REGIONAL REVIEW ON MARINE AQUACULTURE PRODUCTS DEMAND, TRADE AND MARKETS*

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Over the past few years there were tremendous developments in the seafood markets in this region. The most significant changes took place in the retail sector where more varieties of fish are being sold in the markets which are both locally produced or imported; innovative presentations and product forms (whole, gutted, steak, fillet, breaded, frozen, dried, canned, ready-to-eat, preserved etc.); more affordable in terms of prices (even imported products such as salmon and cod are getting cheaper); better quality; and more western style seafood products are available these days (fish burger, sandwich, breaded products, white meat fish fillet, fish & chip etc.).

Under this fast changing scenario particularly in Southeast and Far East Asian countries, aquaculture sector plays an increasingly important role in providing more supplies at affordable or lower prices. We all know that Asia is the largest producer of cultured fish and being a large consumer of seafood, the role of this sector in this part of the world is more important than in other regions. With this backdrop, this paper will review the market trends for fishery products in the region with special focus on marine aquaculture products.

1. GLOBAL DEMAND TRENDS

As a result of population growth and socio-economic developments, global demand for fish and fishery products has continued to grow at the rate of 4.3% per year for the past two decades. Global food fish supply (for human consumption) increased from around 53.4 million MT (Metric Tons) in 1981 to more than 104 million MT in 2003, resulting in an increase in the average per capita fish consumption (apparent consumption) from 11.8 kg to around 16.5 kg during that period. Demand for fishery products is expected to remain strong in the future and the average apparent fish consumption is expected to reach around 18.4 kg/caput/year by 2010 and 19.1 kg/caput by 2015 (FAO).

Table 1: Global Projection for Fish Consumption (kg/caput)

Group	1961/1965	1981/1985	1991/1995	2001	2010*	2015*
Finfish	8.2	9.9	10.6	12.1	13.7	14.3
Others	1.3	2.2	3.2	4.2	4.7	4.8
Total	**9.5**	**12.1**	**13.8**	**16.3**	**18.4**	**19.1**

*Source: FAO. * Projection.*

From the total of more than 104 million MT of fish used for human consumption in 2003, fresh/chilled fish products were most preferred by consumers. More than 52.1% of the total food fish supply was sold in this form. Frozen fish products came second accounting for around 26.9%, followed by canned (11.5%) and cured fish including salted products (9.4%).

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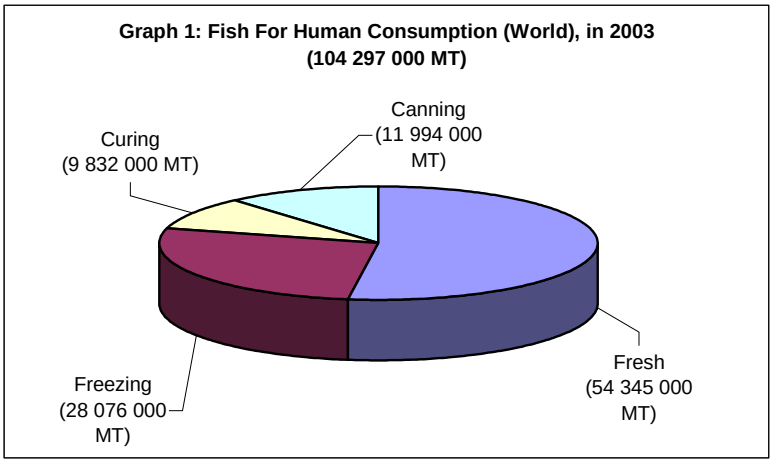
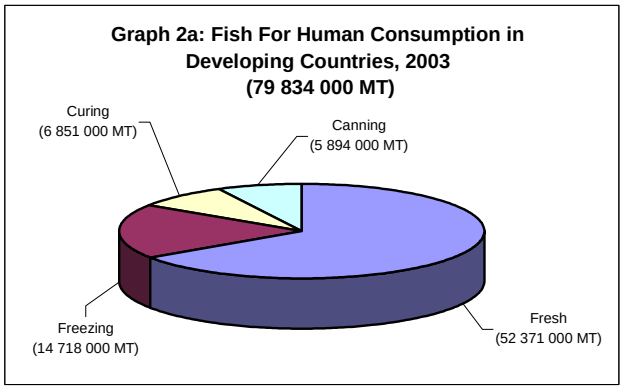
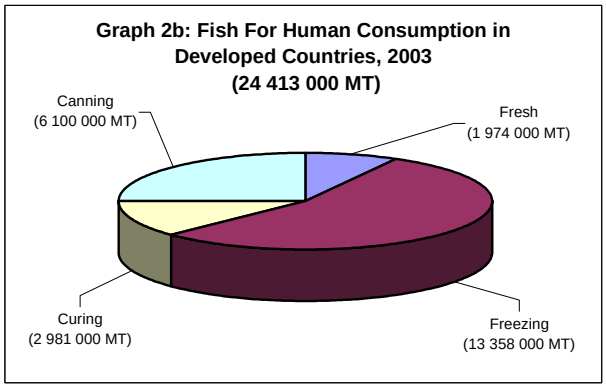


Source: FAO.

There is, however, a big different in fish consumption patterns between developed and developing countries. In developed markets the large proportion (54.7%) of fish products was sold in frozen forms, followed by canned (25.7%) and cured (12.2%) and the rest was fresh fish (6.2%). In contrast, in developing countries, around 65.6% of fish for human consumption was sold in fresh form, followed by frozen products (18.4%), cured products (8.6%) and canned fish (7.4%).





By species groups, freshwater and diadromous fish were the main species group widely consumed species and their contribution to per caput apparent consumption increased from 1.6 kg in early 60s to 4.7 kg in 2001. This was mainly due to the increase in supply from aquaculture sector. Similarly, the contribution of crustacean and molluscs also increased largely because of the fast growing production from aquaculture sector.

However, contribution of marine demersal and pelagic fishes have been dwindling due to the declining fish stocks in many parts of the world.

Table 2: Global Per Caput Apparent Fish Consumption (supply) by Main Species Groups (kg/caput)

Group	1961/1965	1981/1985	1991/1995	2001
Freshwater & diadromous	1.6	2.1	3.2	4.7
Demersal	2.9	3.3	2.9	2.9
Pelagic	2.6	3.1	2.9	3.0
Other marine (unspecified)	1.1	1.4	1.6	1.5
Crustacean	0.5	0.8	1.1	1.5
Molluscs	0.6	1.1	1.6	2.1
Cephalopods	0.2	0.3	0.4	0.5
Other aquatic animal	0	0	0.1	0.1
Total	**9.5**	**12.1**	**13.8**	**16.3**

Source: FAO

2. DEMAND TRENDS IN MAJOR MARKETS

Demand for fishery products have been growing steadily in major markets namely in the US and EU markets but somewhat stagnant in the Japanese market. Demand for cultured species like shrimp, tilapia and catfish are growing faster particularly in the US market.

Per capita fish consumption in the USA grew consistently for the past four years from 14.8 lb in 2001 to 16.6 lb (7.55 kg) in 2004, representing an increase of 12.2% during the period. Fresh and frozen fish products were the main driving force contributing 71% of the total consumption. While the consumption of canned and cured products are on the decline.

Fresh and frozen fishery products, dominated by shrimp and tilapia, contributed significantly to this growth. On the contrary, consumption of canned fishery products declined including canned tuna, which is the second most favourite seafood in the USA.

The demand for farmed fish has been on the rise especially for shrimp, salmon, catfish and tilapia.

Shrimp remained the most favourite species (4.20 lbs/caput) in the list of “Top Ten” fishery products followed by canned tuna (3.30 lbs), salmon, pollack, catfish, tilapia, crab, cod, clams and flatfish. Per capita consumption of tilapia doubled in 3 years, from 0.317 lbs in 2002 to 0.696 lbs in 2004.

The demand (edible weight) of fishery products in the USA totalled 2.18 million MT in 2004.

Table 3: USA per capita consumption of fishery products (in lbs of edible meat)

Year	Fresh and frozen	Canned	Cured	Total
2000	10.2	4.7	0.3	15.2
2001	10.3	4.2	0.3	14.8
2002	11.0	4.3	0.3	15.6
2003	11.4	4.6	0.3	16.3
2004	11.8	4.5	0.3	16.6

Source: NMFS

Table 4: USA per capita consumption of selected fishery products (in lbs)

Year	Fillets and steaks	Sticks and portions	Shrimp
2000	3.6	0.9	3.2
2001	3.7	0.8	3.4
2002	4.1	0.8	3.7
2003	4.3	0.7	4.0
2004	4.6	0.7	4.2

Source: NMFS

As demand for fishery products increases, US imports of edible fish in 2004 increased marginally to US$ 11.3 billion compared to US$ 11.1 billion the year before. Last year, the total imports into the USA set new records at 2 393 673 MT valued at US$ 12.2 billion.

