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ADB Working Paper Series

**Special Study on Sustainable
Fisheries Management and
International Trade in the
Southeast Asia and Pacific region**

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Abstract

This paper analyzes the current status of fisheries and aquaculture in Southeast Asia and international trade. Analysis concludes that a policy of sustainable management for both capture fisheries and aquaculture is of greatest importance, but such a policy has been neither planned nor implemented with a holistic and long-term perspective. Current policy reflects a short-term view and the immediate needs of each nation. Therefore, capacity building of human resources and organizations, including governments, is needed for the formulation of holistic national policies to seek long-term and fundamental remedies for the sustainable management of fisheries resources and intensified and extensive aquaculture. Such holistic national policies should include science-based management, monitoring, enforcement, coordination of capture fisheries and aquaculture, and international trade policies. It may include the effects of climate change and oil price increases, as well as international market trends and regulations or barriers. Moreover, international trade will be promoted based on the sustainability of capture fisheries and aquaculture. ADB members and governments are urged to provide official development assistance for policy implementation, in particular to the private sectors that may not otherwise receive any, and to small and community-related businesses. Recommendations focus on building capacity for the long run, among others, for which facilitation should be provided.

JEL Classification: F64, Q22, O13

Contents

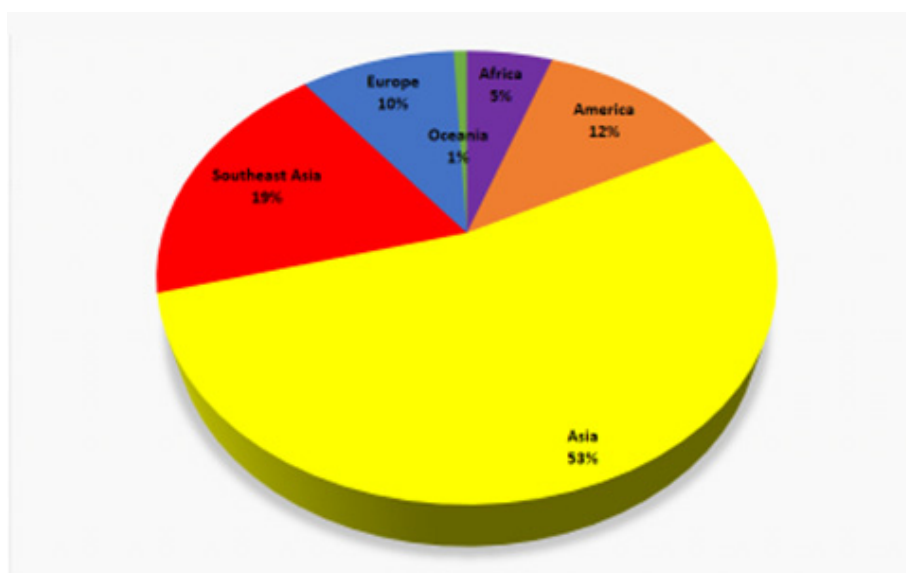
1.	Overview of Fisheries of the World and Southeast Asia.....	3
2.	Fisheries by Sector, Capture Fisheries, and Aquaculture.....	5
2.1	Marine Capture Fishery Production in Southeast Asia	5
2.2	Aquaculture Production in Southeast Asia	7
2.3	Fishing Technology.....	8
2.4	Fisheries by Labor Status	8
3.	The Status of International Trade.....	9
3.1	Fish Trade Increase	9
3.2	Economic Contribution of Fish Trade	10
3.3	Processors for International Trade	11
3.4	Reliance of Southeast Asian Countries on Market Countries	11
3.5	Sanitary and Phytosanitary Measures and Other Trade Measures	11
3.6	EU Policy on Fisheries Trade-Potential Changes in Tariff and Non-tariff Barriers in Fisheries Trade: Inter-regional and Intra-regional	12
4.	Fisheries Management for Marine Capture Fisheries.....	13
4.1	Tuna	13
4.2	Surimi Fisheries or Trawl Fisheries in the Region	14
4.3	Country's Target for Food Security	16
4.4	Climate Change Implications for Fisheries	16
5.	Potential Technical and Financial Assistance from Development Banks and Governments.....	17
6.	Conclusions	17
7.	Recommendations.....	19
8.	Acknowledgements.....	21
	References	22

1. OVERVIEW OF FISHERIES OF THE WORLD AND SOUTHEAST ASIA

Overall, world fishery production is still growing at a steady pace. While capture fisheries are stagnating and decreasing, aquaculture has been increasing at a sufficient pace to offset any stagnation and depletion elsewhere.

Fisheries and aquaculture are important as primary sources of protein for fishery nations as well as important for food security, community living, income generation, and as a source of foreign currency.

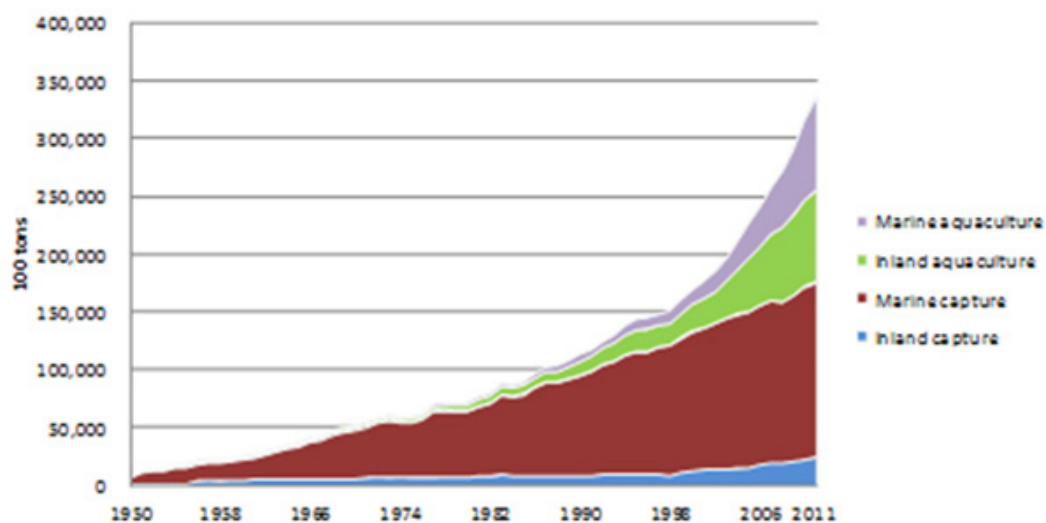
Figure 1: Fishery production by continent in 2010



