

# PART I

## Status and Trends of Capture Fisheries and Aquaculture in Southeast Asia

### I. GLOBAL PRODUCTION AND UTILIZATION OF FISH

For over one and a half decades, the global fisheries production has continued to grow from 136.2 million metric tons in 2000 to 195.7 million metric tons in 2014, increasing at a rate of approximately 3.12% annually (Table 1). During the same period, the utilization of fish for human consumption and non-food uses also increased from 131.0 million metric tons to 167.2 million metric tons or an increase of 1.97% annually (FAO, 2016a). During the period from 2000 to 2009, the percentage of fish produced for human consumption had risen from 74% to approximately 85%, slightly declined during 2010-2011, and remained rather steady at approximately 75% until 2014 (Table 1 and Figure 1). Meanwhile, the human population as major consumer of fish products also increased from approximately 6.1 billion in 2000 to 7.3 billion in 2014, while the per capita fish consumption also increased from an average of 15.9 kg in 2000 to 20.1 kg in 2014 (Figure 2). From the aforesaid data, it could be visualized that the increased supply of fish through enhanced fisheries production has contributed to elevated consumption and other utilization, and as the human population grows the demand for fish and fishery products will also rise. It is quite clear that for developing countries, fish consumption trends depend on the availability of local and seasonal supply of fish and fishery products, which

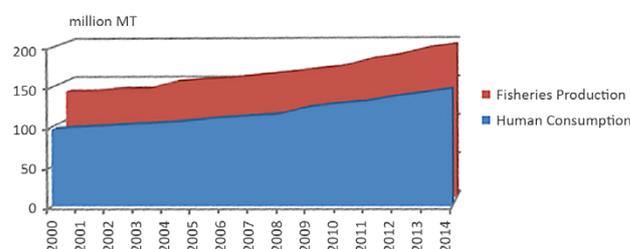


Figure 1. Quantity of fisheries production utilized for human consumption from 2000 to 2014

Source: FAO Fisheries and Aquaculture Information and Statistics Service

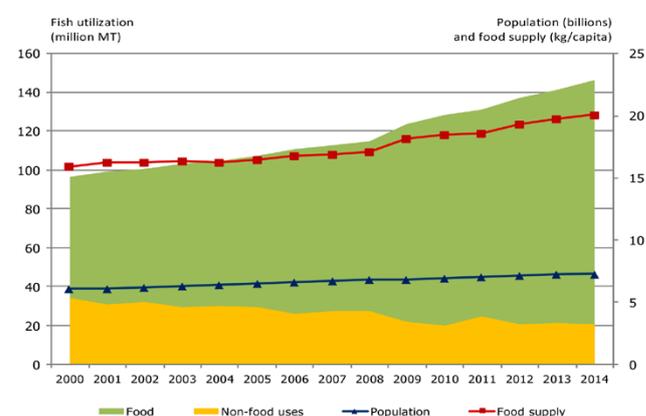


Figure 2. Global fish utilization, food supply and human population in 2000-2014

Source: FAO Fisheries and Aquaculture Information and Statistics Service

Table 1. World fisheries production and utilization from 2000 to 2014

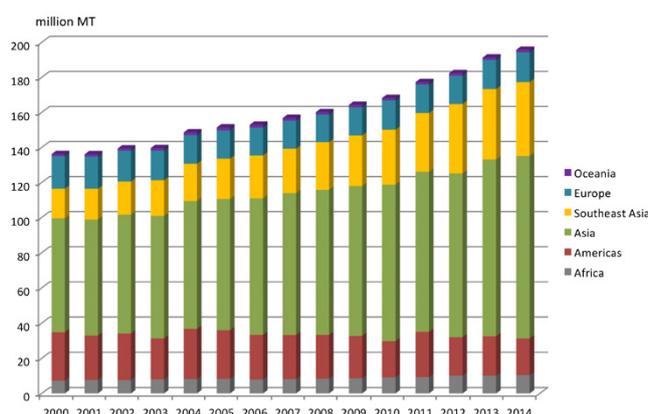
Year	Production (million metric tons)			Utilization (million metric tons)		Human population (billions)	Percentage of production for human consumption (%)	Per capita fish consumption (kg)
	Capture	Aquaculture	Total	Human consumption	Non-food uses			
2000	94.5	41.7	136.2	96.8	34.2	6.1	73.9	15.9
2001	91.8	44.3	136.1	99.5	31.1	6.1	76.1	16.2
2002	92.0	47.4	139.4	100.7	32.2	6.2	75.7	16.2
2003	89.3	50.3	139.6	103.0	29.2	6.3	77.9	16.3
2004	94.0	54.6	148.6	104.4	29.8	6.4	77.7	16.2
2005	93.6	57.8	151.4	107.3	29.7	6.5	78.7	16.5
2006	91.3	61.6	152.9	110.7	26.3	6.6	80.7	16.8
2007	91.9	64.9	156.8	112.7	27.1	6.7	80.6	16.9
2008	91.2	68.9	160.1	115.1	27.2	6.8	80.9	17.1
2009	91.3	73.0	164.3	123.8	22.0	6.8	85.3	18.1
2010	90.2	78.0	168.2	128.1	20.0	6.9	80.0	18.5
2011	94.7	82.6	177.3	130.8	24.7	7.0	73.7	18.6
2012	92.4	90.0	182.4	136.9	20.9	7.1	75.0	19.3
2013	93.9	97.2	191.1	141.5	21.4	7.2	74.0	19.7
2014	94.6	101.1	195.7	146.3	20.9	7.3	74.8	20.1

Source: FAO Fisheries and Aquaculture Information and Statistics Service

also sets the direction of the fish supply chain (FAO, 2014a). Food fish is important as inexpensive source of high-quality protein as well as all essential amino acids, essential fats (omega-3), vitamins, and minerals including calcium, iodine, zinc, iron, and selenium (FAO, 2016a), and thus, is necessary for human health.

The Population Division of the United Nations predicted that global human population will reach 8.5 billion by 2030 and 9.7 billion by 2050 (UN, 2015), increasing at 16.4% and 32.9%, respectively, compared with that in 2014. The world food producing sector must therefore secure the availability of food and nutrition for the growing human population by increasing production and reducing wastes and discards. In this connection and with the assumption that per capita consumption of fish could be maintained at its present level, the global demand for fish would increase by 33% in 2050. Nevertheless, other factors that are likely to affect the demand for fish include level of wealth, urbanization, fish price, prices of substitutes or complementary foods, eating habits and tastes, and the level of subsistence fishing.

The world fisheries production from 2000 to 2014 by continent which is shown in **Table 2** and **Figure 3** indicated a continued annual increase at an average rate of 2.6% or 4.3 million metric tons per year. The major producers are the countries from Asia, contributing about 53.0% to the total production throughout the past decade. The Southeast Asian region which contributed approximately 21.6% to the world’s production maintained an increasing trend from 16.9 million metric tons in 2000 to 42.2 million metric tons in 2014 or an average increase of 1.8 million



**Figure 3.** Trends of fisheries production of each continent from 2000 to 2014 by quantity  
(Note: Asia does not include data of Southeast Asia)

metric tons or 6.8% per year. On the contrary, fisheries production from the Americas after reaching the highest peak of 28.5 million metric tons in 2004 has declined and its total production in 2014 was 20.8 million metric tons. For Europe, the production has also decreased from 18.6 million metric tons in 2000 to around 16.0 million metric tons from 2004 onwards.

## II. FISHERIES PRODUCTION OF SOUTHEAST ASIA

The Southeast Asian region (**Figure 4**) is bordered by the Andaman Sea and the Indian Ocean in the west, and by the western part of the Pacific Ocean in the east. The region comprises 11 countries, namely: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Timor-Leste, Thailand, and Viet

**Table 2.** Fisheries production of each continent from 2000 to 2014 by quantity (million metric tons)

Year	World Total* (million metric tons)	Continents					
		Africa*	Americas*	Asia*	Southeast Asia**	Europe*	Oceania*
2000	136.2	7.3	27.5	64.7	16.9	18.6	1.2
2001	136.6	7.7	25.2	65.8	18.2	18.4	1.3
2002	139.4	7.6	26.5	67.5	18.9	17.6	1.3
2003	139.7	8.0	23.3	69.6	20.4	17.0	1.4
2004	149.4	8.2	28.5	72.7	22.0	16.4	1.6
2005	151.8	8.3	27.6	74.5	23.5	16.2	1.7
2006	153.3	7.9	25.4	77.6	24.9	15.9	1.6
2007	158.2	8.1	25.0	80.6	26.9	16.0	1.6
2008	160.2	8.4	24.9	82.5	27.3	15.7	1.4
2009	163.3	8.6	24.1	85.1	28.0	16.1	1.4
2010	168.2	9.2	20.5	89.0	31.4	16.7	1.4
2011	177.3	9.3	25.7	91.1	33.5	16.3	1.4
2012	182.4	10.1	21.9	93.2	39.6	16.1	1.5
2013	191.1	10.1	22.4	100.4	40.2	16.6	1.4
2014	195.7	10.5	20.8	103.8	42.2	16.9	1.5

Note: Asia does not include data of Southeast Asia

\* Source: FAO Fisheries and Aquaculture Information and Statistics Service

\*\* Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a) for data from 2000-2007; and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a) for data from 2008 to 2014



Figure 4. Map of Southeast Asia

(Source: Google)

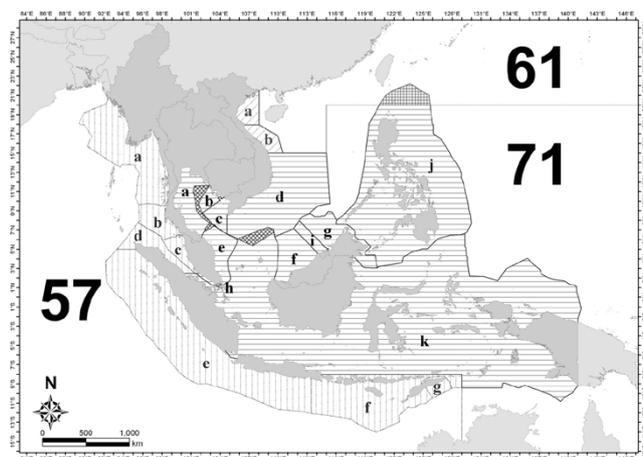


Figure 5. FAO Major Fishing Areas in Southeast Asia

(Source: SEAFDEC, 2008c)

Nam. Although Timor-Leste may have its own fisheries data, SEAFDEC has no mandate to include the country's statistics in this publication as the scope of this publication focuses mainly on the ten ASEAN Member States (AMSs). In terms of fishery statistics for both capture fisheries and aquaculture, the total fisheries production of the Southeast Asian region covers the waters under FAO Major Fishing Areas 57 (Indian Ocean, Eastern), 61 (Pacific, Northwest), 71 (Pacific, Western Central), and 04 (Asia, Inland Waters) as shown in Figure 5.

All inland waters of the Southeast Asian countries have been identified under the Area 04 (Asia, Inland Waters) as shown in Figure 6. However, there is no sub-area for Asia (Fishing Area 04) that is recognized for the collection of catch and effort data for the Southeast Asian region (SEAFDEC, 2008c). The data presented by Lao PDR, which is the sole landlocked country in the region, are therefore reported under Area 04 only. The fisheries production of the Southeast Asian region from 2000 to 2014, summarized in Table 3, was compiled by SEAFDEC based on inputs of the AMSs, and published in the Fishery Statistical Bulletin for the South China Sea Area 2000-2007 and the Fishery Statistical Bulletin of Southeast Asia 2008-2014.

In compiling the data for the Fishery Statistical Bulletin of Southeast Asia, the retained catches officially submitted by the AMSs and various sources had been used as inputs to make the data as complete as possible while utilization of regional inputs had also been maximized. These include the data collected through statistical surveys and from government records as well as those of semi-governmental organizations. In addition, data and information derived

Table 3. Fisheries production of the Southeast Asian countries from 2000 to 2014 by quantity (thousand metric tons)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	2.6	298.8	5,120.5	71.0	1,457.1	1,309.8	2,993.3	10.0	3,713.3	1,961.2	16,937.6
2001	1.6	441.2	5,490.5	81.0	1,411.7	1,474.5	3,166.5	7.8	3,648.4	2,434.7	18,157.9
2002	2.2	424.4	5,515.7	93.0	1,467.5	1,606.2	3,369.5	7.8	3,797.0	2,647.4	18,930.7
2003	2.2	390.7	6,005.6	95.0	1,484.0	1,987.0	3,619.3	7.1	3,914.0	2,859.2	20,364.1
2004	3.1	343.5	6,647.0	95.0	1,538.0	2,148.6	3,926.2	7.6	4,137.1	3,150.6	21,996.7
2005	3.1	546.0	7,183.6	107.8	1,421.4	2,581.8	4,161.9	7.8	4,132.8	3,397.2	23,543.4
2006	3.1	661.5	7,510.8	107.8	1,644.5	2,818.0	4,408.5	11.7	4,051.8	3,656.2	24,873.9
2007	3.2	525.1	9,054.9	91.7	1,654.2	2,808.0	4,711.3	8.0	3,675.4	4,315.5	26,847.3
2008	2.8	536.3	9,054.9	93.5	1,753.3	3,147.6	4,966.9	5.1	3,204.2	4,559.7	27,324.3
2009	2.4	515.0	10,064.1	105.0	1,870.0	3,491.1	4,080.0	5.7	3,137.7	4,782.4	28,053.4
2010	2.8	555.0	11,662.3	113.0	1,806.6	3,902.0	5,155.7	5.2	3,113.3	5,127.6	31,443.5
2011	2.5	631.7	13,626.2	129.6	1,665.8	4,149.8	4,973.6	6.0	2,870.1	5,432.9	33,488.2
2012	5.1	728.0	18,763.9	136.0	1,760.8	4,417.7	4,865.7	6.2	3,068.4	5,816.1	39,567.9
2013	3.4	728.0	19,245.6	164.2	1,749.3	4,715.9	4,695.4	7.2	2,900.6	6,019.7	40,229.3
2014	4.0	745.3	20,600.8	150.6	1,988.3	5,040.3	4,681.4	6.7	2,667.3	6,332.5	42,217.2

Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a) for data from 2000-2007; and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a) for data from 2008 to 2014

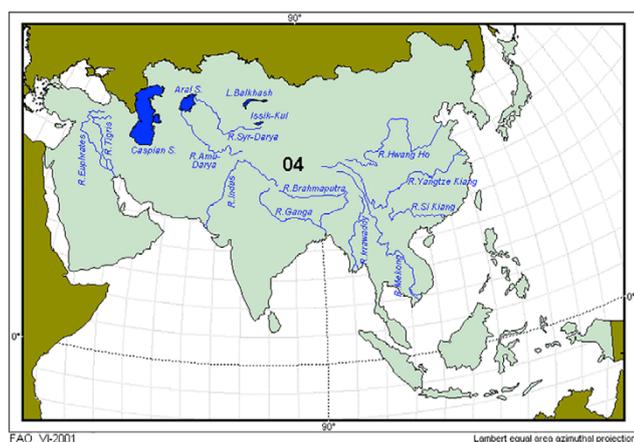


Figure 6. Area 04: Asia-Inland Waters (SEAFDEC, 2008c)

from new statistical techniques, e.g. small-scale surveys had also been sourced to provide inputs to the Bulletin.