Meanwhile in Japan, demand for fishery products is more or less stagnant or even tend to decline mainly due to the country's long economics recession during the 90s; changing life style of the younger generation; and declining domestic fish supply. Per capita fish food supply (apparent consumption) declined from the record high at 72.5 kg in 1994 to 68.6 kg in 2002. While per capita consumption of seaweed was stable at around 1.4 – 1.5 kg for the past few years, the consumption of fish and shellfish declined from 71 kg in 1994 to 67.1 kg in 2002.

Table 5: Japan: Per Capita Fish Food Supply (apparent consumption) (in kg)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Fish & shellfish	67.8	71.0	71.0	69.7	66.4	64.3	65.6	67.2	69.2	67.1
Seaweed	1.3	1.5	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.5
Total	**69.1**	**72.5**	**72.4**	**71.1**	**67.8**	**65.7**	**67.1**	**68.6**	**70.6**	**68.6**

Source: Fisheries Agency of Japan.

A survey done at household level also suggest the same trend. Average consumption of fishery products at household level declined over the years from 66.5 kg/year in 1993 to 56.3 kg in 2002. Household consumption of all types of fishery products were also declining.

Table 6: Japan: Average Consumption of Fishery Products at Household Level (kg)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Fresh/frozen	49.9	47.5	47.8	45.6	45.6	45.1	44.1	43.6	42.5	43.9
Salted/dried	13.7	13.0	12.8	12.6	12.3	12.0	11.5	11.1	10.9	10.7
Seaweed (dried/prepared)	2.9	2.7	2.7	2.7	2.7	1.9	1.8	1.70	1.7	1.7
Total	**66.5**	**63.2**	**63.3**	**60.9**	**60.6**	**59.0**	**57.4**	**56.4**	**55.1**	**56.3**

Source: Fisheries Agency of Japan.

Around 47% of fish supply into Japanese market came from imports while the rest was from the domestic production which has been on the declining trends over the years. Imports of fishery products, in the meantime, have been more or less stagnant for the past three years after reaching the highest record at 3.82 million MT in 2001. There was some signs of recovery during 2004 with the total imports reached almost 3.5 million MT worth US$ 15.1 billion. In 2005 the overall imports were slightly down in terms of quantity to 3.34 million MT but increased in value to ¥ 1 669 billion.

The positive trend noticed is the growing imports of more value-added products especially for farmed shrimp. In 2004, Japan imported 412 447 MT of high value prepared products (excluding raw material) at a value of US$ 2.85 billion compared to 355 271 MT and US$ 2.35 billion in 2003. A large quantity of these are shrimp, fish and cephalopods-based products. During 2001-2004, imports of prepared (value-added) fishery products into Japan increased by 20.5% or 70 230 MT in quantity and 26% in value.

The demand for seafood in Europe is also growing and per capita consumption within 25 EU members countries is expected to increase by 1-12% from 2005-2006 (FAO). General seafood consumption trend up to 2004 showed positive growth with significant increase in the consumption of convenience products. Economic growth, health consciousness, changing life style and better distribution through modern retail outlets are the main forces behind the growth.

Demand for tropical farmed products like shrimp is growing rapidly in the EU markets as reflected by increasing imports. Imports of fresh and frozen shrimp reached the record level at 558 200 MT in 2003, then slightly declined to 554 000 MT in 2004, partly due to the antibiotics issues affecting supplies countries from Asian. In 2005, after the antibiotics issues disappeared and the EU lifted the ban on Chinese shrimp in July 2004, imports of shrimp increased in the main markets like Spain, Italy, France, Germany and UK. Up to October 2005, for example, imports of frozen warmwater shrimp into UK totalled 32 055 MT, or up by 6.8% against the same period of 2004. Similarly imports of frozen warmwater shrimp into Spain increased by 8.2% last year reaching 104 119 MT up to October. China is now the largest supplier of shrimp into Spain taking over Brazil. In Italy, for the period of January-September 2005, imports of warmwater frozen shrimp increased by 9.9% compared to 2004 amounting to 34 148 MT.

Based on a study sponsored by FAO, the future fish consumption in the EU will have three different trends:

- Consumption of cured fish and fresh/chilled fish will be more or less stable.
- Consumption for crustaceans, molluscs, fish fillet and prepared/preserved products will increase.
- Consumption of frozen produce will decrease.

The highest consumption growth is predicted to be for crustaceans, especially for shrimp and fish fillets.

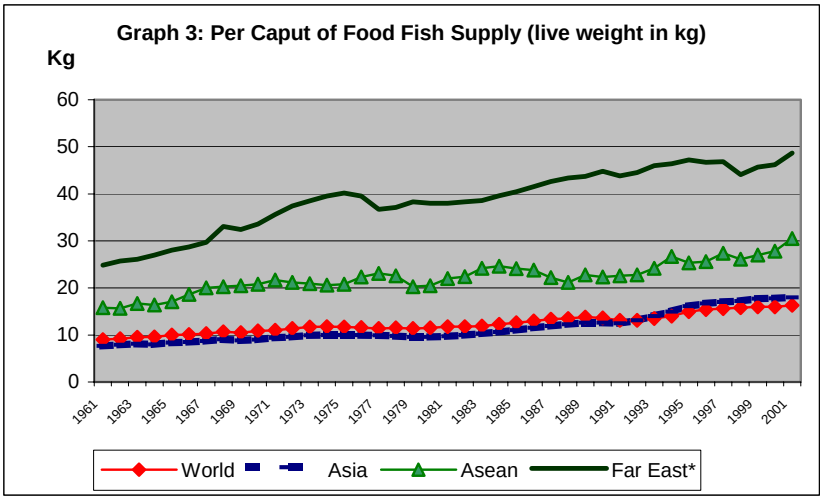
3. DEMAND TRENDS IN SOUTHEAST AND FAR EAST ASIA

Asia, particularly Southeast and Far East Asia, is a unique region as it is being the largest producer, exporter as well as importer of fishery products especially aquaculture products. The following facts speak for themselves: 10 ASEAN member countries plus Far East Asia (China, Japan, Hong Kong SAR, Taiwan Province of China and S. Korea), altogether in 2003:

- Produced : 79.2 million MT fish (60% of the world total)
- Cultured : 46.1 million MT (84% of the world total)
- Exported : 6.95 million MT of fishery products (24.8%)
  US$ 17.7 billion (27.9% of the world total)
- Imported : 9.62 million MT (33.3% of the world total)
  US$ 21.7 billion (31.8% of the world total)
- Per capita fish supply : 39.6 kg (world 16.3 kg)

The demand for fishery product is high and growing in this region (except in Japan as discussed earlier) as the consumers generally have strong preference on fish; abundance supplies both from wild and cultured fish; strong purchasing power (except in some countries in ASEAN); high consumption both at household level and catering sectors; broad preferences for different species and forms (marine, freshwater, live, fresh, cured, dried/salted and also canned and frozen products); booming tourism industry which stimulate demand for high value species; growing modern retail outlets; rapid economic growth (China, Vietnam, Singapore, etc.).

In this region, people eat fish and fishery products almost on a daily basis, thus the average fish consumption is far above the world level. In ASEAN countries, apparent fish consumption was around 30.5 kg/caput in 2001 while at the same time the world's average was only 16.3 kg/caput.



Source: FAO.

In Far East Asian countries, the average fish apparent consumption was 48.7 kg/caput, with China as the main force behind the growth. According to the Ministry of Agriculture of China, average per capita fish consumption increased from 16.4 kg in 2001 to 18.1 kg in 2003 with consumption in coastal areas could reach more than 40 kg/caput (USDA-FAS, GAIN Report No. CH5098, 2005).

The demand growth in this region is driven by growing demand for almost all type of product forms. In addition to the high consumption of live and fresh fish products, the demand for frozen and chilled convenience products, canned (especially tuna) and dried products is also growing rapidly. Frozen breaded fillet and steak products are common sight in supermarkets throughout the region. There is also growing demand for canned products (especially canned tuna) which is sold in various tastes and recipes. Various dried and tit-bit fish products are also popular in Southeast Asia.

As indicated earlier, aquaculture sector plays major role in fish food supply in this region, with certain country like China, the contribution of farmed fishery products is higher than wild fish. Reportedly, 67% of fish food supply in China currently comes from aquaculture and is expected to increase to 70% within the next 5 years period. In other countries in this region, contribution of aquaculture is generally lower than in China.

South East and Far East Asian countries, produced more than 46.1 million MT of cultured aquatic products in 2003 (including seaweed) contributing more than 84% to the global production. If China is included, aquaculture contributed around 58% of the total fish

production in the region indicating the importance of the sector in fish supply. Marine aquaculture (including brackishwater) contributed 57% to the total aquaculture production in 2003. The bulk of the marine aquaculture production consisted of seaweeds, while shrimp, bivalves and finfish are also important cultured species in this region.

With the exception for shrimp and seaweeds, large proportion of marine cultured species in this region is consumed locally or traded among countries in the region. Well known cultured marine finfish like grouper, snapper, Asian seabass, milkfish are mainly consumed within the country or exported to neighbouring markets like Hong Kong SAR (grouper), Malaysia and Singapore. Regional trade of farmed bivalves is also significant such as exports of blood cockle from Malaysia to Singapore and Thailand, clams from China to Japan and S. Korea.