Note: Asia excludes Southeast Asia

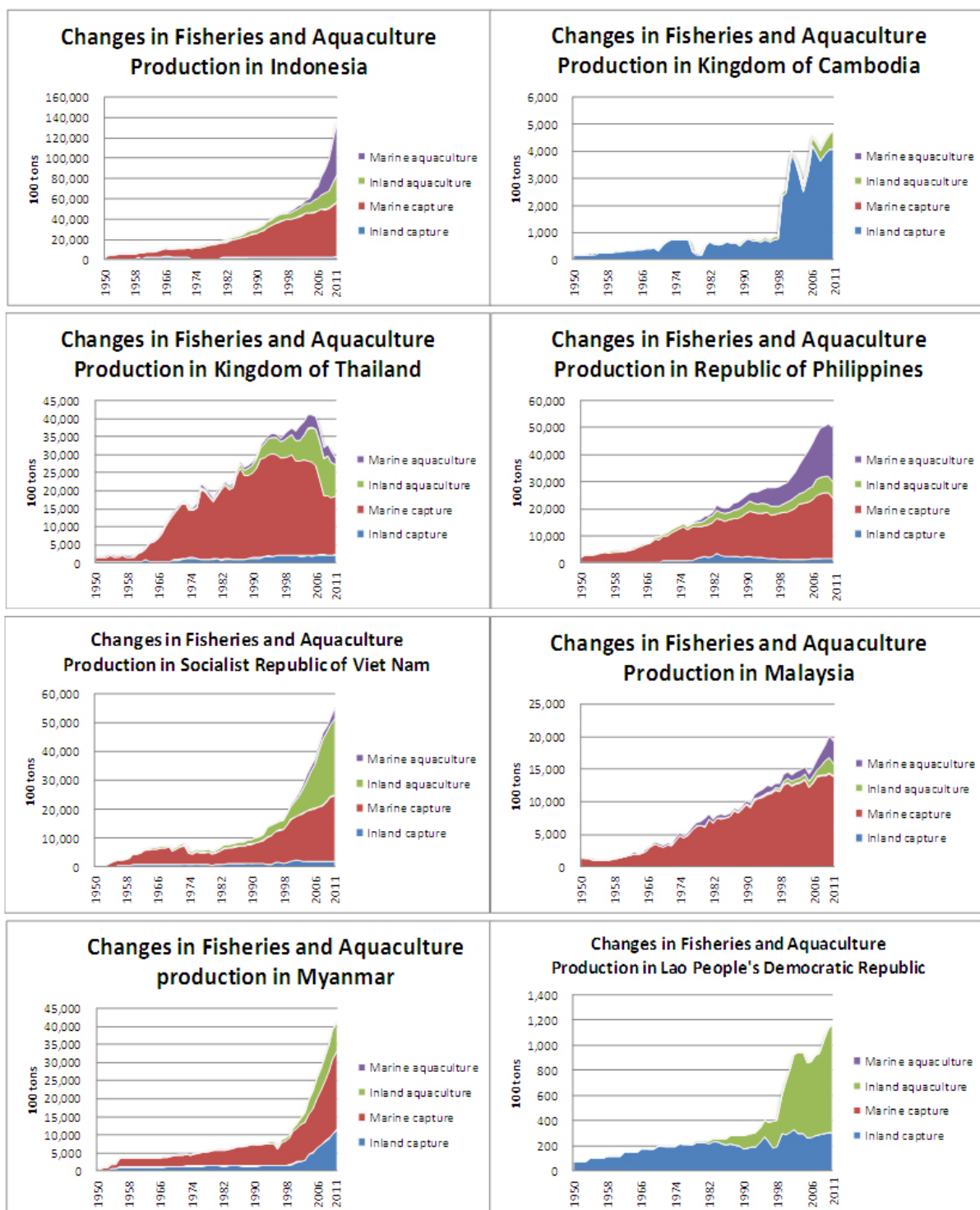
Source: "Fishery Statistical Bulletin of Southeast Asia 2010" by Southeast Fisheries Development Center

Figure 2: Changes in Fisheries and Aquaculture Production in the ASEAN 10 countries (1950-2011)



Source: FAO Fishstat

Figure 3: Changes in Fisheries and Aquaculture Production in the ASEAN 10 countries (1950-2011)

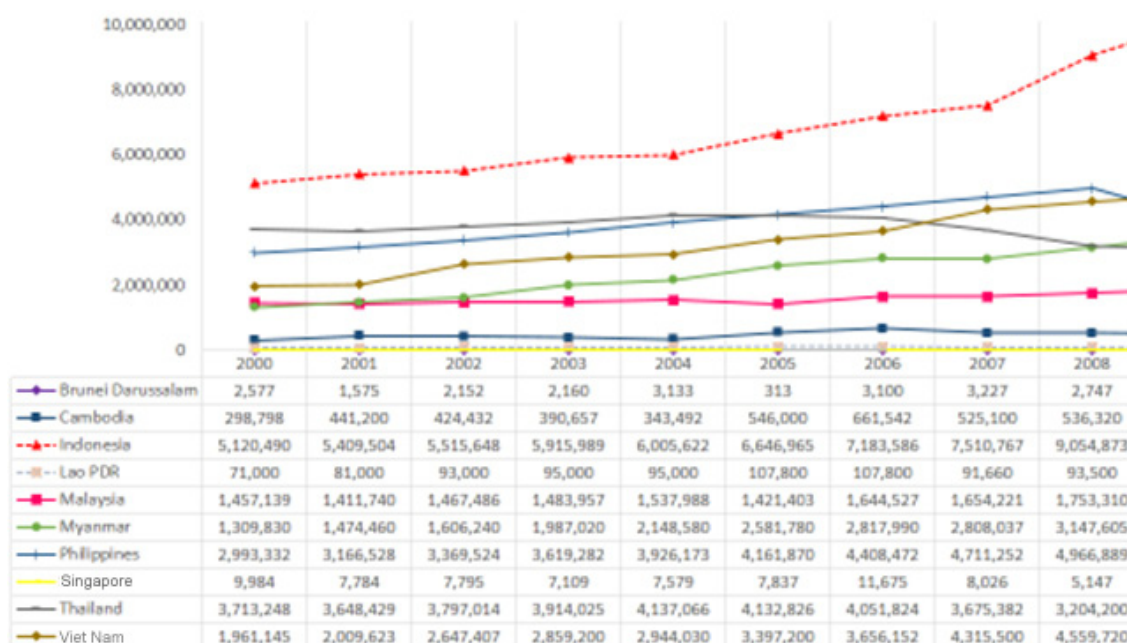


Note: In this report, Southeast Asia designates 10 countries – Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam

In terms of fishery production by continent (million Mt), the Asian region demonstrated a continuous increase from 2006–2010, both in volume as well as value. Regarding volume, the annual increase is 6% but in terms of value the increase is 20%.

1. By weight of production, the total fishery activity of Southeast Asia yielded 24.5 million Mt in 2006, increasing continuously to 31.4 million Mt by 2010. This rapid increase in production is second only to China, whose statistics are of questionable validity (The State of World Fisheries and Aquaculture 2012).
2. In terms of sector production for Southeast Asian fisheries, marine capture comprises 14.9 million Mt., inland capture is 2.4 million Mt, and aquaculture is 14.2 million Mt (total = 31.4 million Mt). By value, marine capture is worth US\$15.9 billion, inland capture is US\$2.5 billion and aquaculture is US\$13.4 billion. (Total = US\$31.8 billion; The State of World Fisheries and Aquaculture 2012). In other words, this is equivalent to approximately twice Japan’s annual total value of US\$14.2 billion (100 = US\$1), but 7 times Japan’s production of 4.8 million Mt in 2011. Therefore the value of Southeast Asian fishery products per kilogram is one third that of the Japanese market.

Figure 4: Total fishery production of the Southeast Asian countries from 2000 to 2009 (MT)



Source: “The Southeast Asian State of Fisheries and Aquaculture 2012” Southeast Asian Fisheries Department Center

2. FISHERIES BY SECTOR, CAPTURE FISHERIES, AND AQUACULTURE

2.1 Marine Capture Fishery Production in Southeast Asia

Marine capture fishery production in Southeast Asia increased slightly, 1.6%, compared to the 11% average increase in terms of value. In 2009, Indonesia remained the largest producer, accounting for 33.8% of the region’s total production volume followed by the Philippines, which accounted for 16.3%, Viet Nam (15%), Myanmar (13.8%), Thailand (10.9%), and Malaysia (9.4 %). In terms of value production in 2009 Indonesia was on top,

constituting 41.2%, followed by Myanmar (21.4%), the Philippines (15.9%), and Malaysia (12.7%). In fifth place, Thailand accounted for 8.7% (The Southeast Asian State of Fisheries and Aquaculture 2012; The South Asian Fisheries Development Center (SEAFEC))

Marine capture fishery production outputs of Brunei Darussalam, the Philippines, Malaysia, Singapore, and Thailand have all shown a decrease. The remaining countries including Cambodia, Indonesia, Lao PDR, and Viet Nam (Fishstat, Food and Agriculture Organization of the United Nations (FAO)) will also decrease in the future unless the respective governments implement appropriate management measures and specific hard target limits on catches are introduced with monitoring and enforcement. Thailand has already experienced a drastic reduction of production from a peak of 2.7 million Mt to 1.5 million Mt because it was phased out of Indonesian waters, and its 200-mile zone of the Thai Bay fishery is no longer the main fishery and the site of depleted resources. Thai vessels still operate in the waters of Myanmar where bottom-fish stocks are depleted (Asian Pacific Regional Office, FAO). If this too is phased out, Thailand's production will be further decreased. The Philippines' production in coastal water has also decreased, but overall production may be sustained by operations at long distance and in high sea areas for tuna, although this resource faces overcapacity.

