuna RFMOs, e.g. WCPFC, IOTC are bound to implement the RFMOs’ Catch Documentation Schemes to be able to import and export tuna and tuna products.

Considering that intra-regional trade and international trade of fish and fishery products is beyond trading with the EU or other framework under RFMOs, AMS considered it important to develop measures that could provide the countries with guidance in improving the traceability system of capture fisheries and combating IUU fishing in the region. The AMS therefore recognized that a regional catch documentation scheme could be used as one of the management tools to improve and strengthen better management of fisheries in the ASEAN region. In view therefore of such circumstances, the AMS proposed that a regional catch documentation system could be developed taking into consideration the format, standard and information requirements of the existing schemes of importing countries, but simplified in order to enhance its applicability by small-scale fisheries in the region. Such regional catch documentation could be called the “ASEAN Catch Documentation Scheme or ACDS”, depending on the requirements of the AMS but aligned with international market-driven measures. In the development of such ACDS, SEAFDEC has provided the platforms for discussion/consultations for drafting the ACDS. Along this process however, it is necessary that the AMS should work together with importing countries in developing the ACDS which could facilitate not only intra-regional trade in fish and fishery products, but also enhance the cooperation among the AMS for the realization of the ASEAN Economic Community (AEC) by 2015. With such conceptual plan, the “Development of ASEAN Catch Documentation Scheme” was supported by the SEAFDEC Council during its 45th Meeting in April 2013 and endorsed by 21st ASWGF in July 2013, and supported by the Special SOM-34th AMAF in August 2013.

The ongoing development of the ACDS, which is being spearheaded by SEAFDEC/MFRDMD with the cooperation of the SEAFDEC Secretariat, puts more focus on marine capture fisheries with the main objective of ensuring that a unified framework is available for the AMS to enhance the traceability of their fish and fishery products, thus contributing to the overall efforts towards effective management of fisheries in the AMS. Specifically, the ACDS would also assure AMS that the credibility of the region’s fish and fishery products is improved for intra-regional and international trade, considering that the entry of fish and fishery products from IUU fishing activities into the supply chain could be prevented for the benefit of all stakeholders. At this initial stage, the scope of the ACDS shall apply to catch of fish and its fishery products with the exception of: freshwater fish and fishery products; aquaculture products obtained from fry or larvae; ornamental fishes, oysters (live), scallops including queen scallops of the genus *Pecten*, *Chlamys* or *Placopecten* (live, fresh or chilled); frozen Coquilles St. Jacques (*Pecten maximus*); other scallops (fresh or chilled); mussels; snails other than those obtained from the sea; prepared and preserved mollusks; corals; and CITES-listed species; as well as to trading of marine fish and fishery products, processed or not, originating from AMS-flagged fishing vessels. Under the ACDS, transshipments, landings of domestic products, exports, imports, and re-exports, under jurisdiction of AMS, would require that all catches must be accompanied by a catch certificate and details of transshipment. Although the ACDS would not cover export/import of fish parts other than the meat, including head, eyes, roe, gut, fin, skin, tail, with the exception of shark fins, it would cover the catch from small fishing vessels (which meet the criteria) that can contribute to trade among the AMS and in such case, a simplified catch document would be applied accordingly. Therefore, the ACDS is intended not only to facilitate intra-regional trade but also to demonstrate the commitment of AMS to combat IUU fishing in the region. Furthermore, a subsequent phase might be developed for all fish and fishery products coming from outside the region.

System (SEAFDEC/MFRDMD, 2014b and 2014c). The development of the ASEAN Catch Documentation Scheme (ACDS) would take into consideration the EC Regulation 1005/2008 to facilitate export of fish and fishery products to the EU countries by the AMS, while the ACDS would focus more on inter- and intra-regional trade of fish and fishery products from marine capture fisheries. The details of such countermeasures are shown in **Box 1**. Furthermore, through the efforts of SEAFDEC, the AMS had initiated the development of policy recommendations and the Plan of Action for regional cooperation on sustainable fisheries resources management in the ASEAN region, which had been used as basis for crafting of the Regional Plan of Action on Sustainable Utilization of Neritic Tuna Resources in the ASEAN Region or RPOA-Neritic Tuna for subsequent adoption by the AMS (SEAFDEC,

2014a). Recently, the Regional Policy Recommendations on Conservation and Management of Eel Resources and Promotion of Sustainable Eel Aquaculture had been developed which would pave the way for the mapping of the regional plans for the conservation and management of eel resources as means of ensuring the sustainable utilization of eel resources in the Southeast Asian region (SEAFDEC, 2014b).

Way Forward

It is recognized that IUU fishing activities bring about negative impacts on the economic, social and ecological attributes of fisheries that affect food security and efforts to alleviate poverty in fishing communities. Specifically, IUU fishing activities contribute to the reduction in food



supply, lost livelihoods and state revenues, diminishing fish stocks and damaging the ecosystems, with the most devastating effects concentrated in developing countries due to their greater vulnerability. These illegal activities form a complex web – from illegal fishing activities to illegal trade, and finally to persistent catching from unsustainably fished stocks with the underlying objective of getting high profit from illegally caught fish. Moreover, the driving forces that lead to the rampant occurrence of IUU fishing in the waters of Southeast Asia could include: inadequate regulatory control over national fishers and fishing vessels, insufficient effective management tools to manage fishing capacity, weak enforcement of fishing legislations, evading the payments of fishing fees and taxes, absence of or inadequate maritime boundary agreements, and incompatible legal frameworks for combating IUU fishing.

It is therefore the commitment of SEAFDEC combined with those of other national, regional and international initiatives and efforts, to contribute to the overall efforts of developing sustainable fisheries and aquaculture in the Southeast Asian region not only for increased fisheries productions but also for improved national economies for food security and livelihoods of peoples in the region. The efforts of SEAFDEC towards attaining more technological advancements would not end with the measures discussed above, as SEAFDEC would continue to boost the development of fisheries and aquaculture in the Southeast Asian region towards sustainability in the years to come. More particularly, SEAFDEC also conforms to the need to strengthen regional and sub-regional efforts to combat IUU fishing as one of the priority actions of the AMS in parallel with the establishment of the ASEAN Economic Community (AEC) by December 2015.



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Trading of Live Reef Food Fish from the Southeast Asian Region: Economic Boon or Bane?

Saivason Klinsukhon

Trading of live reef food fish starts with the capture of reef fish which are kept alive, and then exported mainly to Hong Kong and China, and to smaller markets in Malaysia and Singapore. Live reef fish have long been traded around Southeast Asia as a luxury food item, and in recent decades trading of live fish captured from coral reefs has rapidly expanded threatening the sustainability of the reef resources. The most commonly traded reef fishes include various species of groupers and leopard coral trout, humphead wrasse, and red snapper.

In many Southeast Asian countries, live reef food fish (LRFF) fisheries and live reef food fish trade (LRFFT) have been considered serious threat to the coral reef ecosystems and biodiversity in view of the severe impacts that such activities could create, such as overexploitation of the reef resources; unsustainable capture of juveniles for grow-out and spawning; irresponsible fishing practices such as the use of cyanide and destructive gears; illegal, unreported and unregulated (IUU) fishing; and inadequate valuation of the resources. Nevertheless, the impact of such activities on coastal communities dependent on the reef resources should also be regarded with great concern. It could not be discounted that LRFF fisheries and LRFFT continue to provide livelihoods to many small-scale coastal fishers, but if not contained, these activities could diminish their future income opportunities as well as threaten local food security. With continued severe overfishing in reefs, time will come when the reef fish resources could no longer sustain local utilization, threatening and even completely losing the potential income generating opportunities such as those in ecotourism and other related livelihoods.

Live Reef Food Fish: Economic and Trade Issues

Wild LRFF fisheries have been reported to be concentrated in the Coral Triangle countries of Indonesia, Philippines, and Malaysia, and thus is LRFFT. Although considered as a very small sector, LRFFT is one of the most lucrative sectors of the seafood industry in Asia, considering that its existence is largely driven by high demand for LRFF in Hong Kong and China, and by the high prices fetched by some LRFF species such as the leopard coral trout (*Plectropomus leopardus*) and humphead wrasse

(*Cheilinus undulatus*). This scenario has pushed the desire of many reef fishers to catch more LRFF, fueling the fishing effort in some of the richest coral reef ecosystems in the world that leads to the overexploitation and depletion of targeted reef fish stocks. LRFFT therefore remains a serious threat to the coral reef ecosystems and biodiversity in Southeast Asia, with serial overfishing occurring in many or most countries of the region and with destructive fishing practices compounding the damages. The most common species of live reef food fish imported to Hong Kong by some Southeast Asian countries recorded from 1997 onwards are shown in **Table 1**.

Table 1. Species of live reef fish imported to Hong Kong from Southeast Asia (1997 onwards)

Common name	Scientific name
Giant grouper	<i>Epinephelus lanceolatus</i>
Humpback grouper	<i>Cromileptes altivelis</i>
Orange-spotted grouper	<i>Epinephelus coioides</i>
Brown-marble grouper	<i>Epinephelus fuscoguttatus</i>
Camouflage grouper	<i>Epinephelus polyphekadion</i>
Leopard coral grouper	<i>Plectropomus leopardus</i>
Spotted coral grouper	<i>Plectropomus maculatus</i>
Humphead wrasse	<i>Cheilinus undulatus</i>
Mangrove red snapper	<i>Lutjanus argentimaculatus</i>

Source: SPC (2007)

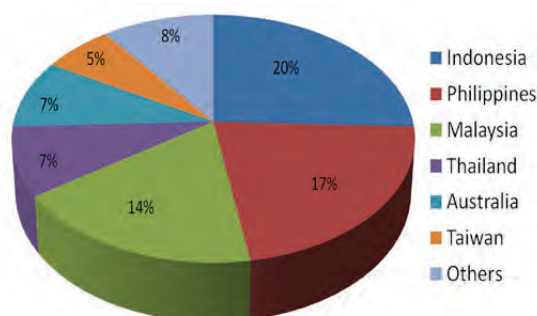


Fig. 1. Share of exporting countries in the volume of LRFF imported by Hong Kong in 2009

In the absence of reliable country-level export data on LRFFT, the best available information was sourced from the import data of Hong Kong, which suggested that between one-half and two-thirds of the LRFF traded originates from three Southeast Asian countries, namely: Indonesia, Philippines, and Malaysia, although Taiwan,



the greasy grouper (*Epinephelus tauvina*) and leopard coral trout (*Plectropomus leopardus*). However, it should also be noted that the region's export of LRFF had not been disaggregated at species level, thus, species classification in LRFFT could be either misreported or under-reported.

Regional Initiatives to Address Issues on LRFFT

The Coral Triangle which embraces an area of 6.0 million km² and spans from Indonesia, Malaysia, Philippines, Papua New Guinea, Timor Leste, to the Solomon Islands, is known as the global center of marine biodiversity. It hosts 76% of the world's coral species, 6 of the world's 7 species of marine turtles, and at least 2,228 reef fish species, which is the most valuable asset in the Coral Triangle. Such reef species are the target of many stakeholders most of whom are small-scale coastal fishers, for the LRFFT in view of the high price commanded by such species in the fish trade arena notwithstanding the need to conserve this valuable reef fish resource.

Australia and Thailand have also been significantly supplying farmed LRFF to the regional market. In the case of Indonesia, Philippines, and Malaysia as the major source of LRFF, management of their respective reef fisheries is either inadequate or even non-existent. Considering that documentation of LRFF production is considerably insufficient, there is a general opinion that in almost every country in Southeast Asia, reef fishery resources could already be overexploited. Although the actual quantities of LRFF traded are difficult to determine, CEA (2011) was able to obtain relevant information from the volume of LRFF imported by Hong Kong in 2009 as shown in **Fig. 1**.

As reported in the Fishery Statistical Bulletin of Southeast Asia 2012 (SEAFDEC, 2014), the total production of major reef fish species from all sources, live and dead fish of the Southeast Asian region in 2012 had been estimated to be about 110,743 metric tons (MT) representing about 0.7% of the region's total production from marine capture fisheries. Comparing with those in 2011 (**Table 2**), this data indicates that there is an increase in the production of LRFF species in almost all Southeast Asian countries, especially



Table 2. Total LRFF production of Southeast Asia (2008-2012) in metric tons (MT)

LRFF species	2008	2009	2010	2011	2012
Honeycomb grouper (<i>Epinephelus merra</i>)	6,986	8,770	3,968	4,307	6,662
Greasy grouper (<i>Epinephelus tauvina</i>)	-	7,600	3,605	2,336	7,617
Groupers nei (<i>Epinephelus</i> spp.)	7,971	8,828	12,627	10,014	12,207
Humpback grouper (<i>Cromileptes altivelis</i>)	5,993	6,650	7,440	9,229	10,698
Leopard coral grouper (<i>Plectropomus leopardus</i>)	9,139	10,670	10,087	14,482	20,699
Groupers, sea basses nei (Serranidae)	24,358	22,356	24,346	23,963	24,794
Humphead wrasse (<i>Cheilinus undulatus</i>)	4,236	5,540	2,017	1,232	984
Mangrove red snapper (<i>Lutjanus argentimaculatus</i>)	8,975	9,181	8,312	9,627	9,971
Wrasses, hogfishes, etc. nei (Labridae)	14,664	16,351	17,488	16,316	17,111
Total LRFF production	82,332	73,590	89,890	91,506	110,743
Total production from marine capture fisheries	13,814,368	14,140,387	14,874,445	15,095,450	15,590,704

Source: SEAFDEC (2014)

Live Reef Food Fish Trade Intergovernmental Forum

In an effort to address the aforementioned concerns on the sustainability of reef fish resources, the Southeast Asian Fisheries Development Center (SEAFDEC) hosted and co-organized with the Coral Triangle Initiative for Coral Reefs, Fisheries and Food Security (CTI-CFF), the Live Reef Food Fish Trade Intergovernmental Forum on 31 January-1 February 2013. Held in Bangkok, Thailand with support from the US Coral Triangle Initiative (US CTI) Support Program, the Forum was attended by senior officials from six Coral Triangle (CT) and Southeast Asian countries with significant interest in LRFFT, namely: Indonesia, Malaysia, Philippines, Solomon Islands, Timor-Leste, and Viet Nam. The Forum tackled the challenges arising from and affecting LRFFT, and explored the opportunities that could support the sustainable development of the LRFF industry not only in the Coral Triangle but also in the Southeast Asian region as a whole.

While SEAFDEC is mainly tasked to promote the sustainable development of fisheries for food security of the Southeast Asian region, actually it has no direct and specific mandate on LRFFT. Meanwhile, the CTI-CFF has the mandate to address the threats that confront the coastal and marine resources of the Coral Triangle, specifically through more effective management and more sustainable trade in live reef fishes and reef-based ornamentals. The Forum therefore supported the priority actions of CTI-CFF and indirectly, the goal of SEAFDEC on sustainable fisheries.

Role of SEAFDEC in the Intergovernmental Forum

For almost five decades, SEAFDEC has been assisting its Member Countries in the sustainable development of fisheries and aquaculture for food security in the Southeast Asian region. In such endeavor, SEAFDEC has enhanced its cooperation and collaboration with many international and regional organizations as well as management bodies including the ASEAN to enhance its capability in assisting the Member Countries to address issues that impede the sustainable development of fisheries. One of the major issues that tend to hamper the sustainability of the region's fisheries is the trading of live reef food fish not only in the main Coral Triangle countries such as Indonesia, Philippines, and Malaysia but also in other SEAFDEC Member Countries such as Viet Nam, Thailand, and Singapore.