While farmed shrimp (black tiger and *vannamei*) is mainly exported to developed markets (USA, Japan and Europe), local consumption and regional trade are also increasing.

Nowadays, live, fresh, frozen and value-added shrimp products are widely sold in supermarkets in this region and often used as promotion item. Increasing supply (mainly of *vannamei*), better distribution, increasing consumers income, wider usage in the catering sector and increasing trade barriers (e.g. anti-dumping, duty, safety and antibiotic issues) in developed markets are the main factors behind the growing domestic market for farmed shrimp. The region is also becoming important market for shrimp raw material for reprocessing.

Consumption for seaweed product is also high especially in Japan, S.Korea and China. There is also growing market for agar and carrageen in the region as the food industry is also expanding rapidly.

Japan for example consumed more than 200 000 MT of edible seaweed (dried nori, kombu etc.) with more than 52 000 MT is imported. While China is the largest producer of seaweed and seaweed products, the country also increasingly becomes an important market for carrageen-seaweed for reprocessing. S. Korea, meanwhile, exports large amount of dried nori and Hijikia (fusifome) mainly to Japan. The Philippines, Indonesia and Malaysia are the main players (producers) of dried seaweed and semi-carrageen products exported mainly to Europe and the USA.

4. REGIONAL SEAFOOD TRADE AND MARKETS

Global trade of fish and fishery products reached US$ 68.3 billion (import value) in 2003, representing an average increase of around 5.1% per year for the past decade. At the same time global exports value also increased by 5.4% annually totalling US$ 63.5 billion in 2003 (fob price). Despite stagnant demand in selected main markets especially in Japan overall global market shows encouraging trend for fishery products.

Table 7: Global trade of fish and fishery products, 1997-2003

Exports	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Quantity (MT)	24,525,564	22,599,429	24,230,015	26,434,946	27,550,549	27,410,474	28,008,554
Value (US$ 1000)	53,633,402	51,392,023	53,114,282	55,579,042	56,459,664	58,494,481	63,508,377
Imports	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Quantity (MT)	23,594,120	22,557,088	24,226,213	26,549,699	27,886,775	28,053,542	28,563,300
Value (US$ 1000)	57,573,408	56,108,158	58,574,571	60,995,816	60,558,951	62,500,451	68,261,513

Source: FAO.

This region (SE and Far East Asia) is still one of the growing market despite the fact that fish consumption is already high. Based on our estimate, total imports of fishery products into this region could reach US$ 25 billion in 2004, representing an average growth of 2.6% annually since 1993 with Japan, China PR, Thailand and S. Korea as the main importing countries. By excluding Japan, the import of fishery products into the region could reach around US$ 7 billion in 2004 showing tremendous growth at around 9% annually since 1993 with China and Thailand as the main forces behind the growth.

Meanwhile, as the main producers of fishery products, exports from South East and Far East Asian countries/territories also increased consistently over the years from US$ 12.7 billion in 1993 to US$ 17.7 billion in 2003. This represent an average annual growth of 4% in value terms. We estimated that the total exports value from the region could reach around US$ 20 billion in 2004.

In ASEAN countries, trade of fishery products has been consistently growing since the economic crisis in 1998 when the exports and imports hit the low level. Export of fishery products from ASEAN increased from US$ 7.75 billion in 1998 to US$ 8.94 billion in 2003, or up by 15.4% during the period.

Table 8: **Exports of Fishery Products from SE and Far East Asia/Territories, 2000-2004* (Q=MT; V=US$1000)**

Country		**2000**	**2001**	**2002**	**2003**	**2004***
Brunei Darussalam	Q	285	149	92	144	NA
	V	296	334	459	706	NA
Cambodia	Q	43,636	38,454	52,752	56,957	NA
	V	37,691	31,308	32,071	34,744	NA
China	Q	1,516,404	1,928,966	2,057,424	2,082,080	2,420,565
	V	3,706,339	4,106,214	4,600,704	5,362,366	6,966,483
Hong Kong, SAR	Q	55,733	49,402	48,446	46,229	NA
	V	76,089	52,859	50,313	47,365	NA
Indonesia	Q	490,416	457,913	539,302	830,383	902,358
	V	1,610,291	1,560,078	1,516,537	1,579,783	1,780,833
Japan	Q	221,868	312,769	306,353	364,655	321,983
	V	832,088	794,897	817,593	952,419	1,369,425
S. Korea	Q	530,870	431,319	424,905	418,799	406,435
	V	1,489,803	1,253,300	1,138,346	1,102,081	1,278,638
Laos	Q	4	30	74	24	NA
	V	29	78	256	26	NA
Malaysia	Q	95,435	126,229	203,327	160,262	238,229
	V	200,469	220,126	381,983	256,197	545,526
Myanmar	Q	111,843	159,705	158,904	72,850	NA
	V	185,030	198,011	248,343	142,566	NA
Philippines	Q	213,839	170,091	171,279	201,630	NA
	V	449,376	414,430	453,030	465,734	NA
Singapore	Q	112,144	102,133	88,516	86,898	90,344
	V	457,274	388,205	325,179	329,952	340,627
Taiwan, Province of China	Q	697,851	692,264	733,616	715,705	577,375
	V	1,762,576	1,815,892	1,617,687	1,305,633	1,578,800
Thailand	Q	1,162,099	1,217,310	1,247,270	1,401,915	1,685,177
	V	4,384,437	4,054,130	3,692,158	3,919,824	4,413750
Viet Nam	Q	302,943	392,796	493,637	508,766	531,323
	V	1,484,413	1,783,913	2,035,515	2,211,050	2,400,781
TOTAL	**Q**	**5,555,370**	**6,079,530**	**6,525,897**	**6,947,297**	**7,500,000****
	V	**16,676,201**	**16,673,775**	**16,910,174**	**17,710,446**	**20,000,000****

*Source: FAO. * National Statistics. ** Estimated.*

Similarly, the imports into ASEAN have recovered tremendously since 1998 with an annual growth of around 9.6% in quantity and 8.4% in value reaching over 2 million MT worth at US$ 2.4 billion in 2003.

Table 9: Imports of Fishery Products into ASEAN and Far Eastern Countries/Territories, 2000-2004* (Q=MT; V=US$1000)

Country		2000	2001	2002	2003	2004*
Brunei Darussalam	Q	6,624	8,335	6,573	7,201	NA
	V	15,239	13,379	13,136	11,847	NA
Cambodia	Q	2,100	852	2,217	3,122	NA
	V	4,130	1,663	4,033	5,514	NA
China	Q	2,514,321	2,280,412	2,483,798	2,324,492	2,985,642
	V	1,820,699	1,816,022	2,226,628	2,426,254	3,239,443
Hong Kong, SAR	Q	329,442	349,416	360,564	356,960	NA
	V	1,970,395	1,785,380	1,786,968	1,773,781	NA
Indonesia	Q	171,349	151,957	110,035	91,707	136,040
	V	101,644	93,730	79,095	76,088	154,0.32
Japan	Q	3,540,479	3,726,738	3,816,227	3,210,472	3,484,982
	V	15,742,561	13,649,228	13,862,980	12,623,644	15,128,617
S. Korea	Q	755,301	1,068,715	1,191,622	1,240,217	1,280,915
	V	1,398,606	1,648,642	1,882,849	1,958,477	2,261,356
Laos	Q	2,510	3,142	2,725	3,164	NA
	V	2,069	2,170	1,727	2,333	NA
Malaysia	Q	322,923	353,400	464,172	386,586	406,190
	V	307,340	336,705	400,345	377,504	509,211
Myanmar	Q	1,536	806	723	1,393	NA
	V	2,153	932	1,354	2,037	NA
Philippines	Q	248,407	180,992	217,069	168,846	NA
	V	111,596	71,362	92,524	86,445	NA
Singapore	Q	182,349	172,994	173,797	185,637	230,446
	V	566,286	489,009	512,404	542,383	744,842
Taiwan Province of China	Q	454,496	423,693	388,207	377,958	387,378
	V	578,932	565,893	496,541	494,222	531,699
Thailand	Q	813,789	977,350	1,006,011	1,078,620	1,255,223
	V	826,699	1,072,467	1,079,379	1,133,815	1,283,025
Viet Nam	Q	19,547	19,189	39,084	86,311	NA
	V	24,272	32,508	99,656	164,216	NA
TOTAL	**Q**	**9,365,173**	**9,717,991**	**10,262,824**	**9,522,686**	**10,500,000****
	V	**23,472,621**	**21,579,090**	**22,539,619**	**21,678,560**	**22,000,000****

*Source: FAO. * National Statistics. ** Estimated.*

Regional trade within ASEAN, between China - ASEAN and between South Asia – ASEAN/ China is also growing, even though the value is relatively small compared with the trade that the region has with developed markets. Regional trade (exports) within East and South East Asia countries (excluding China and developed market like Japan) was less than US$ 1 billion or only 9.2% of the total region's export value in 2003. China's export to Southeast and East Asian countries accounted for more than US$ 1 billion or 15.4% of the country's total exports in the same year.