The trend of Southeast Asia has been a decrease in production from coastal areas, and expanded operations in the high seas as well as in coastal areas of adjacent nations. All Southeast Asian nations have policies of sustainable fisheries in their waters, but none of them have specific provisions in their Fisheries Acts for effective management. Hence, effective management is neither implemented in this region, nor monitored or enforced ("Marine fisheries resources have been largely overexploited." Asian Fisheries Today; Asia-Pacific Fishery Commission, FAO Rapid Publication 2005/6).

Marine fish including tuna, skipjack, and mackerel provided the highest production in 2009 accounting for about 76.4%, while crustacean groups such as tiger prawns and pink shrimps accounted for 4.1%. The mollusk groups such as octopus and squid accounted for 3.5%. Both fish and crustaceans decreased in 2009 over 2008, an indication of overexploitation in this region. This decrease is mostly attributable to Indonesia. However, the Philippines' production also decreased significantly in 2009 over 2008.

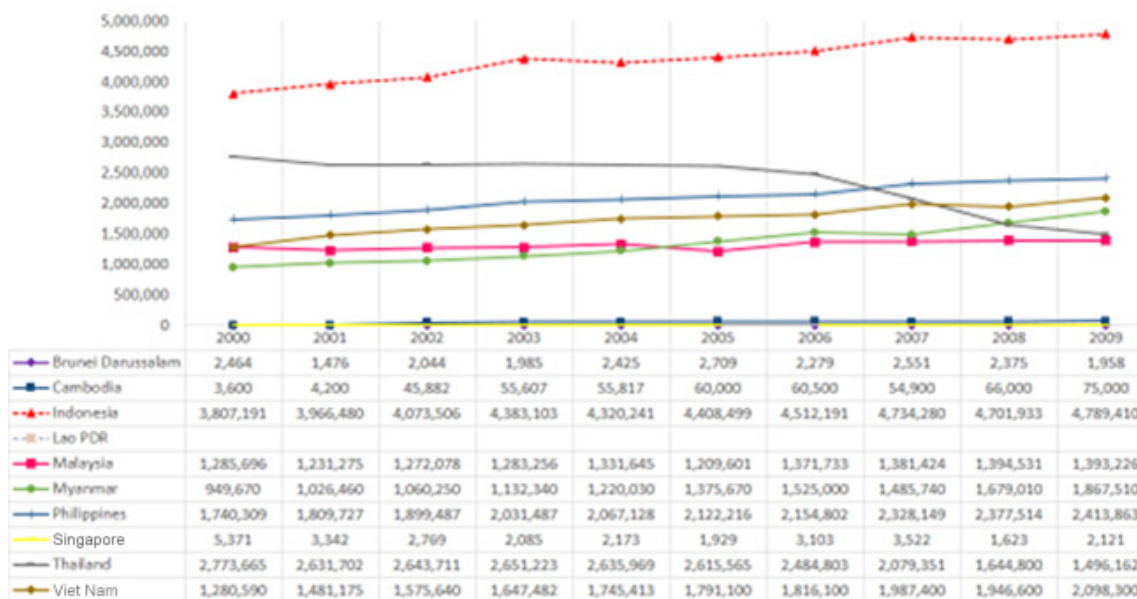
Tuna are the final abundant species for the direct targeting of expansion after coastal resources are depleted. Therefore urgent policies with specific measures to protect and restore the US\$16.0 billion (100 = US\$1) tuna fisheries, and to ensure sustainable production should be put in place as soon as possible.

A fundamental obstacle is that these nations lack reliable data for the scientific assessment needed to set up the Total Allowable Catch (TAC) as a hard target.

Data Validity

As mentioned above, there are fundamental flaws in the available statistics. There is poor classification of fish species, and sometimes none at all. The Southeast Asian nations have a significant lack of classification of species landed for the market. 66.4% of the entire production is classified as 'miscellaneous fish'. This is a serious obstacle for science and management. There is an urgent need to improve the level, magnitude, and accuracy of collection and compilation of fishery data with a detailed species breakdown for stock assessment and management. Myanmar simply describes all marine capture fish as 'miscellaneous' by which no stock assessment can be conducted. Moreover, species-level reporting is not adequately conducted for administration or scientific purposes in the inland fisheries of Myanmar, Cambodia, or Viet Nam.

Figure 5: Production volume from marine capture fisheries in Southeast Asia by country from 2000 to 2009 (MT)



Source: "The Southeast Asian State of Fisheries and Aquaculture 2012" Southeast Asian Fisheries Department Center

2.2 Aquaculture Production in Southeast Asia

Marine aquaculture contributed 52.2% to the region’s aquaculture production in 2009.

Brackish water aquaculture accounted for 21% while inland aquaculture accounted for the remaining 27%. However brackish water aquaculture accounted for 49% in terms of value because the production species comprises prawn and shrimp species such as black tiger. Aquaculture in the region has increased drastically with the pace of 12% annually contributing to the boosting of regional and national economies in Southeast Asia. Aquaculture production in Indonesia is the largest in the region, accounting for 44.3% in terms of volume and 52% in value (The Southeast Asian State of Fisheries and Aquaculture 2012; The Southeast Asian Fisheries Development Center (SEAFDEC)).

The successful aquaculture production is attributed to Eucheuma seaweed (*Eucheuma* spp). Indonesia appears to be the growing nation for aquaculture of shrimp as well as others species and there remains land available for aquaculture in Sumatra, Lampung and Kalimantan, and Takaran among others (The Japanese Fishery Company). There does not appear to be, however, a holistic national plan. Viet Nam is the second largest aquaculture nation in the region with catfish, *Panangus* spp, and *Tilapia* in competition with production by Mississippi USA where an anti-dumping taxation is in place. Viet Nam, however, has been sued by the USA and now an anti-dumping tax has been imposed there too. In the Philippines, production is dominated by Zanzibar weeds (*Eucheuma cottonii*), milk fish, and black tiger shrimp. Black tiger shrimp enjoys popularity in the US market.

In case of Thailand, white leg shrimp (*Penaeus vannamei*), which accounts for 43% of production, is the major species followed by Nile *Tilapia* (*Oreochromis niloticus*) at 13%. Thailand currently has the problem of early mortality syndrome (EMS) a disease whose cause has not so far been clearly identified and no treatment or eradication has been found for EMS. EMS first broke out in southern China and then spread to Viet Nam and Malaysia before coming to Thailand. In Thailand, EMS caused a reduction in production of almost 50% in 2012. Prices increased by 40% from 2012–2013 in response to the scarcity of

production.

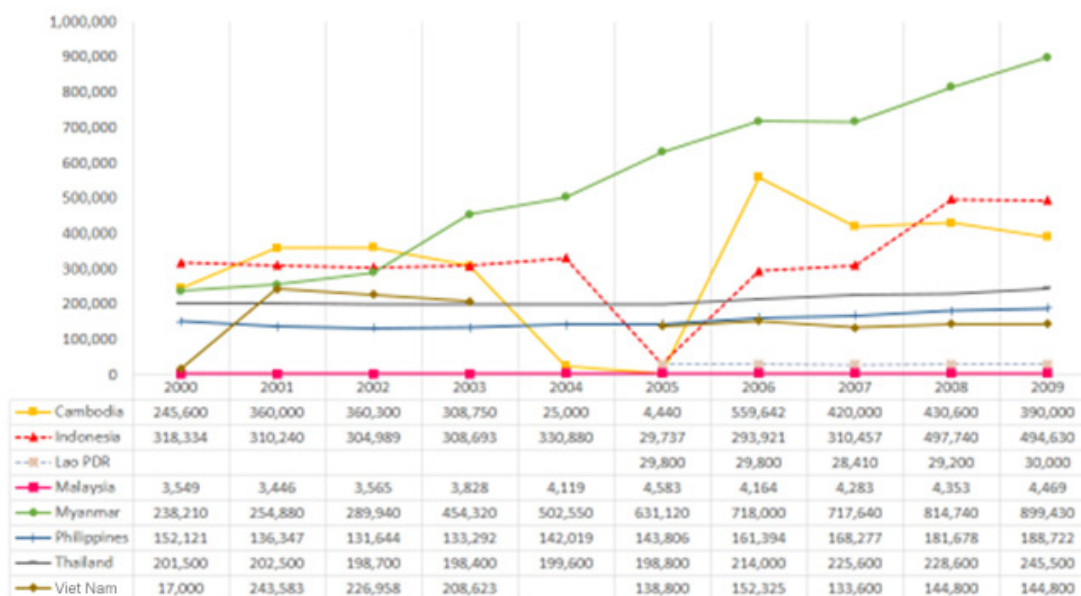
The fisheries industry as well as the Government of Thailand is currently researching the causes of EMS and seeking alternative lands suitable for white leg shrimp aquaculture in other countries such as in Myanmar.