The continuous demand for live reef food fish and the widening geographic scope of the LRFFT have been creating tremendous pressures on the reef fish resources and habitats. The use of destructive fishing methods and haphazard rearing practices of reef fishes as well as the substantial gap on scientific data and information are the

major concerns for the effective management of reef fishery and its trade within the Southeast Asian and Coral Triangle member countries. It is in this regard that SEAFDEC continues to play an active role in the management of reef fish resources by co-organizing the Intergovernmental Forum together with the CTI-CFF in order to discuss the strategies and identify pragmatic solutions to the flourishing LRFFT industry in the region that has created impacts on the sustainability of the reef fish resources. No less than the SEAFDEC Council of Directors, having considered the need to conserve the reef fish resources of Southeast Asia supported the results and recommendations made during the Forum during the Forty-fifth Meeting of the SEAFDEC Council in the Philippines in April 2013. The SEAFDEC Council also gave authority for SEAFDEC to serve as Interim Secretariat in the implementation of the Resolution on Sustainable LRFFT which was developed during the said Forum (SEAFDEC, 2013).

Outputs of the Intergovernmental Forum

Issues that hinder the development of a future management regime for LRFFT, as well as efforts to limit the harvest of reef fish species from the wild and subsequent export of live reef fish, and the establishment of a Stakeholders Forum to support program implementation were also discussed during the Forum. Specifically, the Resolution on Sustainable Live Reef Food Fish Trade for the Southeast Asian and CTI-CFF Member Countries was endorsed and the Forum agreed to designate SEAFDEC as the Interim Secretariat with support from CTI-CFF Interim Regional Secretariat and the US CTI Support Program. The major outputs of the Forum are summarized in **Box 1**.

Resolution on Sustainable LRFFT for Southeast Asian and Coral Triangle Countries

As shown in **Box 1**, one of the major outputs of the Intergovernmental Forum was the approval and signing of the Resolution on Sustainable LRFFT for the Southeast Asian and Coral Triangle Member Countries. The resolution specifically articulated on the commitment of the concerned countries and organizations to pursue



Box 1. Actions resulting from the Intergovernmental Forum

1. **Approval and signing of the Resolution on Sustainable LRFFT for the Southeast Asian and Coral Triangle Countries** by the heads of delegation of the six countries participating in the Forum and attested to by the Secretary-General of SEAFDEC and the representative from the CTI-CFF Regional Interim Secretariat.
2. **Identification of potential agenda items for the LRFFT Regional Forum**, which include: hybridization of grouper species, clear definition of MPA boundaries and responsibility centers, membership in the LRFFT Regional Forum, promotion of aquaculture/mariculture, and assessment of the ecosystem impacts of LRFFT.
3. **Commitment of support from SEAFDEC, USAID and CTI-CFF Regional Interim Secretariat**: SEAFDEC to continue supporting the LRFFT Regional Forum in its capacity as the technical arm of the ASEAN on fisheries development, USAID through the US CTI Support Program to support a meeting between LRFF-producing countries and Hong Kong/China on the demand side, to provide opportunities for representatives from the producing countries to take part in a study visit and learn more on LRFFT with focus on traceability.
4. **Agreement on the crafted way forward**, which includes seeking endorsements from higher authorities of SEAFDEC and the ASEAN, meeting of the LRFFT Regional Forum, and regular meetings between producers and consumers of LRFF.

Source: USAID (2013)

national, intergovernmental and regional actions for the sustainability of LRFFT for the benefit of the stakeholders, especially those dependent on the reef fish resources for their livelihoods. The Resolution contains action items as shown in **Box 2**.

Way Forward

During the 45th Meeting of the SEAFDEC Council in April 2013, the SEAFDEC Council of Directors endorsed the Resolution on Sustainable Live Reef Food Fish Trade (LRFFT) for the Southeast Asian Region and CTI-CFF Member Countries, authorized SEAFDEC to serve as the Interim Secretariat for the LRFFT Regional Forum, and allowed SEAFDEC to enter into collaborative arrangement with the CTI-CFF in order to formalize future cooperation. Such endorsement would enable SEAFDEC to take the leading role in drafting the roadmap and developing the terms of reference (TOR) for the sustainable development of LRFF fisheries, as well as in identifying the organizational and administrative requirements for the Regional Forum.

An ensuing exploratory meeting was organized by SEAFDEC and supporting partners, namely: US CTI Support Program and World Wide Fund for Nature-Coral Triangle Global Initiative (WWF-CTGI) in Hong Kong on 1 August 2013 to initiate the dialogue on sustaining LRFFT. With the Senior Officials of Hong Kong Government's

Agriculture, Fisheries and Conservation Department (AFCD) and representatives from SEAFDEC and supporting partners, the meeting agreed that the ways to sustainably manage these lucrative fishery resources both from the supply and demand sides of the trade, should be closely looked into. Given the importance of Hong Kong and China as the largest consumer markets for LRFF species, the meeting also agreed to reach out to relevant government agencies in these markets.

In this regard, the meeting suggested two routes by which the Hong Kong Government could be engaged in the roadmap. First is through the administrative route by which AFCD can participate in per activity level such as information sharing, *i.e.* statistics on LRFFT imports,

Box 2. Main aspects of the Resolution on Sustainable LRFFT for Southeast Asian and Coral Triangle Countries

1. **Establishment of Marine Protected Areas (MPAs) and conduct of the following activities**: (1) identification of spawning aggregation areas and other transboundary ecosystems that may be included in the Coral Triangle Marine Protected Area System; and (2) establishment of fish *refugia* to protect LRFF species both inside and outside the MPAs.
2. **Development of an Accreditation System** which includes incentives/disincentives designed to encourage LRFF suppliers/traders to follow sustainable and fair trade practices, and to complement the system, countries are encouraged to: (1) establish a network of cyanide testing laboratories to detect violations and promote compliance; (2) identify and collaborate with independent bodies to monitor and check LRFF export and to complement governments' regulatory systems; (3) designate export hubs for shipment of LRFF to simplify trade and streamline regulations; and (4) consider among others, the following conditions for accreditation: (a) proof that export commodity comes from sustainable sources; (b) proof of sustainable management of reef ecosystem; (c) certificate of compliance issued by an independent body designed to monitor and check; and (d) permit to export from designated shipment hubs.
3. **Development and establishment of necessary and appropriate reporting system** to promote consistency in data collection, reporting processes and traceability. The basic information could include species, date caught, size, fishing area, and others as may be required.
4. **Addressing IUU fishing issues related to LRFFT**, which should be consistent with the parties' obligations under the Regional Plan of Action to Promote Responsible Fishing Practices including Combating Illegal, Unreported and Unregulated Fishing in Southeast Asia (RPOA-IUU), and strengthening the cooperation towards preventing transboundary IUU fishing and illegal trading practices.
5. **Enhancing collaboration among participating countries through a Regional Forum**, which is modeled after the Regional Fisheries Management Organization (RFMO) and encourage each country to develop and establish appropriate local and national fora to promote information exchange, collaboration, and continuous dialogue among all concerned stakeholders.

Source: USAID (2013)

consumer education, and aquaculture technology. Since this is within its realm and mandate, the AFCD would integrate this aspect with its current program priorities. The second route is statutory in which case, an ordinance or law could be passed if the intention is to “regulate or control the trade” and sanctions have to be developed and strictly enforced. However, the latter needs some degree of rigor and concrete actionable proposals before the Hong Kong Government could pass the legislative policy on LRFFT. Since this is beyond the mandate of AFCD, relevant bureaus of the Hong Kong Government should be engaged in future discussions on this issue if this route is to be pursued under the roadmap.

Nevertheless, to enable SEAFDEC to pursue the goal of promoting the sustainability of the reef fish resources, it is necessary that the collaboration between SEAFDEC and CTI-CFF be formalized through a Memorandum of Understanding (MOU). SEAFDEC could then explore communication avenues where LRFFT issues could be put forward through various channels of informal fora/dialogues/roundtable discussions with stakeholders where programs, activities, and statistics related to LRFFT imports could be shared. This would also strengthen the role of SEAFDEC as the Interim Secretariat for the LRFFT Regional Forum.

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Policies of Indonesia for Sustainable Tuna Fisheries Management: Issues and Concerns

Thomas Nugroho

Indonesia is an archipelagic country rich in fishery resources. Since the country's reform era in 1999, the Indonesian Government has given more attention towards developing its fishery resources through the Ministry of Marine Affairs and Fisheries (MMAF), as well as exploiting and utilizing such resources to enhance the country's economy. Tunas, which form part of the country's fishery resources, have been playing an essential role in the economic development of Indonesia in view of the rising tuna production which increased at an average annual rate of about 8.4% during the past decade. Indonesia has been leading the Southeast Asian countries in tuna production not only in terms of volume but also in value. In 2013, its tuna production accounted for about 6.4% of the country's total fishery production and 21.5% of its production from marine capture fisheries. The tuna species caught in the territorial waters of Indonesia comprises the oceanic tunas such as skipjack, yellowfin, big-eye, albacore, and southern bluefin; and other tunas such as longtail, kawakawa, bullet, and frigate tunas. Considering the significant contribution of tuna resources to the country's economy, the Government of Indonesia has developed policies for the sustainable management of the country's tuna fisheries. However, the implementation of such policies has been encountering various challenges as explained in this article.

contributed by aquaculture, 37.8% by marine capture, and 3.2% by inland capture fisheries. The country's fisheries sector contributed about Indonesian Rupiah (IDR) 255 billion (equivalent to USD 247,350,000) to the country's GDP (MMAF, 2013) in 2013. Moreover, the country's tuna production reached 1.2 million MT in 2013 valued at USD 1.7 billion, where production had increased at an annual rate of 6.0% (Table 1).

Furthermore, MMAF (2013) also reported that the country's export volume of tuna in 2013 was about 201.2 thousand MT or an increase of more than 41.5% from that of 2012, valued at USD 745.0 million increasing by 33.5% from that of 2012. Such volume of tuna export represented about 16.4% of the country's total volume of exported fishery products. To date, Indonesia continues to be the primary country exporting tuna to the global market. In 2013, the main importers of its tuna products were Japan (19.2%), the EU (13.8%), USA (7.2%), and other countries (59.8%). As reported by MMAF (2012e), tuna products exported by Indonesia are of three main types, namely: tuna frozen (37.7%), fresh or chilled (19.3%), and prepared or preserved (43.0%).

In 2013, the total fishery production of Indonesia reached 19.4 million metric tons (MT) valued at USD 23.7 billion (MMAF, 2013a). In terms of volume, production from aquaculture accounted for 68.5% while marine capture fisheries shared about 29.5%, and the remaining by inland capture fisheries at about 2.0%. Meanwhile, more than one-half of the fishery production value or about 59.0% was

Considering therefore the importance of tunas to the country's economy, the Government of Indonesia has promulgated some policies to underpin the sustainable management of tuna fisheries. Nevertheless, the main challenge in its tuna fisheries management is the effectiveness in dealing with complex resource problems such as the multi-actors involved and implementation of regulations and requirements prescribed by international

Table 1. Tuna production trend of Indonesia from 2009 to 2013 (volume in 1000 MT and value in million USD)

Country: Indonesia	2009		2010		2011		2012		2013	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Total Tuna Production	943.0	312.1	905.3	1,077.0	1,028.2	1,260.3	1,134.3	972.4	1,225.9	1,708.5
Oceanic Tuna	519.6	129.0	515.1	733.1	613.6	817.5	704.8	692.5	786.4	1,186.7
Other Tunas	423.4	183.1	390.2	343.9	414.6	442.8	429.5	279.9	449.5	521.8
Total Production from Marine Capture Fisheries	4,789.4	1,687.0	5,039.4	6,558.1	5,328.6	7,099.9	5,401.0	4,863.3	5,738.9	8,946.4
Total Fisheries Production	10,064.1	7,493.1	11,662.3	14,086.0	13,626.1	14,955.0	18,763.9	13,292.2	19,429.7	23,673.4

Sources: SEAFDEC (2014), SEAFDEC (2013), SEAFDEC (2012), SEAFDEC (2011), MMAF (2014)

Note: The average of conversion rate of IDR to USD was 0.000097 (2009); 0.000110 (2010); 0.000114 (2011); 0.000107 (2012); 0.00097 (2013) (www.x-rate.com/average/?from=IDR&to=USD&amount=1.00&year=)

tuna management bodies at the national and local government levels.

Tuna Fishery Policy of Indonesia

The tuna fishery policy in Indonesia is composed of several aspects, namely: issuance of licenses (for capture fisheries), implementation of fishery observer’s program, assessment of fish stocks, use of fish aggregating devices (FADs), fishing gear used, transshipment practices, and IUU fishing activities. Licenses for capture fishing activities in the fisheries management areas (FMAs) as shown in Fig. 1, comprise: business licence (SIUP), fishing licence (SIPI),

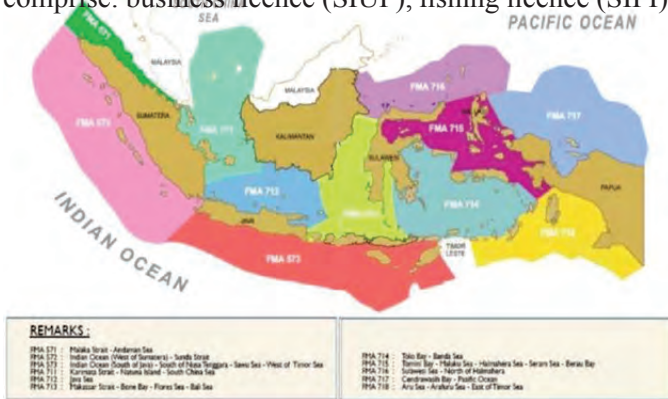


Fig. 1. Fisheries Management Areas (FMAs) of Indonesia (MMAF, 2009)

transporting licence (SIKPI), and investment allocation (APIMP).

All fishing activities carried out by fishers, companies, and integrated fishing investments must have SIUP, SIPI, and SIKPI, where the SIUP is issued only once and remains valid as long as concerned stakeholders are active to carry out fishing activities. SIPI is issued to fishing boats more than 5 GT, while SIKPI is specifically issued to carrier boats. Valid for only one year, SIPI and SIKPI could be extended as necessary. APIMP is particularly issued to fishing companies that have plans to integrally invest in fishing business.

The country’s Ministry of Marine Affairs and Fisheries through the Directorate General of Capture Fisheries had been tasked to issue SIUP, SIPI, and SIKPI for fishing boats having sizes of not more than 30 GT. After the decentralization however, MMAF delegated its authority of issuing SIUP, SIPI, and SIKPI to local government units. Henceforth, Governors have the authority to issue SIUP, SIPI, and SIKPI for fishing boats between 10 GT and 30 GT, and these boats should operate in the territorial waters and EEZ of the country. In order to accelerate the licensing process, MMAF has also recently transferred its tasks of issuing SIPI and SIKPI for fishing boats having sizes

between 30 GT and 60 GT to Governors (MMAF, 2010). Furthermore, the *Bupati* or *Walikota*, a leader in regency, has also the authority to issue SIUP, SIPI, and SIKPI for fishing boats between 5 GT and 10 GT. Nevertheless, issuance of APIMP is the responsibility of the central government through the Board for Coordinating National Investments (BKPM).