In 2014, the total fisheries production of the Southeast Asian region was reported to be 42.2 million metric tons, with an average increase of 7% annually over the past 15 years. Indonesia consistently contributed the highest portion at 20.6 million metric tons or nearly 49% of the region’s total production, followed by Viet Nam, Myanmar, and Philippines at 6.3 million metric tons (15%), 5.0 million metric tons (12%), and 4.7 million metric tons (11%), respectively. The annual production of the Philippines during the period changed as catches were primarily affected by the reduced fishing activities due to typhoons and rough seas<sup>1</sup>. The highest increase in production came from Indonesia at an average annual rate of approximately 11% over the past 15 years, followed by Myanmar, and Viet Nam at 10% and 9%, respectively. Thailand showed declining trends, particularly from 2006 until 2014 at an average rate of 4% annually, which could be mainly due to the decrease in the production of marine capture fisheries (Figure 7). The fisheries production of the Southeast Asian region comes from three sub-sectors, namely: marine capture fisheries, inland capture fisheries, and aquaculture.

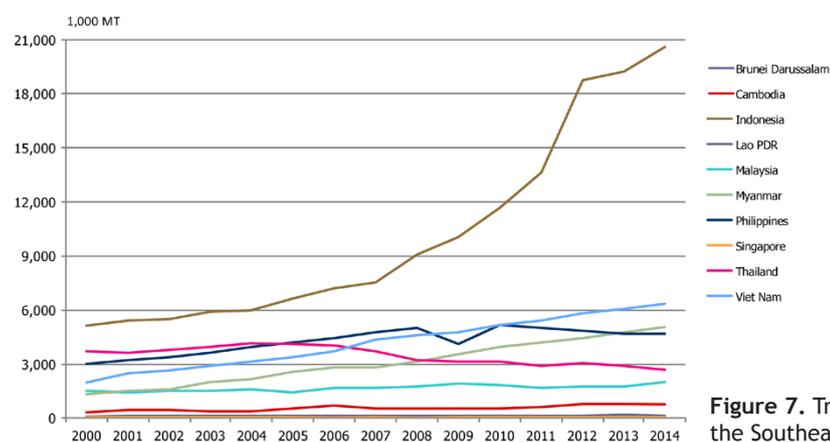


Table 4. Production of the fisheries sub-sectors of Southeast Asia in 2014 by quantity (metric tons) and value (US\$ thousand)

Sub-sector	Quantity (MT)	Value (US\$ 1000)	Value (US\$/MT)
Marine Capture Fisheries	16,655,092	21,635,256	1,300
Inland Capture Fisheries	3,028,233	3,693,300	1,220
Aquaculture	22,533,831	17,409,322	775
<b>Total</b>	<b>42,217,156</b>	<b>42,737,878</b>	

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016)

As shown in Table 4, the total volume of fisheries production of the region by sub-sector in 2014 indicated that the largest portion came from aquaculture accounting for approximately 53%, followed by marine capture fisheries at about 40%, and inland capture fisheries at 7% (Figure 8). In terms of value, marine capture fisheries contributed the highest production value accounting for 50% followed by aquaculture which contributed approximately 41%, and inland capture fisheries at about

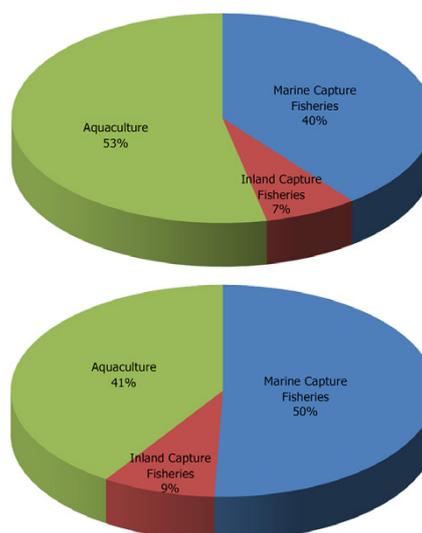


Figure 8. Percentage contribution of the fisheries sub-sectors to the total fisheries production of Southeast Asia in 2014: by quantity (above) and value in US\$ (below)

<sup>1</sup> Personal communication with the Bureau of Fisheries and Aquatic Resources (BFAR), Philippines

**Table 5.** Production trends of the fisheries sub-sectors of Southeast Asia: 2000 to 2014 by quantity (million metric tons)

Year	Marine Capture Fisheries		Inland Capture Fisheries		Aquaculture		Total
	Production (million MT)	Percentage (%)	Production (million MT)	Percentage (%)	Production (million MT)	Percentage (%)	Production (million MT)
2000	11.88	70	1.36	8	3.70	22	16.94
2001	12.25	68	1.59	8	4.32	24	18.16
2002	12.57	66	1.55	8	4.81	26	18.93
2003	13.22	65	1.67	8	5.47	27	20.36
2004	13.59	63	1.88	8	6.52	29	21.99
2005	13.77	59	2.07	8	7.70	33	23.54
2006	14.06	57	2.25	9	8.56	34	24.87
2007	14.57	56	2.52	8	9.76	36	26.85
2008	13.85	51	2.37	8	11.10	41	27.32
2009	14.00	49	2.35	8	11.70	43	28.05
2010	14.87	47	2.38	8	14.19	45	31.44
2011	15.10	45	2.64	8	15.75	47	33.49
2012	15.59	39	2.82	7	21.16	54	39.57
2013	16.32	41	2.95	7	20.96	52	40.23
2014	16.66	40	3.03	7	22.53	53	42.22

*Source:* Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a) for data from 2000-2007; and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a) for data from 2008 to 2014

9% (**Figure 8**). While the value of marine capture fisheries in 2014 was about US\$ 1,300/metric ton, those of inland capture fisheries and aquaculture were about US\$ 1,220/metric ton and US\$775/metric ton, respectively (**Table 4**).

The production trends of the fisheries sub-sectors of Southeast Asia from 2000 to 2014 signify declining contributions from marine capture fisheries, which contributed up to 70% in 2000 but constantly decreased to approximately 40% from 2012 and onwards (**Table 5**). Nevertheless, such reduction was compensated by the contribution from aquaculture which increased from 22% in 2000 to 53% in 2014. These trends indicated the increasing importance of aquaculture as a source of food fish to meet the increasing demand for fish and ensure food security in the region.

### III. MARINE CAPTURE FISHERIES PRODUCTION OF SOUTHEAST ASIA

In 2014, the global marine capture fisheries production was reported to be 82.7 million metric tons, accounting for 42.25% of the total fisheries production (195.7 million metric tons) with Asia and America as the top contributors (**Table 6**). It should be noted however that the trend of the global marine capture fisheries production has slightly decreased from 2000 to 2014 at an average of 229 thousand metric tons annually. This is due to severe fluctuations in production of America and the declining production trend of Europe over the years (**Figure 9**). Specifically for the Southeast Asian region, its marine capture fisheries production of 16.6 million metric tons in 2014 contributed approximately 20.1% to the global

marine capture fisheries production. **Figure 10** shows the increasing trend in marine capture fisheries production of the Southeast Asian countries from 11.9 million metric tons in 2000 to 16.7 million metric tons in 2014, with an average increase of 0.34 million metric tons or 2% annually. In terms of quantity, the total marine capture fisheries production of the Southeast Asian countries during 2000-2014 indicated that Indonesia contributed the highest production especially in 2014 when the country's production was 5.97 million metric tons accounting for approximately 35.8% of the region's total, followed by Viet Nam, Myanmar, and Philippines, with production of 2.71 million metric tons (16.3%), 2.70 million metric tons (16.2%), and 2.13 million metric tons (12.8%), respectively (**Table 7**). Thailand and Malaysia also contributed considerable amount from their production of 1.56 million metric tons (9.4%) and 1.46 million metric tons (8.8%), respectively.

As shown in **Table 7** and **Figure 10**, Indonesia has been the largest producer in the Southeast Asian region throughout the period from 2000 to 2014 in terms of quantity, which had been increasing from 3.80 million metric tons to 5.97 million metric tons at an average rate of 154.00 thousand metric tons annually. Similarly, the marine capture fisheries production of Myanmar had been steadily increasing from 0.95 million metric tons to 2.70 million metric tons with an average rate of 125 thousand metric tons annually. Cambodia's production, although not much, had tremendously increased from 36 thousand metric tons in 2000 to 120 thousand metric tons in 2014 with an average rate of 6 thousand metric tons or 16% annually. The marine capture fisheries production of

**Table 6.** Marine capture fisheries production of each continent from 2000 to 2014 by quantity (thousand metric tons)

Year	World Total* (million metric tons)	Continents					
		Africa*	Americas*	Asia*	Southeast Asia**	Europe*	Oceania*
2000	85,959	4,676	25,532	26,648	11,880	16,138	1,085
2001	84,250	5,051	22,950	26,999	12,247	15,938	1,115
2002	83,688	4,886	24,109	25,711	12,574	15,230	1,177
2003	80,756	5,114	20,730	25,908	13,219	14,540	1,275
2004	85,344	5,223	25,691	25,699	13,591	13,884	1,466
2005	84,207	5,155	24,890	25,331	13,771	13,742	1,502
2006	81,476	4,706	22,437	25,682	14,059	13,344	1,368
2007	81,785	4,702	22,111	26,238	14,571	13,300	1,377
2008	81,132	4,830	21,880	26,379	13,846	13,005	1,224
2009	79,589	4,972	21,012	26,211	14,002	13,254	1,210
2010	78,910	5,152	17,445	26,488	14,874	13,756	1,195
2011	83,696	5,049	22,441	26,665	15,095	13,271	1,175
2012	80,836	5,704	18,392	26,960	15,591	12,919	1,270
2013	82,246	5,546	18,817	27,134	16,322	13,387	1,210
2014	82,756	5,799	16,858	28,452	16,655	13,660	1,332

Note: Asia does not include data of Southeast Asia

\* Source: FAO Fisheries and Aquaculture Information and Statistics Service

\*\* Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a) for data from 2000-2007; and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a) for data from 2008 to 2014

**Table 7.** Marine capture fisheries production of the Southeast Asian countries in 2000-2014 by quantity (thousand metric tons)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR*	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	2.46	36.00	3,807.19	-	1,285.49	949.67	1,740.04	5.37	2,773.67	1,280.59	11,888.48
2001	1.93	42.00	3,979.48	-	1,239.28	1,039.46	1,818.73	3.44	2,634.17	1,488.16	12,246.65
2002	2.05	45.88	4,073.51	-	1,272.08	1,060.25	1,899.49	2.77	2,643.71	1,575.64	12,575.38
2003	1.99	55.61	4,385.10	-	1,289.26	1,139.34	2,038.49	2.09	2,658.22	1,649.48	13,219.58
2004	2.43	55.82	4,379.24	-	1,369.65	1,279.18	2,079.93	2.17	2,654.97	1,765.71	13,589.10
2005	2.71	60.00	4,464.50	-	1,299.60	1,388.67	2,129.22	1.92	2,625.57	1,799.50	13,771.69
2006	2.28	60.50	4,512.19	-	1,379.86	1,525.00	2,154.80	3.10	2,484.80	1,816.10	13,938.63
2007	2.55	54.90	4,734.28	-	1,381.43	1,485.74	2,327.20	3.52	2,079.35	1,987.40	14,056.37
2008	2.36	66.00	4,741.93	-	1,394.53	1,679.01	2,377.52	1.62	1,644.80	1,946.60	13,854.37
2009	1.96	75.00	4,779.41	-	1,391.09	1,787.51	2,398.84	2.12	1,496.16	2,068.30	14,000.39
2010	2.35	85.00	5,039.42	-	1,428.88	2,048.59	2,424.48	1.73	1,617.40	2,226.60	14,874.45
2011	2.16	114.70	5,328.64	-	1,373.11	2,169.82	2,171.77	1.62	1,633.65	2,300.00	15,095.47
2012	4.52	110.00	5,400.98	-	1,472.24	2,332.79	2,145.23	1.97	1,612.07	2,510.90	15,590.70
2013	2.83	110.00	5,767.02	-	1,492.90	2,483.87	2,187.37	1.65	1,630.05	2,647.00	16,322.69
2014	3.19	120.25	5,967.1	-	1,458.13	2,702.24	2,131.87	1.43	1,559.75	2,711.10	16,655.06

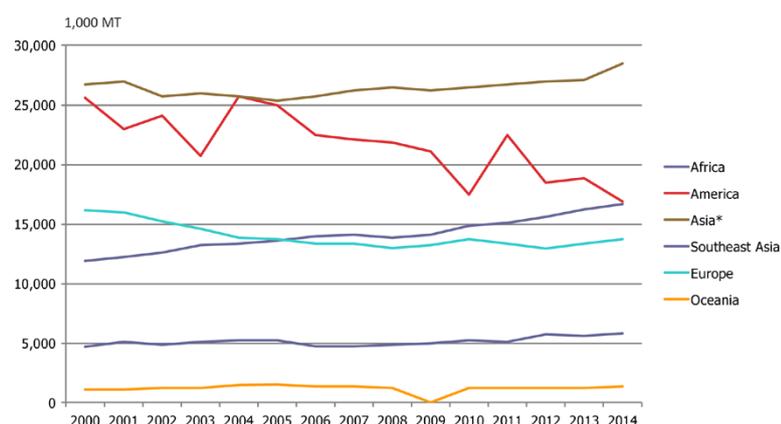
\* - means magnitude is zero or not applicable. Being a landlocked country, Lao PDR has no marine capture fisheries

Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a) for data from 2000-2007; and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a) for data from 2008 to 2014

Thailand showed declining trends, especially after 2005 (Figure 10), which could be mainly attributable to reduced overfishing in the country and environmental degradation in the Gulf of Thailand, as well as the cessation of fishing operations by Thai vessels in Indonesian waters since 2008 (FAO, 2014a).