In Myanmar, the main products of aquaculture comprise inland species. The main species is Roho labeo (*Labeo rohito*), which accounts for 64% of entire production. There is also some marine or brackish water aquaculture such as of black tiger shrimps (*Penaeus monodon*) in Arakanese state, but it is still under development. Intensive aquaculture, however, has not yet been developed and is not the priority of the Government of Myanmar at present (The Department of Fisheries Presentation to the Thai Delegation in Yangon, May 21).

2.3 Fishing Technology

The main equipment for fishery production is trawling and purse seine nets. Although all countries still use driftnets and bottom gillnets, pole and line, as well as jigging in coastal fisheries, most marine capture fishery production comes from trawling and purse seine nets. They are powerful and efficient, producing large amounts of catch in a single haul. Trawl-caught trash fish are directed to fishmeal and feeding for aquaculture. In Malaysia, trawling is prominent with trash fish production accounting for 35% of the total. The continued production of trash fish, however, leads to a decrease of overall production and shrinkage of fish size.

Figure 5: Production volume from inland capture fisheries of the Southeast Asian countries from 2000 to 2009 (MT)



Source: "The Southeast Asian State of Fisheries and Aquaculture 2012" Southeast Asian Fisheries Department Center

"Trash fish production implies that, for the time being, sufficient feed for aquaculture production will be available. Inevitably, a vicious spiral has evolved where the demand for low value/trash fish has supported increasing fishing pressure on already degraded resources" (the above-mentioned reference FAO 2005/6).

2.4 Fisheries by Labor Status

Since fisheries contributed significantly to individual, regional, and national economies, the

labor status of fisheries is a major issue for the national policy of each government. Southeast Asian countries have begun to boost economic development and this affects the agriculture and fisheries workforce. Increasing the income of workers in fisheries will be an important national policy. Sales proceeding from fisheries products are of a higher value than those from agriculture products, and so promotion of fishery production and aquaculture for both international trade and domestic consumption is what the government and the private sectors ought to strive for. However, as national income levels increase, the advantage of competitive wages in the fisheries workforce may be lost. Younger generations will lose their eagerness to engage in such a difficult, dirty, and dangerous job. Therefore, even among the Southeast Asian nations a decrease in the fisheries workforce is inevitable, and the shrinkage of rural fishery communities and concomitant increase in urban populations will be a phenomenon of the future as was the case in Japan during the high economic growth economic era of the 1960s and 1970s.

In 2009, Indonesia reported the highest number of fishery workers at 5.9 million people, with 36% involved in marine capture fisheries of which 50% were full-time. Of the inland fisheries, there are 458,000 workers, comprising 37% that are full-time.

Myanmar has the second largest number of fishery workers at 3.2 million, comprise 44% marine capture workers of which 16% are full-time, 18% part-time and the rest occasional fishers. Inland capture fisheries have 1.6 million workers of which 31% are full time and 19% are part-time. In aquaculture, there are 780,000 workers and 25% are full-time; the part-time and occasional workers are the major working force engaged in paddy-field rice production. These numbers demonstrate the great number of fishers reliant on fisheries, and with per capita income being so small fishery workers are inevitably poor (Southeast Asian State of Fisheries in 2012, SEAFDEC).

3. THE STATUS OF INTERNATIONAL TRADE

3.1 Fish Trade Increase

From 2000–2010, world exports of fish and fishery products increased in terms of volume by 646,000 Mt annually, and in terms of value by US\$5200 million annually. In 2008, Europe – including Norway and Iceland, which are not EU members – exported the largest amount of fish and fishery products, accounting for 37% in terms of volume and 38% in terms of value. Europe itself is a major importer of fish commodities from outside of the EU member nations. Southeast Asian countries exported more than 14% of the global export volume. From Asia, China is the largest exporter – including re-exporting – contributing 11.0% to the global export value, followed by Norway providing 7%. From among the Southeast Asian countries, Thailand's export value contributes 6% to the world total value while Vietnam contributes 4%.

In 2008, Europe was also the largest importer at 40% and 47% of volume and value, respectively. Japan, in 2008, imported the world largest share of fish and fisheries products for a single nation, accounting for 14%, but as of 2012 China is the largest importing nation in terms of value followed by Japan. The US is also one of the largest-importing nations, accounting for 13% of global imports. Considering 9% of the domestic supply of fish and fishery products to be insufficient for domestic consumption, the US government adopted a national guideline in 2011 to increase domestic fisheries production by introducing and enhancing aquaculture.

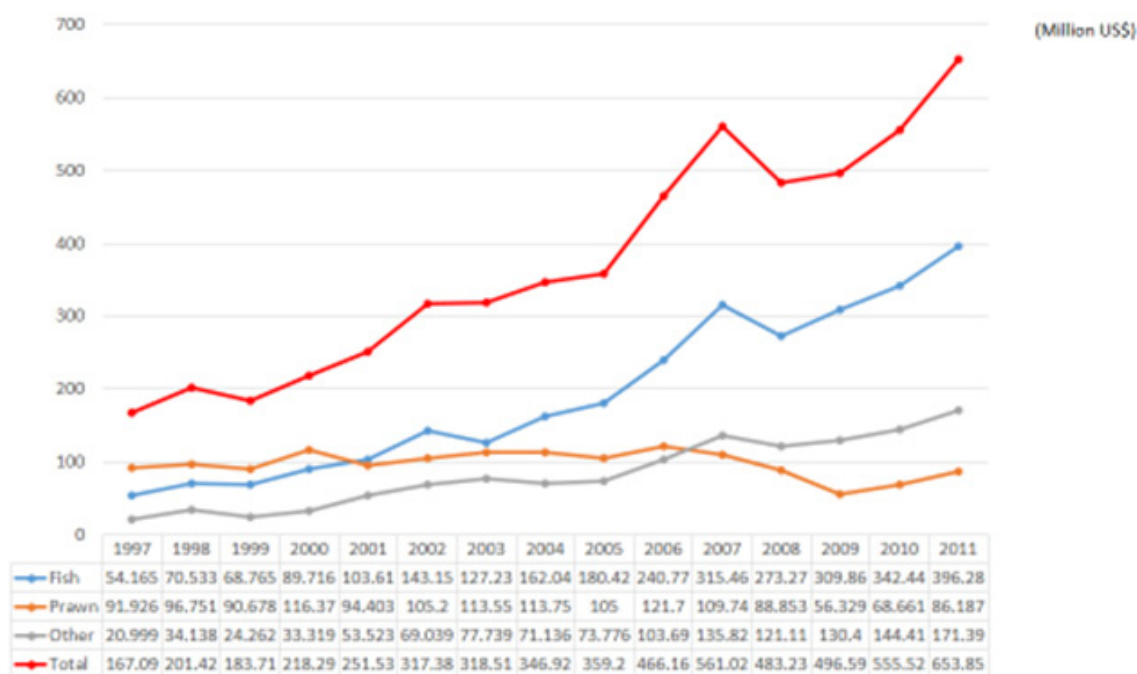
In the period of 1976-2008 the fishery trade grew significantly at an average annual rate of increase of 8.3 % (FAO 2010, States of Fisheries) in terms of value. This was due to structural changes in the nations with long distance fleets such as loss of fishing grounds, introduction of aquaculture, and its modernization for cold chains from production to consumers. In addition, increasing consumption of fishery commodities, trade liberation

policies, globalization of food transportation systems, technology innovations for quality control, and preservation has promoted international trade, not only to developed nations, but also to developing countries such as China and the Middle East. Improvements in processing and packing of prepared and preserved seafood have been significant with technology transfer occurring through on-the-job training by developed countries. The Surimi production technology transfer is one example by which Japanese industry has contributed to that of Southeast Asia. The recent developments in fishery products have been facilitated by frozen forms. However, the most recent trend in tradable products has been either chilled forms or fresh forms to meet the demands of the high quality of seafood market.

