

# Maximizing the Utilization of Fish Catch for Human Consumption

Goh Kian Heng and Tan-Low Lai Kim

This article highlights the R&D activities of SEAFDEC Marine Fisheries Research Department based in Singapore, on the utilization of low-value marine and freshwater fish catch for the production of surimi and fish jelly products, a breakthrough that could enhance the growth of the surimi industry in the Southeast Asian region.

Small-scale fish trawlers operating in the Southeast Asian region normally catch substantial amounts of fishes that are sorted onboard the vessels into high economic-value species and other species. The latter comprise a significant portion of small demersal fishes also known as “trash fish” that are generally discarded as they are not mostly used for human consumption or are turned into feeds for livestock and cultured fishes. Even while the region’s fish stocks are reported to be over-exploited, the region’s trash fish production or discards in 2005 was estimated to be about 1.056 million mt or about 10% of the region’s total marine fish catch (10.785 million mt) during that year (SEAFDEC, 2008). On the other hand, according to APFIC (2005) the world’s production in 2003 has been reduced by 24% (or about 32 million mt) to fish meal and other non-food uses, although not much information is available on how much

trash fish is presently used in the Asia-Pacific region. Among the reasons for the low discards in the Southeast Asian region include the fact that in many countries trash fish is still used for direct human consumption such as in Indonesia and the Philippines, and that some discards are no longer thrown away as these are sold at good prices to fish meal processing plants as in the case of Thailand. In Vietnam, it has been reported that fishers prefer to catch low-value fish for commercial purposes rather than target the high economic-value fish with large portion of low-value fish as by-catch.

While the region’s fish catch has been reported to be dwindling, the demand for fish is expected to increase. In 2006 for example, fish production from the Southeast Asian countries from capture and aquaculture was about 24,000,000 mt of which about 15,000,000 mt or about 63% was consumed (**Table 1**), while 18% was exported and the remaining 19% for other uses including the manufacture of non-food products.

As the region’s population is expected to grow and the demand for fish would continue to increase, there is a need to prevent potential future shortage in fish supply considering that the peoples in the region are fish-loving, thus, the maximum utilization of the fish catch should be assured. This effort is also expected to help improve

**Table 1.** Total fish production and consumption in Southeast Asia (2006)

Countries	2006 Population (millions) <sup>1</sup>	Per Capita Fish Consumption <sup>2</sup> (kg/person/year)	2006 Fish Consumption (mt)	2006 Fish Production <sup>3</sup> (mt)	2006 Fish Export <sup>3</sup> (mt)
Brunei Darussalam	0.4	36.1	14,440	3,100	736
Cambodia	14.1	23.4	329,940	532,700	48,868
Indonesia	225.5	20.9	4,712,950	6,989,033	884,954
Lao PDR	6.1	28.6	174,460	107,800	-
Malaysia	26.9	55.4	1,490,260	1,498,732	253,154
Myanmar	51.0	24.2	1,234,200	2,581,780	271,071
Philippines	86.3	31.7	2,735,710	4,414,310	171,071
Singapore	4.5	37.9	170,550	11,676	97,009
Thailand	65.2	32.6	2,125,520	4,162,096	1,700,160
Vietnam	84.2	25.4	2,138,680	3,647,627	830,826
<b>Southeast Asia’s Total</b>	<b>564.2</b>	<b>26.8</b>	<b>15,126,670</b>	<b>23,948,854</b>	<b>4,257,849</b>
<b>World Total</b>	<b>6,555.0</b>	<b>16.4</b>	<b>107,502,000</b>	<b>159,897,138</b>	

**Sources**

1 World Population Data Sheet, Population Reference Bureau, Washington DC, USA

2 Annual Average of Annual Per Capita Consumption of Fish and Shellfish for Human Food: 2003-2005 Average (estimated live weight equivalent), NOAA, USA (Sourced from Food and Agriculture Organization of the United Nations)

3 Source: FAO FishStat Plus 2008

the socio-economic conditions of the small-scale fishers through increased incomes, and at the same time ensure their food security.