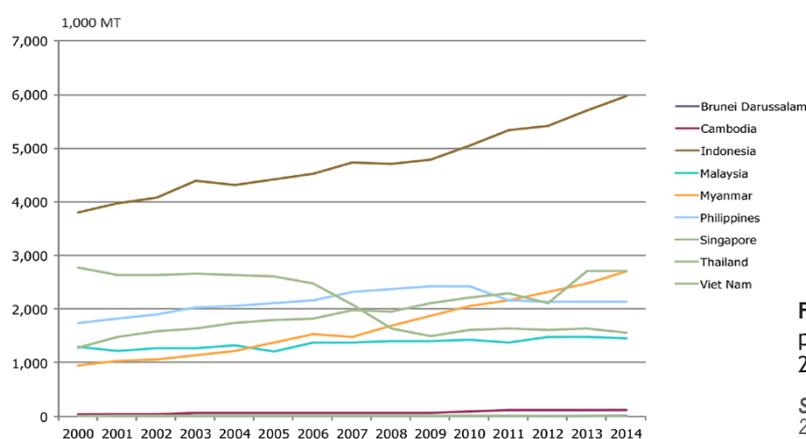
Meanwhile, the corresponding values of the production from the region's marine capture fisheries during the same

period are shown in Table 8. Although some countries were not able to provide the data, the total value of the region's marine capture fisheries production from 2000 to 2014 seems to have increased corresponding to the increasing trend of the quantity of production. By country, Indonesia also led the Southeast Asian countries accounting for about 37% of the total value in 2014, with Malaysia emerging as the second highest producing country contributing about 22%. Meanwhile, Myanmar



**Figure 9.** Trends in marine capture fisheries production of each continent by quantity (Asia does not include data of Southeast Asia)

Source: FAO (2014a); and SEAFDEC (2005a; 2006; 2008a; 2008b; 2009a; 2010a; 2010b; 2011; 2012a; 2013; 2014; 2015a; 2016a)



**Figure 10.** Trends in marine capture fisheries production of Southeast Asian countries in 2000-2014 by quantity

Source: SEAFDEC (2005a; 2006; 2008a; 2008b; 2009a; 2010a; 2010b; 2011; 2012a; 2013; 2014; 2015a; 2016a)

**Table 8.** Marine capture fisheries production of the Southeast Asian countries in 2000-2014 by value (US\$ million)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	...	...	1,810	-	1,158	...	1,445	11.0	1,230	...	5,723
2001	...	...	2,225	-	1,096	...	1,322	7.0	1,197	924	6,771
2002	...	...	2,896	-	1,107	...	1,444	6.0	1,346	875	7,676
2003	...	...	2,927	-	1,056	...	1,459	6.0	1,545	964	7,958
2004	...	...	3,164	-	1,103	...	1,597	6.0	1,535	...	7,405
2005	...	...	3,726	-	1,087	...	1,681	6.0	1,535	...	7,405
2006	...	...	4,106	-	1,343	...	1,997	12.0	1,629	...	9,091
2007	8	...	4,868	-	1,464	...	2,452	14.0	1,586	...	10,421
2008	7	...	4,957	-	1,667	1,585	2,811	8.6	1,276	...	12,336
2009	5	111	1,687	-	1,833	3,081	2,650	10.0	1,244	...	10,417
2010	7	...	6,558	-	2,015	3,400	2,525	11.0	1,383	...	15,899
2011	8	...	7,100	-	2,268	3,580	3,016	10.0	1,412	3,784	21,179
2012	8	...	4,863	-	2,583	3,849	2,890	12.0	1,449	4,384	20,049
2013	8	...	8,996	-	2,646	4,098	2,996	11.0	1,592	...	20,349
2014	9	...	8,014	-	4,768	4,459	2,787	9.0	1,589	...	21,635

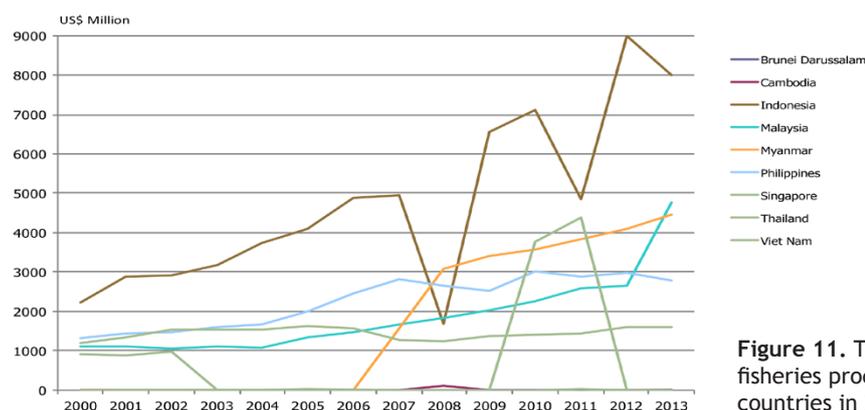
\* - means magnitude is zero or not applicable. Being a landlocked country, Lao PDR has no marine capture fisheries.

Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a) for data from 2000-2007; and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a) for data from 2008 to 2014

which came third contributed about 21%, Philippines ranking fourth accounted for 13%, and Thailand at the fifth rank contributed about 7% (Figure 11).

With regards to species classification of the marine capture fisheries production of the Southeast Asian region, the

countries reported a total of 203 species and/or species groups. These species include 163 finfishes, 18 crustaceans, 19 mollusks, and 3 aquatic invertebrates. Table 9 shows the major groups of species from marine capture fisheries of the Southeast Asian countries with the corresponding production in quantity and value in 2014. Nevertheless,



**Figure 11.** Trends of the value of marine capture fisheries production of the Southeast Asian countries in 2000-2014 (US\$)

**Table 9.** Production of major groups of species of marine capture fisheries of the Southeast Asian countries in 2014 by quantity (metric tons) and value (US\$ thousand)

Major groups of species	Production by quantity (metric tons)										Total value (US\$ thousand)
	Brunei Darussalam	Cambodia	Indonesia	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total	
Shads, milkfish, barramundi, etc.	...	...	112,616	31,658	...	3,038	24	34	...	147,370	290,117
Flounders halibuts, soles, etc.	...	...	27,932	6,481	...	657	...	7,358	...	42,428	66,826
Red fishes, basses, congers, etc.	...	...	1,053,550	268,841	...	295,994	347	166,011	...	1,784,743	2,982,826
Jack, mullets, sauries, etc.	...	...	1,068,961	253,049	...	546,460	102	146,777	...	2,015,349	2,842,025
Herring, sardines, anchovies, etc.	...	...	509,342	71,135	...	433,712	48	218,981	...	1,233,218	1,119,766
Tunas	...	...	1,561,894	85,420	...	580,525	63	47,559	...	2,275,461	3,711,934
Mackerels	...	...	355,003	181,376	...	120,318	18	187,701	...	844,416	1,421,856
Sharks and rays	...	...	119,474	28,460	...	10,576	188	7,317	...	166,015	238,544
Misc. fishes	2,906	120,250	505,918	307,327	2,702,240	13,571	222	488,554	1,974,500	6,115,488	6,089,826
Crabs	...	...	86,701	13,489	...	28,525	120	32,967	...	161,802	449,538
Lobsters	...	...	10,086	819	...	213	5	1,156	...	12,279	66,894
Shrimps, prawns, etc.	...	...	164,559	39,682	...	33,765	...	47,258	...	285,264	778,556
Misc. crustaceans	187	...	99,444	67,939	...	...	225	...	...	168,295	397,554
Oysters	...	...	1,397	...	...	102	...	...	...	1,499	312
Mussels	...	...	4,024	...	...	23	...	...	...	23	4,242
Cockles, clams, etc.	...	...	50,219	8,268	...	610	...	15,576	...	74,673	85,452
Cuttlefish, squids, etc.	...	...	175,391	88,856	...	62,948	71	123,738	...	451,004	1,019,987
Mollusks	93	...	12,154	...	...	...	...	4,878	...	17,125	6,769
Invertebrates	...	...	47,974	5,326	...	835	...	63,881	...	118,016	62,232
Others	...	...	...	...	...	...	...	...	736,600	736,600	...
<b>Total</b>	<b>3,186</b>	<b>120,250</b>	<b>5,967,139</b>	<b>1,458,126</b>	<b>2,702,240</b>	<b>2,131,872</b>	<b>1,433</b>	<b>1,559,746</b>	<b>2,711,100</b>	<b>16,655,092</b>	<b>21,635,256</b>

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

it should be noted that the large portion of the production from the region (36.7%) were recorded as “miscellaneous fishes” and “miscellaneous crustaceans,” meaning that the catches were recorded without being classified into species or species groups. Besides miscellaneous fishes, the major species caught include tunas (13.7%); jack, mullets, sauries, etc. (12.1%); red fishes, basses, congers, etc. (10.7%); herrings, sardines, anchovies, etc. (7.4%).

In terms of production value, it should be noted that although the production volume of Indonesia has steadily increased during the period 2009-2014 (Figure 10), the corresponding value had been highly fluctuating particularly from 2007 onwards (Figure 11) due to the decreasing production values of several major species such as marine fishes *nei* by 52%, 14% for skipjack tuna (*Katsuwonus pelamis*), 12% for scads *nei* (*Decapterus*

spp.), and 5% for the narrow-barred Spanish mackerel (*Scomberomorus commerson*). However, several countries were not able to provide their respective data on production value to support the overall regional picture of the value of marine capture fisheries production, *i.e.* Cambodia, Lao PDR, and Viet Nam, although the latter was able to report for some years. In the case of Myanmar, the country started to report the value of its production from 2008 to the present, and the trend showed increasing value by US\$ 479 million per year. Nevertheless, the general picture of the region seemed to indicate a highly fluctuating trend in production value over the years.

In terms of prices (values of the production per metric ton), the species with the highest price was lobster at US\$ 5,450/metric ton, which was mainly produced by Indonesia and in smaller quantities by Thailand and Malaysia. This was followed by crabs at US\$ 2,780/metric ton produced mainly by Indonesia and Thailand; shrimps, prawns, etc. at US\$ 2,730/metric ton from Indonesia, Thailand, Malaysia, and Philippines; miscellaneous crustaceans at US\$ 2,360/metric ton from Indonesia and Malaysia; cuttlefishes, squids, etc. at US\$ 2,260/metric ton from Indonesia, Thailand, Malaysia, Philippines, and a small quantity from Singapore (Table 9).

### 3.1 Economically Important Marine Species

The economically important marine species that provided significant contributions to Southeast Asia's total fisheries production in 2014 include tunas, small pelagic fishes (*e.g.* sards, mackerel, anchovies, sardines), crustaceans and mollusks, demersal fishes, and seaweeds. These species are high in demand not only within the Southeast Asian region but also in other regions of the world, and thus dominate the fishery exports of the Southeast Asian countries.

#### 3.1.1 Tunas

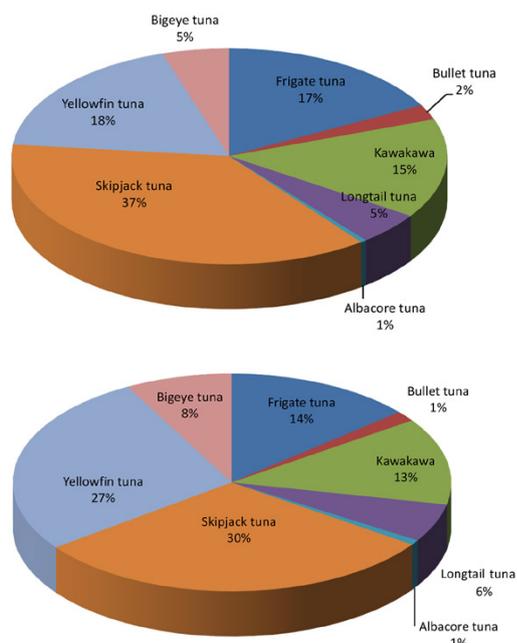
The tuna species that are caught in the exclusive economic zones (EEZs) of the Southeast Asian countries could be taxonomically classified under the family Scombridae, and broadly categorized into two groups, *i.e.* oceanic tunas which include skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), bigeye tuna (*T. obesus*), albacore tuna (*T. alalunga*), and bluefin tuna (*T. thymus*, *T. orientalis*, and *T. macoyii*); and neritic tunas including frigate tuna (*Auxis thazard*), bullet tuna (*A. rochei*), kawakawa (*Euthynnus affinis*), and longtail tuna (*T. tonggol*). Tunas are caught by commercial fishing gears, particularly trawl nets and purse seines as well as several other traditional fishing gears.

In 2014, only five countries could provide the statistics on tuna production by species, namely: Indonesia, Malaysia, Philippines, Singapore, and Thailand. Brunei Darussalam, Cambodia, Myanmar, and Viet Nam were unable to report their respective tuna production. Table 10 shows the tuna production of Southeast Asia in 2014 accounting for approximately 4.7% or approximately 12.0% of the region's total marine capture fisheries production. The total production of oceanic tunas accounted for approximately 60.8% of the region's total tuna production. In 2014, Indonesia was the leading tuna producer in the Southeast Asian region contributing to the region's total tuna production by approximately 67.0%, followed by the Philippines contributing about 28.0%, Malaysia 3.0%, and Thailand 2.0%. In terms of species, skipjack tuna (*Katsuwonus pelamis*) contributed the highest production volume accounting for more than 37.0% of the region's total tuna production, followed by yellowfin tuna (*Thunnus albacares*) at 18.0%, and frigate tuna (*Auxis thazard*) at 17.0% (Figure 12).