The practice of outsourcing of processing at the regional level is very significant, and its extent is dependent on species, product form, cost of labor, and quality and level of training of workers. For example, whole fish from the Japanese, European and North American markets are sent to Asia (China, India, Thailand, and Viet Nam), and companies in those countries are established as joint ventures for processing and packing with companies within the markets. However, these geographical advantages are likely to change. Nations that now experience increases in wages/income, political instability, and less accountability and transparency of contract are prone to making investments in other Asian nations such as Myanmar, which currently attracts investment. Hence, there have been complaints addressed by the companies of investing nations that the government systems, nature of contracts, and working practice are neither clear nor transparent enough to sustain long-term trustworthy business practices (author’s hearing from Japanese companies in June 2013).

In terms of product quality, freshness is a high priority for consumers and requires production sites to be closer to the fisheries so processing and packing of products can take place nearby.

Figure 6: Exported fish and fishery products in 1997-1998 to 2011-2012



Source: “Statistics of Exported Fish and fishery Products from Myanmar (2010-2011) & (2011-2012)
 * Ministry of Livestock and Fisheries, Department of Fisheries

3.2 Economic Contribution of Fish Trade

The Southeast Asian nations export to major fish-consuming nations such as Japan, the European Union, and the US. At first they exported to Japan, and gradually diversified the

markets to the EU and USA. Currently other markets, such as those in China, the Middle East, Russia, and Brazil are expanding. Those markets are expanding as income levels increase, the economies develop, and the style of dietary life becomes more borderless and international in a harmonizing of culture. Moreover, more attention is being given to health and aesthetics as the hygiene and sanitary treatment of fishery products are developed. Elements of Japanese dietary seafood culture such as sushi and tempura are now served in a locally adjusted style in each nation and some of these styles are even exported back to Japan. This means that seafood, even in raw forms, is now accepted and adapted as international cuisine.

Fish is the most heavily traded of foods and fast growing among agricultural commodities in the international markets. However, significant concerns have been raised by fisheries management experts and buyers of raw material for Surimi that fisheries management in Southeast Asia is less than adequate. None of the nations have an effective fisheries management regime with stock assessment, legislation, monitoring, and enforcement. A grave concern is the rapid depletion of marine fish production. This depletion has already been observed in the catch statistics of Thailand, the Philippines, and Indonesia. Although the production statistics aren't available for Myanmar, many professionals in the industry, the market places, and the processing and packing sector are concerned about recent decreases in the total production and shrinkage of catch sizes.

3.3 Processors for International Trade

Processors for international trade have become more integrated with producers/fishers, especially for bottom fish and tuna where the large processors are located in Asia.

In the case of large producers, catfish and shrimp have established advanced centralized processing plants to improve the product mix, to obtain better yields, and to respond to the evolving quality and safety requirements in importing countries.

In Norway and Iceland, improved processing technologies are also important for the utilization of all fish parts. For example, in different dietary cultures such as those of Africa bone and heads are appreciated, and in Spain skins are consumed. Even the stomach is a highly valued delicacy in Chinese cuisine. Furthermore, any unused portion of the fish may be utilized in water treatment, cosmetics, and for healthfood ingredients such as chondroitin and glutamic acid. Nothing may be discarded, and components may be further used for non-human applications.

3.4 Reliance of Southeast Asian Countries on Market Countries

Exports rely on the importing market, and processing technologies are heavily dependent upon the supply of services and training to developing countries. In total, 78% of fishery products are directed to the developed nations.

Owing to stagnant fishery production or the unsustainable management of domestic fisheries, developed countries are likely to depend on the import of fish and fishery products from developing nations regardless of the quality of fisheries management and aquaculture policy in those nations. However, continuous supply of fishery and aquaculture products to the market countries may not be possible because faceoff the depletion of marine capture fisheries and the unsustainability of aquaculture practices.

3.5 Sanitary and Phytosanitary Measures and Other Trade Measures

At present, the international trade measures for fishery products require high-level quality and safety-related import standards and practices. The EU has the Generalized System of

Preferences (GSP) for the special treatment of developing nations. The EU also has the EU certification on products for import to the EU Market, as well as the Catch Certificate. Health and safety standards are imposed by the EU as Good Aquaculture Practices. The Government of Thailand has adopted measures equivalent to the EU standard, known as the Good Aquaculture Practice.

In the case of Japanese buyers the requirements are higher because of consumer demands and Japan being a raw fish consuming culture. They, in particular, train the counter-part companies and joint venture partner companies for enhancing and improving the quality levels of products to meet the demands of the Japanese market.

Japan's tariff rates for fishery products are at 3.5%, but ASEAN nations already have Economic Partnership Agreements (EPAs) with the Government of Japan since around 2005, which brings the tariff to zero at the present time. The USA requires environmentally friendly fishing devices for turtle release. It also imposes higher tariffs such as anti-dumping tariffs and countervailing tariffs. Furthermore, for years the USA has also imposed a trade ban on Myanmar including fisheries products in due consideration of their policy to promote the democracy. This ban has now come to an end.

Disease Control and Early Mortality Syndrome

Shrimp and prawn aquaculture cannot escape outbreaks of disease. Early mortality syndrome (EMS) erupted 2 years ago in southern China, then came down to Vietnam and Malaysia, and now prevails in Thailand. The cause of this syndrome has not been fully elucidated nor is there any cure or treatment. At first some of the shrimp die, and gradually all of the shrimp in the pond die. Finally, rampant death spreads to all the other ponds. As the name implies, the death of shrimp occurs at the early stages of aquaculture. Vannamei shrimp may die within 20–30 days of the start of farming. There is a report that EMS may be facilitated by vibrio bacteria that exist in the seawater, but this has yet to be proven.

Ethoxyquin Residues

A major proportion of shrimp and prawn are exported to the Japanese market. The Ministry of Health, Labor and Welfare of the Japan Government have set a standard limit for chemical residues such as anti-oxides in fishmeal imported from abroad. In 2012 and 2013, shrimp and prawn containing ethoxyquin were not allowed to be imported and the Government shipped them back to India, Viet Nam, and the Philippines.

This issue of ethoxyquin was taken up at the WTO subcommittee of sanitary and phytosanitary measures. In Japan, this issue was commissioned for formal consideration and decision by the Food Safety Commission of the Japan Government in October 2012.

The limit for imported fish, including salmon, is set at 1 ppm. However, shrimp and prawn are not on the positive list and are treated as others, and subject to the strict limit of 0.01 ppm. This has caused a dispute between the exporting nations and Japan. This difference of limits between fish, and shrimp and prawn is now being challenged by the exporting nations and the buyers of trading companies in Japan.

3.6 EU Policy on Fisheries Trade-Potential Changes in Tariff and Non-tariff Barriers in Fisheries Trade: Inter-regional and Intra-regional

Certificates of the products produced in the processing facilities or aquaculture facilities are required in addition to sanitary and phytosanitary requirements that include water quality, cleanness of facilities, air-conditioning, worker hygiene, as well as entrance and exit controls and temperature controls among others. In addition, there is the catch certificate, vessel registration number, country of origin, landing place, and method of transportation among others.