Issues and Concerns

Regulations on licensing a fishing activity in Indonesia had been confronted with problems related to transparency and evaluation of SIUP, SIPI, and SIKPI at the national or local levels. Firstly, the purpose of issuing SIUP, SIPI, SIKPI, and APIMP is for the government to obtain revenue from the various activities in the fisheries sector. In order to be issued either SIUP or SIPI or SIKPI or APIMP, boat owners must pay certain fees divided into three kinds of fishing taxes, namely: fishing effort (PPP), fish catch (PHP), and fishing in foreign waters (PPA). However, information related to the actual number of SIUP, SIPI, SIKPI, and APIMP issued and the total revenues collected by either the national or local government units has not been well managed and reported.

It should be reckoned based on the data compiled by the government that the number of fishing licences issued in 2012 to at least 2,396 fishing companies was 4,584, while the number of fishing licenses issued in 2013 published by MMAF was 2,405, 4,298, and 545 for SIUP, SIPI, and SIKPI, respectively. Some discrepancies could however be observed in this data since the total number of fishing boats that should have been issued the corresponding licences was 410,907 units indicating that only about 1.8% of the fishing boats have the necessary licenses to fish, while the MMAF has no information about compliance of fishing boat operators to the regulation on the need to obtain fishing licences nor information about the total revenues that the government has obtained from such licensing regulation.

Secondly, it is imperative for the government to periodically estimate the status of the tuna resources including total allowable catch (TAC), as such information are necessary for issuing a fishing licence. It is sad to note however that the government has insufficient information on how much tuna resource stock is accurately available. Although Indonesia has established the National Commission for Stock Assessment of the country’s fishery resources, and the National Tuna Commission, assessment of the level of stock of the tuna resources has not been conducted regularly. As a result, there has been no transparent and accountable data to predict the level of stock of the tuna resources leading to difficulties in obtaining a credibly



Fig. 2. Samples of tunas caught by fishing boat (KM. MEGA 807) as noted by an observer assigned by the Directorate of Fish Resource (SDI) onboard the fishing boat, in Bitung, North Sulawesi (Clockwise from upper left corner: skipjack ($l = 30$ cm, $w = 0.7$ kg), skipjack ($l = 41$ cm, $w = 1.0$ kg), big-eye ($l = 47$ cm, $w = 1.0$ kg), yellowfin ($l = 40$ cm, $w = 0.9$ kg))

scientific data. Some samples of tunas caught in Bitung, North Sulawesi are shown in **Fig. 2**.

As indicated in **Fig. 2**, collection of scientific information on tunas caught by fishing boats has been carried out by the government but the concerned institutions involved in analyzing the data had not been integrally designated, thus, there are possible overlapping roles in managing the information on tunas. At the central level, MMAF has two institutions that take charge of managing the country's observer onboard program (MMAF, 2013b), *i.e.* the Directorate of Fish Resource (SDI) and the Centre for Research, Fisheries Management and Conservation of Fish Resource (P4KSI). At the local level, information on tunas are being compiled and managed by local government units in the provinces and regency (*kabupaten/kota*). The absence of an integrated management of tuna information led to the insufficiency of accurate and accountable data that could be easily provided to the public by the government.

Lastly, even if the central government has regulations about assessment of the fishery resources, strategic plans to manage data collection of harvested and landed tuna in some parts of the FMAs have not been established, making it difficult for the government to manage the tuna fisheries. So far, no scientific research had been carried out to determine the compliance of fishing companies to the country's licensing regulation, and to evaluate the transparency and accountability of the government in managing the issuance of the necessary fishing licences. Although MMAF has already declared a moratorium on issuance of fishing licenses in the FMAs from 3 November 2014 to 30 April 2015 (MMAF, 2014), still it has not been effective in preventing the continued reduction of government income due to IUU fishing. Nonetheless, the Government of Indonesia is consistently and seriously implementing its Tuna Fishery Policy and is also undoubtedly executing law enforcements to fishing companies that do not comply with such regulation.

Unreliability of Information

Recently, the MMAF predicted that the maximum sustainable yield (MSY) for all kinds of fish is 6.5 million MT per year. It should be noted however, that this MSY is almost the same as what the government has estimated in 1974, which was 6.2 million MT. Meanwhile, the MSY level of large pelagic fish including tuna was estimated to be more than 1.1 million MT, and 3.6 million MT for small pelagic fish. Based on the government's estimates, the moderate stock level of skipjack tuna implies that it is not fully exploited nor is it overexploited, especially in FMA 571-573 and FMA 713-717. Yellowfin tuna on the other hand, has been fully exploited in FMA 572-573 and FMA 714-716, whereas in FMA 713 and 717 the yellowfin had been overexploited. Big-eye tuna has been overexploited in all FMAs and fully exploited in FMA 713, while albacore



Fig. 3. Fishing boats using hand-line (a), mini purse seine (b), and purse seine (c) operating in Bitung (a, b), and Manado (c), North Sulawesi, Indonesia

and southern bluefin tuna had been fully exploited in FMA 573.

Although a status of tuna stock could be fully exploited and overexploited for all species in some areas except skipjack, the number of fishing gears used to harvest tunas followed an upward trend. These fishing gears consist mainly of long line, hand-line, pole and line, and purse seines (Fig. 3). It has been reported that the number of long line, and pole and line operating in some areas of FMA had increased by 21.8% and 26.2%, respectively, during the period between

2001 and 2011. Also during such time, the country's tuna production from long line, and pole and line had increased by 3.9% and 4.6%, respectively.

Estimating either the resource stock or number of fishing gears or the production of tuna has not been supported by transparent and accountable data in some FMAs, for although in some areas of the FMAs, fishing ports had been constructed by the government to serve as tuna landing centers, but the MMAF still need to improve its information collection system in order to come up with

Box 1. Possible reasons that could lead to the unsustainable tuna fishery resource of Indonesia

First, the *minapolitan* intends to enhance the utilization level of the country's fishery resources to increase fisheries production, fishers productivity, and quality of fisheries products; enhance fisher's income; and develop fisheries production centers in some coastal areas of the country. All these are for the pursuit of improved economic development growth of the fisheries sector. In order to increase the contribution of the fisheries sector to the country's economy, MMAF developed a strategy aimed at upgrading the minimum limit of national fisheries production from 5.47 million MT to 5.50 million MT in 2014, by adding 570 units of fishing boats comprising 130 units with sizes between 10 GT and 30 GT, and more than 440 units of 30 GT, as well as increasing the number of fishing gears comprising several types, by 4481 units (MMAF, 2012c). The private sector had also been encouraged to develop integrated business in fisheries, develop more fish processing units, and make use of more fishing and carrier boats with cumulative sizes of up to 2,000 GT. Moreover, private sector operating fishing boats with cumulative sizes between 200 and 2,000 GT are required to cooperate and provide raw materials for the fish processing units and are also allowed to increase the number of their fishing boats through private procurement system approved by the government. Procurement of fishing boats of sizes more than 30 GT could also be made by the central government through its import mechanism for fishing boats up to 1000 GT in size. Meanwhile, the local government units have been given the authority to procure fishing boats between 10 GT and 30 GT; and less than 10 GT. Such policies led to the rising numbers of fishing boats and gears every year surely threatening the sustainability of the tuna fishery resource.

Second, the number of FADs in some areas of the FMAs had been increasing without any control in sight. The national or local government has the authority to issue FAD licences while the MMAF does not have a strategic plan for management of the FADs. Although the use of FADs had been regulated through Ministerial Decree Number 30 of 2004 (MMAF, 2004), such regulation has not been revised by MMAF. In spite of the regulation's directive on the locations for installing FADs, the distribution of FADs in some areas of the FMAs has not been properly managed and controlled by the government.

Third, there is a need for the government to control and monitor all fishing activities on the country's sea waters. Fishing activities that need extra attention by the government include transfer and loading of tuna catch from one boat to another at sea. The MMAF has recently implemented a policy that allows transshipment of tuna at sea with the condition that the volume should be reported, landed and loaded to nearest fishing ports as indicated in the SIPI and SIKPI, except fishing boats using purse seine with sizes of up to 1000 GT (MMAF, 2012a). However, the government still faces some difficulties in determining the actual volume of tuna being transferred from fishing boats to carrier boats at sea, and as a result, information about transshipments at sea could not be published by the government.

Fourth, the MMAF has established a regulation for fishing boats to install vessel monitoring system (VMS) and to use logbooks. The VMS installed on fishing boats with sizes between 30 GT and 60 GT makes use of the offline system while for 60 GT, the VMS is operated through online system. However, the government still lacks the ability to monitor and control the movement of fishing and carrier boats in spite of such VMS regulation, while fishers have been reluctant to participate in the government's effort to compile information on tuna catch through the logbook system, and are unable to comply with the relevant fisheries regulations impeding government's efforts to promote compliance with international regulations.

Fifth, in an effort to overcome the inaccuracy of data reported by fishers, MMAF adopted a regulation assigning government observers onboard fishing boats and tasked to monitor and record all activities during operations of fishing and carrier boats at sea (MMAF, 2013b). Thus, observers have joined onboard fishing and carrier boats with sizes of up to 30 GT and operating in the high seas. The costs of assigning observers onboard are borne by the central government as well as owners of fishing and carrier boats. In addition, fishing and carrier boat owners must ensure the safety of the observers and access to communications; and provide accommodation and food. Through such policy, observers would receive salaries only without incentives after working onboard for one month. Difficulties had been noted in getting appropriate information required by the government when observers are not given incentives that could have enhanced their motivation in improving the quality of data collected. Giving incentives would ensure the good performance of observers in monitoring all fishing activities at sea.

Sixth, since 2012 the Indonesian Government has been actively involved in preventing, deterring and eliminating IUU fishing, through the reformulation of its national legislation and promotion of bilateral and multilateral agreements for responding to international provisions and requirements. In this regard, the MMAF has instituted reforms of its fisheries policy that include improvement of information required by the global market. Although MMAF has already issued the relevant regulation through a fish certification system through the Ministerial Decree Number 13/2012 (MMAF, 2012b), information about the number of certificates issued by the government and the volume of tuna production recorded through such certification system has not been compiled nor reported. Furthermore, the number of cases of exported tuna rejections had not been reported, despite getting the necessary certificates from the government.

proper and accurate data that could be used by scientists and policy makers. Furthermore, fishing ports as center of activities of fishers have not been given the effective roles in providing tuna information. A total of 968 fishing ports have been established in some areas of the FMAs (MMAF, 2012d), classified into five types, namely: oceanic fishing port (6 units), archipelagic fishing port (13 units), coastal fishing port (47 units), fish landing place (900 units), and private fishing port (2 units). Although improvement of the data collection system for tuna production had been initiated since 2007 with support from the Western and Central Pacific Fisheries Commission (WCPFC), there is still a need for the government to reconcile the information collected from all the fishing ports.

Major Constraints

The MMAF developed in 2009 a directive of national policies for increasing productivity, efficiency and value-adding of fisheries products through a national strategic plan of fisheries development (MMAF, 2009). Based on such plan, some coastal areas had been established for regional development growth through the *minapolitan* that focused on strengthening human resources, improving science and technology, advocating empowerment and entrepreneurship, and promoting fisheries industrialization. Recently however, the country is confronted with problems in managing its fishery resources as certain contradiction seems to exist between the policies for upgrading the country's economic growth and conserving the tuna fishery resource. Some rationales of the inability of the government to ensure the sustainability of the tuna fishery resource due to policy obstacles are elucidated in **Box 1**.

Conclusion and Recommendations

As described in **Box 1**, the Government of Indonesia is facing some problems in tuna fisheries management, therefore, there is a need for the government to seriously and consistently implement regulations and promote compliance of the requirements of international bodies. Despite the move for accountability and transparency as urgent agenda of the government in monitoring and controlling fishing activities, there is a need to empower the fishers and encourage them to participate in any actions to be undertaken by the government, especially in fulfilling and complying with relevant regulations.

In addition, the National Tuna Commission established by MMAF should be more effective in creating alternative solutions for overcoming the unreliability of information related to tuna fisheries management. Indeed, the government should also be more active in its involvement in networks of global markets that campaign for the sustainability of tuna fishery resources.

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Advocating Sustainable Management of Fish Conservation Zones in Lao PDR: the Case of Nam Houm Reservoir

Chainuek Phakhounthong

Nam Houm Reservoir in Lao PDR is located about 30 km north of Vientiane Municipality and is under the administrative jurisdiction of Naxaythong District of the Capital City of Vientiane. Commissioned in 1981, Nam Houm Reservoir has a total water surface area of 500 ha or 880 ha at full supply level and an average depth of about 8 m. Living in the vicinity of the Reservoir are 3,300 people in four villages with 82 registered fishers, only 50% of whom could be considered fulltime. A local fisheries management group was established by the Mekong River Commission to ensure that fisheries in Nam Houm Reservoir is managed in accordance with the Fishery Law and relevant regulations of Lao PDR. The Reservoir is used not only for irrigation but also as source of water supply as well as for navigation, fisheries, fish culture, and tourism among others. Four major inlet streams supply water to the Reservoir. A permanent fish conservation zone or FCZ has been established in the Reservoir (1,500 m from the dam) where no fishing is allowed for all types of fishing gears the whole year round.

Lao PDR is a landlocked country with a total area of 236,800 km², and is bordered by Cambodia, China, Myanmar, Thailand, and Viet Nam. The country's fisheries activities are concentrated in reservoirs constructed in the Mekong River and its tributaries. Specifically, reservoir fisheries are small-scale inland fishing activities, and are important source of food and income for rural communities. As such, it has become imperative to manage reservoir fisheries

for sustainability so that it could continue to provide the local people with source of protein and income. Since the country's Fishery Law provides that communities have the right to manage the resources under their jurisdictions, communities have established community management systems for the actual management of small water bodies in their respective domains.

FAO (2006) reported that more than one-half of the communities in northern Lao PDR have their own systems of traditional aquatic resources management. These include the establishment of conservation zones such as deep pools in rivers where fishing activities are controlled by their own regulations; putting into effect seasonal fishing restrictions



Nam Houm Reservoir, Lao PDR

Table 1. Fisheries production of Lao PDR (2008-2012): volume in metric tons (MT), value in US\$1,000

Fisheries of Lao PDR	2008		2009		2010		2011		2012	
	Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
Inland capture fisheries	29,200	240,334	30,000	93,168	30,900	-	34,000	-	34,105	-
Aquaculture	64,300	91,141	75,000	111,801	82,100	-	95,600	-	101,895	-
TOTAL	93,500	331,475	105,000	204,969	113,000	-	129,600	-	136,000	-

Source: Fishery Statistical Bulletin of Southeast Asia 2012 (SEAFDEC, 2014)

during spawning of economically important species; and advocating the use of responsible fishing gears and practices, *e.g.* prohibiting the use of poisonous chemicals and dynamite, banning the use of destructive gears, and using only selective gears that do not capture the juveniles and migrating fish species. Nevertheless, enforcement of such schemes remains a problem considering that management of the country's natural aquatic resources by the communities is still governed by local customary regulations.