Table 10. Tuna production of the Southeast Asian countries in 2014 by quantity (metric tons)

Species	Quantity (metric tons)					
	Indonesia	Malaysia	Philippines	Singapore	Thailand	Total
<b>Neritic tunas</b>	<b>513,607</b>	<b>56,702</b>	<b>169,609</b>	<b>no data</b>	<b>38,059</b>	<b>777,977</b>
Frigate tuna ( <i>Auxis thazard</i> )	204,491	2,302	134,095	...	...	340,888
Bullet tuna ( <i>Auxis rochei</i> )	45,005	...	...	...	...	45,005
Kawakawa ( <i>Euthynnus affinis</i> )	208,522	29,535	35,514	...	22,179	295,750
Longtail tuna ( <i>Thunnus tonggol</i> )	55,589	24,865	...	...	15,880	96,334
<b>Oceanic tunas</b>	<b>810,555</b>	<b>11,370</b>	<b>384,942</b>	<b>1</b>	<b>409</b>	<b>1,207,277</b>
Skipjack tuna ( <i>Katsuwonus pelamis</i> )	496,682	4,689	233,853	1	...	735,225
Southern bluefin tuna ( <i>Thunnus maccoyii</i> )	1,063	...	...	...	...	1,063
Yellowfin tuna ( <i>Thunnus albacares</i> )	217,847	5,783	139,920	...	124	363,674
Albacore tuna ( <i>Thunnus alalunga</i> )	8,750	47	...	...	14	8,811
Bigeye tuna ( <i>Thunnus obesus</i> )	86,213	851	11,169	...	271	98,504
<b>Total</b>	<b>1,324,162</b>	<b>68,072</b>	<b>554,551</b>	<b>1</b>	<b>38,468</b>	<b>1,985,254</b>

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)



**Figure 12.** Percentage of tuna species production of Southeast Asia in 2014 by quantity (*above*) and value in US\$ (*below*)

In terms of the value of production in 2014, tuna contributed approximately 7.0% to the region’s total fisheries production or 14.0% of the region’s total marine capture fisheries production. Skipjack tuna (*Katsuwonus pelamis*) also provided the highest production value at about 30.0% of the region’s total tuna production, followed by yellowfin tuna (*Thunnus albacares*) contributing about 27.0%, and frigate tuna (*Auxis thazard*) about 14.0% (**Figure 12**). Data in **Table 11** suggest that albacore tuna (*Thunnus alalunga*) commanded the highest price among the tuna group at about US\$ 2,555/metric ton, followed by bigeye tuna (*Thunnus obesus*) at US\$ 2,465/metric ton, southern bluefin tuna (*Thunnus maccoyii*) at 2,355/metric ton, and yellowfin tuna (*Thunnus albacares*) at US\$ 2,310/metric ton.

The region’s tuna production in 2014 (**Table 11**) was derived mostly from FAO Major Fishing Areas 71 (Pacific, Western Central) and 57 (Indian Ocean, Western). Nevertheless, most of the production figures were actually based on the areas where tunas were landed and not fished. In 2014, the total value of tuna production from Fishing Area 71 was about US\$ 2,803 million or 91% of the region’s total tuna production value, with an average price of about US\$ 1,690/metric ton, while the total value of the production from Fishing Area 57 of about US\$ 277 million provided the remaining 9% at an average price of US\$ 850/metric ton. For Fishing Area 71, the species that contributed the highest value to the total production value was skipjack tuna followed by yellowfin tuna, frigate tuna, and kawakawa; while for Fishing Area 57 the highest contributor was kawakawa followed by yellowfin tuna, frigate tuna, and longtail tuna.

### 3.1.2 Small Pelagic Fishes

The small pelagic fishes, which are also main contributors to the fisheries production of Southeast Asia, could be grouped as scads, mackerels, anchovies, and sardines. In 2014, production from small pelagic species contributed approximately 8.4% to the region’s total fisheries production or 21.2% to the region’s total marine capture fisheries production. **Table 12** shows the region’s production of small pelagic species in 2014, indicating that scads and mackerels are among the most important, contributing about 93.0%. Indonesia was the main contributor at 1,690 thousand metric tons accounting for 48.0% of the region’s total small pelagic production, followed by Philippines at 967 thousand metric tons (27.0%), Thailand at 454 thousand metric tons (13.0%), and Malaysia at 416 thousand metric tons (12.0%). Singapore reported that its total production of small pelagic species in 2014 was 112 metric tons.

**Table 11.** Tuna production of Southeast Asia in FAO Major Fishing Areas in 2014 by quantity (metric tons), and value (US\$ thousand)

Species	Quantity (metric tons)			Value (US\$ thousand)			Average value (US\$/metric ton)
	Fishing Area 57	Fishing Area 71	Total	Fishing Area 57	Fishing Area 71	Total	
<b>Neritic tuna</b>	<b>166,994</b>	<b>610,983</b>	<b>777,977</b>	<b>143,690</b>	<b>901,508</b>	<b>1,045,198</b>	
Frigate tuna ( <i>Auxis thazard</i> )	47,610	293,278	340,888	44,010	380,995	425,005	1,245
Auxis rochei ( <i>Bullet tuna</i> )	27,934	17,071	45,055	13,243	34,053	47,296	1,050
Kawakawa ( <i>Euthynnus affinis</i> )	57,653	238,097	295,750	49,771	348,395	398,166	1,345
Longtail tuna ( <i>Thunnus tonggol</i> )	33,797	62,537	96,334	36,666	138,065	174,731	1,815
<b>Oceanic tuna</b>	<b>159,844</b>	<b>1,047,433</b>	<b>1,207,277</b>	<b>133,585</b>	<b>1,902,340</b>	<b>2,035,925</b>	
Skipjack tuna ( <i>Katsuwonus pelamis</i> )	72,088	663,137	735,225	39,620	888,163	927,783	1,260
Southern bluefin tuna ( <i>Thunnus maccoyii</i> )	1,063	...	1,063	2,502	...	2,502	2,355
Yellowfin tuna ( <i>Thunnus albacares</i> )	45,246	318,428	363,674	44,178	796,272	840,450	2,310
Albacore tuna ( <i>Thunnus alalunga</i> )	8,764	47	8,811	22,307	186	22,493	2,555
Bigeye tuna ( <i>Thunnus obesus</i> )	32,683	65,821	98,504	24,978	217,719	242,697	2,465
<b>Total</b>	<b>326,838</b>	<b>1,658,416</b>	<b>1,985,304</b>	<b>277,275</b>	<b>2,803,848</b>	<b>3,081,123</b>	

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

Specifically in 2014, four species of scads that were reported in the fishery statistics of Southeast Asia accounted for approximately 37.0% of total small pelagic species production (Figure 13). Nonetheless, nearly 60.0% of scads had been reported as scads *nei* without being classified into species, followed by yellowstripe scad (*Selaroides leptolepis*) at approximately 16.5%, bigeye scad (*Selar crumenophthalmus*) at 15.5%, and hardtail scad (*Megalaspis cordyla*) at 8.0%. Indonesia was the lead producer of scads, contributing nearly 50.0% to the total scads production in the region, followed by Philippines at approximately 31.0% (Table 12).

Mackerels which contributed approximately 30% to the total small pelagic species production in 2014 (Figure 13) comprise six species, namely: narrow-barred Spanish mackerel (*Scoberomorus commerson*), seerfishes (*Scomberomorus* spp.), scomber mackerels *nei* (*Scomber* spp.), short mackerel (*Rastrelliger brachysoma*), Indian mackerel (*Rastrelliger kanagurta*), and other rastrelliger mackerels (*Rastrelliger* spp.). *Rastrelliger* spp. contributed nearly 77% to the region's total mackerel production, with Indonesia as the largest producer, which provided 52% to the region's total mackerel production (Table 12).

For sardines, the Philippines, Indonesia, and Thailand reported catching six species but their statistics report

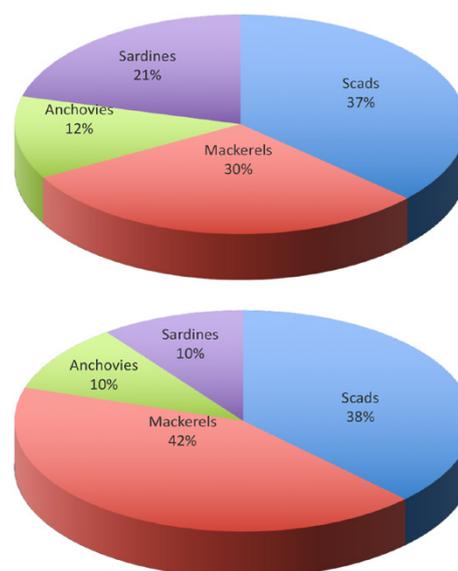


Figure 13. Percentage production of major groups of species of small pelagic fishes of Southeast Asia in 2014 by quantity (above) and value in US\$ (below)

indicated only three species, namely: sardinellas *nei* (*Sardinella* spp.), spotted sardinella (*Amblygaster sirm*), and rainbow sardinella (*Dussumieria acuta*) as shown in Table 12. The production of sardines contributed about 21% to the total small pelagic production of the region

Table 12. Small pelagic fishes production of the Southeast Asian countries in 2014 by quantity (metric tons) and value (US\$ thousand)

Major groups of species	Country					Quantity (metric tons)	Value (US\$ thousand)	Average value (US\$/metric ton)
	Indonesia	Malaysia	Philippines	Singapore	Thailand			
<b>Scads</b>	<b>638,248</b>	<b>193,159</b>	<b>397,572</b>	<b>32</b>	<b>68,082</b>	<b>1,297,093</b>	<b>1,758,904</b>	<b>1,355</b>
Scads <i>nei</i> ( <i>Decapterus</i> spp.)	376,276	102,644	265,806	32	33,044	777,802	994,339	
Bigeye scad ( <i>Selar crumenophthalmus</i> )	16,650	47,630	116,382	...	20,537	201,199	363,638	
Yellowstripe scad ( <i>Selaroides leptolepis</i> )	199,674	13,816	...	...	...	213,490	254,334	
Hardtail scad ( <i>Megalaspis cordyla</i> )	45,648	29,069	15,384	...	14,501	104,602	146,593	
<b>Mackerel</b>	<b>556,228</b>	<b>197,985</b>	<b>137,232</b>	<b>80</b>	<b>171,285</b>	<b>1,063,810</b>	<b>1,988,106</b>	<b>1,870</b>
Narrow-barred Spanish mackerel ( <i>Scomberomorus commerson</i> )	165,808	...	16,914	...	...	182,722	426,629	
Seerfishes <i>nei</i> ( <i>Scomberomorus</i> spp.)	35,417	16,609	...	62	9,091	61,179	139,621	
Scomber mackerels <i>nei</i> ( <i>Scomber</i> spp.)	1,271	...	1,403	...	...	2,674	1,349	
Short mackerel ( <i>Rastrelliger brachysoma</i> )	269,411	...	39,602	...	...	309,013	416,108	
Indian mackerel ( <i>Rastrelliger kanagurta</i> )	84,321	...	79,313	...	45,258	208,892	248,001	
Other rastrelliger mackerel ( <i>Rastrelliger</i> spp.)	...	181,376	...	18	116,936	298,330	756,398	
<b>Sardines</b>	<b>296,281</b>	<b>...</b>	<b>361,120</b>	<b>...</b>	<b>80,648</b>	<b>738,049</b>	<b>477,964</b>	<b>650</b>
Sardinellas <i>nei</i> ( <i>Sardinella</i> spp.)	220,565	...	354,423	...	80,648	655,636	284,118	
Spotted sardinella ( <i>Amblygaster sirm</i> )	46,578	...	...	...	...	46,578	32,230	
Rainbow sardinella ( <i>Dussumieria acuta</i> )	29,138	...	6,697	...	...	35,835	26,275	
<b>Anchovies</b>	<b>199,226</b>	<b>24,836</b>	<b>71,855</b>	<b>...</b>	<b>133,592</b>	<b>429,510</b>	<b>466,825</b>	<b>1,085</b>
Stolephorus anchovies ( <i>Stolephorus</i> spp.)	199,226	24,837	71,855	...	...	295,918	408,600	
Anchovies <i>nei</i> ( <i>Engraulidae</i> )	...	...	...	...	133,592	133,592	58,225	
<b>Total</b>	<b>1,689,983</b>	<b>415,981</b>	<b>967,779</b>	<b>112</b>	<b>453,607</b>	<b>3,527,462</b>	<b>4,691,799</b>	

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

(Figure 13), with sardinellas *nei* (*Sardinella* spp.) having the highest production that accounted for 89% of the total sardines production (Table 12).

Another important small pelagic species is anchovy with total production of 429,510 metric tons in 2014 (Table 12), contributing approximately 12% to the region's small pelagic production (Figure 13). Indonesia and Thailand were the main producers providing 46% and 31%, respectively, to the region's total anchovy production (Table 12).

In terms of value, mackerels ranked first accounting for about 42% of the total small pelagic species production, followed by scads at about 38% (Figure 13). The data shown in Table 12 also suggest that mackerels commanded the highest price compared to the other small pelagic species at about US\$ 1,870/metric ton, followed by scads at US\$ 1,355/metric ton, anchovies at US\$ 1,085/metric ton, and sardines at about US\$ 650/metric ton.

### 3.1.3 Demersal Fishes

Demersal fishes generally live on or near the ocean floor or sea beds that usually consist of mud, sand or rock, and are bottom feeders which live in and feed from the sea bottom. The major species groups of demersal fishes found in the Southeast Asian waters include the flounders, halibuts, soles, lizardfish, sea catfishes, threadfin breams (*Nemipterus* spp. and *Polynemus* spp.), snappers (*Lutjanus* spp.), groupers *nei* (*Epinephelus* spp.), sillago whittings,

croakers and drums, fusilier (*Caesio* spp.), pony fish (*Leiognathus* spp.), goatfishes, sweetlips, emperors, etc. Demersal fishes are usually caught by trawl nets, bottom gillnets, longlines, and handlines.

Based on the data of Southeast Asia in 2014, the total demersal fish production in terms of quantity was approximately 1,827,171 metric tons contributing about 11% to the total marine capture fisheries production of the region (Table 13). Indonesia, as the leading producer of demersal fish species, provided 1,081,482 metric tons or 59% of the region's total demersal fish production, followed by the Philippines with 296,651 metric tons contributing 16%, Malaysia with 275,322 metric tons or 15%, Thailand with 173,369 metric tons providing about 9%, while Singapore reported a few volumes. For Indonesia, the main demersal fish species were snappers contributing 12% to the country's total demersal fish production followed by threadfins *nei* at 11.8%, groupers at 10%, and catfishes at 9%.