The Generalized System of Preference

This is a non-reciprocal trade program that has been adopted by a number of developed countries to provide trade preference to developing countries and least developing countries. The generalized system of preference (GSP) had its formal origins in 1971 when exemptions to the most favored nations (MFN) principle were introduced under the general agreement on tariffs and trade (GATT), and later made permanent under an enabling clause, paving the way for different tariff preferences.

The EU GSP has long been the vehicle through which it extended a non-reciprocal trade preference to 176 countries and territories (Naumann and Eckart 2011).

There are some requirements for fisheries products to be treated as GSP products, such as wholly obtained from the exporting countries, and the company must be under more than 50% of ownership.

As Southeast Asian countries develop their economy they phase out of the GSP, as in the case of Malaysia. In addition, the agreement of economic partnership agreement (EPA) was reached with countries such as Thailand. These countries must also phase out of the GSP of EU.

4. FISHERIES MANAGEMENT FOR MARINE CAPTURE FISHERIES

Marine capture fisheries are heavily reliant upon natural marine resources. While the trend of global marine capture fishery production has been a decline from 2000–2009, these areas also showed a particular decline in coastal areas. The experts and scientists in SEAFDEC and FAO who examined the production and stocks share the view that the coastal areas in this region such as the Thai Bay, the coasts in the Philippines, the internal seas of Indonesia, the coasts in the southern part of Myanmar, and the South China Sea are either heavily depleted or overfished. Even the offshore areas in the region such as the Indonesian internal waters face significant overcapacity and overfishing by foreign vessels coming from Thailand. It has been concluded that the southern coastal zone of Myanmar, including the Tanintharyi Coasts, are heavily overfished by foreign vessels in this manner (FAO and SEAFDEC).

The capture fisheries of Southeast Asian nations have suffered a decline in production attributable to a lack of appropriate management measures, monitoring, as well as enforcement.

Thailand showed a significant decrease in marine capture fishery production from 2,774,000 Mt in 2000 to 1,496,000 Mt in 2009. The coastal areas are heavily depleted and habitats are industrialized, reclaimed, polluted and/or overfished.

The pressure on the catch seemingly fuels overexploitation and ecosystem degradation. The lack of appropriate management measures as well as conflicting short-term goals of production by national administrations provide further challenges to the development of sustainable fisheries in the region (FAO 2005/6 report).

4.1 Tuna

Tuna species are very important commercial fishery resources in the exclusive economic zone (EEZ) of Southeast Asian countries and the high seas. The most important species are skipjack, yellow fin, big eye, bluefin, and southern blue fin tuna. These tuna are classified as the oceanic tuna that migrate to off-shore areas and are targeted by the relatively bigger fishing boats and by the vessels of long distance fleets from countries such as Japan, Taiwan, Korea, China, and the US. The other tuna migrate to coastal zones and include:

frigate tuna, bullet tuna, long tail tuna, and kawakawa among others. These tuna are classified as neritic or coastal tuna, and are important species for coastal fishing and for the small-scale fisheries in those nations.

Although the oceanic tuna such as bluefin, southern bluefin, and big eye are of high value for serving as sushi and sashimi in the world markets, and in particular in Japan, neritic tuna prices are also high. Frigate tuna and kawakawa, as canned products for the European markets, are highly regarded.

In the Sulu Sea and the Celebes Sea there are plenty of fish aggregating devices (FADs), firmly attached to the bottoms of those seas at a depth of 1000 meters (SEAFDEC survey 2010). At a sighting survey of FADs in the Sulu Sea by a SEAFDEC research vessel, 500~700 FADs were detected in that narrow semi-closed sea. Such areas are very good fishing grounds not only for oceanic tuna but also for neritic tunas. FADs are effective for attracting fish.

There are significant concerns, however, over the health of tuna stocks. In particular, FADs attract juvenile tuna that are caught in purse seine nets in bulk, which is construed as bad practice for the sustainable management of tuna and tuna-like species.

If juvenile tunas continue to be caught in large numbers by purse seiners, the future of tuna stocks are subject to depletion/overexploitation causing bankruptcy of the fishing industries in the Philippines, Malaysia, Thailand, Viet Nam and Indonesia.

This matter of concern should attract the attention of member nations. It is of prime importance to have the attention of high-level government officials and politicians to adopt policies to take immediate action to protect these species not only at the national level but also at the ASEAN ministerial level.

There have been no management measures taken by the respective Southeast Asian countries for oceanic tuna, or even for the neritic tuna that migrate in the EEZ of each nation. Hence none of the nations adopt appropriate management measures. There is a need to strengthen the capacity of human resources for stock assessment. At present, human resources as well as physical capacities such as research vessels to collect data are far from adequate.

Effective management should include the setting up of regional organizations for semi-enclosed areas surrounded by various countries. Lack of cooperation is a fundamental obstacle to taking any action to prevent depletion of tuna stocks.

Emphasis should be placed on the effective demarcation of the western central Pacific fisheries convention, which governs the oceanic tuna separate from one the Southeast Asian countries that and their neritic tuna.

4.2 Surimi Fisheries or Trawl Fisheries in the Region

This product was first made by Japanese technology for immediate use in 'Kamaboko' or fish cake. Surimi is an intermediate product made from minced fish meat. This surimi was made of Alaskan pollack by the Japanese fleets in the 1960s to fully utilize the stocks that were otherwise useless. Technology was later introduced by Japan to other nations. Kamaboko currently has the status of a popular international seafood and is appreciated as a healthy and aesthetic food for consumers around the world. One of the hit commodities is imitation king crab leg-meat. The rapid growth of surimi industry in Southeast Asian countries has impacted the demand of surimi producers (2007 SEAFDEC report).

Surimi Production in the Southeast Asia

The production of surimi in Thailand, Malaysia, Viet Nam, Myanmar, and Indonesia is primarily based on demersal species such as threadfin bream (*Nemipterus* spp), big eye

(Priacanthus spp) and lizardfish (Saurida spp), since they are most abundant raw materials found in the region.

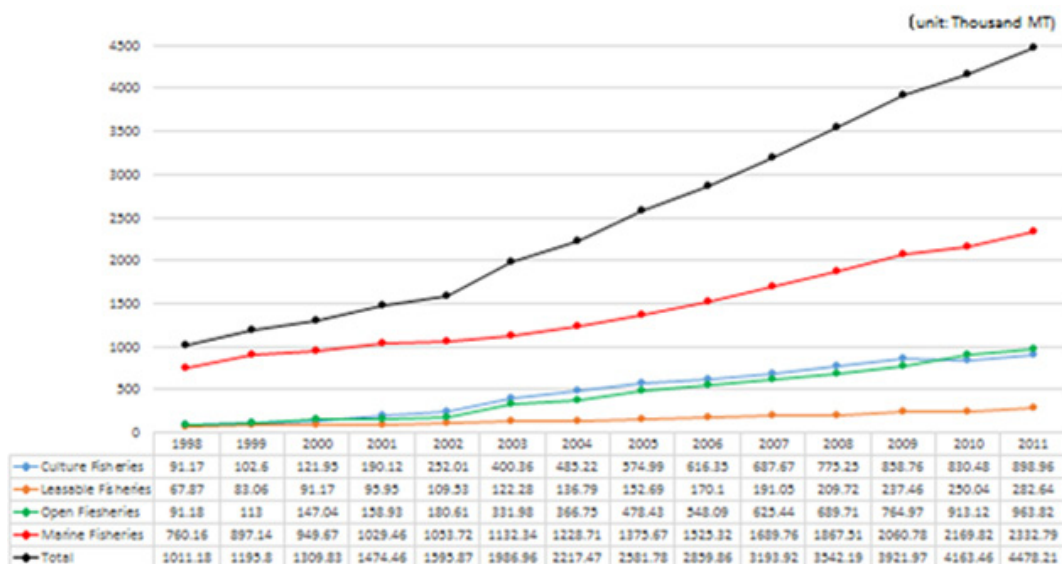
Thailand started surimi production in 1978 and increased its production to

65,000 tons by 1994, and to 150,000 by 2005. Until 2005 the production and export of surimi expanded annually. Production of surimi from the catches of the Thai fishing fleet operating mainly in Indonesian waters was phased out by the strict control of licensing and enforcement. Thai operations in the southern part of Myanmar are currently neither controlled nor licensed well. The domestic production of Thailand had already demonstrated a decline by the 1990s. Thailand should have taken earlier action to recover the resources of their own waters but did not. Instead, they refocused their extra fishing efforts on other countries rather than recover their own depleted stocks along the coasts of the Bay of Thailand and the Malay Peninsula.