Meanwhile, only around 7.5% of the total exports value of fishery products from South Asia was destined to Southeast and Far East Asia while to China was 6.1%.

Table 10: Regional Trade Flows
(Exports' value in US$ 1000)

Destination by region	From					
	China (% of the total)		East and South East Asia		South Asia	
North America	1,234,460	(19)	3,261,577	(31.8)	540,239	(26.7)
EU (25)	573,935	(8.9)	1,130,667	(11.0)	595,390	(29.5)
Other Western Europe	5,893	(0.1)	69,799	(0.7)	10,375	(0.5)
Other Developed Countries	3,129,819	(48.3)	3,672,899	(35.8)	463,224	(22.9)
South Asia	2,487	(0.04)	26,666	(0.3)	37,329	(1.8)
East and Southeast Asia	1,000,499	(15.4)	948,940	(9.2)	152,378	(7.5)
China	377,342	(5.8)	655,354	(6.4)	122,405	(6.1)
Others	151,454	(2.3)	497,525	(4.8)	99,852	(4.9)
TOTAL	**6,475,882**	**(100)**	**10,263,427**	**(100)**	**2,021,192**	**(100)**

Source: FAO.

In the future, regional trade of fishery products is expected to grow faster as a results of growing demand in the region, on-going trade liberalization process (ASEAN-China, FTAs, etc.), increase production particularly from aquaculture and external factors such as increasing trade and non-trade barriers from developed markets.

The following sections are brief reviews on trade and market trends for selected marine aquaculture products in the region:

4.1. Shrimp

P. vannamei (Whiteleg shrimp) and *P. monodon* (Black tiger shrimp) are the two main forces behind the growth of the global shrimp industry and market for the past decade. Both species contributed around 77% of the total cultured shrimp production in 2003. In the global shrimp trade, even though there is no official figure, both *vannamei* and black tiger shrimp is estimated to contribute around 50-60% of the shrimp quantity traded in the international market.

Farmed *vannamei* production has increased at the rate of 56% per year for the past ten years from only 109 397 MT in 1993 to 723 858 MT in 2003. Asia is mostly responsible for the growth with its share that grew from almost nothing before 2000 to around 64% in 2003.

Farmed black tiger shrimp production on the other hand, has been up and down for the past ten years due to disease-related problems, and the annual production growth was only around 3.4% during the period of 1993 to 2003. Thus in Asia, the growth of shrimp farming industry for past two years has been mainly accelerated by the growth of *vannamei* farming which plays as an important alternative for black tiger shrimp farming.

As aquaculture has made more shrimp available at affordable prices to end users, demand for shrimp in general has increased in the global market, especially in the main traditional shrimp markets namely in the USA, Western Europe but leveled off in the former leading market Japan. The USA has replaced Japan as the leading market for shrimp since 1997 and Japanese imports, especially for the frozen shrimp, have declined over the years due to the country's long economic recession. Nevertheless, in 2004, the overall shrimp imports into Japan increased by 6.5% as compared to 2003, mainly due to the Yen appreciation and the anti-dumping case in the US against 6 shrimp producing nations. Imports of fresh and frozen shrimp also slightly increased by 3.5% in 2004 amounting to 242 037 MT, but then slightly down to 233 376 MT last year.

Traditionally, Japanese consumers have strong preference for black tiger shrimp, thus the market is still dominated by this species, both in the shell-on or value-added products such as *nobashi* and other peeled products. In the shell-on market alone around 63.5% of the market share is taken by black tiger shrimp followed by white shell-on products (16%) consisting mainly of banana and white Indian shrimp. Farmed *vannamei* is mainly imported from China (particularly peeled shrimp) and from Brazil as well Ecuador. Imports of *vannamei* from Ecuador, in fact, has been in declining trend from more than 5 500 MT in 1999 to only 852 MT last year. Brazil managed to increase its exports in 2002 to 1 452 MT then dropped to 1 068 MT in 2005. Thus, the impact of *vannamei* shrimp in the Japanese market, especially with regard to black tiger shrimp market is very minimal.

Table 11: Japan: Imports of shrimp (all types), 1998 & 2001-2005 (in MT)

Product type	**1998**	**2001**	**2002**	**2003**	**2004**	**2005**
Live	364	577	406	293	383	271
Fresh/chilled	85	99	36	19	33	19
Frozen, raw	238,906	245,048	248,868	233,195	241,445	232,443
Dried/salted/in brine	2,349	1,704	1,875	1,977	2,351	2,008
Cooked, frozen	10,338	14,045	13,936	13,927	16,745	17,051
Cooked & smoked	376	515	468	453	618	422
Prepared/ preserved (incl. tempura & canned shrimp)	13,984	23,980	27,678	33,361	39,692	42,181
Sushi (with rice)	50	160	194	92	341	263
Total	**266,038**	**286,128**	**293,461**	**283,318**	**301,608**	**294,658**

Source: Japanese Customs.

However, there have been changes in consumers' preference for shrimp in the Japanese market. As the market becomes more price sensitive, demand has moved from large to medium size shrimp as the latter is perceived to be cheaper. This trend is more visible in the retail market. In the food service sector, *sushi* bars have started to response to this trend and serve required sizes of *sushi* shrimp which are smaller than before. Re-processors of *sushi* and *tempura* shrimp have also started to use relatively smaller sizes of shrimp in order to accommodate the final consumer's demand pattern and affordability. This strategy works out in favour of farmed white shrimp where the predominant counts are 51/60 and above.

In the small size peeled shrimp market segment, especially in the catering sector, white peeled shrimp is also preferred that gives room for *vannamei* to penetrate the segment. It is also worth to note that supermarkets in Japan have started promotion sales for farmed white shrimp from China (mostly *vannamei*), thus we can expect the increasing popularity of *vannamei* in the near future. It was reported however, that *sushi* bars still prefer black tiger and they are reluctant to use *vannamei*.

Imports of shrimp into the US continues to set new record at 518 379 MT in 2004 representing an average increase of 11.2% per year for the past five years. Even though supplies from 6 countries affected by the anti-dumping duties were lower in 2004, but other major suppliers such as Indonesia, Bangladesh, Mexico and Malaysia managed to fill the gap and tremendously increase their exports to the market. Imports from the 6 effected countries dropped by 13.4% from 372 890 MT in 2003 to 322 957 MT in 2004, while imports from non-affected countries went up from 131 605 MT to 194 660 MT, representing an increase of almost 50%. Last year, shrimp imports into the USA increased by 2.7% over 2004 reaching 532 160 MT worth US$ 3.7 billion (for all product forms).

Imports of shrimp into the EU has also increased significantly for the past few years with imports into the UK, Spain, Italy, France and Germany increasing by almost 10% for the past five years. The popularity of warmwater shrimp (*Penaeus spp*) has been growing rapidly in these five countries.

Generally competition between black tiger and *vannamei* shrimp is still limited in certain areas especially in the small sizes and peeled market segments. Competition is more obvious between producing countries exporting black tiger shrimp or *vannamei* to different markets.

As the main producer of cultured shrimp, both black tiger and *vannamei* shrimp, Southeast and Far East Asian countries are increasingly also becoming important markets for shrimp. The demand for shrimp in Malaysia, Singapore, Hong Kong SAR, China, Thailand, South Korea, Indonesia and also Vietnam have increased tremendously over the years due to the following factors:

- Increase in supply of farmed shrimp at lower price, especially for black tiger and *vannamei* shrimp.
- Increase in consumers' income.
- Changing consumer life style and preferences toward healthy food.
- Improved distribution channels especially the fast growing number of modern retail outlets/supermarkets.
- Increase in popularity of Japanese style seafood restaurants.
- Trade barriers enforced by importing countries (such anti-dumping case in the US and antibiotic case in the EU) that force producers to sell their product in the domestic and regional markets.
- Wider usage of shrimp in the catering sector.

In addition to black tiger shrimp, *vannamei* is also widely sold and consumed in China, Thailand, Hong Kong SAR, Singapore and Malaysia. In Malaysia, where the farming of *vannamei* was previously banned, *vannamei* is sold in supermarkets and wet markets at around RM15-19/Kg (US$4-5/Kg). The ban of farming of *vannamei* in Malaysia was lifted last year. As production increased tremendously in China *vannamei* shrimp has become abundant in local and its popularity is also growing.

Regional trade of *vannamei* is also growing as production increase and at the same time producing countries like China, Thailand and Vietnam are facing anti-dumping duties in the US market. Imports of shrimp into certain countries in Asia, which are not affected by the anti-dumping duties, have increased tremendously in 2004. In 2004, China exported 12 069 MT to Indonesia, 6540 MT to Malaysia and 3 976 MT to Singapore, representing increase of 245.3%, 36.4% and 168.6% respectively compared to the previous year. Exports of fresh and frozen shrimp from Thailand to Asia also increased significantly by 6.9% in 2004 with exports to Malaysia, Hong Kong SAR and S Korea increased by 2500%, 20% and 29.4% respectively compared to the previous year.