In terms of value, threadfin breams (*Nemipterus* spp. and *Polynemus* spp.) had the highest value at approximately US\$ 544 million. Second were the snappers at US\$ 408 million with major species that comprise mangrove red snapper (*Lutjanus argentimaculatus*) and snappers *nei* (*Lutjanus* spp.). Groupers *nei* came in third with groupers *nei* (*Epinephelus* spp.), chocolate hind (*Cephalopholis boenak*), leopard coral grouper (*Plectropomus leopardus*), and humpback grouper (*Cromileptes altivelis*) as the major species, at US\$ 393,624 million.

**Table 13.** Production of major groups of species of demersal fishes of Southeast Asian countries in 2014 by quantity (metric tons) and value (US\$ thousand)

Major groups of species	Country					Quantity (metric tons)	Value (US\$ thousand)	Average value (US\$/metric ton)
	Indonesia	Malaysia	Philippines	Singapore	Thailand			
Flounders, halibuts, soles	27,932	6,481	657	...	7,358	42,428	66,826	3,795
Catfishes	102,111	25,465	4,292	45	2,883	134,796	219,681	1,630
Lizardfishes	22,283	40,057	4,313	...	34,876	101,529	168,984	1,665
Groupers <i>nei</i>	110,418	10,296	18,924	29	...	139,667	393,624	2,820
Sillago-whittings	1,605	1,993	11,896	2	3,177	18,673	14,272	765
Bigeyes <i>nei</i>	51,399	17,136	...	...	35,849	104,384	116,047	1,110
Snappers	130,301	19,979	18,497	86	5,179	174,042	408,054	2,345
Fusiliers	94,487	500	19,874	3	...	114,864	127,949	1,115
Threadfins <i>nei</i>	128,393	64,021	41,798	42	51,649	285,903	544,336	1,905
Pony fishes	87,905	8,957	50,613	15	...	147,490	139,516	945
Drums and croakers	77,928	39,205	...	34	19,402	136,569	215,683	1,580
Sweetlips <i>nei</i>	20,503	4,380	...	22	...	24,905	39,930	1,605
Emperor breams	41,578	2,199	11,996	...	...	55,773	53,075	950
Goatfishes <i>nei</i>	82,659	18,069	27,380	14	...	160,952	160,952	1,600
Spinefeet <i>nei</i>	38,740	2,609	26,427	28	...	67,804	115,128	1,698
Others	63,240	13,975	59,984	27	12,996	177,602	104,643	589
<b>Total</b>	<b>1,081,482</b>	<b>275,322</b>	<b>296,651</b>	<b>347</b>	<b>173,369</b>	<b>1,827,171</b>	<b>2,982,826</b>	

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

In the Southeast Asian region, the production of demersal fishes has gained significant economic importance due to the high price of major demersal fish species such as flounders, halibuts, and sole that commanded the highest average price at about US\$ 3,795/metric ton, followed by groupers *nei* at US\$ 2,820/metric ton, snappers at US\$ 2,345/metric ton, and threadfins *nei* at US\$ 1,905/metric ton (Table 13).

### 3.1.4 Crustaceans and Mollusks

Crustaceans and mollusks continue to serve as one of the most important contributors to the region's marine capture fisheries production. Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, and Thailand reported on their respective production of several species of crustaceans and mollusks. Although Cambodia, Myanmar, and Viet Nam had also been reported to be catching some species of crustaceans and mollusks, these countries were unable to provide the necessary data by species to the Fishery Statistical Bulletin of Southeast Asia 2014. At this point in time, it is therefore difficult to conclude the actual trend of the production of crustaceans and mollusks in the region. Nonetheless, based on the statistics currently available in 2014, the production of crustaceans and mollusks contributed about 6.0% to the region's total marine capture fisheries production. Indonesia was the largest producer contributing 473,524 metric tons accounting for 46.0% of the region's total crustaceans and mollusks production, followed by Malaysia at 21.0%, Thailand at 21.0%, and Philippines at 12.0% (Table 14).

Specifically for crustaceans, although this group contributed only about 3.8% to the total marine capture fisheries production by quantity, its contribution in terms of value was nearly 8.0% because these are high-value commodities that command high prices. The main crustacean species in the Southeast Asian region include the blue swimming crab (*Portunus pelagicus*), Indo-Pacific swamp crab (*Scylla serrata*), lobsters (*Panulirus* spp.), banana prawn (*Penaeus merguensis*), giant tiger prawn (*Penaeus monodon*), Penaeus shrimps (*Penaeus* spp.), and penaeid shrimps (*Metapenaeus* spp.). Nonetheless, it should be noted that nearly 30.0% of crustaceans had been reported as marine crustaceans *nei* and not classified according to species. While penaeid shrimps (*Metapenaeus* spp.) contributed 19.0% in quantity, blue swimming crab (*Portunus pelagicus*) contributed 17.0%, and banana prawn (*Penaeus merguensis*) contributed 16.0%. For mollusks, the important species were cuttlefishes (*Sepia* spp.), common squids (*Loligo* spp.), and octopuses (Octopodidae). Squids contributed 71% to the total mollusks production, followed by cuttlefishes at 17%.

In terms of average prices (Table 14), lobsters *nei* (*Panulirus* spp.) posted the highest at about S\$ 5,450/metric ton followed by the giant tiger prawn (*Penaeus monodon*) at US\$ 3,845/metric ton, banana prawn (*Penaeus merguensis*) at US\$ 3,070/metric ton, common squids *nei* (*Loligo* spp.) at US\$ 2,945/metric ton, blue swimming crab (*Portunus pelagicus*) at US\$ 2,795/metric ton, and Indo-Pacific swamp crab (*Scylla serrata*) at US\$ 2,685/metric ton.

**Table 14.** Production of major groups of species of crustaceans and mollusks of the Southeast Asian countries in 2014 by quantity (metric tons) and value (US\$ thousand)

Major groups of species	Country						Quantity (metric tons)	Value (US\$ thousand)	Average value (US\$/metric ton)
	Brunei Darussalam	Indonesia	Malaysia	Philippines	Singapore	Thailand			
<b>Crustaceans</b>	<b>187</b>	<b>361,290</b>	<b>121,929</b>	<b>62,503</b>	<b>350</b>	<b>81,381</b>	<b>627,640</b>	<b>1,692,542</b>	
Blue swimming crab	...	52,488	...	27,253	...	26,635	106,376	297,175	2,795
Indo-Pacific swamp crab	...	34,213	...	1,272	21	1,964	37,470	100,540	2,685
Lobsters <i>nei</i>	...	10,086	819	213	5	1,156	12,279	66,894	5,450
Banana prawn	...	89,606	...	...	...	9,506	99,112	304,518	3,070
Giant tiger prawn	...	34,784	...	645	...	1,545	36,974	142,515	3,845
Penaeid shrimps <i>nei</i>	...	...	...	9,530	...	20,209	29,739	51,965	1,745
Metapenaeus shrimps <i>nei</i>	...	40,169	39,682	23,590	...	15,998	119,439	279,558	2,340
Marine crustaceans <i>nei</i>	187	99,944	81,428	...	324	4,368	186,251	449,377	2,415
<b>Mollusks</b>	<b>93</b>	<b>112,234</b>	<b>88,856</b>	<b>61,252</b>	<b>71</b>	<b>128,616</b>	<b>391,122</b>	<b>1,026,756</b>	
Cuttlefishes <i>nei</i>	...	17,930	24,533	1,321	32	23,716	67,532	166,367	2,465
Squids <i>nei</i>	...	75,312	62,405	55,693	39	85,107	278,556	820,047	2,945
Octopuses <i>nei</i>	...	6,838	1,918	4,238	...	14,915	27,909	33,573	1,205
Marine mollusks <i>nei</i>	93	12,154	...	...	...	4,878	17,909	6,769	395
<b>Total</b>	<b>280</b>	<b>473,524</b>	<b>210,785</b>	<b>123,755</b>	<b>421</b>	<b>209,997</b>	<b>1,018,762</b>	<b>2,719,298</b>	

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

### 3.2 Fishing Vessels

According to SOFIA (FAO, 2016), the total number of fishing vessels in the world in 2014 was estimated at about 4.6 million (Table 15). Asia alone, excluding Southeast Asia had the highest number, consisting of 2.2 million vessels and accounted for 47.54%, followed by Southeast Asia (27.57%), Africa (14.75%), Latin America and the

Caribbean (6.00%), Europe (2.07%), North America (1.89%), and Oceania (0.19%) (Figure 14).

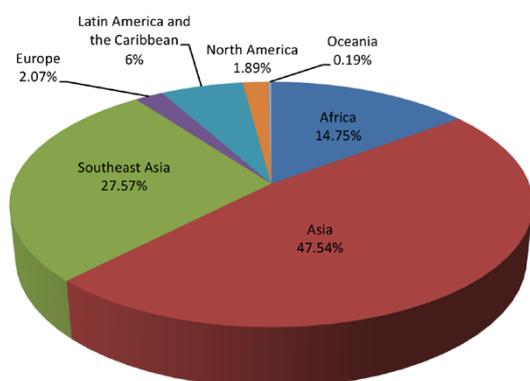
In Southeast Asia, the number of fishing vessels reported is based on the registered boats in the respective countries, although Cambodia was unable to report its number of registered fishing boats. Therefore, based on the available data in 2014 and the Regional Classification of Fishing Boats, Indonesia had the highest number of fishing boats at 651,966 comprising 477,782 powered and 174,184 non-powered boats, followed by the Philippines with 476,124 boats which include 469,807 municipal (less than 3 GT) and 6,317 commercial (more than 3 GT) fishing boats (Philippine Fisheries Profile 2014), and Malaysia with 57,972 boats comprising 54,940 powered and 3,032 non-powered boats (Table 16). The fourth highest number was reported by Viet Nam with 31,235 boats, followed by Myanmar with 28,958 boats of which 15,226 were powered 13,732 and were non-powered, Thailand with 23,556 boats, Singapore with 158 boats, and Brunei Darussalam with 38 boats.

**Table 15.** Number of fishing vessels (powered and non-powered) of each continent in 2014

	Number of fishing vessels (thousand)	Percentage (%)
<b>World</b>	<b>4,606.00</b>	
Africa	679.20	14.75
Asia*	2,189.50	47.54
Southeast Asia	1,270.00	27.57
Europe	95.50	2.07
Latin America and the Caribbean	276.20	6.00
North America	87.00	1.89
Oceania	8.60	0.19

**Source:** Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

\* Excludes data from Southeast Asia



**Figure 14.** Percentage of fishing vessels (powered and non-powered) in each continent in 2014 (FAO, 2016a)

The Regional Classification of Fishing Boats was developed to be able to compile the statistics on the fishing units considering the extent of existing fishing operations in Southeast Asia (SEAFDEC, 2008c). The data on fishing boats in the Southeast Asian countries indicated some increase in terms of numbers from 2000 to 2009, slightly decreased in 2010-2011, and slightly increased again since 2012 (Table 17). This merely reflected the improvements made by the countries in vessel registration and data collection on fishing vessels.

**Table 16.** Number of fishing vessels in Southeast Asia in 2014

Country	Powered boats		Non-powered boats	Total
	Out-board	In-board		
Brunei Darussalam	...	38	...	38
Indonesia	237,696	240,086	174,184	651,966
Malaysia	37,803	17,137	3,032	57,972
Myanmar	12,490	2,736	13,732	28,958
Philippines*	...	...	...	476,124
Singapore	146	12	...	158
Thailand	...	23,556	...	23,556
Viet Nam	...	...	...	31,235
<b>Total</b>	<b>288,135</b>	<b>283,565</b>	<b>190,948</b>	<b>1,270,016</b>

**Source:** Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)  
\* Philippine Fisheries Profile 2014

**Table 17.** Number of fishing vessels in the Southeast Asian countries from 2000 to 2014

Year	Brunei Darussalam	Cambodia	Indonesia	Malaysia*	Myanmar	Philippines**	Singapore	Thailand	Viet Nam	Total
2000	...	...	475,392	31,531	64,905	476,499	...	57,801	...	1,106,128
2001	...	...	514,291	31,780	42,271	476,499	...	57,801	...	1,122,642
2002	...	65,716	460,298	30,751	29,082	476,499	146	15,568	102,674	1,180,734
2003	...	65,151	528,720	35,458	32,120	476,499	145	15,983	102,069	1,256,145
2004	...	65,151	549,100	36,136	32,620	476,499	147	16,432	102,069	1,278,154
2005	...	...	566,597	36,136	61,857	476,499	146	57,801	...	1,198,916
2006	...	...	616,300	38,276	...	476,499	144	58,119	...	1,189,338
2007	3,128	...	604,937	39,221	...	476,178	144	58,119	...	1,181,727
2008	3,184	...	604,847	40,959	31,371	476,178	142	12,920	22,529	1,192,130
2009	2,750	108,145	596,230	48,745	30,248	476,178	133	16,891	24,990	1,304,310
2010	2,743	...	570,827	49,756	32,824	476,178	39	15,381	25,346	1,173,094
2011	2,607	...	581,845	53,002	30,848	476,178	39	17,203	28,424	1,190,146
2012	2,627	...	616,690	54,235	30,349	476,178	4	18,089	27,988	1,226,160
2013	46	...	603,318	57,095	27,638	476,178	155	16,548	30,132	1,211,110
2014	38	...	651,966	57,972	28,958	476,124	158	23,556	31,235	1,270,007

*Source:* Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

\* Updated figures provided by Fisheries Management Information Division, Department of Fisheries Malaysia

\*\* Based on Philippine Fisheries Profile 2014

### 3.3 Fishers and Fish Farmers

Fisheries and aquaculture play, directly or indirectly, an essential role in the livelihoods of millions of people around the world. The world's number of fishers by region suggested that since 2010 more than 75 million people were engaged in capture fisheries and aquaculture (Table 18). The classification of fishers and farmers was developed to compile statistics on the number of fishers by sub-sectors (marine capture fisheries, inland capture fisheries, and aquaculture) and their working status (SEAFDEC, 2008c). From 2000 to 2010, the trends in the number of fishers have varied by region, and the number of fishers during 2000-2012 had increased and then slightly decreased until recently. Generally, employment in fishing continues to decrease in countries with capital intensive economies. Factors that may account for this include policies to cut fleet overcapacity and less dependence on

human work owing to technological developments and associated increased efficiencies (FAO, 2016a). Asia has the largest number of fishers in many decades. In 2014, 76% of the global population engaged in the fisheries and aquaculture sector came from Asia (excluding Southeast Asia) followed by Southeast Asia (11%), Africa (8%), and Latin America and the Caribbean (5%).