Myanmar’s Overfishing

Myanmar fishery production is rapidly growing. The total production by Myanmar was 1.47 million MT in 2002 and 4.47 million MT in 2012. Marine Capture fisheries have also grown progressively from 1.03 million MT in 2002 to 2.33 million MT in 2012 (Fishery Statistics 2012, Department of Fisheries, Ministry of livestock and Fisheries). But it is unacceptable that the statistics available on marine capture fisheries is limited to total catches, with no species by species breakdown by the vessel size, by species, or by area. Therefore, this data is unusable for scientific assessment and management. It is an urgent high priority to tackle these fundamental problems; otherwise the health of fish stocks in Myanmar’s EEZ fisheries cannot be determined. It appears, however, from the fish landed that there is a decrease and depletion of many of demersal stocks.

Figure 7: Fishery production



Source: “Fishery Statistics (2007-2008)” and “Fishery Statistics 2012”
The Republic of the Union of Myanmar Ministry of Livestock and Fisheries, Department of Fisheries

According to the survey result of the marine fisheries (p.57 Fishery Statistics 2012, Department of Fisheries), it was noted that the maximum sustainable yield is 1.05 million Mt. This survey estimate covers the region between the 200-meter depth area and the coastal line. As it is assumed that the current production of 2.3 million Mt caught by Myanmar’s vessels as well as licensed vessels is from the area up to 200-meter depth from the coast, the present catch level appears to represent serious overexploitation of resources.

4.3 Country's Target for Food Security

This issue relates to Indonesia and Thailand, among others, regarding whether future fishery production is sustainable or not. Southeast Asian countries have insufficient fishery management (SEAFDEC and FAO), and most of the fisheries resources are overexploited or depleted. As aquaculture production at sea and at intensive inland sites expands, however, there are increasing problems coming from over-use or over-capacity.

The environment for aquaculture deteriorates after use for several years, and diseases can be triggered by factors that may be attributable to complex issues including environment degradation. However, many countries still seem to be expanding production. They must, therefore, introduce more science-based sustainable targets of production. Indonesia will soon experience a downward trend in marine capture fisheries because of over-exploitation and lack of sustainable management.

While Indonesia still has land available to expand marine, brackish, as well as inland aquaculture, in the long term aquaculture production needs to be targeted for future sustainability and food security.

In the case of Thailand, a scientifically grounded individual quota system must be introduced and implemented; otherwise Thailand's fisheries will have a devastating outcome. Aquaculture in Thailand may require the long-term use of lands for aquaculture as well as the use of trash fish. A holistic scheme should be planned for sustainability and food security.

The case of Niigata prefecture's individual quota on sweet shrimp could be used as a 'Model Case' for Asian countries regarding leadership style and communications involving all the key stakeholders including fishers, processors, and officers in the prefecture. The leadership by the governor is a workable example for implementation in the face of difficulties due to resistance from vested interest groups, within an Asian context.

4.4 Climate Change Implications for Fisheries

Recently, rising concern for climate change means that the fisheries sector must respond to innovate and reconsider the fishing gear used for the sake of fuel efficiency, instead of drawing trawl nets for long hours. Moreover, as the price of fuel oil increases, more effective use of fishing gear and reform of the operational pattern of fisheries is also needed.

The global effect of climate change has caused alarm in many areas. The fisheries sector is among the most vulnerable. CO₂ emission directly causes a decrease of ocean pH leading to ocean acidification and the rise of water temperature. Both of these effects can change the ocean ecosystem including the habitats and behavior of fish and fisheries resources. Although efforts have been to elucidate the effects of climate changes in the ocean, much remains unknown. The overall conclusion, however, is that it will lead to a reduction in fisheries production. In tropical areas the temperature rise will bring more fish to the higher latitudes, and the primary production of phytoplankton will decrease. Thereafter production of the higher ecological niches, including fisheries resources, will be reduced. There are models to analyze the future production of some fish, such as salmon and saury. They become smaller in size and weight, lessening production. Moreover, acidification will damage the coral reefs and demolish ecosystems including nursery areas. It is necessary, however, to elucidate the specific effect of climate change in the oceans specific to the Southeast Asian countries. Aquaculture is also vulnerable because rising temperature affects ponds and intensive facilities, which are usually located in shallower waters. In addition, the recent problem of EMS is said to be induced by higher water temperature. Hence, the waters in aquaculture areas are quick to respond to the climate change.

5. POTENTIAL TECHNICAL AND FINANCIAL ASSISTANCE FROM DEVELOPMENT BANKS AND GOVERNMENTS

The Japan international cooperation agency (JICA) extended technical assistance and development and research cooperation grant aid to fisheries areas. This grant aid was also extended to ASEAN nations. But as income level increased such assistance and cooperation was phased out of ASEAN nations. Myanmar is now eligible as one of the priority nations for official development aid (ODA).

Japan's criteria for aid are whether the recipient nations have a policy of sustainable management and are cooperating in the international or regional management organizations.

The US now provides assistance through SEAFDEC to manage fisheries resources, with a view to prioritizing what ASEAN considers SEAFDEC to be. SEAFDEC is the only regional fisheries organization for assessment and enlightening member nations and ASEAN. Its responsibilities should be extended to cover the rising needs of priority areas such as national policy formulation and management, something SEAFDEC does not currently have a mandate for.

There are some impediments to in potential assistance. Japanese, European and US business corporations or enterprises may not extend assistance to small-scale processing or packing facilities. In addition, small businesses may be outside of the focal points of business. Such small businesses should be supported instead by the ODA and public credit organizations.

Finally, as the requirements for sanitation and health as well as quality become increasingly higher to obtain the certificate of standards of the EU, financial assistance for those countries in need is of a vital importance.

6. CONCLUSIONS

Southeast Asian countries have both different and diversified characteristics in capture fisheries and aquaculture. However, the overall similarity of their challenges in the fisheries sector is recognized as follows:

1. In terms of fisheries sector administration it is clear that capacity building is urgently needed. There is a lack of human resources: specialists and experts in fisheries management, in laws and regulations for rule-making, in scientific assessment and enforcement in the areas of quality control, international trade, distribution and transportation, and processing and storing. There is also a lack of economic analysts.

To address these limitations, institutions should be established for professional training and education with fundamental and practical core courses. There should also be courses in leadership for adaptive change. Such institutions should also have schools aimed at the workers level, with practical training to educate skilled workers on fishing vessels as captain/fishing masters, and workers at the processing facilities and industrial aquaculture ponds.

2. The principles of sustainability for capture fisheries and aquaculture have been addressed in all of the Southeast Asian nations. However none of the countries have yet adopted effective management measures with specific provisions: even monitoring, surveillance, and enforcement were weak. Moreover, science-based quotas have not been introduced in any of the countries, although the importance of right-based management is recognized. Experts in FAO and SEAFDEC, among others, have stressed that effective management measures need to be introduced

and implemented. The governments should address a holistic national policy to ensure the sustainability of both fisheries and aquaculture on scientific grounds.