Fisheries in Lao PDR could be classified into inland capture fisheries and aquaculture. The country's statistics showed that its total fisheries production has been growing steadily during the five-year period from 2008 to 2012 (**Table 1**) at an annual average rate of 9.0% in terms of volume (SEAFDEC, 2014).

Although the country's concerned agency has been exerting efforts to compile and come up with its annual fisheries production, there is a need to examine more carefully the country's production from capture fisheries considering that production from this sub-sector is fully derived from inland fisheries. In order to address this concern, the country has been seeking assistance from various agencies and organizations for the improvement of its system of collecting and compiling fishery statistics in order that the status and trend of its fishery sector could be established (SEAFDEC, 2014).

Inland Capture Fisheries

In 2012, the country's total production from inland capture fisheries was reported at 34,105 metric tons (MT) which accounted for about 25% of the country's total fisheries production (SEAFDEC, 2014). In its report, FAO (2006) indicated that full-time fishers are very rare in Lao PDR although most families are engaged in subsistent fishing. Commercialization of the country's fisheries is constrained by the attitude of fishers to fish, first and foremost for their own subsistence, which is coupled by the seasonal nature of fishing activities in rivers and floodplains. Nevertheless, the FAO report also indicated that most aquatic resources

in the country are heavily exploited with an average catch per unit effort of 300 g/hour of fishing.

Catch from inland capture fisheries of Lao PDR comprises numerous species (**Box 1**) but is dominated by the small fish species. It is noteworthy that the use of explosives, chemicals and electric fishing had been banned as stipulated in the country's Fishery Law, but many observers have noted that such practices are still being used in remote water areas.

Aquaculture

The aquaculture sector in Lao PDR although growing slowly has been contributing a big portion to the country's annual total fisheries production, especially in terms of volume. During the five-year period from 2008 to 2012, the country's aquaculture production accounted for an average of about 73.0% of the country's total annual fisheries production, as shown in **Table 1**. The most common species cultured and the culture systems adopted are shown in **Box 2**. FAO (2006) reported that in addition to the most common species cultured such as tilapia and Indian carp, other species such as the indigenous silver barb (*Barbodes gonionotus*) and *Barbodes* spp. are also cultured in some highland areas. Although not intended for culture, other wild aquatic species such as snakehead, climbing gourami (*Anabas* spp.), catfish, eels, small freshwater shrimps, and other aquatic animals (OAAs), *e.g.* frog, and snails, could be harvested from ponds providing additional source of nutrition and income for rural households. The culture systems adopted by most households include pond culture, rice-fish culture in rain-fed and irrigated rice fields, and cage culture in reservoirs and river tributaries.

Fish Utilization

Products from fish and OAAs play an important role in sustaining the source of nutrition for the people of Lao PDR contributing a large share of the people's fish consumption, and as source of income and employment of rural people. Collected mostly during the rainy season from water bodies and wetlands, many fish species could also be available

Box 1. Inland fishery resources of Lao PDR

Fish Resources			Habitat ¹					
Scientific Name	Family	Lao Name	MR	TR	RL	WSP	RFP	IW
<i>Akysis variegates</i>	Akysidae	Pa khao	X	X	X	X	X	X
<i>Amblyrhynchichthys truncatus</i>	Cyprinidae	Pa khao tapo	X	X	X	X	X	X
<i>A. bantamensis</i>	Babinae	Pa khao	X	X	X	X	X	X
<i>Acantopsis choirorhynchos</i>	Cobitinae	Pa it	X	X	X	-	-	-
<i>Anabas testudineus</i>	Anabantidae	Pa kheng	X	X	X	X	X	X
<i>Amphotistius laosensis</i>	Dasyatidae	Pa phahang	X	X	-	-	-	-
<i>Amyda</i> spp. (soft-shelled turtle)		Pa phaong	X	X	X	-	-	-
<i>Aaptosya grypus</i>	Cyprinidae	Pa sanak	X	X	X	-	-	-
<i>Acantopsi</i> ssp.	Cobitinae	Pa harkkoy	X	X	X	-	-	-
<i>Arius stomi</i>	Artidae	Pa khat ock soplem	X	X	X	X	X	X
<i>Achiroide</i> ssp.	Soleidae	Pa pane	X	X	X	-	-	-
<i>Annamia normani</i>	Homalopteridae	Pa thihin	X	X	X	X	-	-
<i>Barbichthys laevis</i>	Barbinae	Pa cheork	X	X	X	X	-	-
<i>Bagrarius bagrarius</i>	Sisoridae	Pa ke	X	X	X	X	-	-
<i>Botia hymenophysa</i>	Cobitinae	Pa khieokai	X	X	X	X	-	-
<i>Bagroide macropterus</i>	Bagridae	Pa kihia	X	X	X	X	-	-
<i>Bangana behri</i>	Cyprinidae	Pa vananor	X	X	X	X	-	-
<i>Barbichthys nitidus</i>	Cyprinidae	Pa vahangdam	X	X	X	X	-	-
<i>Chitala blanci</i>	Notopteridae	Pa tonkay	X	X	X	X	-	-
<i>C. ornate</i>	Notopteridae	Pa tonkquay	X	X	X	X	-	-
<i>Catlocarpio siamensis</i>	Cyprinidae	Pa khao	X	X	X	X	-	-
<i>C. enoplos</i>	Cyprinidae	Pa khao	X	X	X	X	-	-
<i>Cirrhinus jullieni</i>	Cyprinidae	Pa dork ngyo	X	X	X	X	X	X
<i>C. molitorella</i>	Cyprinidae	Pa keng	X	X	X	X	-	-
<i>C. microlepis</i>	Cyprinidae	Pa phone	X	-	-	-	-	-
<i>Cirrhinus lineatus</i>	Barbinae	Pa soi	X	X	X	X	X	X
<i>Clarias batrachus</i>	Clariidae	Pa douk na	X	X	X	X	X	X
<i>C. macrocephalus</i>	Clariidae	Pa douk ouy	X	X	X	X	X	X
<i>Channa marulius</i>	Channidae	Pa kho na	X	X	X	X	X	X
<i>C. micropettes</i>	Channidae	Pa kado	X	X	X	X	-	-
<i>C. orientalis</i>	Channidae	Pa kouan	X	X	X	X	-	-
<i>C. striata</i>	Channidae	Pa ko	X	X	X	X	X	X
<i>Discherodontus ashmendi</i>	Cyprinidae	Pa seou	X	X	X	X	X	X
<i>Dngila spilopleura</i>	Cyprinidae	Pa khao	X	X	X	X	X	X
<i>Euryglossa panoides</i>	Soleidae	Pa pane	X	X	X	X	-	-
<i>Hypsibarbus lagleri</i>	Cyprinidae	Pa paktongpae	X	X	X	X	X	X
<i>H. mekongensis</i>	Siludae	Pa nang hang dam	X	X	X	-	-	-
<i>Heterobagrus bocourti</i>	Bagridae	Pa kagneng	X	X	X	X	-	-
<i>Kryptopterus apogon</i>	Siluridae	Pa nangnoy	X	X	X	X	-	-
<i>K. schilbeides</i>	Siluridae	Pa nangleuang	X	X	X	X	-	-
<i>K. cheveyi</i>	Siluridae	Pa nanghangdeng	X	X	X	X	-	-
<i>Labeo erythrurus</i>	Barbinae	Pa ya	X	X	X	-	-	-
<i>L. dyocheilus</i>	Barbinae	Pa vanoy	X	X	X	-	-	-
<i>Mekongina erythrospila</i>	Cyprinidae	Pa sa ih	X	X	X	-	-	-
<i>Morulius chrysophekadion</i>	Cyprinidae	Pa phia	X	X	X	-	-	-
<i>M. nemurus</i>	Bagrinae	Pa kot leuang	X	X	X	X	-	-

¹ MR = Mekong River; TR = Tributaries; RL = Reservoirs and Lakes; WSP = Water sheds and Ponds; RFP = Rain fed paddy field; IW = Irrigation weirs
Source: FAO (2006) cited from DLF (2001)

Box 2. Most common aquatic species cultured in Lao PDR and culture systems used

English name	Scientific name	Lao name	Culture System
Tilapia	<i>Oreochromis</i> spp.	Pa nin	Culture in ponds and community ponds, seed production in state and private hatcheries, cage culture in reservoirs, and rice-fish culture
Common carp	<i>Cyprinus carpio</i>	Pa nai	Culture in ponds and community ponds, seed production in state and private hatcheries, cage culture in reservoirs, and rice-fish culture
Indian carp	<i>Cirrhina mrigala</i>	Pa marican	Culture in ponds and community ponds, seed production in state hatchery, cage culture in reservoirs
Javanese carp	<i>Puntius gonionotus</i>	Pa paak	Culture in ponds and community ponds, seed production in state and private hatcheries, cage culture in, reservoirs
Bighead carp	<i>Aristichthys nobilis</i>	Pa hua nyai	Culture in ponds and community ponds, seed production in state and private hatcheries, cage culture in reservoirs
Silver carp	<i>Hypophthalmichthys molitrix</i>	Pa kedleab	Culture in ponds and community ponds, seed production in state hatchery, cage culture in reservoirs
Rohu	<i>Labeo rohita</i>	Pa rohu	Culture in ponds and community ponds, seed production in state hatchery
Snakeskin gourami	<i>Trichogaster pectoralis</i>	Pa salid	Pond culture
Catfish	<i>Clarias</i> spp.	Pa duc	Culture and seed production in state hatchery

Source: DLF at <http://rfdp.seafdec.org.ph/meetings/manila-meetransb/report-lao.html>



during the dry season after having been trapped in shallow ponds. In some cases, harvesting of fish from cage culture in reservoirs and river tributaries is timed so that fish could be available during the dry season. In an effort to supplement the supply of aquatic products during the dry season, fish is preserved into various forms based on cultural preference and local conditions. However, the fish processing industry in Lao PDR still adopts traditional processing systems and management, and remains underdeveloped in terms of food safety and quality. Bounma (2007) suggested that there is a need for the country to establish or improve its institutional infrastructures as well as enhance the skills of human resource in fish processing in order that the country could attain good quality and safety of its fish and fishery products. Generally produced by households as backyard industry, the most common forms of preserved fish products are fermented fish (*pa daek*), pickled fish (*pa som*), other fermented fish (*pa chao*, *ka pi pa*, *pa jao*), fish sauce (*nam pa*), dried fish (*pa heng*), and smoked fish (*pa lon fai*).

Fish Marketing

In Lao PDR most fish produced from inland fisheries and rural aquaculture is consumed domestically with only small portion sold in local markets due to inadequate transportation and preservation facilities, and insufficient supply of ice especially in remote areas. Nevertheless, FAO (2007) noted that there is considerable fish trading activity between Thailand and Lao PDR where Lao traders market high-value fishes to Thailand through the Mekong River transport system.

Fish Consumption

As of 2012, many reports have shown that the total population of Lao PDR was 6.5 million increasing at an average annual population growth of 2.0%. The total land area of 236,800 km² and population density of about 28 people per km² of land area makes Lao PDR one of the least densely populated countries in the world. Of its total population, about 67% are engaged in various forms of fisheries activities. Many reports also indicated that the country's total consumption of fish and other aquatic animals (OAAs) is 29.0 kg/person/year, implying that the amount of fish and OAAs consumed in the country in 2012 could be about 188,500 MT.

Phonvisay (2013) reported that out of the total consumption of 29.0 kg, 24.1 kg comprises fish, 4.1 kg OAAs, and about 0.4 kg from imported marine products, implying that 156,650 MT of fish was consumed in Lao PDR in 2012. Since the reported total fish production of Lao PDR in 2012

was 136,000 (**Table 1**), therefore there is a need for these figures to be reconciled in order to get the actual picture of the total annual fish production versus consumption of fish in Lao PDR.

Reservoir Fisheries in Lao PDR

Most hydropower dams/reservoirs in Lao PDR (**Box 3**) are used not only to generate hydropower and as source of irrigation water, but also for fisheries which could comprise a total area of about 96,000 ha or 960 km² (Phonvisay, 2013). In addition, small water bodies that include shallow lakes, small natural pools, peat swamps, and wetlands could



comprise another 114,800 ha or 1,148 km² of water bodies used for fisheries activities while irrigation reservoirs and weirs could also contribute another 60,000 ha or 600 km² of water areas for small-scale fisheries (**Table 2**).

Nam Houm Reservoir

Nam Houm is a small irrigation reservoir in Naxaythong District near the Capital City of Vientiane. The Reservoir also supports capture fisheries, cove aquaculture and pond aquaculture. Fisheries activities in Nam Houm are managed by the Ang Nam Houm Village or Community Fisheries of Nam Houm Reservoir. Local fishers use traditional gears for fishing such as gillnet, cast net, long line and fish traps among others.

Reports have shown that there are 82 registered small-scale fishers living around the Reservoir and are organized into six (6) fishing groups. Fish production from the Reservoir during the wet season (July-September) is reported to be not less than 100 kg/day and an average of 60-70 kg/day during the dry season (October-May). The total annual fish production from the Reservoir is about 57.0 MT/year. Meanwhile, aquaculture in Lao PDR is practiced in fish ponds, oxbow lakes, irrigation weirs, rice-fields (rice-fish culture), and in water bodies (cage culture).

Box 3. Hydropower dams/reservoirs in Lao PDR

Dam/reservoir	Year commissioned	Main purpose	Surface area at full supply level	
			km ²	ha
Huay Siet	1987	Irrigation	1.7	170
Huay Xone	-	Irrigation	0.4	40
Nam Bak 2	planned	Hydropower	4.9	490
Nam Houm	1981	Irrigation	8.8	880
Nong Niaou	-	Irrigation	0.5	50
Nam Leuk	2000	Hydropower	17.2	1,720
Nam Lik 2	2010	Hydropower	24.4	2,440
Nam Lik 1	2011	Hydropower	22.3	2,230
Nam Mang 3	2004	Hydropower	11.0	1,100
Nam Ngum 1	1971	Hydropower	460.0	46,000
Nam Ngum 2	2010	Hydropower	122.2	12,220
Nam Ngum 3	2014	Hydropower	25.6	2,560
Nam Ngum 4b	planned	Hydropower	0.2	20
Nam Ngum 5	2018	Hydropower	14.6	1,460
Nam Song Diversion	2011	Hydropower	1.3	130
Nong Taleuk	1990s	Irrigation	1.5	150
Nong Seuam	1990s	Irrigation	1.6	160
Nam Souang	1981	Irrigation	15.0	1,500
Pak Peung	1990	Irrigation	3.9	390

Source: Adapted from Hortle (2007)

Table 2. Utilization of inland water resources in Lao PDR and estimated fish production

Fisheries	Water resource	Total area (ha)	Production (kg/ha/year)	Production ² (MT)
Capture fisheries	Mekong River and tributaries	304,704	70	21,329
	Large hydropower reservoirs	96,030	317	8,405
	Shallow lakes, small natural pools, pit swamps, wetlands	114,800	150	17,220
	Irrigation reservoirs and weirs	60,000	150	9,000
	Rice-fields, small streams, floodplains ³	1,161,347	100	33,143
	Sub-total		1,736,881	787
Aquaculture	Fish ponds	22,000	1,500	33,000
	Oxbow lakes and irrigation weirs for aquaculture	15,000	600	9,000
	Rice-fields for rice-fish culture	5,000	250	1,500
	Cage culture in water bodies	-	- ⁴	11,250 ⁵
	Sub-total		42,000	-
TOTAL		1,778,881	-	143,847

Source: Adapted from Phonvisay (2013)

² Production data in 2007

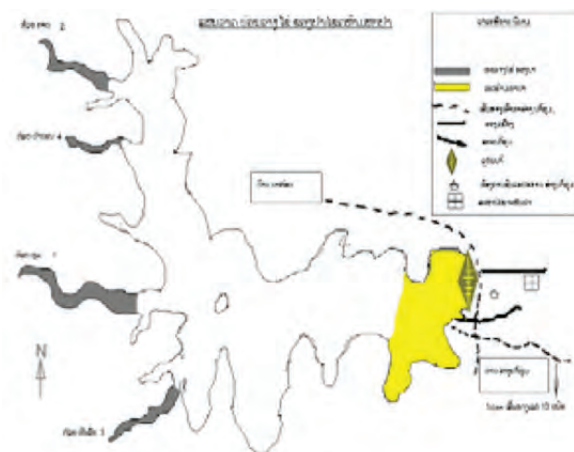
³ This includes wet-season rice-fields (632,850 ha), dry-season irrigated rice-fields (153,677 ha), wet-season irrigated rice-fields (344,820), and flooded areas (30,000 ha)

⁴ Estimated number of cages: 4,500

⁵ Estimated production: 2.5 MT/cage

Fish Conservation Zones

Results of a survey conducted by SEAFDEC (2010, unpublished) showed that Nam Houm Reservoir is used for many purposes such as for irrigation, water supply, navigation, fisheries, fish culture in cages, and tourism. There are about 3,300 people living in four villages in the vicinity of the Reservoir. A permanent fish conservation zone (FCZ) located in front of the dam (1,500 m from the dam) has been established, where no fishing is allowed in the FCZ area for all types of fishing gears the whole year round. Another four seasonal fish conservation zones are located in the headwater area or small tributaries/streamlets that supply water to the Reservoir. These areas are declared as no-fishing zones during the fish spawning season that usually starts from May and could last until August.