With regards to the number of fishers and fish farmers in the Southeast Asian region in 2014 (Table 19), Myanmar had the highest number at 3,781,550 followed by Indonesia at 2,667,440 and Philippines at 877,185. Thailand ranked fourth with 666,908 followed by Lao PDR with 594,500 and Malaysia with 169,937. Although small, Brunei Darussalam and Singapore were able to report their number of fishers and fish farmers, however, Cambodia and Viet Nam were not able to provide the same information. The number of fishers and farmers with corresponding working

**Table 18.** Number of fishers and fish farmers of each continent

	2000	2005	2010	2012	2013	2014
<b>World</b>	<b>59,476</b>	<b>66,502</b>	<b>76,177</b>	<b>77,133</b>	<b>75,599</b>	<b>75,385</b>
Africa	4,266	4,570	5,258	6,183	6,288	5,958
Asia*	49,560.1	56,497.7	57,971.5	60,935.8	59,922.5	57,583.1
Southeast Asia	2,296.9	2,058.3	9,288.5	6,279.2	5,837.5	8,178.9
Europe	882	764	764	750	382	479
Latin America and the Caribbean	1,988	2,146	2,433	2,520	2,783	2,800
North America	352	339	333	332	334	334
Oceania	131	127	129	133	52	52

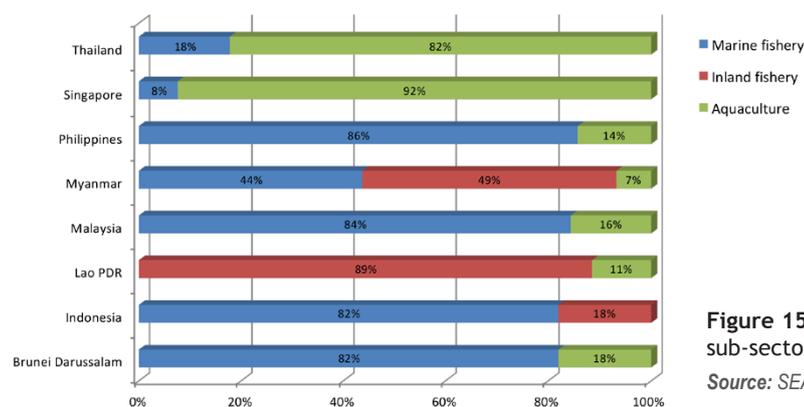
*Source:* Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a); and The State of World Fisheries and Aquaculture 2016 (FAO, 2016a)

\* Excludes data from Southeast Asia

**Table 19.** Number of fishers and fish farmers in the fisheries sub-sectors of Southeast Asia in 2014 by working status

Country	Marine Capture Fisheries			Inland Capture Fisheries			Un-specified	Aquaculture		Total
	Full-time	Part-time	Occasional	Full-time	Part-time	Occasional		Full-time	Part-time	
Brunei Darussalam	433	...	...	...	...	...	...	95	...	528
Indonesia	1,192,350	689,740	304,810	217,930	161,480	101,130	...	...	...	2,667,440
Lao PDR	...	...	...	...	...	...	...	...	...	594,500
Malaysia	143,421	...	...	...	...	...	...	26,516	...	169,937
Myanmar	230,550	252,000	917,000	488,000	301,000	...	796,500	224,123	...	3,781,550
Philippines	...	...	...	...	...	...	...	...	...	877,185
Singapore	36	...	...	...	...	...	...	508	162	706
Thailand	...	...	...	...	...	...	...	...	3,781,55	666,908

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)



**Figure 15.** Percentage of fish workers in the fisheries sub-sectors of Southeast Asia in 2014

Source: SEAFDEC (2016a)

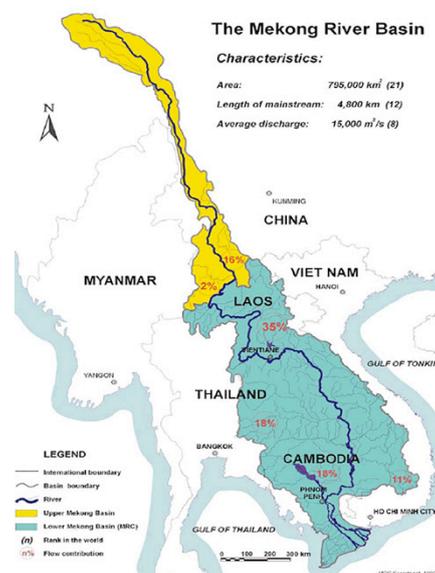
status is shown in **Figure 15**. There is however a need to exert efforts in improving data availability by encouraging the countries to enhance their data collection and reporting through census using questionnaires. This would enable the countries to compile the necessary information on fisheries including the number of fishers and fish farmers as well as the number of fishing vessels and gears.

#### IV. INLAND CAPTURE FISHERIES PRODUCTION OF SOUTHEAST ASIA

In Southeast Asia, the inland capture fisheries sector is important for its role in providing significant contribution to livelihood, food security, and local economy particularly for people in rural communities. The Mekong River Basin in Southeast Asia for example (**Figure 16**), recognized as one of the world’s species-rich habitats, is a primary source of protein to a large number of people. In addition, the region being located in the tropical zone is also endowed with rivers, lakes, and reservoirs that serve as important habitats to numerous inland aquatic species. Despite its undeniable importance, information on production of inland capture fisheries are usually very scarce due to the nature of fishing activities that are mostly undertaken as small-scale operations, while large portion of the production is used for household consumption without being landed and not recorded at landing sites. Furthermore, activities in inland capture fisheries are

highly seasonal, making data collection and analysis very much different from the other fisheries sub-sectors. According to the Mekong River Commission (MRC) Fisheries Programme, production from the region’s inland capture fisheries depends primarily on annual flooding of the plains and wetlands around lakes, rivers, and along the Lower Mekong Basin.

Through the efforts made by many agencies to improve the compilation of information on inland capture fisheries



**Figure 16.** The Mekong River Basin (Source: MRC)

production in Southeast Asia, most of the countries were able to provide the necessary data including Brunei Darussalam and Singapore even if their respective production could be considered negligible. In most cases however, it is presumed that such data could be very much underestimated. Results of consumption surveys undertaken by the MRC in Cambodia, Lao PDR, Thailand, and Viet Nam also confirmed that the fisheries production of the Lower Mekong Basin is probably significantly higher than what had been officially reported. Nonetheless, data in **Table 20** and **Table 21** show the trends of inland capture fisheries production of the Southeast Asian countries, in terms of quantity and value, respectively.

During 2000-2014, the region's production of inland capture fisheries has increased linearly by 6% per year and had a total of 3,028,233 metric tons in 2014 (**Figure 17**), accounting for approximately 15% of the region's total capture fisheries production or 7% of the region's total fisheries production. It should be noted that in the case of Myanmar, its inland capture fisheries production has significantly increased almost four times during the last decade (**Figure 17**).

In 2014, the inland capture fisheries production of Myanmar was highest accounting for 45.6% of the region's total capture fisheries production, followed by

**Table 20.** Inland capture fisheries production of the Southeast Asian countries from 2000 to 2014 by quantity (metric tons (MT))

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	0	245,600	318,334	*29,250	3,549	238,210	152,121	0	201,500	170,000	1,358,564
2001	0	360,000	310,240	*31,000	3,446	254,880	136,347	0	202,500	243,583	1,541,996
2002	0	360,300	304,989	*33,440	3,565	289,940	131,644	0	198,700	226,958	1,549,536
2003	0	308,750	308,693	*29,800	3,828	454,320	133,292	0	198,400	208,623	1,645,706
2004	0	250,000	330,880	*29,800	4,119	502,550	142,019	0	199,600	*206,600	1,665,568
2005	0	444,000	297,370	29,800	4,583	631,120	143,806	0	198,800	138,800	1,888,279
2006	0	559,642	293,921	29,800	4,164	718,000	161,394	0	214,000	152,325	2,133,246
2007	0	420,000	310,457	28,410	4,283	717,640	168,277	0	225,600	133,600	2,008,267
2008	0	430,600	497,740	29,200	4,353	818,740	181,678	0	228,600	144,800	2,335,711
2009	0	390,000	494,630	30,000	4,469	899,430	188,444	0	245,000	144,800	2,397,773
2010	0	405,000	344,972	30,900	4,545	1,002,430	185,406	0	209,800	194,200	2,377,253
2011	0	445,000	368,542	34,000	5,695	1,163,159	193,698	0	228,500	202,500	2,641,094
2012	0	528,000	393,552	34,105	5,042	1,246,460	195,804	0	222,500	194,500	2,819,963
2013	0	528,000	391,324	40,143	5,640	1,302,970	194,615	0	213,700	196,800	2,873,192
2014	0	505,005	446,509	60,237	5,611	1,381,030	211,941	0	209,800	208,100	3,028,233

Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

\* FAO Fisheries and Aquaculture Information and Statistic Service

**Table 21.** Inland capture fisheries production of the Southeast Asian countries from 2000 to 2014 by value (US\$ thousand)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	0	...	155,472	...	...	...	59,285	0	174,920	...	389,677
2001	0	...	189,590	...	...	...	57,022	0	157,072	...	403,684
2002	0	...	237,888	...	6,316	...	64,518	0	145,038	...	453,861
2003	0	...	257,779	...	6,316	...	66,029	0	170,236	...	500,658
2004	0	...	268,990	...	7,632	...	80,442	0	184,658	...	541,901
2005	0	...	323,827	...	8,446	...	84,077	0	194,859	...	611,950
2006	0	...	264,372	...	8,470	...	101,477	0	222,573	...	596,877
2007	0	...	368,247	215,708	9,855	...	125,464	0	266,740	...	985,172
2008	0	255,500	521,019	240,334	11,556	788,325	145,912	0	254,057	...	2,215,437
2009	0	334,845	616,640	93,168	11,014	1,349,145	164,252	0	273,290	...	2,834,477
2010	0	...	546,937	...	13,138	1,503,645	174,479	0	288,277	...	2,526,476
2011	0	...	635,754	...	17,978	1,744,738	185,799	0	330,193	...	2,914,402
2012	0	...	793,238	...	18,376	1,869,690	196,239	0	349,062	...	3,226,605
2013	0	...	741,813	194,730	20,129	1,954,455	206,569	0	356,767	...	3,474,463
2014	0	...	721,042	313,232	19,441	2,071,545	220,480	0	347,560	...	3,693,300

Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

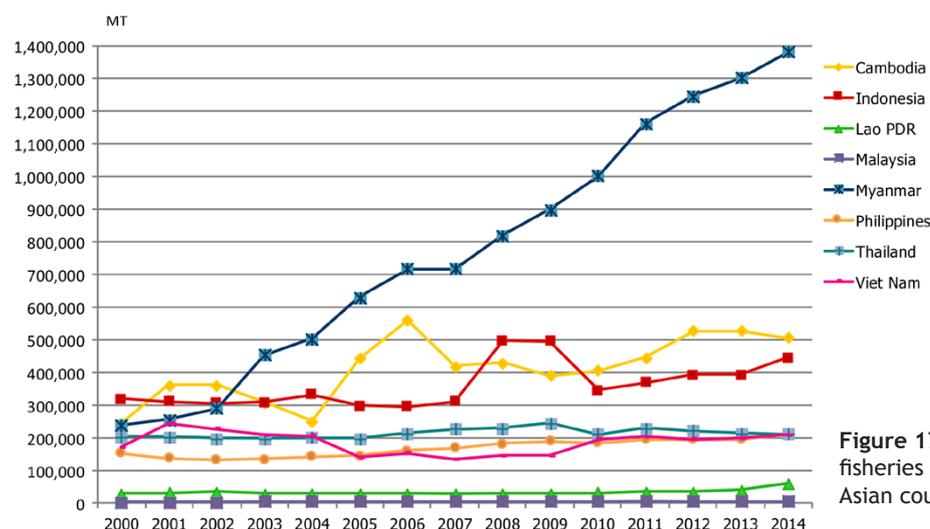


Figure 17. Trends of inland capture fisheries production of the Southeast Asian countries in 2000-2014 by quantity

Cambodia at about 16.7%, Indonesia at 15.0%, while Philippines, Thailand, and Viet Nam accounted for about 7.0% each (Table 22). For Lao PDR, although the reported production is not high compared with the other Southeast Asian countries, the importance of inland fishery is very significant considering that all capture fisheries production of the country is derived from inland capture fisheries.

One of the countries in the region with considerable proportion of inland capture fisheries production is Cambodia, its production in 2014 of which represented about 81% of its total capture fisheries production and almost 68% of the country’s total fisheries production (Table 22). For Myanmar, its inland capture fisheries production represented about 34% of its total capture fisheries production and 27% of the country’s total fisheries production (Table 22).

In terms of production of major groups of species (Table 23), only Indonesia, Malaysia, Philippines, and Thailand provided the figures at species levels and thus, only

22% of the total capture fisheries production could be reported. For Indonesia, its large portion of catch came from striped snakehead (*Channa striata*), followed by Nile tilapia (*Oreochromis niloticus*), Asian redtail catfish (*Mystus nemurus*), and snakeskin gourami (*Trichogaster pectoralis*).

For the Philippines, the large share of its production was derived from tilapia (*Oreochromis* spp.) and freshwater mollusks (Mollusca). For Thailand, production from Nile tilapia ranked first, followed by silver barb (*Barbonymus gonionotus*) and striped snakehead. Meanwhile, in terms of value, the region’s production of Asian redtail catfish was the highest at about US\$ 2,255/metric ton. This was followed by the striped snakehead at US\$ 2,080/metric ton, climbing perch at US\$ 1,665/metric ton, and Nile tilapia at US\$ 1,535/metric ton (Table 23).