In the Southeast Asian region, the volume of low-value fish catch depends on the fishing season, the fishing grounds and the fishers' efforts in sorting the catch. Low-value fishes are grouped into deteriorating quality unsuitable for human consumption which are used to produce feeds and low-value small-sized fish which are acceptable for human food. The quality of the fish usually deteriorates because of poor methods and unavailability of facilities for preserving fish while onboard the vessels and the long period spent at sea. On the other hand, trash fish that could be used for human consumption are produced by fishermen on short fishing trips (e.g., 1-2 days).

In order to address the concerns of maximizing the utilization of fish catch, the SEAFDEC Marine Fisheries Research Department (MFRD) conducted a project from 2002 to 2005, on maximizing the utilization of fish catch from both marine and freshwater environments under the ASEAN-SEAFDEC Special Five-Year Program. This was an offshoot of the 2001 ASEAN-SEAFDEC Conference on Sustainable Fisheries for Food Security in the New Millennium which put much emphasis on the maximum fish utilization and reduction of wastage from fisheries post-harvest. Thus, MFRD has since then conducted post-harvest projects on small pelagic marine and freshwater fish species in the region to maximize their utilization. In carrying out the project activities, MFRD collaborated with the National Center for Quality Control and Product Development (NCQC) of Indonesia to examine the utilization of small pelagic fish species, and with the Fisheries Administration (FiA) of Cambodia for the utilization of freshwater fish catch from the Tonle Sap Great Lake.

## Maximum Utilization of Small Pelagic Marine Species

The maximum utilization of small demersal fishes for human consumption has been promoted through the production of



fish jelly products such as fish balls and cakes are highly popular traditional products in the Southeast Asian region. This was through the R&D activities of MFRD on the development of frozen surimi (raw materials for making of fish jelly products) and fish jelly products from small demersal fish species or trawl by-catch which include the big eye snapper (*Priacanthus* spp.), threadfin bream (*Nemipterus* spp.), lizardfish (*Saurida* spp.), etc. (Siriporn, 2007 and 2007a).

Besides utilizing small demersal fish species for value-addition, MFRD also conducted R&D activities on utilization of small pelagic fish species, which are often regarded as low economic value fish due to its poor consumer preference and often for its poor quality due to improper handling by fishers onboard the vessels and on-shore processing. As such, small pelagic fish species are under-utilized and most of the time the fish species end up as post-harvest losses.

Table 2. Capture production of major small pelagic species in Southeast Asia by ISSCAAP groups (2005)

Small pelagic fishes for production of surimi-based products	ISSCAAP Groups	Family	Scientific Name	2005 Production (mt)
Round scads	Jacks, mullets, sauries, etc.	Carangidae	<i>Decapterus</i> spp.	743,327
Selar scads	Jacks, mullets, sauries, etc.	Carangidae	<i>Alepes</i> spp.	348,525
Indian mackerels	Mackerels	Scombridae	<i>Rastrelliger kanagurta</i>	483,306
Indo-Pacific mackerel	Mackerels	Scombridae	<i>Rastrelliger brachysoma</i>	236,479

### Remarks

1 ISSCAAP - International Standard Statistical Classification of Aquatic Animals and Plants

**Table 2** shows the 2005 landing data of small pelagic fish species in the region (SEAFDEC, 2008), indicating that the round scads (*Decapterus* spp.) formed the largest catch from the jacks, mullets and sauries group at 743,327 mt, forming the largest catch from the jacks group. Another major group of species landed was the mackerels group, with the Indian mackerels (*Rastrelliger kanagurta*) at 483,306 mt and the Indo Pacific mackerels (*Rastrelliger brachysoma*) at 236,479 mt, contributing 61% and 30% of the total catch of the mackerel group, respectively. The project therefore targeted on scads and the mackerels for the production of surimi-based products (Goh and Yeap, 2005). The result was an array of value-added products ranging from snack food to surimi-based products which have been promoted in many countries in the region (MFRD, 2006).