Nam Houm Reservoir showing permanent Fish Conservation Zone (yellow)

As in other reservoirs in Lao PDR, management initiatives have mostly been focused on the conservation and protection of the fishery resources through the



establishment of protected areas in critical breeding and spawning grounds, and re-stocking of economically important fish species. In addition, cage culture has been promoted to provide alternative source of income for fishers and decrease pressure from exploiting the natural fish populations.

Reservoir Fisheries Management Committee

In addition to conservation and protection of the fish resources, the local communities have been empowered as the stakeholders in fishery management. In 2000, the Management of River and Reservoir Fisheries in the Mekong River Basin (MRRF) initiated the establishment of a local management body for Nam Houm Reservoir, the so-called “Reservoir Fisheries Management Committee of Nam Houm”. The members were elected from representatives of village organizations such as village headman, village elders, village security, youth, women, fishers, and other stakeholders. The Nam Houm RFMC has a total of 20 members representing the four villages located around the Reservoir and has been officially approved by the District Governor.

Traditional Fish Processing and Marketing

Fishery products derived from fish in the Nam Houm Reservoir are usually home-made and comprise a variety of traditional products such as dried fish, fermented fish, fish sauce, and smoked fish among others. While in the past, the district authorities leased the right for buying and selling fish to private entrepreneurs based on annual bidding contracts where the winning bidder pays annual taxes from sale of fish to the district authorities, starting in 2005 however, Nam Houm RFMC had taken over the full responsibility of harvesting and marketing fish from the Reservoir. Under such scheme, local fishers sell their catch to a collection unit of the RFMC at the main fish landing site located in front of the dam.

In an effort to improve their fishery products, MRRF organized a study tour for Nam Houm RFMC members to visit and learn about processing fish and fishery products in Thailand, especially in improving the quality and safety of fish and fishery products. After the study trip, members of the Nam Houm RFMC especially the women, organized themselves into fish processing groups and started producing various value-added products from fish caught in the Reservoir.

Activities of Nam Houm RFMC

The Nam Houm RFMC has been exerting efforts towards improving its organization as well as enhancing the capability of the fishers’ groups. Thus, the RFMC has been improving the awareness of its members and local people on the Fishery Law and fishing regulations of Lao PDR, conducting patrol activities of the Reservoir and FCZs especially during fish spawning season.

Moreover, the RFMC has been conducting re-stocking and stock enhancement activities of economically important fish species, and conducting experiments on cage culture in the Reservoir using high-value fish species. In addition, the Nam Houm RFMC has also considered establishing its Reservoir Management Fund using as seed money the proceeds from fish auctions. The Nam Houm RFMC has envisioned that in the near future, it would be able to develop a micro-finance system that could be availed of by the households around the Reservoir.

Issues and Concerns

Considering the need to improve collection system for fisheries data and statistics in Nam Houm Reservoir, the Nam Houm RFMC has been promoting capacity building activities for its fishers groups. In addition, RFMC also intends to develop an overall reservoir fishery management



plan for Nam Houm, enhance the fisher groups' skills in the operation and management of mobile hatchery to produce more seeds for re-stocking and enhancement, and promote the adoption of fish apartments for the conservation zones that would control the entry of illegal fishers and enhance the fish stocks in these zones.

In addition to the issues on inadequate fisheries data collection system, the Nam Houm RFMC is also strengthening its effort in combating IUU fishing in the Reservoir, considering that fish production from Nam Houm Reservoir had been decreasing resulting in the continued presence of illegal fishing operations in the Reservoir. Some fishers, especially from other villages not governed by any fishers' groups still continue to use illegal fishing gears such as electric implements and nets with small mesh size. The illegal use of such equipment resulted in overfishing that could be disadvantageous to legal fishers who comply with the regulations of the RFMC, as well as on the un-sustainability of reservoir fisheries. Nonetheless, all these concerns could be attributed to the inadequate enforcement of the country's Fishery Law and related regulations.

Way Forward

The Government of Lao PDR has put greater emphasis on the need to manage its fisheries in a sustainable manner, considering that the people of Lao PDR depend on fish as major source of nutrition in their diets. However, the Government would need technical assistance from international and regional agencies and organizations to be able to achieve these goals. For example, in the collection and compilation of fishery statistics, especially from reservoir fisheries, there is a need to reconcile the figures from actual fish catch with those catch data reported to SEAFDEC and FAO. This effort could be carried out by the Government if the capacity in terms of knowledge and skills, of the staff responsible to collect, compile and analyze data is enhanced.



There is also a need for the restructuring of the over-all management plan of the country's reservoir fisheries to ensure that this is managed in a sustainable manner in order that it would continue to contribute to the socio-economic well-being of the rural people. In such manner, the country could consider adopting the ecosystem approach to fisheries management since under this concept, the well-being of the resources as well as those of the resource-users could be assured in a holistic manner. Aquaculture systems should be improved as this could provide alternative livelihoods and additional income to fishers, and at the same time reduce pressure on inland capture fisheries. Stock enhancement should be continued but should take into consideration the biodiversity of fishery resources especially in lakes and reservoirs of the country.

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Biosecurity System in Malaysian Fisheries: Gearing up for Safe and Quality Seafood

Hemalatha Raja Sekaran

The fisheries sector of Malaysia plays a significant role in its economic development and is also a source of employment, foreign exchange and protein supply for the country's populace. Statistics in 2012 have shown that Malaysia is one of the top fish-consuming countries in the world with an average consumption of 52.0 kg/person/year. In the same year, the fisheries sector had shown a significant increase in its contribution to the nation's economy of about Malaysian Ringgit (RM) 11,440 million. The food fish sector which comprises marine capture fisheries, inland capture fisheries and aquaculture produced 1,780,168 metric tons of fish and fishery products valued at about RM 10,597 million while the non-food fish commodities, namely seaweeds, ornamental fishes and aquatic plants accounted for about RM 843 million. As a whole, the fisheries sector contributed 1.1% or RM 7.822 billion to the nation's Gross Domestic Products in 2012 (Annual Fisheries Statistics, 2012). There is still room for expansion of the countries' fisheries sector however, such endeavor although bringing in increased diversity, fisheries production and trade volume, could also be key contributors to the spread of recognized and emerging fish diseases from region to region. Moreover, the changing aquaculture practices such as the use of various aquaculture chemicals that supposedly control the spread of diseases could lead to increased concerns on safety of food fish. Thus, it has become very significantly important to develop biosecurity measures in fisheries practices to secure not only fish health but also food safety benefiting the consumers.

Basically, the fisheries industry in Malaysia encompasses three (3) main sub-sectors, namely: marine capture fisheries, inland capture fisheries and aquaculture. The fisheries sector in Malaysia is governed by the Department of Fisheries (DOF) under the Ministry of Agriculture and Agro-based Industry (MOA) via the empowerment of Fisheries Act 1985. The DOF which has jurisdictions over all matters pertaining to live fish is also recognized as the national Competent Authority (CA) responsible for all matters involving live fish. As a member of the World Trade Organization (WTO) since 1995, Malaysia had also ratified the Sanitary and Phytosanitary (SPS) Agreement that was designed to protect human, animal and plant life or health in its member countries. Since then, Malaysia has been actively involved with international standard-setting organizations such as the CODEX Alimentarius Commission (CAC), World Organization for Animal Health (OIE), and the

International Plant Protection Convention (IPPC) which developed standards for various biosecurity sectors in accordance with their respective mandates. As part of the SPS implementation in the country's fisheries sector, DOF established its Fisheries Biosecurity Division (FBD) for the control and management of fish health and food safety, particularly for fish and fishery products. FBD is mandated to ensure that the spread of fish diseases is contained and that fish and fishery products are free from contaminants for safe consumption. In achieving these objectives, FBD conducts several activities, *i.e.* official control, official analysis and official guarantee at the primary production of the supply chain, such as in aquaculture farms, fishing vessels, feed mills, and fish meal manufacturing plants.

Official Control

Biosecurity is a strategic and integrated approach that encompasses policy and regulatory frameworks (including instruments and activities) for analyzing and managing relevant risks to human, animal and plant life and health, and associated risks to the environment (FAO, 2007). In this respect, one of the key functions of FBD is policy coordination and standards development in relation to fisheries biosecurity. This includes developing, coordinating and harmonizing fisheries biosecurity policies for the country taking into account national food safety and fish health policies as well as relevant policies from other agencies to achieve enhanced biosecurity control within the fisheries sector. FBD is also responsible for the development of regulations necessary to strengthen biosecurity control within the country, including regulations for compliance with biosecurity measures for international and domestic trade of live fish. In order to complement the policy and regulations in relation to biosecurity, FBD develops biosecurity standards, protocols and guidelines which contain minimum requirements or specifications of certain products or processes, used as reference in the development of regulations and operating procedures. Thus, FBD had developed the Biosecurity Measures Plan as guide for fish farmers, in particular for ornamental fish producers and exporters, in line with Good Aquaculture Practices (GAqP) to promote sustainable production. Other standards that have been developed include fishery product specification and process standards such as MS 1998: 2007 Good Aquaculture Practice - General Guidelines, and MS 2467: 2012 Seaweed Cultivation-Code

of Practice. Meanwhile, adoption of international standards relevant to the interest of the national government is being promoted and enforced. Considering that WTO allows its member countries to act on trade in order to protect human, animal or plant life or health, provided they do not discriminate or use this as disguised protectionism, FBD notifies concerned countries on live fish import requirements of Malaysia that had been prepared in accordance with the SPS Agreement. This is meant to strengthen the country's import control measures that safeguard aquatic animal health in the country. Thus, countries intending to export live fish to Malaysia shall comply with these requirements as per notification.

Import Control

Transboundary movement of fish is well known as possible carrier of diseases and therefore, the country's fish health biosecurity is concerned with import controls to prevent the introduction of new diseases into Malaysia. Under Article 5 of the SPS Agreement, it is stipulated that member countries shall ensure that their sanitary and phytosanitary measures are based on assessments, taking into account available scientific evidence and relevant economic factors in order to minimize negative impacts to trade. In this regard, FBD conducts Import Risk Analysis (IRA) for the importation of new/alien aquatic animal species or species that are not endemic to Malaysia, to identify the possible hazards in terms of pathogen and ecological risks that are associated with concerned species. Moreover, FBD also underlines the specific biosecurity conditions to manage risks.

In view of some devastating diseases, *e.g.* early mortality syndrome (EMS) that caused massive losses to the shrimp industry in the Asian region, DOF Malaysia introduced a new policy to protect the Malaysian shrimp industry, and as a protocol, risk assessment is required for the importation of shrimp broodstock into the country. FBD carries out risk assessment by conducting document verification, inspection at source (exporting country) and compliance audit at local shrimp hatcheries to verify that these comply with biosecurity requirements and that broodstocks are healthy and free from any of the OIE-listed diseases.



Fish Health Management

While competent authorities are proactive in preventing the introduction of pathogens into Malaysia, risk management programs to control such pathogens have already been established in the country. As with aquatic animal health, it is important to establish "disease-free" geographical compartments throughout the country for continuous trading of fish and fishery products. Furthermore, in order to improve fish health status in the country, FBD had established a fish health management program that comprises surveillance activities encompassing food fish and ornamental fish species, based on standards promoted by OIE and FAO, national legislations, and importing countries' requirements.

This health management program aims to maintain Malaysia as a disease-free country, eradicate existing diseases or control diseases within certain geographical area to prevent the spread of aquatic diseases through the conduct of various activities. The fish health surveillance activity includes sampling and inspection carried out at least twice a year at the exporters' and importers' premises, and aquaculture farms, particularly farms with species that have been suspected to be associated with OIE-listed diseases. Sampling is conducted for food fish as well as ornamental fish farms where samples are collected for disease screening analysis in official laboratories of the country. Meanwhile, inspection is performed at registered ornamental fish farms as well as importers' and exporters' premises by conducting document checks, *e.g.* fish movement record, mortality record, disinfection record, waste disposal record, and water quality record. On-site observations of biosecurity facilities, *e.g.* footbath, vehicle dipping, quarantine area, water treatment facilities, incinerator, water inlets and outlets are also conducted to look into all possible factors that may pose risk to the health of fish and aquatic species. The main target populations for such surveillance program are the koi and goldfish, mainly for Koi Herpes Virus (KHV) and Spring Viraemia of Carp Virus (SVC).

Food Safety Management

In food chains, hazards could be introduced anywhere from production to consumption, so that any breakdown in security at any point can result in adverse health consequences to individual or multiple biosecurity sectors. For instance, aquaculture chemicals that are used widely to control the spread of aquatic diseases may accumulate as residues in fish and eventually cause negative impact to human health. As global awareness towards food safety increases, food safety standards especially in terms of trade requirements had become more stringent. In Malaysia, food safety is governed by the Ministry of Health as empowered by Food Act 1983 and Food Regulations 1985. However, control of fisheries activities at primary production is still under the jurisdiction of DOF. In this regard, FBD has established



various public health management programs to minimize food safety hazards at aquaculture farms, fishing vessels, and feed manufacturing plants.