The other countries were not able to report their inland capture fisheries production at species level due to inadequacy of experts who are capable of identifying the

Table 22. Contribution of inland capture fisheries production to the respective Southeast Asian country’s capture fisheries production and total fisheries production in 2014 by quantity (metric tons)

Country	Inland capture fisheries production (metric tons)	Capture fisheries production (metric tons)	Total fisheries production (metric tons)	Percentage of inland capture fisheries production in total capture fisheries production (%)	Percentage of inland capture fisheries production in total fisheries production (%)
Brunei Darussalam	0	3,186	3,947	-	-
Cambodia	505,005	625,255	745,310	80.77	67.76
Indonesia	446,509	6,413,648	20,600,772	6.96	2.17
Lao PDR	60,237	60,237	150,592	100.00	40.00
Malaysia	5,611	1,463,737	1,988,302	0.38	0.28
Myanmar	1,381,030	4,083,270	5,040,311	33.82	27.40
Philippines	211,941	2,343,813	4,681,418	9.04	4.53
Singapore	0	1,433	6,695	-	-
Thailand	209,800	1,769,546	2,667,309	11.86	7.87
Viet Nam	208,100	2,919,200	6,332,500	7.13	3.29
<b>Total</b>	<b>3,028,233</b>	<b>19,683,325</b>	<b>42,217,156</b>	<b>Ave: 15.38</b>	<b>Ave: 7.17</b>

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

**Table 23.** Production of major groups of species of inland capture fisheries of the Southeast Asian countries in 2014 by quantity (metric tons) and value (US\$/metric ton)

Major groups of species	Country								Total	Percentage in inland capture fisheries production (%)	Value (US\$/metric ton)
	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Thailand	Viet Nam			
Asian redbtail catfish	...	27,157	...	...	...	...	...	...	27,157	0.90	2,255
Climbing perch	...	16,162	...	...	...	2,393	13,400	...	31,955	1.06	1,665
Cyprinids <i>nei</i>	...	...	...	...	...	32,236	...	...	32,236	1.06	975
Freshwater mollusks <i>nei</i>	...	997	...	...	...	59,428	...	...	60,425	2.00	150
Misc. fishes	505,005	96,987	60,237	5,611	1,381,030	...	101,400	208,100	2,367,587	78.18	1,120
Silver barb	...	11,903	...	...	...	...	26,200	...	38,103	1.26	1,335
Nile tilapia	...	28,637	...	...	...	...	28,100	...	56,737	1.87	1,535
Striped snakehead	...	39,030	...	...	...	11,199	14,700	...	64,929	2.14	2,080
Snakeskin gourami	...	23,643	...	...	...	6,431	3,900	...	33,974	1.12	1,020
Tilapia <i>nei</i>	...	...	...	...	...	54,180	...	...	54,180	1.79	1,265
Torpedo-shaped catfishes <i>nei</i>	...	19,039	...	...	...	6,211	9,500	...	34,750	1.15	1,490
<b>Total</b>	<b>505,005</b>	<b>263,555</b>	<b>60,237</b>	<b>5,611</b>	<b>1,381,030</b>	<b>172,078</b>	<b>197,200</b>	<b>208,100</b>	<b>2,802,033</b>	<b>92.53</b>	<b>1,320</b>

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

fishes by species. Thus, Cambodia, Lao PDR, Myanmar, and Viet Nam could only provide their statistics classified into miscellaneous fishes. Taking into account the contribution of these countries' inland capture fisheries production to the region's total fisheries production which is considerably significant, there is a need to intensify capacity building to enable the countries to compile their data classified by major groups of species. The capacity building in the region could include strengthening the data compilation system and mechanism by means of conducting training courses on species identification, collection of accurate data through surveys, and data analysis. The impact of such effort could reflect the significance of inland fisheries in ensuring food security and enhancing the livelihoods of people in the region.

## V. AQUACULTURE PRODUCTION OF SOUTHEAST ASIA

Increase in the world's human population from 6.1 billion in 2000 to 7.3 billion in 2014 led to the world's increasing demand for fish to sustain food security requirements. From 2000 to 2014, the aquaculture production at global level has continued to grow at an average rate of 7% annually or about 4.24 million metric tons/year (Table 24). Asia including that of Southeast Asia continued to be the leading aquaculture producer, and in 2014, accounting for about 92% of the world's total aquaculture production, out of which aquaculture production from the Southeast Asian countries contributed about 22% (Figure 18).

In the Southeast Asian region, while capture fisheries continued to show a declining trend particularly for marine capture fisheries from nearly 70% of the region's total fisheries production in 2000 to only 40% in 2014, aquaculture has steadily increased to compensate such decline. In addition to its contribution to food security, aquaculture also plays a vital role in enhancing people's livelihood and generating income by reforming the practice of using low-value fish as feed to produce higher value aquaculture products, thus, enhancing the economic growth of countries in the Southeast Asian region. Such reforms are necessary since using fish to produce fish could result in negative impacts on capture fisheries as the demand for fish-based ingredients for aquaculture feeds would increase.

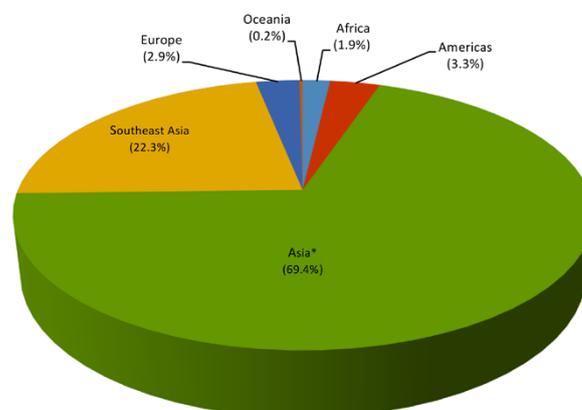


Figure 18. Percentage of continents' aquaculture production to world's total aquaculture production in 2014 by quantity

**Table 24.** Aquaculture production of each continent from 2000 to 2014 by quantity (metric tons)

Year	World Total* (million metric tons)	Continents					
		Africa*	Americas*	Asia*	Southeast Asia**	Europe*	Oceania*
2000	41,724,570	451,270	1,457,011	33,651,810	3,969,068	2,056,729	138,682
2001	44,324,713	489,275	1,765,476	35,591,301	4,257,005	2,092,655	129,001
2002	47,374,985	570,091	1,873,058	37,947,956	4,806,000	2,043,395	134,485
2003	50,271,308	624,608	1,975,940	39,936,929	5,439,809	2,161,537	132,485
2004	54,570,596	638,380	2,163,028	43,139,386	6,308,557	2,173,437	147,808
2005	57,820,603	727,390	2,192,363	45,089,956	7,512,534	2,135,194	163,166
2006	61,592,069	843,010	2,406,759	47,547,636	8,426,187	2,193,569	174,908
2007	64,798,959	916,790	2,386,409	49,853,487	9,237,586	2,367,132	176,006
2008	73,045,920	1,061,423	2,497,533	51,667,749	11,063,934	2,327,892	180,428
2009	73,045,920	1,103,338	2,554,484	54,306,390	12,379,436	2,518,895	183,377
2010	78,029,002	1,423,963	2,527,146	57,139,820	14,186,737	2,545,890	205,446
2011	82,649,339	1,537,737	2,789,598	59,696,054	15,751,145	2,661,427	213,378
2012	90,049,125	1,645,797	2,993,451	61,185,941	21,156,490	2,855,439	212,007
2013	97,162,044	1,738,014	3,071,887	68,175,004	21,203,449	2,767,782	205,908
2014	101,139,072	1,861,271	3,365,210	70,229,317	22,533,831	2,933,146	216,297

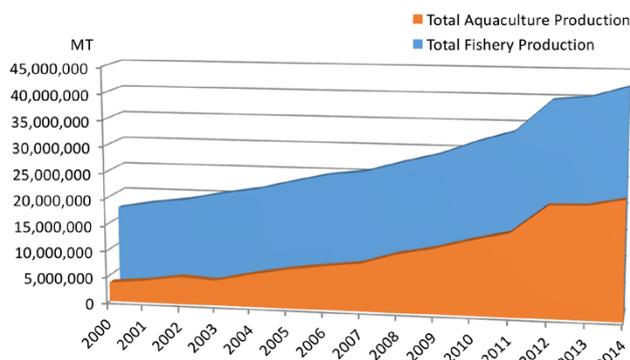
Note: Asia does not include data of Southeast Asia

\* Source: FAO Fisheries and Aquaculture Information and Statistics Service

\*\* Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

From 2000 to 2014, the total production of aquaculture in the Southeast Asian region has continued to increase at an average rate of about 1,326 thousand metric tons/year or 14% per year, while its contribution to the region's

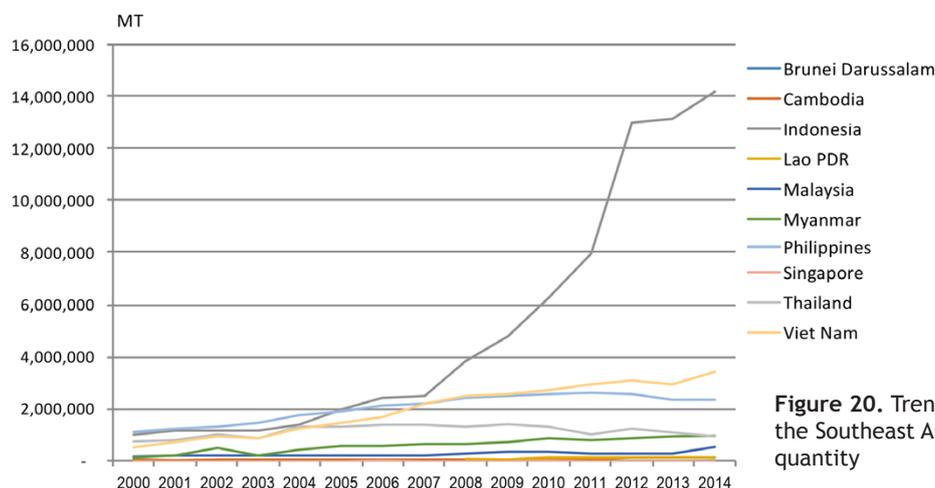
total fisheries production had increased from 21% to 53% (Table 25). Moreover, the constant increase in aquaculture production of the region could be observed in 15 years, between 2000 and 2014 (Figure 19 and Table 25).



**Figure 19.** Contribution of the region's aquaculture production to the total fisheries production of Southeast Asia from 2000 to 2014

In terms of quantity, Indonesia emerged as the top aquaculture producer in 2014, contributing about 63% to the region's total aquaculture production, followed by Viet Nam about 15%, the Philippines about 10%, and Thailand about 4% (Figure 20).

In terms of value of the region's aquaculture production, the actual trend could not be established as some countries were not able to provide the data regularly (Table 26). Nevertheless, from the available data in 2014 in terms of average value per metric ton of aquaculture produce (Table 25 and Table 26), Brunei Darussalam had the highest value at about US\$ 11,675/metric ton, followed by Singapore



**Figure 20.** Trends of aquaculture production of the Southeast Asian countries in 2000-2014 by quantity

**Table 25.** Aquaculture production of the Southeast Asian countries from 2000 to 2014 by quantity (metric tons)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total (aquaculture production)	Total (fisheries production)
2000	113	14,430	994,965	...	151,771	121,950	1,100,902	4,613	738,083	510,555	3,637,382	16,937,296
2001	99	14,000	1,132,784	...	158,156	190,120	1,219,456	4,442	814,227	709,891	4,243,175	17,621,843
2002	158	22,003	1,180,961	...	166,217	497,564	1,338,393	5,012	1,021,226	956,059	5,187,593	18,930,761
2003	159	22,547	1,180,385	...	169,265	158,846	1,454,503	5,432	886,589	891,845	4,769,571	20,274,399
2004	708	37,675	1,354,501	...	171,267	437,970	1,717,027	5,406	1,301,497	1,198,617	6,224,668	21,147,665
2005	703	42,000	1,941,096	...	175,792	574,990	1,895,847	5,917	1,318,461	1,467,300	7,422,106	22,987,784
2006	700	41,390	2,377,474	...	168,574	574,990	2,092,275	8,572	1,353,021	1,687,727	8,304,723	24,501,878
2007	674	50,200	2,466,030	...	178,244	604,657	2,165,604	4,504	1,370,431	2,194,500	9,034,844	25,302,872
2008	390	39,720	3,855,200	64,300	243,124	653,855	2,407,698	3,518	1,330,800	2,468,320	11,066,925	27,207,826
2009	460	50,000	4,789,100	75,000	333,451	724,163	2,477,196	3,566	1,396,010	2,539,300	12,379,246	28,917,096
2010	421	60,000	6,277,923	82,100	373,151	850,959	2,545,765	3,501	1,286,117	2,706,800	14,186,737	31,438,431
2011	293	72,000	7,928,962	95,600	287,042	816,820	2,608,120	3,974	1,007,934	2,930,400	15,751,145	33,488,051
2012	556	90,000	12,969,364	101,895	283,559	838,426	2,524,641	3,577	1,233,772	3,110,700	21,156,490	39,567,813
2013	606	90,000	13,147,288	124,085	260,774	929,000	2,373,386	5,566	1,056,844	3,215,900	21,203,449	40,229,315
2014	761	120,055	14,187,124	90,355	524,565	957,041	2,337,605	5,262	897,763	3,413,300	22,533,831	42,217,156

Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

**Table 26.** Aquaculture production of the Southeast Asian countries from 2000 to 2014 by value (US\$ thousand)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total Value
2000	...	...	1,083,046	...	255,348	...	728,296	9,946	2,457,007	...	4,533,643
2001	473	27,961	1,342,965	...	317,524	...	718,461	8,291	2,137,398	1,160,928	5,714,001
2002	715	26,598	1,562,287	...	284,437	...	686,398	6,847	1,559,294	1,340,095	5,466,671
2003	...	...	1,741,558	...	308,501	...	686,331	7,433	1,461,664	1,635,525	5,841,013
2004	3,093	42,165	1,966,996	...	309,750	...	799,826	8,524	1,714,509	2,356,981	7,201,844
2005	...	...	2,168,720	...	341,126	...	892,536	9,971	1,353,179	2,945,650	7,711,182
2006	...	...	2,341,501	...	351,975	...	1,085,011	9,477	1,990,005	...	5,777,969
2007	3,212	58,038	2,447,539	...	352,981	1,862,403	1,334,719	9,052	2,134,592	4,544,750	12,747,286
2008	392	61,790	4,222,498	91,141	452,880	782,566	1,718,634	9,262	2,065,301	4,617,700	14,032,164
2009	658	87,954	5,189,522	111,801	700,910	853,165	1,720,961	8,793	2,422,630	4,867,779	15,964,173
2010	4,950	...	6,980,897	...	793,085	917,706	1,835,308	14,864	2,830,930	...	13,377,740
2011	1,671	126,850	7,219,307	...	757,320	740,655	1,984,554	15,039	2,562,798	6,281,507	19,689,700
2012	4,730	...	7,635,708	...	833,156	1,348,346	2,152,328	12,686	3,313,323	6,383,000	21,683,275
2013	3,495	...	10,348,414	...	768,026	1,714,315	2,186,360	32,215	3,163,814	...	18,216,639
2014	8,884	...	9,503,444	108,426	1,197,902	1,857,360	2,135,384	42,756	2,555,166	...	17,409,322

Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

at US\$ 8,125/metric ton suggesting that their aquaculture production, although minimal, is of high value. Thailand also had the highest average value from its aquaculture production in 2014 at about US\$ 2,845/metric ton although it could be easily overtaken by Viet Nam if only the latter's value of its aquaculture production in 2014 was made available, noting that in 2012, the average value of the aquaculture production of Viet Nam was about US\$2,050/metric ton. Based on the 2014 data, Malaysia came quite close to Thailand at US\$ 2,285/metric ton followed by Myanmar at US\$ 1,940/metric ton, Philippines at US\$ 915/metric ton, and Indonesia at US\$ 670/metric ton.