MFRD has successfully processed the round scad into pelagic fish surimi for further processing into surimi-based products. The value-added products made from the pelagic surimi included the comminuted products such as chikuwa, fish sausage, fish nuggets, and fish cookies (using vacuum drying techniques for the processing of fish cookies). The products made from the mackerel groups include the fish floss and dried sweet meat. The latter is a form of Chinese New Year snacks popularly known in Singapore and Malaysia as “bah kwa” and in Indonesia as “dendeng”, which were conventionally made from meat of land animals such as beef, chicken or pork.

The trials conducted to produce surimi from pelagic fish species made use of the alkaline leaching method. Although the surimi produced may not possess superior gel strength, it provides the fish jelly products processors an alternative to incorporate different grades of surimi to their products to serve as cost reduction factor and at the same time be able to stabilize the availability of raw materials to the fish jelly products industry.

### Maximum Utilization of Low-value Freshwater Fish Species

The project activity was conducted in Cambodia with the collaboration of its FiA. Although Cambodia ranked fifth in production from inland capture fisheries after China, Bangladesh, India, and Myanmar, with its catch of 422,000 mt in 2006 (FAO, 2008), the Tonle Sap Great Lake in Cambodia has the world’s largest floodplain which increases and decreases in size from 3,000 km<sup>2</sup> at the peak of the dry season in May to 12000 km<sup>2</sup> in the wet season in October. Moreover, it has also been reported that there are more than 3.5 million people or more than 25% of the country’s total population living around the Tonle Sap

Great Lake and depending on freshwater fisheries for their livelihoods.

Considering that three species which are abundant in the Great Lake, are considered as low-value and under-utilized, namely: the featherback fish (*Notopterus* spp.), snakehead fish (*Channa* spp.) and soldier river barbs (*Cyclocheilichthys enplos*), these were used as the target species of the project activity. Thus, MFRD conducted experimental studies to develop a new range of value-added fish products from under-utilized freshwater fish resources, which are acceptable to the palate of the Southeast Asian people. This activity was also envisaged to promote the conversion of under-utilized freshwater fish species for human consumption as well as to develop value-added products that could be exploited to improve the socio-economic conditions of the people who are dependent on freshwater fisheries.

During the product development, the featherback fish and snakehead were used to produce fish bah kwa, fish cracker, fish siew mai, and fish tofu. For the soldier river barbs, these were used to produce snacks products such as fish “murukku” and fish satay. “Murukku” is originally a South Indian vegetarian snack product made from dhal flour and spices, formed into noodle-like strands and deep fried to form a crispy product (MFRD, 2005). In fish “murukku” the minced fish meat of soldier barb was used as a substitute for the dhal flour in the mixture that included the other spices.

Moreover, fish satay was also produced from the soldier barbs. Fish satay is a popular dried seasoned fish snack commonly made from small demersal marine fishes. For the freshwater fish species, the soldier river barbs served as good substitutes for the marine fishes.

### Way Forward

MFRD continues to conduct regional training courses in fish processing for government officials, fish technologists



The publications produced by MFRD on Maximizing Utilization of Fish Catch for marine and freshwater species

and commercial processors from Southeast Asia, on the technologies in utilizing the abundance of low market value fish resources for the production of frozen surimi, fish jelly products and other value-added products. With technological approach, MFRD is able to develop fishery products from low-value small demersal and pelagic fish species as well as under-utilized freshwater fishes, and transfer the technology to the ASEAN countries. The approach towards value addition is an effort to create awareness in maximizing the utilization of fish catch to address the issue on sustainable fisheries. Thus, the utilization of such species would not only contribute towards food security for the peoples of the region but also to the national economies of the ASEAN countries.

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### About the Authors

**Mr. Goh Kian Heng** is a Technical Officer of the SEAFDEC Marine Fisheries Research Department based in Singapore. He presented a paper on Maximizing Utilization of Fish Catch for Human Consumption - Small Pelagic Marine Fish Species and Freshwater Fish Species during the ASEAN-SEAFDEC Regional Technical Consultation on Small-Scale Fisheries in Southeast Asia, 29 April-2 May 2008 in Bangkok, Thailand, from which this article was based.

**Ms. Tan-Low Lai Kim** is the Chief of the SEAFDEC Marine Fisheries Research Department, 2 Perahu Road, Singapore 718915.