3. Experience in Niigata prefecture with right-based fisheries management can be used to introduce and implement a similar policy in Southeast Asian countries, whose fisheries are likely to resemble those of Japanese rural areas where fishers have strong political power. These similarities will be a good basis for the planning of individual transferable quotas/individual quotas in this region. The experience in Niigata can be broken down into two parts: the governor's leadership for adaptive change, and the planning and implementation of right-based management.
4. In addition to human resources infrastructure for fisheries activities is also fundamentally scarce, namely landing locations, paved streets for transportation, fishing vessels, water supply, and electricity.
5. Financial assistance to the fishers, aquaculturists and fishery processors are not available from official financial institutions, while private arrangements for loans come with disadvantageous conditions, and are beyond the capacity of those who intend to modernize and innovate their business. Small scale fishers, community based fishers, aquaculture farmers, and processors should be given an opportunity to learn transfer of technology and innovation for business by official development assistance, extended to them by governments or development banks.
6. International trade is of prime importance for fisheries and aquaculture in this region. Therefore, the sanitary and phytosanitary measures such as limiting ethoxyquin residues, eradication or mitigation and long-term treatment of diseases, and sustainable aquaculture are heavy challenges for Southeast Asian countries. The use of trash fish for feeding should be explored as healthier and sustainable development of coastal fisheries and aquaculture progresses.

Summary of Constraints and Problems of Fisheries Policies in Selected Countries

Country	Constraints and Problems
Indonesia	<ul style="list-style-type: none"> ● Overfishing in both marine and inland fishery waters ● Weak practical fisheries management, particularly concerning monitoring, surveillance, and enforcement ● Lack of financial support in terms of credit.
Thailand	The Fisheries Act, amended in 1953 and 1985, is the principal legislative instrument. Currently there is a motion for a further amendment for strict resource-based management to be introduced in two years, but industries are opposed. 'Hearing from Department of Fisheries by Dr. Komatsu.'
Philippines	<ul style="list-style-type: none"> ● The Philippines Fisheries Code (Republic Act 8550) was adopted but there are problems of open access, overfishing, and lack of management ● Inadequacy of technical and human resource capabilities, particularly among managers
Viet Nam	<ul style="list-style-type: none"> ● The investigation and assessment of aquatic resources is done with low efficiency and improper methods. Data is not strong enough for management and protection of resources ● Despite the Fisheries Law of 2003, implementation and control is very difficult ● Over-capitalization for increasing number of vessels ● Disease control of aquaculture is not sufficient
Myanmar	<ul style="list-style-type: none"> ● Lack of scientific data and legislation to support management of aquatic resources ● Overexploitation of marine resources: 1.05 million Mt (0–200M depth) versus production of 2.3 million Mt (all ocean) ● Difficulty in control and enforcement ● Lack of infrastructure for aquaculture and processing ● Lack of human resources: managers, experts, scientists, and enforcement officers
Malaysia	<ul style="list-style-type: none"> ● Sustainable development should be reinforced ● Human resources in fisheries areas are inadequate

Source: Dutch Institute of Economy and Agriculture, FAO, SEAFDEC, and Hearing by Dr. Komatsu of the Government of Thailand and the Government of Myanmar.

7. RECOMMENDATIONS

The key policy implications on the most pressing issues for each country are:

1. The sustainable management of both fisheries and aquaculture through the science-based formulation of national policies. In order to do so, capacity building of human resources will be most pressing for the Southeast Asian countries. There should be an interdependency of hardware and software to achieve sustainability and formulate a holistic national policy on fisheries and aquaculture.
2. To establish fisheries high schools or training centers to provide practical skills

related to fishing gear, oceanography, processing, quality control, and trading business for those who may serve as working-level leaders.

3. To establish college/graduate schools to provide professional levels of education in advanced management, science, and administration to qualify those that will become the high-level scientists, experts, economists, and government officials that serve in the future at senior levels.
4. The building and equipping of the institutions/schools, enforcement vessels, and aircrafts should be provided in the form of ODA by donor nations including Japan.

The establishment of an institution to exercise the functions of research and scientific assessment of stocks together with providing education and training for scientists. Experts and advisors in advanced nations should cooperate to provide their expertise in the areas of scientific assessment, data collection, monitoring, and enforcement.

5. Assistance in collaborating with the international organizations and the advanced governments to assist the Southeast Asian governments to formulate national policy with due attention to sustainability and climate change.
6. To introduce safe, healthy, and accountable products for both domestic consumption and international trade. The introduction of guidelines for sanitary and phytosanitary regulation to meet consumer standards in the market nations is the key to sustainable international trade. The market nations should harmonize trade and take sanitary and phytosanitary measures including limiting chemical residues such as ethoxyquin. The market nations should provide transparent international trade policies and practice guidelines.
7. Exporting nations should take the appropriate measures to elucidate the causes of diseases and to eradicate them.
8. International special organizations should cooperate for the eradication and remedy of diseases of fisheries products. ASEAN nations need to cooperate with the relevant international organizations and the competent agencies to initiate global reviews of the causes and treatment to enable the permanent and sustainable use of the aquaculture ponds.
9. The infrastructure is of vital importance for the orderly development of fisheries, aquaculture, and fishery processing industries. Such infrastructure may include, among others, landing facility, storage, paved transportation roads, water supply, sledges, and electricity as well as the equipment and material for the construction of plants, freezers, refrigerators and packing machinery.
10. Introduction of the cold chain is of vital necessity. Such a cold chain should include fishing boats, transportation boats, and landing sites as well as the distribution tracks, storing freezers and packing facilities. The cold chain should connect the landing site and packing facilities/exporter to the air/fishing ports. The airports must have storage facilities to keep produce prior to departure.
11. Since there is a lack of available and reliable funding to renovate vessels and to expand the seafood business to meet the requirements of the international and domestic consumers, funding should be made available at a low interest rate and for longer terms. To facilitate the creation and establishment of such loans, funds should be provided by either governments or international development banks such as the ADB. Funding bodies should be encouraged to provide information seeking and sharing seminars or to assist those organizations such

as SEFDEC to organize them regularly on sustainable fisheries, aquaculture, and trade. There should also be regular reviews and updates of information on market country policies and market trends in the EU, Japan and the US. This may facilitate the appropriate business decisions of export companies.

12. Further special study should be encouraged to follow up this current study. Those areas of the study should include: the importance and contribution of the workforce of the fisheries to the national economy and employment opportunities; the magnitude of the seafood industry sectors including fisheries, processors, wholesalers, middlemen, retailers, and restaurants, among others, in the respective nations; and close and detailed examination of national legislation regarding fisheries and aquaculture with a views to the provision of sustainable management. Pacific islands nations need special study too.

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REFERENCES

- Government of Thailand, Department of Fisheries and Cooperatives. *Thailand's Good Aquaculture Practice (GAP) (TAS 7401-2009) for Shrimp Farming Based on FAO guidelines on Aquaculture Certification.*
- SEAFDEC Secretariat. 2012. *Annual Report.*
- Government of the Republic of the Union of Myanmar, Ministry of Livestock and Fisheries. 2012. *Fishery Statistics.* November 1.
- Government of the Republic of the Union of Myanmar, Ministry of Livestock and Fisheries, Department of Fisheries. 2010-2011; 2011-2012. *Statistics of Exported Fish and Fishery Products.*
- Compiled for CBI by LEI Wageningen UR. 2012. *The Vietnamese Seafood Sector: a Value Chain Analysis.*
- Compiled for CBI by LEI Wageningen UR. 2012. *The Indonesian Seafood Sector: a Value Chain Analysis.*
- Compiled for CBI by LEI, Part of Wageningen UR. 2002. *The Philippine Seafood Sector: a Value Chain Analysis.*
- SEAFDEC Secretariat. 2013. *Regional Cooperation on Sustainable Tuna Fisheries Management in the Southeast Asian Waters.* 1-5 April.
- Pandgsorn, Laong-Manee, and Siriraksophon. *Trend of SURIMI Raw Materials in Southeast Asia.*
- SEAFDEC Secretariat. 2012. *Fishery Statistical Bulletin.* June.
- FAO. 2012. *The State of World Fisheries and Aquaculture.* Rome.
- FAO, Asia-Pacific Commission. *Asian Fisheries Today: the Production and Use of Low Value/Trash Fish from Marine Fisheries in the Asia-Pacific Region.*
- SEAFDEC Secretariat. 2012. *The Southeast Asia State of Fisheries and Aquaculture.*
- M. Aung-Thwin and M. Aung-Thwin Reaktion. 2012. *A History of Myanmar since ancient times.* Tradition and Transformation Books.