Established to provide assurance to importing countries on the safety and quality of Malaysian aquaculture products, the Aquaculture Residue Monitoring Plan (ARMP) was developed based on Regulation (EC) No 178/2002, Regulation (EC) No 852/2004 and Council Directive 96/23/EC. ARMP serves as an important part of the country's overall strategy of minimizing harmful residues and contaminants in aquaculture products, and verifying the implementation of Good Aquaculture Practices (GAQP). Based on annual monitoring scheme of ARMP, aquacultured shrimps and fishes are monitored for the presence of prohibited substances, *i.e.* veterinary drugs, pesticides, heavy metals, dyes, and other contaminants that are potentially harmful to human.

Hygiene on Board (HOB) was also established to ensure hygiene onboard vessels and that safe seafood is brought by these vessels to the market. The objectives of HOB are to reduce contamination in fish and fishery products onboard fishing vessels so that importing countries, especially the European Union, could be assured of the safety and quality of marine caught fish from Malaysia. In addition, HOB is designed to guarantee that marine caught fish that are supplied to processing plants, the products of which are intended for export to the EU complies with the EU food safety law and standards.

HOB is also one of the means of assuring that the implementation of good on-board handling and sanitary practices is enforced. Monitoring involves on-board sampling to check the presence of contaminants, *i.e.* heavy metals, histamine, parasites, polycyclic aromatic hydrocarbon (PAH), dioxin, polychlorinated biphenyl (PCB), as well as organoleptic examinations and inspection for poisonous fishes.

The SPS Marine Program is another scheme that has been implemented by DOF since 1999 in response to the SPS Agreement by the World Trade Organization (WTO), as a measure to improve food safety and quality. The purpose of this program is to ensure that marine fish captured from Malaysia is safe for consumption and consumers' confidence of the safety of marine products enhanced. Sampling is conducted on an annual basis to monitor contaminants such as histamine, heavy metals, microbiological elements, poisonous planktons while organoleptic examinations are also carried out onboard to assess the freshness of fish.

While the SPS Marine Program focuses on marine captured products, the SPS Aquaculture Program aims to ensure that aquaculture products are safe for consumption protecting humans from risks arising from aquaculture additives, contaminants, toxins or disease-causing organisms in aquaculture food products. This program is also part of the country's monitoring and control program to verify that aquaculture products comply with Malaysian food laws. Samples are collected randomly from aquaculture farms' premises and analyzed for undesired substances, *i.e.* veterinary drugs, heavy metals, microbiological elements, and chemical contaminants. The occurrence of harmful algal bloom (HAB) that could lead to red tide incidents and marine pollutions resulting in shellfish poisoning, has prompted FBD to implement the National Shellfish Monitoring Program (NSMP). This program is an annual sampling scheme for monitoring the presence of toxins and contaminants in shellfish. The substances that are monitored include microbiological elements, heavy metals, biotoxins, PCB, and harmful planktons. Results from the NSMP are used to identify and map areas of the country that are considered clean for potential shellfish aquaculture.

Aquaculture feed and its ingredients could also be potential sources of contamination and residue accumulation in aquaculture products. Thus, a monitoring program for aquaculture feeds and fish meal has been introduced to control these hazards from entering into the food chain. The program also provides assurance to importing countries on the safety and quality of feeds and fish meal manufactured in Malaysia. Undesired substances such as heavy metals, microbiological elements, chemical contaminants, growth promoters, veterinary drug residues, mycotoxins, and terrestrial animal proteins are monitored to prevent contamination of the feeds and fish meal. In accordance with the country's MS 1998: 2007 Good Aquaculture Practices - General



Guidelines, feeds used for aquaculture should be free from antibiotics and from banned substances, and are produced utilizing halal ingredients.

Audit and Inspection

In the context of Malaysian fisheries biosecurity, audit and inspection activities are conducted to verify that the implementation of biosecurity systems in aquaculture farms and fishing vessels is in accordance with the regulations and standards specified by national competent authorities. In this regard, FBD introduced certification schemes on voluntary basis for aquaculture farms and fishing vessels to encourage the adoption of responsible practices during aquaculture and fishing operations. The Malaysian Good Aquaculture Practice Certification Scheme (MyGAP) has been developed based on the MS 1998: 2007 Good Aquaculture Practices - General Guidelines although it is confined to aquaculture farms and hatcheries that grow food fish and ornamental fish species.

The country's Fish Quality Certificate (FQC) is not only a certification scheme designed for establishments that intend to export fish and fishery products, but is also applicable to aquaculture farms and premises, hatcheries, fishing vessels, and feed manufacturing plants. FBD conducts auditing procedures and awards FQC and MyGAP certificates to establishments that comply with the biosecurity measures as stipulated in relevant standards. During the audit process, emphasis is given to critical points where hazards could be possibly introduced into the control system, and if non-conformance is found, appropriate corrective actions are taken to mitigate the risks.

Considering that transboundary movements of fish and fishery products could lead to the introduction of known, new and emerging pathogens and subsequently disease establishment in natural aquatic environments and aquatic biodiversity of the receiving and neighboring regions, countries or territories, the FBD conducts Inspection Prior to Export (IPTE) to provide safety assurance to the countries

that import live fish from Malaysia. IPTE is carried out by FBD at the exporter quarantine facilities where live fish consignments are observed for clinical signs and quarantine records are inspected before such consignments are released for export. Malaysia makes sure that assurance is always provided to importing countries by taking appropriate actions to secure the aquatic animal health status of the country's fish and fishery products. The Malaysian Quarantine and Inspection Services Agency (MAQIS) was established at entry/exit points/borders to safeguard the health of plants and animals including aquatic animals, and ensure that aquatic animals imported into Malaysia are free from diseases.

Official Analysis

Official analysis is part of the biosecurity program implemented in Malaysia to support the official control program, specifically to control food safety of fish and fishery products as well as ensure the health of aquatic animals along the supply chain. In this regard, DOF has established several official laboratories nationwide to carry out analysis of samples collected during the process of implementing the official monitoring programs such as ARMP, HOB, SPS Marine and Aquaculture, and aquatic animal health surveillance, among others. While performing routine analysis, these laboratories also cater to requirements for analysis in emergency cases, *e.g.* emergence of new diseases, disease outbreaks or mass mortalities in aquaculture farms.

These official laboratories carry out analysis for parameters not only in public health but also in aquatic animal health. The analyses for public health include those for bacteria, veterinary drug residues, histamine, heavy metals, pesticides, plankton identification, biotoxins, water quality and porcine DNA identification. As for aquatic animal health, the laboratories undertake analysis for bacteria, viruses, parasites, fungi, water quality as well as histopathology as means of disease identification. Analysis for disease identification is mainly focused on OIE-listed diseases.

Considering the importance of enhancing the competence of the country's official laboratories and obtaining international recognition, DOF took one step further to obtain ISO/IEC 17025:2005 accreditation. As a result, some of the official laboratories have already been accredited for ISO/IEC 17025:2005 while other laboratories are still working towards obtaining such accreditations. Meanwhile, DOF also maintains close connection with other international organizations and participates in international fora to share information on latest laboratory technologies, equipment and methodologies, besides participating in proficiency testing given by accredited proficiency testing (PT) providers and ring tests among established laboratories.



Official Guarantee

Under the context of biosecurity, official guarantee refers to documents issued by the country's competent authorities to certify that its products do not contain hazards and comply with relevant standards. Thus, health certificate is an official guarantee provided by DOF to assure importing countries that live fish exported from Malaysia does not carry any pathogen and free from diseases. A Health Certificate is issued based on the results of IPTE inspections and laboratory analysis which form part of official control and official analysis activities. FBD issues the Health Certificate for live and fish meal consignments intended for the export market, while a Health Certificate for fishery products is issued by the Ministry of Health, as the authority responsible for the safety of food. The health certificates contain health declaration requirements taking into account the varying requirements of importing countries. As a whole, it is the responsibility of FBD to ensure that all the requirements are fulfilled before the consignments are released for export.

Challenges in Biosecurity Faced by the Southeast Asian Countries

The fisheries sector, mainly aquaculture had recently suffered significant losses due to diseases. Much of the impact falls on small-scale fish farmers, constituting the majority of fish producers in the Southeast Asian region, with devastating effects on their incomes and livelihoods as well as on international trade. Due to free trade connections, aquatic animal pathogens tend to spread rapidly throughout the region and internationally, multiplying the losses and impacts on fishers and fish farmers.

Nonetheless, improved health of plants and animals as well as the well-being of human populations are the ultimate outcomes of a well-functioning biosecurity system, and this has been the aim of every country in the region. Many developed countries for instance the European countries, have well established biosecurity systems in place. However, most countries in Southeast Asia still encounter significant challenges in the practical implementation of health management strategies, specifically in the areas of diagnosis, surveillance, risk analysis, emergency preparedness, and in their respective quarantine and certification programs.

Developed countries, for example in the European Union, have set higher standards on import requirements for fish and fishery products compared with those in the Southeast Asian countries. In this regard, there is a need for the countries in the region, to improve their respective biosecurity systems to ensure that fish and fishery products destined for export markets meet the relevant importing countries' requirements. Moreover, capacity building is needed to ensure that the

countries would have a pool of trained biosecurity experts who are ready to check for control systems adopted by the countries, in line with importing countries' requirements.

Way Forward

Effective biosecurity, particularly aquatic animal health management is a shared responsibility that requires coordinated approach from all countries. Therefore, the Southeast Asian countries should work closely and form proactive cooperation with international and regional organizations such as the Network of Aquaculture Centres in Asia-Pacific (NACA), Southeast Asian Fisheries Development Center (SEAFDEC), OIE, CODEX, FAO, and other relevant bodies to address issues on biosecurity. Nevertheless, to ensure the efficient implementation of biosecurity measures, establishing an integrated approach to promote to fisheries operators and government agencies, the importance and significance of eliminating and combating aquatic animal diseases, is necessary. Surely enough, significant improvements in biosecurity systems and outputs could be achieved if more coherent national and international approaches are developed, promoted, and adopted by relevant stakeholders.

The benefits that could be gained from these endeavors would include improved regulatory and policy frameworks for human health, particularly food safety; improved animal and plant health; greater efficiencies in the use of human and financial resources; better understanding of potential risks; and appropriate measures are in place and well-managed for improved protection and sustainable use of the environment. Finally, a more holistic approach to biosecurity would lead to the achievements of these benefits in manners that avoid inconsistencies, fill the gaps, and ultimately prevent the creation of unnecessary barriers to trade (FAO, 2007).

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Upholding Local Knowledge for Sustainable Fishery of the Unicorn Leatherjacket Filefish *Aluterus monoceros*: A Case in Malaysia

Mohammad Faisal Md Saleh

The unicorn leatherjacket *Aluterus monoceros* (Linnaeus 1758) is a filefish of the family Monacanthidae. Locally known as 'ikan barat-barat' in Malaysia, this species is a demersal fish found in sub-tropical areas around the world at depths that range from 1.0 m to 50.0 m. With lengths measuring up to 76 cm, this species is generally pale gray to gray-brown in color and is equipped with small hairs that cover the skin giving it a coarse texture like sand-paper (Froese and Pauly, 2006). In Malaysia, the fish is locally consumed as grilled fish or *asam pedas* (a Malay-style cuisine). The country's highest landing of this species was recorded in Terengganu State with Dungun District as the major contributor to the State's filefish landings.

Considerable quantity of unicorn leatherjacket filefish landings have recently been recorded in the States of

Terengganu, Pahang, Kelantan, East Johor, Perak, Sabah, and Sarawak in Malaysia. However, there has been very limited research on this species in the country. In fact, the species was only listed in Malaysia's Annual Fisheries Statistics Report starting in 2008. In Terengganu, recording of the main landing of this fish species also started in 2008, with Dungun District recording the highest landing compared to the other districts of the State. The reported rise in the production of this fish in early 2014 made it necessary to conduct land-based surveys on its fishery in the concerned districts of Terengganu State.

Parallel with the land-based surveys conducted from February to March 2014, compilation of secondary information was also carried out using the Annual Fisheries Statistics Reports of Malaysia (2008-2013) while the local



Unicorn leatherjacket filefish *Aluterus monoceros* (Linnaeus 1758)



Map of Malaysia showing the states where significant landings of the unicorn leatherjacket filefish had been recorded

knowledge on filefish fishery was recorded during the surveys. The data compiled revealed that in the East Coast of Peninsular Malaysia, abundant catch has been recorded from February to April and from August to November every year. The fish is caught using trawl nets, lift nets and traps. Based on their local knowledge, the fishers from Terengganu designed a unicorn lift net fishing gear which is a selective gear for the *A. monoceros*. The use of such gear could have contributed to the increasing catch trend of this fish in Terengganu. However, the fishers also reported that the unicorn lift net fishing gear is not yet licensed by the Department of Fisheries Malaysia (DOFM).

Results of the surveys included a recommendation that the unicorn lift net fishing gear should be licensed by DOFM as it is a selective fishing gear, and that the country's filefish resource should be managed efficiently to ensure the sustainability of its fishery. In addition, research on the unicorn leatherjacket filefish should be enhanced, especially on the biological aspects of the fish, oceanographic parameters and population dynamics as the results could provide detailed information necessary for the sustainable management of the filefish resource for improved economic returns in the future.

Characteristics of the Unicorn Leatherjacket Filefish

Unicorn leatherjacket filefish is categorized as demersal fish (reef-associated) from the family Monacanthidae. However, Bussing and Lavenberg (1995) and Kuitert and Tonozuka (2001) reported that the juvenile stage of the fish is pelagic. Feeding on benthic organisms (Sommer *et al.*, 1996), the fish populates the marine areas where the water depth reaches up to 80 m (Allen and Erdmann, 2012). In Malaysia, landing of leatherjacket fishes is dominated by the species *Aluterus monoceros* (Linnaeus 1758) which is known as “*ikan barat-barat*” or “*ikan ayam-ayam*” (Bernama Media News, 2013).

Moreover, Mansor *et al.* (1998) reported that other species of filefishes are also being captured in Malaysia such as the tassel filefish or prickly leatherjacket *Chaetodermis peniciliger*, fan-bellied leatherjacket *Monacanthus chinensis*, and the hair-finned leatherjacket *Paramonacanthus japonicus*. Morphologically, the unicorn leatherjacket filefish has two dorsal spines, 45-52 dorsal soft rays, and 47-53 anal soft rays. It has rudimentary pelvic spine that disappears during its adult phase (Figueiredo and Menezes, 2000) and snout is concave in adult fish (Myers, 1991). The fish is greyish-sandy in color with small brown spots on its upper part, pale yellow-brown dorsal and anal soft rays; and dark brown caudal membrane (Hutchins, 1986). There are no scales but the skin has



Top: skinned leatherjacket filefish ready for cooking
Above: grilled leatherjacket filefish, a popular menu for this kind of fish

rough texture which is usually removed before cooking (Mohammad Faisal Md Saleh, 2014). The fish could grow up to a maximum total length of 76 cm (Claro, 1994) and maximum weight of about 3.0 kg (IGFA, 2001).

The fish is distributed mainly in tropical and sub-tropical waters (Harmelin-Vivien and Quéro, 1990) including the West Atlantic, East Atlantic, East Pacific, Northwest Indian, East Indian Oceans, and South China Sea (Guallart and Vicent, 2009). In spite of such wide distribution of filefishes, there has been very limited information available on the research of unicorn leatherjacket species, especially in Malaysia. In fact, the fish has never been listed in the country's Annual Fisheries Statistics Reports, not until its 2008 issue.