Table 12: Asia: Fresh and Frozen Shrimp Imports (excluding dried and processed products), 1997-2004 (in MT)

Countries	1997	1998	1999	2000	2001	2002	2003	2004
Taiwan Province of China	23,239	20,337	22,977	22,561	13,568	11,978	7,281	5,110
Singapore	16,716	15,119	14,319	14,091	12,148	12,812	12,000	12,695
Hong Kong SAR	23,019	22,044	19,609	29,335	25,104	25,373	20,348	18,571
Malaysia	23,773	23,110	19,892	16,469	23,971	22,814	32,080	21,017*
Korea RP	9,407	2,740	4,654	6,666	12,965	22,200	21,883	25,000**
China	14,160	15,142	1,677	57,358	63,114	67,691	68,315	57,878
Thailand	12,199	14,492	15,247	17,808	24,124	29,448	26,524	23,745
Total-Asia (excl. Japan)	**120,722**	**108,710**	**103,514**	**164,288**	**174,994**	**192,316**	**188,431**	**164,016**

*Source: National Statistics. * Frozen only. ** Estimate.*

From the facts discussed above it can be concluded that developing shrimp farming industry to culture both black tiger and *vannamei* seems to be the better option at the moment rather than choosing only one of them. Among the reasons are:

- Both species complement each other and that can reduce business risk within the industry.
- Shrimp farmers would have an alternative to switch to one of them should be there any technical or marketing problems.
- In the global market, both species generally serve different market segments, and the competition is still limited in small size segments especially in the retail sector.
- Increasing availability of cheaper shrimp (from *vannamei*) will create more demand in domestic markets.
- With technology development and improvement in the production efficiency, the industry is expected to be able to cope with the declining prices and offer cheaper products in the global market.

The strong competition in the near future seems to be among *vannamei* producers from Latin America and Asia. Among Asian producers, China should be watched closely as the country is currently the leading *vannamei* producer and there are indications that the country will increase its production and its presence in the global market. Even though currently the bulk of *vannamei* production is smaller size 60/70 and 70/80 pc/Kg) but many farmers are now trying to produce larger shrimp size which is said to be economically more viable as it fetches higher price and at more cost effective. Once this effort succeeds then there will be more competition with black tiger shrimp in larger market segments.

It is interesting to note that Thai government is reportedly trying hard to increase farmed black tiger production's share from the currently less than 10% to 35% within the next five years.

4.2. Bivalves - Molluscs

Many prefer to call bivalves as shellfish which includes two main seafood groups, crustaceans and molluscs. Bivalves usually refer to groups of species like oysters, clams, cockles, mussels and scallops. Bivalves contributed around 9.5% to the total fisheries production in 2003 (excluding aquatic plants), higher than the contribution of crustaceans (6.6%) and cephalopods (2.4%). Though it is an important industry to many

coastal nations, the bivalves industry and trade are mainly concentrated in a few countries/regions such as Far East (China, Japan and Korea RP); Europe (France, Spain, Italy and Denmark); North America (USA and Canada) and South America (Chile, Peru and Argentina).

The International trade in bivalves is very much regionalized and not many countries are able to penetrate distant markets outside their regions, mainly due to technical barriers such as strict regulations on imports of bivalve products in major markets. As a result, bivalves contribution to the total global trade in fish and fishery products was only around 2.5% in value in 2003, lower than shrimp (17%), tuna (9%), salmon (6%) and cephalopods (4%).

Global bivalves production from aquaculture has consistently increased over the years from 5.3 million MT in 1993 to 11.2 million MT in 2003, an average increased of 10.9% annually during the period. As a result, aquaculture contribution of bivalves to the overall bivalves production increased from 72.8% in 1993 to 84.0% in 2003. Meanwhile, the production from wild harvest has been more or less stagnant at around 1.9 – 2.0 million MT. Its contribution in fact declined from 27.2% to 16.2% during the same period.

China became the single largest producer of bivalves with a production of 8.8 million MT in 2003, contributing 66.7% of the global harvest (both wild and cultured) in that year. Japan was the second largest producer, far behind China with a production of around 951 400 MT (7.2%), followed by USA (6.3%), South Korea (2.9%) and Spain (1.7%). Other main bivalves producing countries are France, Thailand, Italy, Canada and Denmark.

In the aquaculture sector, the top five leading producers of bivalves are China, Japan and Rep. of Korea in Asia and Spain and France in Europe. China contributed more than 79% of the global aquaculture production of bivalves in 2003.

World exports of fresh and frozen bivalves went up from 500 000 MT valued at US$ 1.30 billion in 2001 to 553 600 MT worth US$ 1.46 billion in 2003. In the global market more than 90% of bivalves are traded in live, fresh, frozen and dried forms, and only less than 10% as canned products.

In terms of quantity, clams (including cockles and arkshells) and mussels dominate the global fresh and frozen bivalve trade, accounting for around 32% and 44% respectively. In terms of value, however, scallops contributed more than 38.4% to the total bivalves export in 2003, followed by mussels (26%), clams (25%), and oysters (10%).

There is also an active trade in clams and cockles among ASEAN countries particularly between Malaysia, Thailand and Singapore. Large quantities of cockles and clams from Malaysia are sold to Thailand for reprocessing and re-export and to Singapore for local consumption. Thailand imported 24 867 MT of blood cockle worth Baht 211 million (US$ 5.3 million) in 2005 almost all coming from Malaysia. At the same time, Thailand also exported 4 239 MT of blood cockle with the main market being Hong Kong SAR, Japan and China. Meanwhile, Thailand is also the largest supplier of bivalves from the SE Asian region, especially canned clams. In 2005, Thailand exported 2 437 MT of canned clams worth Baht 267.4 million (US$ 6.7 million).

Table 13: Thailand: Exports of canned clams, 2005

Main Destinations	Q (MT)	V (Baht million)
Australia	22	2.4
Canada	47	38.3
China	26	2.1
Germany	22	2.0
UK	49	5.0
Italy	101	8.9
Japan	91	9.1
USA	1535	142.4
Total (incl. others)	**2437**	**267.4**

Source: Thai Customs.

Japan is the largest market for bivalves in Asia, and in fact the country is the largest importer of clams, mainly from neighbouring countries like China and Korea Peninsular. Its imports of clams in 2004 totalled 90 236 MT valued at US$ 147.4 million, and China accounted for 47.2% of the supply. Overall, bivalves imports into Japan in 2004 reached 99 087 MT worth US$ 192.3 million with China taking 44% market share followed by N. Korea (35.3%) and S. Korea (19.5%).

Table 14: Japan: Imports of live, fresh and frozen bivalves, by main suppliers, 2004 (Q=MT; V=US$ 1000)

Origins	Clam		Oyster		Scallop		Mussel		Total	
	Q	V	Q	V	Q	V	Q	V	Q	V
China	42,608	64,308	133	449	817	3,773	1	3	43,559	68,533
RP Korea	11,857	37,691	7,457	38,985	-	-	-	-	19,314	76,676
N. Korea	321,938	42,992	-	1,731	-	-	-	427	34,938	42,992
New Zealand	3	12	191	-	2	14	115	-	311	2,184
Russia	1,182	1,908	-	-	-	-	-	-	1,182	1,908
Total (incl. others)	**90,236**	**147413**	**7,903**	**42,178**	**824**	**3,856**	**124**	**475**	**99,087**	**192,293**

Source: Japan Fish Traders Association.

China, the largest market for bivalves is mainly supplied locally. The country, also imports high value bivalves from other countries to serve the growing demand from the catering sector. The major bivalves suppliers to China are S. Korea, New Zealand, USA and Canada (mussels, clams and oysters).

Table 15: China: Exports of bivalves in 2004

	MT	US$ 1000
Oyster	17,404	23,868
Mussel	17,230	21,241
Scallops	12,681	39,942
Clam	89,628	149,043
Total	**136,943**	**234,094**

Source: China Society of Fisheries.

Other important markets for bivalves in Asia are Hong Kong SAR, Taiwan Province of China and Singapore. In 2004, Hong Kong SAR imported almost 19 000 MT of bivalves mainly from mainland China, Japan, USA and Canada while Taiwan Province of China an important market for oysters and scallops imports mainly from the USA, Canada and Japan. In 2004, Singapore imported 8 597 MT of bivalves (molluscs) in live, fresh and frozen forms mainly from Malaysia.

Bivalves trade between developing countries and major markets has not developed well like other seafood products. This is mainly because of safety related issues. Importing countries enforce strict import regulations on bivalves which many developing countries are unable to meet compared to other seafood.

From Asia, only Japan, South Korea, Thailand and Vietnam are currently qualified to export their bivalves to the EU markets.

Bivalve producing countries in Asia like Indonesia, have been trying to get approval to export their products to the EU without success.

Singapore, one of the main bivalve markets in the Southeast Asian region also applied stringent import inspection procedures on bivalve products which are considered to be of high health risk. Imports of bivalve must be accompanied by a health certificate from the competent authority in the country of origin and samples are collected from every consignment for laboratory tests.