Current Catch Performance of the Unicorn Leatherjacket in Malaysia

Based on the Annual Fisheries Statistics of Malaysia starting in 2008, the unicorn leatherjacket filefish was mostly landed in the East Coast of Peninsular Malaysia, with Terengganu recording the highest quantity of landing followed by Pahang. In the West Coast of Peninsular Malaysia, Perak had also recorded landings of this particular species, while small landings were noted in Sabah, Sarawak and Johor Timur (Table 1).

Malaysia's Annual Fisheries Statistics Reports (2008-2013) indicated that on the average, the landing seasons of the unicorn leatherjacket filefish in the East Coast of Peninsular Malaysia were the periods from February to April and August to November (Fig. 1). However, a different situation was observed in Perak where the landing months differed but showed a constant trend. Meanwhile, landings of this filefish in Sabah showed fluctuating trend with catch peaks in February, April, June and September while in Sarawak, the peak appears to occur only in July (Fig. 2).

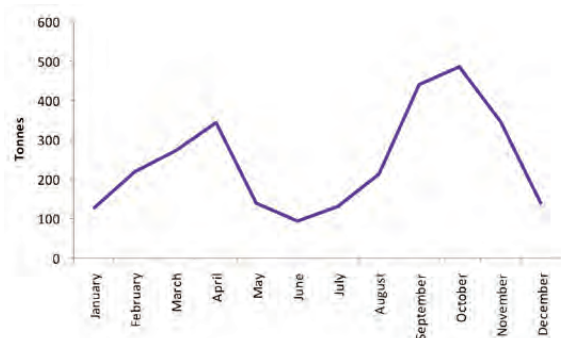


Fig. 1. Average monthly landings in the East Coast of Peninsular Malaysia (2008-2013)

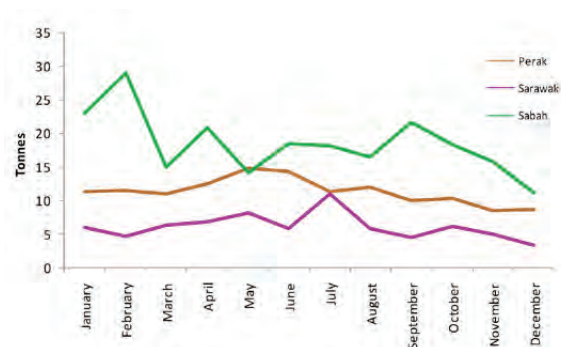


Fig. 2. Average monthly landing in Perak, Sarawak and Sabah (2010-2013)

Landing Performance of the Unicorn Leatherjacket Filefish in Terengganu

Based on the data from Malaysia's Annual Fisheries Statistics Reports (2008-2013), landing of unicorn leatherjacket filefish in the State of Terengganu contributed about one percent to the total marine fish landing for the State. On the average, 1,547 MT had been landed in Terengganu per year since 2008 and the trend has been increasing since then, by six out of the State's seven districts. In particular, Dungun District had the largest number of fish landed at 5,475 MT from 2008 to 2013, followed by Marang and Kuala Terengganu, while the three remaining districts recorded similar landings within the same period (Fig. 3). Comparing the total amount of the fish landed in five districts (excluding Dungun) with the quantity landed in Dungun, it can be observed that the

Table 1. Unicorn leatherjacket filefish landing in Malaysia, 2008-2013 (in metric tons (MT))

Year	Kelantan	Terengganu	Pahang	Johor Timur	Perak	Sarawak	Sabah
2008	-	732	58	-	-	1	-
2009	23	1,102	1,371	11	18	15	-
2010	116	235	2,007	6	182	44	147
2011	127	1,262	1,182	4	108	65	277
2012	256	4,148	1,269	5	127	121	232
2013	745	1,795	1,349	8	129	62	232
Total	1,266	9,274	7,236	34	564	308	888

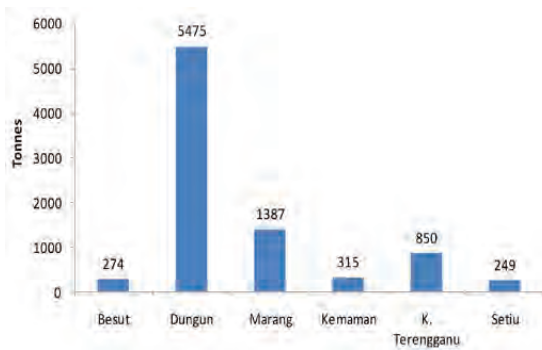


Fig. 3. Unicorn leatherjacket filefish landings by districts of Terengganu (2008 to 2013)



Fig. 4. Average monthly catch of the unicorn leatherjacket filefish in Terengganu (2008-2013)

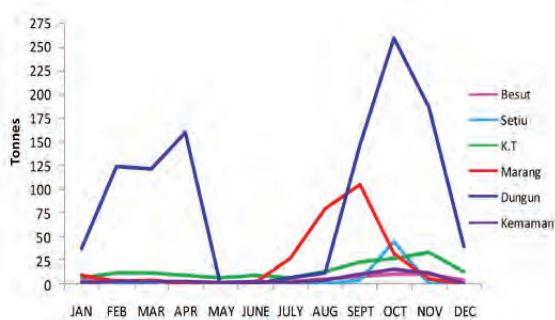


Fig. 5. Average monthly landing of the unicorn leatherjacket filefish by districts of Terengganu (2009-2013)

catch in Dungun still surpassed with a large difference of 2,399 MT. The seventh district which is Hulu Terengganu has no record of filefish landing because it is terrestrial with no marine ecosystem.

Thus, the two periods with abundant catch of unicorn leatherjacket filefish in Terengganu State are during the early and later parts of the year (Fig. 4). Abundant catch during the early part of the year was recorded from February until April, while the end of year phase was from September to November. In particular, the highest catch was recorded in October of 2008 until 2013. Overall, it could be gleaned that high average landings occur in months which are usually during the approaching year-end for all districts except in Dungun where high average catch occurred not only at the early part of the year but also towards the end of the year (Fig. 5). From the aforementioned catch performance, it could be concluded that the landing performance in Terengganu for this particular fish had been influenced by the landing performance in Dungun.

Fishing Gears

The fishing gears used to catch the filefish *A. monoceros* are trawl nets, lift nets, traps and many more, but the main fishing gear used in the East Coast of Peninsular Malaysia is dominated by trawl nets and lift nets (Table 2). Meanwhile the fish is caught in Perak and Sabah using the trawl nets only, and a small catch has been reported in Sarawak using traps (Table 3).

The unicorn lift net, known locally as “*tangguk barat*” or “*sauk barat*” (in Bahasa Melayu) is a selective gear which catches almost 100% unicorn leatherjacket filefish only. Unique and designed by fishers from Terengganu, this gear is made of a round stainless steel frame with a large diameter. The net can either be made of catgut strings or polyethylene. The bait is usually hung at the center of the net at the same level as the stainless steel frame. Baits used are jellyfish or fresh squid.

Table 2. Catch of unicorn leatherjacket filefish according to gears used in the East Coast of Peninsular Malaysia (2008-2013), in metric tons (MT)

Year	Trawl Nets	Purse Seines	Drift Nets	Lift Nets	Traps	Hook &Line	Bag Net
2008	445	13	223	1	70	38	-
2009	1768	28	561	-	127	19	3
2010	1524	52	45	-	28	710	4
2011	1382	55	76	946	25	90	-
2012	1334	6	448	3327	45	518	-
2013	2075	34	169	901	101	617	-
Total	8,528	189	1,522	5,174	396	1,992	7

Table 3. Catch of unicorn leatherjacket filefish by gears used in Perak, Sabah and Sarawak (2008-2013), in MT

Year	Perak	Sabah	Sarawak	
	Trawl nets	Trawl nets	Trawl nets	Traps
2008	-	-	1	-
2009	18	-	15	-
2010	182	147	44	-
2011	108	277	65	-
2012	127	232	24	97
2013	129	232	1	62
Total	564	888	149	159

Table 4. Summary of gears used to catch the unicorn leatherjacket filefish, baits used and price by survey areas

	Dungun	Marang	Merang, Setiu	Kuala Terengganu
Fishing gear	<i>Tangguk barat</i>	<i>Tangguk barat</i>	<i>Sauk barat</i>	<i>Tangguk barat</i>
Bait	Jellyfish; Squid	Jellyfish; Squid	Jellyfish	Jellyfish; Squid
Price at jetty (1 kg)	RM 8-10	RM 5 (S); RM 7 (B)	RM 7	RM 8-10

Note: S = Small; B = Big

Local Knowledge of the Filefish *Aluterus monoceros* among Fishers from Terengganu, Malaysia

Local information regarding *A. monoceros* had been gathered on the field by interviewing representatives from Dungun, Marang, and Merang, Setiu in February until March 2014. Results of the interview conducted by Mohammad Faisal Md Saleh (2014) indicated that the fish caught by fishers from Dungun was heavier, weighing about 700-1300 g each compared to the fish caught in Marang, which weighs 350-500 g only.

Fishers from Dungun had to go as far as 65 to 80 nautical miles from the shore to catch the filefish spending three to four nights during each trip but fishers from Marang travel only around 5 to 20 nautical miles offshore to fish and preferred a one-day trip only. In addition, the Chief of Dungun Fishermen's Association (personal comm., 2014) cited that the landing season for the fish in Dungun is from September until March of the following year, and the operation areas is near the 'unjam' (FADs).

On the other hand, the landing season in Marang is from July until September, and in Setiu, the season usually starts in June and lasts until September. The gear used by the fishers for catching the unicorn leatherjacket filefish by fishers from these three districts, is the unicorn lift net (*tangguk barat* or *sauk barat*). Moreover, while the

wholesale price for this fish is between RM8 and RM10 per kg in Dungun and Kuala Terengganu, the price is RM7 per kg in Marang and Setiu, (Table 4).

Products from the Unicorn Leatherjacket Filefish *Aluterus monoceros*

The unicorn leatherjacket filefish is full of meat with no small bones, making this fish very famous among grilled-fish lovers in Malaysia as well as in Indonesia. Besides grilling, the fish can also be pan fried or cooked the asam pedas style (a Malay cuisine). The fish is reported to be exported to China and Singapore where it is known as Gé tún in Mandarin. In China, the fish is usually steamed or as one of the ingredients in famous Chinese soups. In Thailand, the fish in fillet form is used for collagen and gelatin production. Ahmad *et al.* (2010) reported that pepsin-solubilized collagen (PSC) and acid-solubilized collagen (ASC) had been successfully extracted from the skin of the fish. Thus, the skin of the fish could be an alternative source for collagen. Advanced research found that the gelatin film extracted from the fish's skin contained antimicrobial properties and could be incorporated with bergamot oil and lemongrass oil for active antibiotic packaging (Ahmad *et al.*, 2012).

Discussion and Recommendations

The unusual landing of filefish *A. monoceros* in Dungun, Terengganu in early 2014 has created much attention to this fish species. Although landing of such fish species had contributed only about one percent of total marine fish landing for the State of Terengganu since 2008 with the highest landing contributed by Dungun District, the fish caught in Dungun was much heavier compared with the catch from the other districts. Differences in the total landings of the catch could have been influenced by the size of fishing boats, capability of boat crew, and number of days per trip. As mentioned earlier, fishers from Dungun had to travel up to 80 nautical miles offshore to fish for three to four nights per trip, thus, catching more fish not only in terms of quantity but also in terms of weight. Therefore, it could be assumed that heavier fish is found offshore while fish inshore could be lighter in weight. Furthermore, the use of unicorn lift net fishing gear by fishers from Terengganu could have helped in landing greater amount of the filefish since it is a selective gear catching mostly *A. monoceros* compared with non-selective fishing gears like trawl nets and traps.

However, since the unicorn lift net fishing gear is not yet licensed by the Department of Fisheries Malaysia (DOFM), it is therefore suggested that the DOFM could consider taking the necessary actions by licensing the gear and

subsequently incurring fees from the use of the unicorn lift nets. Such action could pave the way for preserving the filefish resource as the unicorn lift nets have proven to be efficient, effective and selective. Nevertheless, fishers are strongly encouraged to use the lift nets that should not be more than 8 feet in diameter, to ensure sustainability of the fishery, and that fishers are required to land only commercial sized fish and let go of the small ones. Releasing small fish and juveniles is however possible with the use of the lift net because it is selective and small fishes still survive after capture. Furthermore, future research on this filefish should be conducted, focusing on selected biological aspects, oceanographic parameters and population dynamics. In addition, the State Government should play active role in promoting the sustainable fishery and consumption of the filefish by organizing local and international events. Moreover, DOFM and local fishers' groups should organize discussions and dialogues to look for ways and means of enhancing partnerships in the sustainable management of the filefish resource for continuous economic gains and returns from this resource in the future.

Conclusion

As shown in the Fisheries Statistics Reports, Terengganu State had been landing the highest quantity of *Aluterus monoceros* or 'ikan barat-barat' in Malaysia. In particular, Dungun District accounted for the most abundant amount of the fish compared with the other districts. Most of the fishers from Terengganu use the unicorn lift nets or 'tangguk barat' to catch the filefish. This fishing gear is very effective to catch the filefish as it is selective and delivers almost 100% of unicorn leatherjacket filefish catch only. Therefore, the Department of Fisheries Malaysia is requested to license the unicorn lift net fishing gear as soon as possible so that catching the filefish could be controlled and sustainability of the filefish resource is assured.

Acknowledgement

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Fifth SEAFDEC Department: Racing towards Sustainable Development and Management of Inland Fisheries in Southeast Asia

Budi Iskandar Prisantoso and V.T. Sulit

The Southeast Asian Fisheries Development Center (SEAFDEC) was established on 28 December 1967 with the signing of the **Agreement Establishing the Southeast Asian Fisheries Development Center** by Senior Officers of the Contracting Governments, namely: Japan, Malaysia, Philippines, Singapore, Thailand, and Viet-Nam. Open to the governments of the Southeast Asian countries referring to the Union of Burma, the Kingdom of Cambodia, the Republic of Indonesia, the Kingdom of Laos, Malaysia, the Republic of the Philippines, the Republic of Singapore, the Kingdom of Thailand, and the Republic of Viet-Nam, and Japan, the Membership of the Center was amended by the Protocol Amending the Agreement on 18 November 1994 so that the Membership of the Center shall be open to the governments of the Southeast Asian countries and Japan. Thus, in addition to the abovementioned six countries, the Government of the Socialist Republic of Viet Nam renewed its membership in SEAFDEC in 1995, the Government of Brunei Darussalam became new member in 1995, the Union of Myanmar in 1999, the Government of the Republic of Indonesia in 2000, the Government of Cambodia in 2001, and the Government of Lao People's Democratic Republic in 2002. To date, SEAFDEC has 11 Member Countries.

Concurrent with the establishment of SEAFDEC, two Departments were also established on 28 December 1967, namely: Marine Fisheries Training Department (TD, based in Samut Prakan, Thailand) and Marine Fisheries Research Department (MFRD, based in Singapore); and the Secretariat (based in Thailand). Recognizing the need to improve fish culture techniques in the region, the

Member Governments agreed on 7 July 1973 to establish the Aquaculture Department (AOD) in Iloilo, Philippines as the third SEAFDEC Department, thus enabling SEAFDEC to promote research, training and extension activities in fish culture. In order to promote the proper development and management of fishery resources in the EEZs of the Member Countries, the Marine Fishery Resources Development and Management Department (MFRDMD) was established in Kuala Terengganu, Malaysia on 6 February 1992 as the fourth Department of SEAFDEC.