A lot of assistance is needed in the pre and post harvest practices of bivalves in developing countries, in order to enable them to meet importing countries requirements and to improve product quality and safety. The prospects for developing the bivalve industry in developing countries will depend on their ability to build reliable monitoring and inspection programmes and developing sustainable farming practices.

4.3. Seaweeds

The seaweed industry is a very diverse. It covers hundreds of species that are found in the northern and southern Hemispheres, ranging from coldwater to warmwater species. Seaweeds are classified into three main groups: green, red and brown seaweeds, based on their pigment (colour). Commercially important seaweeds fall under the red and brown groups accounting for almost 99% of the total harvest which comes from about 42 countries.

The diversity of the industry is exemplified by the usage of seaweed products in our daily lives. Seaweeds are consumed as food (directly) and extracted into hydrocolloids for various uses in food, medicine, bacteriological, cosmetics, textiles, toiletries and chemical industries. From the global seaweeds (red, brown and green) production of about 8.65 million Metric Tonnes (MT) wet basis in 2003, about 5.5-6.0 million MT was consumed as food and about 1.2-1.5 million MT was extracted for hydrocolloids (agar, carrageenan and alginate) while the rest was used for other purposes like fertilizer and feed.

The edible seaweeds (for food) industry is concentrated mostly in 3 countries namely China, Japan and the Republic of Korea, while the hydrocolloids industry is dominated by a few big companies in Europe and the United States of America (USA) such as *CP Kelco*, *Danisco*, *Degussa*, *FMC Biopolymer* and *ISP*. These companies have a very strong foothold in the industry making it difficult for any new comer to enter the hydrocolloids market. Meanwhile, seaweed farming is dominated by small scale farmers who are mostly located in the Asia Pacific region. Around 88% of the total seaweed harvests came from culture which is almost exclusively carried out in Asia Pacific countries. Thus more than 60% of the global dried seaweed (raw material) exports come from Asia, mainly destined for Europe, the USA and Japan.

In the global market, seaweed products are traded mainly in three different groups: dried raw materials seaweeds; hydrocolloids (agar, alginate and carrageenan); and edible seaweed products (*nori*, *hizikia*, *wakame*, *kombu*). The first two groups are widely traded in the international market, while the edible seaweeds are mainly traded regionally in Far

Eastern countries (Japan, Republic of Korea and China). The overall value of global seaweed trade is estimated to be around US$ 5 billion, the bulk of it contributed by edible seaweed products.

Exports of dried seaweed have been hovering around 250 000 MT a year with the Philippines, Indonesia and Chile as the main suppliers taking about 45% of the total export quantity. In 2003, the global dried seaweed exports totalled around 255 000 MT valued at US$ 340 million. The Philippines was the largest supplier of carrageenophyte seaweeds while Indonesia exports both carrageenophyte and agarophyte (dried *Gracilaria*) seaweeds. Imports of dried seaweed into traditional markets in Europe and the US have been in declining trends as seaweed producers like Indonesia, the Philippines and Chile have also started developing their own agar and carrageenan processing industries. The market prospects for dried seaweed is good for carrageenophyte as demand for carrageenan is growing, but the demand for agraophyte and alginophyte seaweeds is facing buyer markets.

a. Agar

The global trade of agar is quite active and slowly growing with world exports reaching almost 15 000 MT valued at US$ 114.2 million in 2002. Germany, Korea RP, Taiwan Province of China, Thailand and France were the main agar exporters while Japan and the US were the main importers. The imports of agar (Kanten) into Japan reached more than 1 633 MT valued at US$ 27.8 million in 2004, mainly coming from Chile, Korea RP, Morocco and China. The US market consumes about 2 000 MT/year of agar of which around 64% comes from imports. Its imports reached a peak of 1 286 MT valued at about US$ 19 million in 2003 with Chile, Morocco and Spain being the main suppliers. In 2005, the US imported 1 222 MT of agar-agar worth US$ 19.4 million.

About 90% of agar is used in the food industry while the rest is for bacteriological purposes. It is predicted that the market for food grade agar is stable and not likely to expand while the market for agarose will expand as its uses in biotechnology increase.

Table 16: Agar markets, by product categories in 2001

Markets by application		
Application	**Tonnes**	**Percent**
Food	6,930	91
Bacteriological	700	9
Total	**7,630**	
Markets by grade and source		
Grade / seaweed	**Tonnes**	**Percent**
Powder / *Gracilaria*	4,100	54
Powder / *Gelidium*	2,305	30
Square / *Gracilaria*	250	3
Strips / *Gracilaria*	275	4
Bacto / *Gelidium*	700	9
Total	**7,630**	

Note: The total market has a value of about US$ 137 million.
Source: A Guide to the Seaweed Industry, FAO, 2003.

b. Carrageenan

The global carrageenan sales in the food industry are estimated to be around US$ 320 - 340 million annually and the market size in Europe is about 15 000 MT/year, in the USA around 9 000 MT/year and the rest of the world about 25 000 MT/year. The global

market growth for carrageenan is about 4-6% annually driven by modest growth in food applications which take about 90% of the total carrageenan market.

Imports of carrageenan into the USA increased significantly for the past five years from 5 918 MT valued at US$ 41.6 million in 1999 to 9 658 MT valued at US$ 62 million in 2005. The Philippines is the largest supplier of carrageenan into the USA, followed by Denmark, Canada, France and Chile. The usage of Semi-Refined Carrageenan (SRC) in the food industry in the US has been increasing since the 90s slowly replacing refined carrageenan as the former is cheaper.

In 2003, the Philippines exported 42 594 MT seaweeds and seaweed products worth US$ 80.8 million (fob value) consisting of:

- Dried seaweeds : 31 324 MT (US$ 33.2 million)
- Carrageenan : 10 108 MT (US$ 47.2 million)
- Edible seaweeds : 1 162 MT (US$ 506 000)

Despite the USA and Europe, China, S. Korea and Japan were also the main markets for seaweed products from the Philippines.

In Southeast Asia, the demand for carrageenan is also growing and the current market size is estimated around 1 800 - 2 000 MT. Indonesia, Malaysia and Thailand are the main markets with the consumption of carrageenan estimated to be around 280 -300 MT, 200 MT and 780 MT respectively.

The prospects of the market for carrageenan is good, driven by good demand from dairy and meat industries and new uses in the health industry.

Table 17: Market size of carrageenan in the food industry

Europe	15,000 MT (40% of the total quantity)
USA	9,500 MT (25% of the total quantity)
Other markets	25,000 MT (35% of the total quantity)
Total	**37,500 MT**

Source: Various sources.

c. Alginate

Around 32 000 - 39 000 MT of alginate is produced in the world annually mainly in the USA (10 000 - 12 000 MT), China (8 000 - 10 000 MT), the UK (6 000 - 8 000 MT, Norway (5 000 MT), France (2 000 MT) and Japan (1 500 - 2 000 MT). About 67% of alginate is of technical grade for industrial purposes (such as textiles) while around 33% is used in the food and pharmaceutical industries.

Around 12 000 MT of alginate was consumed in the USA in 2000. The US is also the biggest importer of alginate totalling 4 179 MT worth US$ 25 million in 2003. Japan also imports a significant amount of alginates reaching the highest level in 2002 at 1 619 MT then dropping to 1 474 MT worth ¥717 million in 2003.

Table 18: Alginate markets by sectors, 2001

Application	Tonnes	%
Food and pharmaceutical	10,000	33
All technical grades	20,000	67
Total	**30,000**	**100**

Source: H. Porse, CP Kelco ApS, 2002, pers. Comm. FAO Circular No. 968.

The growth in the alginate market is predicted to be lower compared to carrageenan at around 2-3% annually. The industry is facing strong competition from China producers who sell cheaper alginate made from *Laminaria*.

d. Edible seaweeds

The international market for edible seaweeds usually refers to four main product forms namely nori (*Porphyra*), kombu (*Laminaria*), hijikii (*Hizikia*) and wakame (*Undaria*), even though there are other products or species which are also eaten in certain countries. These four edible seaweed products are mostly traded in 3 countries namely China, Japan and Republic of Korea. Japan consumes more than 200 000 MT of edible seaweeds (dried forms) annually with almost 39% coming from imports. Edible seaweeds enjoy strong demand as a health food product in Japan and its import mainly coming from China (*wakame*) and Korea, RP (*hijikii*). Japan imports of edible seaweed reached the highest point at 76 414 MT in 2004. Korea, RP exports of dried nori (laver) increased tremendously in 2004 reaching 5 079 MT worth US$ 24 million, mainly to Japan and China. Meanwhile, China's exports of dried *Laminaria* totalled 36 906 MT valued at US$ 63 million in 2004 mainly supplying the Japanese market.