Since the abovementioned four SEAFDEC Departments put more focus on marine fisheries and aquaculture, and considering the importance of inland fisheries for food security, livelihood and well-being of peoples in the whole Southeast Asian region, the establishment of a regional center for inland fisheries was put forward by *His Excellency Dr. Fadel Muhammad*, the former Minister of Marine Affairs and Fisheries of Indonesia during the ASEAN-SEAFDEC Conference held in June 2011. The proposal which was unanimously supported by the SEAFDEC Council of Directors in the subsequent year, came into fruition two years later when the Government of Indonesia represented by *Prof. Syarief Widjaja*, the Secretary-General of the Ministry of Marine Affairs and Fisheries (MMAF) and SEAFDEC Council Director for Indonesia, signed the National Legitimacy Document on 2 September 2014 to officially launch the establishment of the Inland Fishery Resources Development and Management Department (IFRDMD) in Palembang, Indonesia as the fifth Department of SEAFDEC.

The signing of the Legitimacy Document by the Government of Indonesia in September 2014 gives due recognition to IFRDMD as an inter-governmental organization under



the SEAFDEC framework and accordingly confirms the necessary privileges for IFRDMD. This development also provided the assurance that more focus of SEAFDEC activities would be given on inland fisheries, as well as on inland fishery resource conservation and management. The new SEAFDEC Department would only be operational by 2015 once the construction of buildings, laboratories, and other facilities which has been ongoing would be completed. However, initial activities of IFRDMD have already been ongoing during the last quarter 2014, at its temporary site in the compound of Indonesia's Research Institute for Inland Fisheries also in Palembang. The conduct of such initial activities enabled the IFRDMD to promptly address regionally important and relevant issues at the soonest time possible.



Box 1. Characteristics of the Inland Capture Fisheries of Southeast Asia

- Inland capture fisheries comprises *large number of small-scale fishers*, mostly subsistent and engaged in only part-time fishing activities
- Activities related to inland capture fisheries are *highly seasonal*, with the highest peak during flood receding periods or at the end of the rainy season
- Production from inland capture fisheries is *highly diversified*, where catch could be large in number and quantity, but small in size with high species diversity
- Inland fishery resources could be *freely accessed at any time*, and production could be *landed anywhere* without proper recording
- Inland fisheries *production goes to various channels*, for direct household consumption, sold in local markets, or exported to markets within the region

Source: Chumnarn (2014)

Status of Inland Capture Fisheries in the Southeast Asian Region

In 2012, the total production from inland capture fisheries of the Southeast Asian region was reported to be approximately 2.8 million metric tons (MT), accounting for more than 7% of the region's total fisheries production (from all sectors) or about 16% of the total production from capture fisheries (SEAFDEC, 2014). The top-producing Southeast Asian country is Myanmar, followed by Cambodia and Indonesia. Other countries are also closing in, such as the Philippines,

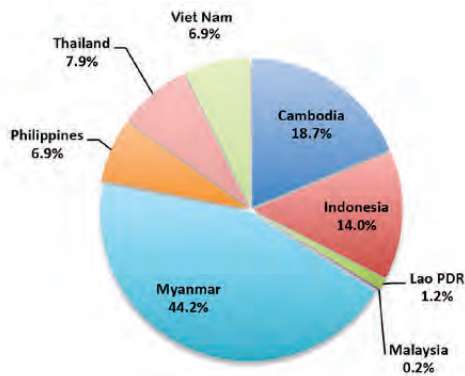


Fig. 1. Contribution of Southeast Asian countries to the region's total production from inland capture fisheries

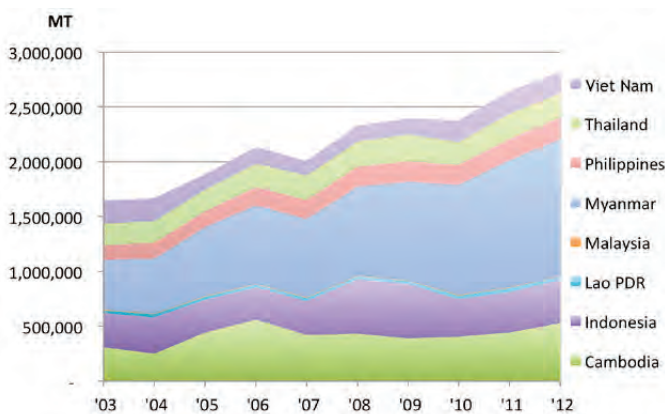


Fig. 2. Production from inland capture fisheries of the Southeast Asian countries

Thailand and Viet Nam which have also been reported to consistently produce considerable amount of inland fisheries products during the past decade (Fig. 1 and Fig. 2). For the region's only landlocked country Lao PDR, its production may not be very high but this is derived mainly from inland fisheries. The foregoing therefore connotes the relevance of inland fisheries to food security in the Southeast Asian region. Considering also the characteristics of the region's inland fisheries (Box 1), it has become imperative for this sub-sector to be properly and sustainably managed, and SEAFDEC/IFRDMD would be very relevant for the sustainable development and management of this fisheries sub-sector.

Issues and Concerns

Inland fisheries form an important component of the economies of many countries in the region, specifically creating employment and income generating opportunities, and serving as source of food supply for rural communities. This contribution is particularly important for poverty alleviation, food security and nutritional well-being of



many rural communities, particularly in the developing countries, as well as in low income food deficit countries. Nevertheless, the sustainable development of the region's inland fisheries is confronted with issues and concerns that need to be addressed as shown in **Box 2**.

Box 2. Action Plans to Address the Challenges that Confront Inland Fisheries Development in Southeast Asia

Rectifying the low priority that planners and policy makers give to inland fisheries

- Enhancing the methodologies for collecting statistics on production from inland capture fisheries to address the concerns on inadequacy of data and other relevant information
- Boosting the development of non-conventional data collection and model for inland ecosystem valuation using existing data and information to advocate the importance of inland fisheries
- Synthesizing and packaging meaningful information for policy makers and public by integrating data available from various sources, e.g. censuses and statistics, research studies, local/traditional knowledge

Applying the ecosystem approach to fisheries in inland fisheries management

- Promoting the “catchment approach” to ensure consistency in management levels (local, national or regional) and ecosystem boundary
- Strengthening the “holistic approach” by taking into consideration the activities of other sectors involved and sharing the same inland resources/ecosystems

Securing ecosystem functions and improving R&D on mitigation measures

- Raising the awareness of other sectors as well as planners/policy makers on the importance of inland fisheries and its ecosystem functions, by generating and disseminating relevant and credible information
- Establishing and advocating measures to mitigate the impacts of development projects, e.g. incorporation of fish passages in cross-river barrier construction, stock enhancement programs, integration of underpasses in road construction and development

Maximizing the utilization of inland fishery resources

- Developing and upholding responsible fishing gears/practices that promote species selectivity
- Enhancing preservation and post-harvest technologies to ensure that fish is utilized for year-round consumption, improve safety and quality of traditional fish products for local consumption, and generate value-added products

Developing appropriate resources enhancement programs

- Enhancing the yield from inland capture fisheries by stocking hatchery-bred seeds (focus on low trophic and indigenous species) in closed ecosystem
- Strengthening conservation measures through the use of indigenous species with seeds produced specifically for stock enhancement purposes
- Promoting habitat conservation and improvement by making the habitats favorable for enhancing natural reproduction of aquatic species
- Developing indicators for evaluating the successes of resource enhancement programs
- Promoting culture-based fisheries

Conclusion and Recommendations

The sustainability of inland capture fisheries is very much dependent on the quality of aquatic habitats and ecosystems. However, fishery is not the only sector dependent on inland ecosystems, as the same ecosystems also provide wide ranges of products and services for people living adjacent to inland fisheries areas. These resulted in competition/conflicts among resource users with different interests, e.g. fisheries, irrigation for agriculture, forestry, transport, tourism, and development opportunities, as well as hydropower development. Initiatives have been undertaken by the fisheries-related sectors in conserving and managing the aquatic ecosystems to enhance inland fisheries production and sustain the livelihoods of people living in inland fisheries areas. The unavailability of reliable data and information on the importance of inland fisheries, has led to this sub-sector being overlooked by planners and policy makers, and given low priority compared to the other development sectors sharing the same water resources. Such situation also resulted in management decisions that may have created negative impacts to this sub-sector.

In order to improve awareness on the importance of inland fisheries and enhance better conservation and management of inland ecosystems for the sustainability of inland fisheries, it is therefore necessary for countries in the Southeast Asian region to improve data collection of inland fisheries. There is also a need to improve governance for sustainable inland fisheries through the application of ecosystem approach to fisheries, as well as co-management in order to appropriately integrate inland fisheries management with habitat management, and enhance the involvement of local communities and relevant stakeholders in the planning, management and conservation of the inland aquatic habitats and resources.



Considering the abovementioned conditions, SEAFDEC/IFRDMD is tasked to manage and coordinate the project activities of SEAFDEC that aim to promote the sustainable development and management of the region's inland capture fisheries. Its initial project on the "Promotion of Responsible Utilization of Inland Fisheries Resources in Southeast Asia" is considered as a way of establishing and strengthening regional networking for sustainable inland fisheries management and fish conservation of inland water resources. Capacity building activities such as regional training courses and workshops would be organized as these are key measures to improve the capacity of ASEAN fisheries officials on the responsible utilization of inland fisheries resources.

Way Forward

At the onset, IFRDMD has initiated the implementation of the project on the "Promotion of Responsible Utilization of Inland Fisheries Resources in Southeast Asia" which is aimed at reviewing activities and methodologies for promoting inland fisheries in the ASEAN Member States (AMS) and finding ways and means for the sustainable development of inland fisheries, promoting effective inland fisheries management measures in AMS, and conducting studies on the development of habitat conservation/resources enhancement measures suitable for Southeast Asia.

Specifically for 2015 and racing for the sustainable development of inland fisheries, IFRDMD plans to carry out the following activities: (1) workshop to review activities and methodologies for promotion of inland fisheries and find ways forward; (2) study on co-management and right-based fisheries management applicable to inland fisheries in Southeast Asia; (3) workshop to develop guidelines for effective inland fisheries management in Southeast Asia; (4) regional training course on improving the management of inland fisheries; (5) study on the development of habitat conservation and resources enhancement measures applicable to Southeast Asia; and (6) workshop to develop policy recommendations on responsible inland fishery resources utilization in Southeast Asia.

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CALENDAR OF EVENTS

Date	Venue	Title	Organizer(s)
2014			
14-16 October	Malaysia	Expert Group Meeting on Drafting of Catch Documentation System	SEAFDEC/MFRDMD & Secretariat
21-23 October	Siem Reap, Cambodia	Regional Workshop on Culture-based Fisheries	NACA
29-31 October	Bali, Indonesia	5 th ASEAN Tuna Working Group Meeting 2014	MMAF, Indonesia
4-6 November	Cairns, Australia	7 th RPOA Coordination Committee Meeting	RPOA/IUU
5-7 November	Timor Leste	10 th Senior Officials Meeting of CTI-CFF	CTI-CFF
12-14 November	Phnom Penh, Cambodia	Expert Meeting on Mekong Cooperation on Fisheries, Aquatic Resources and Wetlands: 20 years lesson learnt	SEAFDEC-Sweden Project
18-20 November	Shah Alam, Malaysia	1 st Meeting of the Scientific Working Group on Neritic Tuna Stock Assessment in the Southeast Asian Waters	SEAFDEC-Sweden Project
19-20 November	Penang, Malaysia	3 rd Meeting of the ASEAN Public-Private Taskforce for Sustainable Fisheries and Aquaculture	MARKET
19-21 November	Bali, Indonesia	Bali Tuna Conference: Mainstreaming Sustainable Tuna Management in the Asia-Pacific	MMAF, Indonesia
25-26 November	Jakarta, Indonesia	International Symposium in Conservation, Management and Trading of <i>Anguilla bicolor</i>	MMAF Indonesia, JICA
25 November-4 December	Iloilo, Philippines	Training Course on Community-based Freshwater Aquaculture for Remote Rural Areas of Southeast Asia	SEAFDEC/AQD
27-28 November	Bangkok, Thailand	Regional Consultation on Strategy and Action Plan for Sustainable Intensification of Aquaculture in Asia-Pacific	FAO/RAP
29 November	Bangkok, Thailand	FAO Workshop on Prioritization of Asia Regional Aquaculture Development and Management	FAO/RAP
1-3 December	Ubon Ratchathani, Thailand	37 th Meeting of the SEAFDEC Program Committee	SEAFDEC
4-5 December	Ubon Ratchathani, Thailand	17 th Meeting of the Fisheries Consultative Group of the ASEAN-SEAFDEC Strategic Partnership (FCG/ASSP)	SEAFDEC & ASEAN
9-11 December	Myanmar	Regional Technical Consultation on Development and Use of Alternative Dietary Ingredients in Aquaculture Feed Formulations	AQD
16-18 December	Langkawi, Malaysia	1 st Regional Technical Consultation on ASEAN Catch Documentation Scheme	SEAFDEC/MFRDMD & Secretariat
2015			
20-22 January	Trat Province, Thailand	Sub-regional Technical Meeting for Collaborative Fisheries Management Between Cambodia and Thailand	SEAFDEC-Sweden Project
20-22 January	HCM City, Viet Nam	3 rd OIE Global Conference on Aquatic Animal Health: "Riding the wave to the future"	OIE
22-23 January	Bangkok, Thailand	Technology Innovative Forum - Creating a More Sustainable and Responsible Seafood Industry in Asia	MARKET
26-28 January	FAO HQ, Italy	Global Conference on Inland Fisheries	FAO
24-26 February	Kuala Lumpur, Malaysia	RTC on Regional Guidelines for Managing Fishing Capacity	SEAFDEC & DOF Malaysia
3-4 March	Kuala Lumpur, Malaysia	Core Expert Meeting on Sharks and Rays	SEAFDEC/MFRDMD
10-12 March	Thailand	Regional Workshop on Port State Measure in Southeast Asia	SEAFDEC/TD
20 March-11 May	Sulu-Sulawesi Seas	Collaborative Research in Sulu-Sulawesi Seas (M.V. SEAFDEC 2)	SEAFDEC/TD
23-27 March	Siem Reap, Cambodia	Tenure & Fishing Rights 2015 (UserRights 2015) A Global Forum on Rights-based Approaches for Fisheries	FAO
31 March-3 April	Chiang Rai, Thailand	47 th Meeting of the SEAFDEC Council	SEAFDEC & DOF Thailand
1-3 April	Darwin, Australia	5 th MCS Sub-Regional (Arafura and Timor Seas) Group	RPOA-IUU
8-10 April	Pontianak, Indonesia	6 th Sub-regional Meeting on Southern and Eastern Area of the South China Sea and Sulu-Sulawesi Seas	RPOA-IUU
24-27 May	Colombo, Sri Lanka	Regional Consultative Workshop on Improving the Contribution of Culture-based Fisheries and Related Fishery Enhancements in Inland Waters to Blue Growth	APFIC/FAO

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



Secretariat



TD



MFRD



AQD



IFRDMD



IFRDMD

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The first prize drawing winner, *Pim Sub-arnaek*, from the national drawing contest in Thailand

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.