Table 19: Japan: Imports of edible seaweeds 1999-2004 (Q=MT; V=¥ million)

	1999		2000		2001	
	Q	V	Q	V	Q	V
Dried *nori*	114	301	196	552	234	835
Hijiki	7,460	5,253	6,088	3,557	6,838	4,243
Wakame	50,096	9,269	40,035	7,173	40,831	7,305
Other seaweed	3,590	1,635	4,221	1,832	4,281	1,921
Total	**61,260**	**16,458**	**50,541**	**13,114**	**52,184**	**14,303**
	2002		**2003**		**2004**	
	Q	V	Q	V	Q	V
Dried *nori*	239	802	343	852	365	695
Hijiki	6,088	4,671	6,603	5,220	6,880	4,751
Wakame	42,834	8,348	40,302	7,823	69,757	12,026
Other seaweed	4,434	2,033	4,938	2,276	4,785	2,874
Total	**53,594**	**15,854**	**52,186**	**16,171**	**77,787**	**20,616**

Source: Japanese Customs

Table 20: China: Exports/ Imports of seaweeds and seaweed products in 2004

	Exports		Imports	
	Quantity (MT)	Value (US$ million)	Quantity (MT)	Value (US$ 1000)
Laminaria	36,906	63,026	1,189	229
Other seaweeds	4,286	19,110	48,540	23,951
Agar	2,704	16,430	125	873
Alginate	12,882	36,561	314	1,889
Total	**56,778**	**135,127**	**60,168**	**27,012**

Source: The Ministry of Agriculture, China, 2005.

Generally, the prospects of edible seaweed in these three countries are not very encouraging as the markets are fully supplied or even over-supplied for certain products. An aggressive marketing campaign is being launched by edible seaweed producers to introduce these products in other markets like the USA, Europe and Asia.

4.4. Finfish

Grouper, Asian seabass, milkfish, snapper and bastard halibut are among marine finfish popularly cultured in the region. The industry is diverse in terms of species being cultured with generally low production and/or productivity. Except for milkfish, the large proportion of farmed marine finfish in the region is sold in live form as it is the only viable way to offset the high production cost. As the supply of marine finfish into the markets come mainly from wild catch which are generally much cheaper, farmed marine finfish like grouper, snapper and to some extent Asian seabass cannot compete in wider and processed products markets.

a. Grouper

In the global market, grouper is usually traded in three different forms: live, fresh/chilled and frozen forms of whole fish, fillets and steak products. Asia, especially Southeast and Far East Asian countries, are both the main suppliers and markets for groupers which are mainly traded in live and whole fresh/chilled forms. Farmed grouper almost exclusively to cater live market in the region.

The following are market segments for grouper:

Live grouper: Mainly traded in Southeast and Far East Asia with Hong Kong SAR as the largest market and distribution centre. Supplies both from wild and cultured grouper.

Fresh/chilled grouper: Asia is the largest supplier and market, while there is significant amount of fresh/chilled grouper fillet imported into the USA from Mexico and other Latin American countries (wild grouper).

Frozen grouper: Small amount of frozen grouper is widely traded in the international market with the USA, European and Middle Eastern (the Gulf) countries as the main markets (wild grouper).

Hong Kong SAR as the main market for live grouper imported almost 6,000 MT of high value live grouper annually worth more than HK$ 550 million (US$ 70 million). The exact import figure is believed to be much higher, and predicted to be around 10,000 - 15,000 MT/year, as there is also large amount of live grouper brought into Hong Kong SAR by

registered live fish transport vessels which are mostly not recorded. The main species imported into Hong Kong SAR are coral trout grouper, green grouper, flowery grouper and other grouper species coming mainly from the Philippines, Indonesia, Thailand, Malaysia and Australia.

Live grouper imported into Hong Kong SAR arrive by two main transportations: by air and by sea using live fish transport vessels which are usually owned by Hong Kong SAR traders. More and more live grouper nowadays are imported by air. After arrival in Hong Kong SAR, live grouper will be sent to live wholesale markets around the territory then distributed mainly to restaurants. Kwun Tong wholesale market is the main wholesale market in Hong Kong SAR for live grouper.

Other important live grouper markets are China, Thailand, Malaysia, Taiwan Province of China and Singapore. Except Singapore, the other markets are largely supplied by local production with Thailand, Malaysia and Taiwan Province of China being also the main exporters of live grouper. China is increasingly becoming an important market for live grouper and imports a significant amount from Hong Kong SAR. There is however, no official figure as to how much live grouper is imported into the mainland. Singapore also imports live grouper to satisfy local demand, mainly from Malaysia and Indonesia. INFOFISH estimates that around 400 - 500 MT of live grouper is imported annually into Singapore by boat from nearby Sumatera Islands (Batam or Riau), by air from other parts of Indonesia and Sabah and by truck from West Malaysia.

Note: Article on "Live Fish Trade in Asia: Update - by Sudari Pawiro is attached. The article is published in the INFOFISH International magazine No. 1/2006 (Jan/Feb 2006).

As indicated above, the international market for processed grouper is relatively small compared with other marine finfish, mainly because of limited production. FAO recorded that frozen grouper production reached the highest level at 16 144 MT in 2002 then declined to 13 504 MT in 2003, with Mexico and the Philippines being the two main producers. As many countries do not have separate trade statistics for grouper products, global trade (imports) recorded by FAO is also very small which was only less than 4 000 MT worth over US$ 18 million in 2003.

India, Pakistan and Indonesia are the main exporters of frozen grouper while Mexico is the largest fresh/chilled grouper supplier mainly to the US market. India exported more than 5 000 MT of frozen grouper, known as reef cod, to mainly Middle Eastern and European countries as well as the US market.

In supermarkets in Malaysia whole chilled grouper is sold in tray packs or in bulk. Flowery grouper is sold at around RM 15.00/kg (US$ 4/kg) while leopard coral trout is sold at around RM 18 - 22/kg (US$ 4.8-5.9/kg) at the retail market. In live seafood restaurants, grouper can fetch a price as high as RM 120/kg (US$ 32/kg). Demand for grouper is expected to increase in the domestic market as a result of increasing supply from aquaculture and increasing consumers' income.

b. Asian seabass

Meanwhile, international trade for Asian seabass is very limited and the bulk of the production is consumed locally or traded among neighbouring countries in Southeast Asian countries. Thus, the main producers like Thailand, Indonesia, Malaysia, Singapore and Taiwan Province of China are also the main markets for this species. The fish is mainly sold in live and whole fresh/chilled forms, while only small amount is frozen. Unfortunately, there is no separate trade statistics for Asian seabass as it falls under

general “seabass” which refers to various species such as European seabass, Japanese seabass, giant seabass, Chilean seabass and also Asian seabass.

Under this category, the global trade of “seabass” is on the rise whereby the total world exports increased from 3 601 MT in 1994 to 26 058 MT in 2003 while the imports reached the highest level at 41 057 MT in 2002 before dropping to 38 624 MT in 2003. This statistics however, particularly refers to European seabass trade and only small percentage involves Asian seabass

The main Asian seabass exporting countries are Australia, Thailand, Malaysia, Taiwan Province of China and Indonesia. Australia is aggressively promoting its barramundi and targeting the USA and Europe as the main markets. It exports live fingerlings to the USA and UK for growing out and sell the harvest in those markets.

Thailand exports live and fresh/chilled Asian seabass to Hong Kong SAR, Malaysia and also Singapore. Exports of live marine foodfish from Thailand recorded at 3 225 MT valued at Baht 367 million (US$ 9.2 million) in 2004 consisted mainly of grouper, snapper and also Asian seabass. The country also exports a small amount of frozen seabass, around 38 MT worth Baht 3.4 million in 2004, mainly to USA, Japan and Saudi Arabia.

Meanwhile, Taiwan Province of China exported almost 200 MT of frozen seabass in 2003 with the main market being the USA, Canada and Europe. Other supplying countries are Indonesia and Malaysia which export mainly live seabass to neighbouring Singapore market.

Singapore, meanwhile, imports around 1 000 MT of live marine foodfish annually and it is estimated that around 50% is live Asian seabass mainly from Malaysia and Indonesia. While the country also imports large amount of frozen seabass (more than 2 700 MT in 2004) it is believed that it is mainly of Chilean seabass. Even though the fish is relatively unknown in Japan, China and South Korea, small amounts of Asian seabass are also imported into these countries mainly from Thailand and Taiwan Province of China.

There is a small but growing market for Asian seabass in the USA and UK. In 2004, the US imported 16 090 MT of various “seabass” products worth US$ 132 million. The imports mainly consisted of Chilean seabass (9 580 MT) followed by perch (530 MT), bass (838 MT) and frozen seabass (302 MT). To target the growing US market, *Australis Aquaculture* of Australia has set up Asian seabass growing facilities in Massachusetts whereby the company exports live fingerlings from Australia and grows the fish up to 600 gram for the period of 8 months. Similar arrangement has also been established by another Australian company, *Aquabella Group PLc*, in England. Even though European markets are still dominated by European seabass (*Dicentrarchus labrax*), but there is high possibility that Asian seabass can compete in those markets particularly in northern European countries.

The average value of farmed seabass declined over the years from the highest at US$ 5.6/kg in 1995 to the lowest at US$ 3.4/kg in 2002 before moving up again to US$ 4.2/kg in 2003. Among the main producing countries, Australia and Singapore markets pay higher price for Asian seabass, while Taiwan Province of China produces low value of the fish, which is cultured in earthen pond. In Australia, the massive rise in volume of farmed seabass has driven down the average wholesale price from around A$ 10/kg for fresh/chilled gutted fish in 2000 to around A$ 7.50 - 8.50/kg in 2005. Following the trend, fish fillet of Asian seabass (skin-on) also dropped from A$ 22/kg in 2000 to around A$ 17 - 18/kg in the Sydney wholesale Fish Market.

In Asia, Asian seabass price dropped during the economic crisis in 1998/1999 then recovered in 2000/2001 before dropping again in the last few years. In Hong Kong SAR, live Asian seabass price went up to the highest level at around HK$ 50/kg (US$ 6.5) in 2000/2001 then declined to HK$ 33.3/kg (US$ 4.3) in 2004. Ex-farm price of Asian seabass in Thailand, however, has been stable at around Baht 90/kg (US$ 2.3) since 2001.

The domestic market in Malaysia for Asian seabass is mostly satisfied from local production and only when there is a short supply, the fish is also imported from Southern Thailand and Indonesia. About 90% of the local Asian seabass production is consumed in local market mostly through catering sector in live form. Selling of fresh/chilled Asian seabass is also slowly growing, mainly through supermarkets where sales promotion is regularly conducted.

In the catering sector, Asian seabass is prepared in various styles such as steamed, deep fried, Thai-style, grilled etc. Consumption is usually high during festive season e.g. Chinese New Year.

Asian seabass price in Malaysia market tends to decline over the years from the average RM 15.00/kg (US$ 4/kg) in 1998 to RM 13/kg (US$ 3.5/kg) in 2005, in retail market, while in seafood restaurant, Asian seabass is priced (live) around RM 40.00/kg.

c. Milkfish

Milkfish is mainly cultured in Indonesia, the Philippines and also Taiwan Province of China and is largely for local consumption and only small amount is exported to ethnic market in the Middle East and North America. In Indonesia and the Philippines, milkfish (called *Bandeng* in Indonesia and *Bangus* in the Philippines) is very popular among the local. The Philippines produced farmed milkfish at 246 505 MT in 2003 mainly for local market and small amount is exported to North America and the Middle East.

Taiwan Province of China in 2004 exported 8 166 MT worth NT$ 455 million of milkfish, the bulk in frozen form, mainly to Saudi Arabia, USA, Canada, Australia and Southeast Asian countries.

Indonesia produced around 226 000 MT of milkfish, largely for local consumption which is popular fish in Java and South Sulawesi Islands. Milkfish is also used as bait in tuna longliner which is widely practiced in Indonesia.

5. THE CHALLENGES AND TRADE ISSUES

In recent years, trade of seafood products in the international market has been very challenging with a lot of controversies and issues affecting the trade flows. Among the challenges and issues related to marketing of marine aquaculture products are:

(a) Declining prices: Prices of selected farmed products such as black tiger and *vannamei* shrimp tend to decline over the years, especially for traditional products such as block frozen headless shrimp. For example, the price of black tiger headless from Indonesia to Japan (c&f price) for size 16/20 has declined from the higher level at around US$ 15.00 – 17.00/kg for the period of 1995 – 2000 to around US$ 10.00 – 12.00 for the past few years. Similarly, there is also signs of softening price of *vannamei* shrimp in Europe as a result of increasing cheaper supply from China. In the local market, such as in Malaysia, shrimp is also getting cheaper as a result of abundance supply from aquaculture. Due to strong

competition from other species, seabass price has also been declining. The declining prices of farmed products is not exclusively suffered by tropical species but also hit coldwater species such as salmon and European seabass and seabream. Reportedly, the price of high-grade bluefin tuna in Japan declined sharply from around ¥5000/kg ten years ago to currently around ¥2000/kg because of the sharp increase in farmed bluefin tuna supplies.

(b) Strong competition from other products: The fast growing regional market has attracted seafood products from all over the world. Coldwater species such salmon, cod, pollack etc. nowadays can be found in almost every supermarkets in the region. Nile perch fillet from Lake Victoria and *tra* and *basa* fillet from Vietnam are flooding the regional markets giving strong competition to marine finfish locally produced such as Asian seabass, snapper and grouper.

(c) Limited marketing options for farmed marine finfish: Due to high production cost, farmed grouper, snapper and to some extend Asian seabass are only viable to be marketed in live form. At the moment selling them as processed products is not economically viable.

(d) Trade issues: The anti-dumping duty enforced by the US on shrimp from six (6) countries has had significant effect to the shrimp industry in the region and also to the market. In addition to the economic and financial losses suffered by the industry in the affecting countries (India, Thailand, China and Vietnam), many shrimp processors and producers are now giving more attention to the local and regional markets. As a result, competition in the local and regional market is increasing resulting in decreasing prices.

This trend has also been exploited by highly competitive retail sector which often use shrimp as a promotional item. While this is a good thing for consumers who can now buy shrimp at cheaper prices, but producers and farmers are being squeezed of their profit margin.

The increasing imports of shrimp from the affected countries to non-affected countries such as Indonesia and Malaysia has also raised concern among the industry resulting Indonesian authority bans the importation of shrimp.

(e) Environmental issues: We all know what the environmental issues' are in marine aquaculture sector, but recently the issues have increasingly been linked to trade and many feel they are also used as trade barriers. The green groups are now targeting multinational chain retailers and catering sector to influence them to buy and sell seafood from eco-friendly sources.

(f) Safety issues: The uncontrollable use of certain antibiotics has also affected the trade of marine farmed products especially shrimp. When the issue of chloramphemicol and nitrofurans residues in shrimp is more or less resolved, recently, malachite green found in fish products has become another issue for the industry.

(g) Traceability and country of origin labelling: While the industry players in this region, especially big seafood processors and exporters are fully aware and possibly capable of fulfilling traceability and country of origin labelling requirements, the implementation at small players, especially at farmer's level will be a bit complicated. Due to small and scattered nature of fish farming industry in the region, implementing traceability concept needs extra work and cost.

(h) Rules of origin: Rules of origin enforced by importing countries such as EU's GSP scheme can also have an effect on the regional trade. For example, seafood products from ASEAN enjoy preference tariff under EU-GSP scheme except for products from Myanmar due to political reason.

As a result, some packers in other ASEAN countries are having problem to import raw materials from Myanmar if the final products is to be exported to the EU.

6. FUTURE PROSPECT

The regional seafood market and trade in the region are expected to expand further largely due to the economic development, increase in supply from aquaculture sector, growing retail and catering sectors and changing lifestyle towards healthier foods. Demand for shrimp is predicted to grow faster than other farmed marine products. The growth will be driven by increasing supply and sales both at retail and catering sectors.

For marine finfish aquaculture, the market expansion will be very much depend on the development of production technology and the reduction in production cost. Otherwise, the market for certain farmed finfish species such as grouper and snapper will still be limited to live market segment.

In this region, high percentage of bivalve consumption is done through catering sector such as hotel and restaurant, especially for high value species such as mussel, oyster and scallop. With the growing catering sector in this region, as a result of increasing consumers income, changing of lifestyle, booming tourism industry etc., the demand for bivalves is also expected to grow. Aquaculture will play major role to meet the growing demand. The competition is also expected to come from imported products such as green mussel from New Zealand.

The prospects for seaweed products are generally good for hydrocolloid seaweeds especially for carrageenan. The international market for carrageenan is expected to grow by 4-6% per year as a result of growing food industry. The demand for SRC which is produced a lot in the region, is also growing faster replacing refined carrageenan.

For edible seaweed however, the market is more or less stagnant with the current production level can fulfill the demand. With the increasing popularity of Japanese and Korean seafood restaurants in the region, demand for certain edible seaweed may grow slowly in South East Asian countries.

References

1. FAO, Fisheries Statistics – Commodities, Vol. 97, 2003.
2. FAO, Fisheries Statistics – Aquaculture Production, Vol. 96/2, 2003.
3. Fisheries Statistics of Japan 2001-2003, Ministry of Agriculture, Forestry and Fisheries, Japan, 2004.
4. China Seafood Imports and Exports in 2004, Edited by the China Society of Fisheries.
5. Fisheries of the United States 2004, National Oceanic and Atmospheric Administration, National Marine Fisheries Services (NMFS), November 2005.
6. Statistics of Japanese Fishery Products Imports, 2004; Japan Fish Traders Association, Japan.
7. Globefish – Bivalves Commodity Update, May 2005.
8. Globefish – Shrimp Commodity Update, October 2005.
9. Philippines Fisheries Profile, 2003 – Bureau of Fisheries and Aquaculture Resources.
10. Imports into Hong Kong SAR, December 2004, Agriculture, Fisheries and Conservation Dept., Hong Kong SAR.
11. China, PR of Fisheries Products Annual 2005, GAIN Report, CH 5098, USDA Foreign Agricultural Services, 2005.