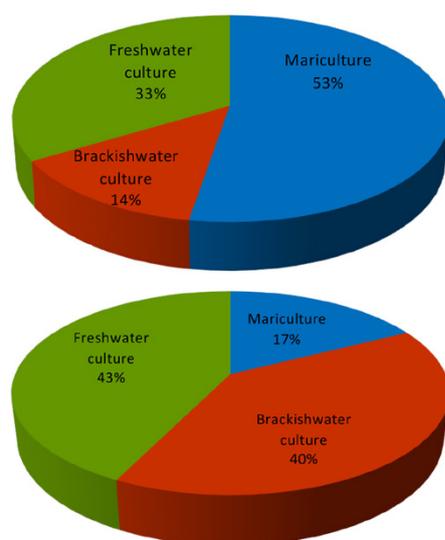
The aquaculture production of the Southeast Asian region could be classified into culture environments, namely: mariculture, brackishwater culture, and freshwater culture. In 2014, Indonesia is the top producer of aquaculture products from mariculture and brackishwater culture, followed by Philippines for mariculture, and Thailand and Philippines for brackishwater culture. As for freshwater culture, the top producer was Viet Nam followed by Indonesia (**Table 27**). In terms of quantity, mariculture contributed 53% to the region's total aquaculture production in 2014 while brackishwater culture contributed 14% and the remaining 33% from freshwater culture (**Figure 21**). In

**Table 27.** Production from aquaculture environments of the Southeast Asian countries in 2014 by quantity (metric tons) and value (US\$ thousand)

Country	Quantity (metric tons)			Total	Value (US\$ thousand)	Average value (US\$/metric ton)
	Mariculture	Brackishwater culture	Freshwater culture			
Brunei Darussalam	162	592	7	761	8,884	11,675
Cambodia	7,416	...	112,639	120,055	...	...
Indonesia	9,029,843	2,446,031	2,711,250	14,187,124	9,503,444	670
Lao PDR	0	0	90,355	90,355	108,426	1,200
Malaysia	287,980	125,801	110,784	524,565	1,197,902	2,285
Myanmar	59,705	1,845	895,491	957,041	1,857,360	1,940
Philippines	1,820,533	254,692	262,380	2,337,605	2,135,384	915
Singapore	4,252	200	810	5,262	42,756	8,125
Thailand	202,732	279,907	415,124	897,763	2,555,166	2,845
Viet Nam	454,100	...	2,959,200	3,413,300	...	...
<b>Total</b>	<b>11,866,723</b>	<b>3,109,068</b>	<b>7,558,040</b>	<b>22,533,831</b>	<b>17,409,322</b>	<b>770</b>

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

terms of value, notwithstanding the unavailability of data from some countries, freshwater culture contributed 43% followed by brackishwater culture at 40% and mariculture at 17%.



**Figure 21.** Contribution of the culture environments to the aquaculture production of Southeast Asia in 2014 by quantity (above) and value in US\$ (below)

Data on aquaculture production of the Southeast Asian countries by species in 2014 indicated that Indonesia was the biggest producer derived largely from *Eucheuma* seaweeds *nei* (*Eucheuma* spp.) accounting for about 63% of the country’s total aquaculture production, followed by *Gracilaria* seaweeds *nei* (*Gracilaria* spp.) accounting for 8%, Nile tilapia (*Oreochromis niloticus*) at 7%, torpedo-shaped catfishes (*Clarias* spp.) at 5%, and milkfish (*Chanos chanos*) at 4%. The second highest producer is Viet Nam, where 67% of its aquaculture production came from marine fishes *nei* (Osteichthyes) followed by Penaeid shrimps *nei* (*Penaeus* spp.) at 16% of the country’s total

aquaculture production. In the case of Philippines as the third highest aquaculture producer, its main aquaculture product is the elkhorn sea moss (*Kappaphycus alvarezii*) contributing 61% to the country’s total aquaculture production followed by milkfish accounting for 17%, Nile tilapia at 7%, spiny eucheuma (*Eucheuma denticulatum*) at 5%. For Myanmar, its main production from aquaculture is roho labeo (*Labeo rohita*) which accounted for 61% of the country’s total aquaculture production followed by catla (*Catla catla*) accounting for 7%, tilapias *nei* (*Tilapia* spp.) at 5%, giant tiger shrimp (*Penaeus monodon*), and mrigal carp (*Cirrhinus mrigala*) and silver barb (*Barbonymus gonionotus*) at 4% each. For Thailand, its main aquaculture product is the whiteleg shrimp (*Penaeus vannamei*) accounting for 29% of the country’s total production from aquaculture followed by Nile tilapia (*Oreochromis niloticus*) at 21%, green mussel (*Perna viridis*) at 13%, hybrid catfishes (*C. gariepinus* x *C. macrophalus*) at 13%.

In terms of value of major aquaculture species, Brunei Darussalam had the highest average value at about US\$ 11,675/metric ton (Table 27), especially for the orange-spotted grouper (*Epinephelus coioides*) which is the country’s main aquaculture commodity valued at US\$ 20,085/metric ton followed by the snappers *nei* (*Lutjanus* spp.) at about US\$ 16,010/metric ton, giant seaperch (*Lates calcarifer*) at US\$ 13,405/metric ton, blue shrimp (*Penaeus stylirostris*) at US\$ 12,060/metric ton, and jacks, crevalles *nei* (*Caranx* spp.) at US\$ 11,390/metric ton. Singapore had the second highest average value at US\$ 8,125/metric ton (Table 27), with the mud spiny lobster (*Panulirus polyphagus*) commanding the highest price at US\$ 67,025/metric ton followed by marble goby (*Oxyeotris mamoratus*) at US\$ 41,570/metric ton, humpback grouper (*Cromileptes macropomum*) at US\$ 37,750/metric ton, penaeid shrimps *nei* (*Penaeus* spp.) at US\$ 34,560/metric ton, Indo-Pacific swamp crab

(*Scylla serrata*) at US\$ 28,290/metric ton, and groupers *nei* (*Epinephelus* spp.) at US\$ 25,360/metric ton. For Thailand, its aquaculture production (Table 27) was at the third highest with an average value of about US\$ 2,845/metric ton. Specifically, the aquaculture species with the highest value were the giant river prawn (*Macrobrachium rosenbergii*) at US\$ 7,650/metric ton followed by giant tiger prawn (*Penaeus monodon*) at US\$ 7,065/metric ton, whiteleg shimp (*Penaeus merguensis*) at US\$ 5,675/metric ton, and giant seaperch (*Lates calcarifer*) valued at US\$ 3,785/metric ton.

## 5.1 Mariculture

Globally, mariculture production has grown from 21 million metric tons in 2000 to 47.45 million metric tons in 2014 (FAO, 2016). In 2014, Asia (including the Southeast Asia) was the highest producer of mariculture products at approximately 42.96 million metric tons or 90% of the global mariculture production, out of which the Southeast Asian countries contributed 30% to the global mariculture production. From 2000 to 2014, the region's total mariculture products increased in terms of quantity by about 759 thousand metric tons/year (Table

**Table 28.** Mariculture production of the Southeast Asian countries from 2000 to 2014 by quantity (metric tons)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	53	408	197,114	...	84,963	23,038	747,414	4,398	149,810	32,900	1,240,098
2001	30	394	221,010	...	87,468	68,854	827,670	3,700	246,602	319,071	1,774,799
2002	16	4,064	234,859	...	94,671	134,784	936,851	4,303	384,094	396,099	2,189,741
2003	18	8,324	249,242	...	92,936	25,709	1,039,081	4,786	361,400	443,135	2,224,631
2004	...	16,915	736,689	...	84,699	...	1,273,598	4,786	400,400	155,235	2,672,322
2005	37	16,400	890,074	...	80,239	804	1,419,727	5,280	364,061	213,800	2,990,422
2006	500	500	1,365,919	...	71,374	...	1,566,056	8,113	317,457	216,200	3,546,119
2007	...	16,630	1,509,062	...	72,922	...	1,626,206	4,159	309,497	208,500	3,746,976
2008	390	1,370	2,377,382	...	96,159	48,303	1,793,395	3,235	...	48,420	4,368,654
2009	72	4,925	2,537,100	...	111,524	50,464	1,860,462	3,286	316,927	172,003	5,056,763
2010	109	...	3,514,702	...	89,366	75,441	1,933,396	3,098	270,628	...	5,886,740
2011	121	2,620	4,605,825	...	60,975	3,158	1,992,953	3,448	135,481	318,300	7,122,701
2012	556	...	5,769,736	...	131,005	52,693	1,910,568	3,022	225,181	374,300	8,467,061
2013	134	4,633	8,372,817	...	41,941	4,775	1,727,165	4,159	237,817	368,800	10,762,241
2014	162	7,416	9,029,843	...	287,980	59,705	1,820,533	4,252	202,732	454,100	11,866,723

**Source:** Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

**Table 29.** Mariculture production of the Southeast Asian countries from 2000 to 2014 by value (US\$ thousand)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	...	...	134,182	...	47,895	...	75,410	5,952	40,692	...	273,284
2001	...	...	73,047	...	48,158	...	77,623	5,382	54,847	880,737	1,109,600
2002	...	...	122,985	...	51,579	...	86,379	4,079	57,207	1,024,056	1,315,130
2003	...	...	180,007	...	75,526	...	96,373	5,258	62,260	1,255,758	1,619,311
2004	...	4,585	167,787	...	60,263	...	171,539	7,147	97,215	622,600	1,271,964
2005	...	...	353,019	...	67,828	...	171,539	7,147	97,215	622,600	1,271,964
2006	...	...	220,568	...	108,470	...	216,342	7,381	1,457,754	189,500	1,919,809
2007	...	5,300	432,802	...	131,304	...	270,984	7,980	...	...	929,804
2008	392	3,890	983,185	...	159,407	...	500,275	8,082	...	1,493,750	2,994,548
2009	...	19,700	1,297,568	...	189,275	208,905	383,899	7,551	71,837	174,000	2,224,666
2010	...	...	1,437,044	...	34,369	193,568	934,081	13,204	110,379	...	2,722,645
2011	740	8,070	1,127,599	...	27,785	2,088	535,916	12,986	69,189	...	1,784,373
2012	4,716	...	1,349,055	...	500,888	213,465	649,976	10,028	201,477	...	2,929,605
2013	712	...	1,810,287	...	78,374	17,728	533,742	22,344	208,428	...	2,671,615
2014	1,710	...	1,668,006	...	234,956	260,538	665,468	28,724	181,171	...	3,040,573

**Source:** Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

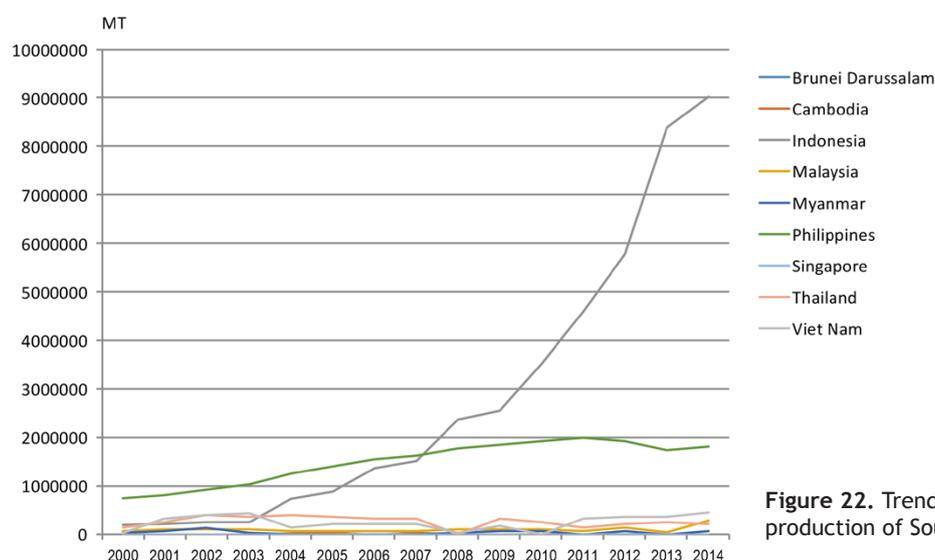


Figure 22. Trends of the quantity of mariculture production of Southeast Asian countries in 2000-2014

Table 30. Mariculture production of major groups of species of Southeast Asia from 2000 to 2014 by quantity (metric tons)

Year	Major group of species					Total
	Aquatic plants	Marine fishes	Marine mollusks	Shrimps	Others	
2000	910,635	21,971	291,122	...	16,370	1,240,098
2001	1,017,136	21,580	358,311	...	377,772	1,774,799
2002	1,147,212	29,037	495,371	...	518,121	2,189,741
2003	1,257,452	38,504	470,724	...	457,951	2,224,631
2004	1,987,178	42,216	642,727	75	126	2,672,322
2005	2,266,406	70,521	596,837	40,608	16,500	2,990,422
2006	2,883,247	69,314	551,143	40,630	1,785	3,546,119
2007	3,134,993	91,972	518,330	130	1,551	3,746,976
2008	3,534,124	245,967	588,563	...	...	4,368,654
2009	4,277,095	64,279	553,401	...	161,988	5,056,763
2010	5,198,944	224,993	462,158	...	645	5,886,740
2011	5,840,426	449,323	291,382	...	1,750	6,582,881
2012	7,488,620	244,770	311,560	79,099	343,012	8,467,061
2013	9,879,417	292,890	334,836	127,050	186,379	10,820,572
2014	10,767,935	485,559	312,452	126,200	174,577	11,866,723

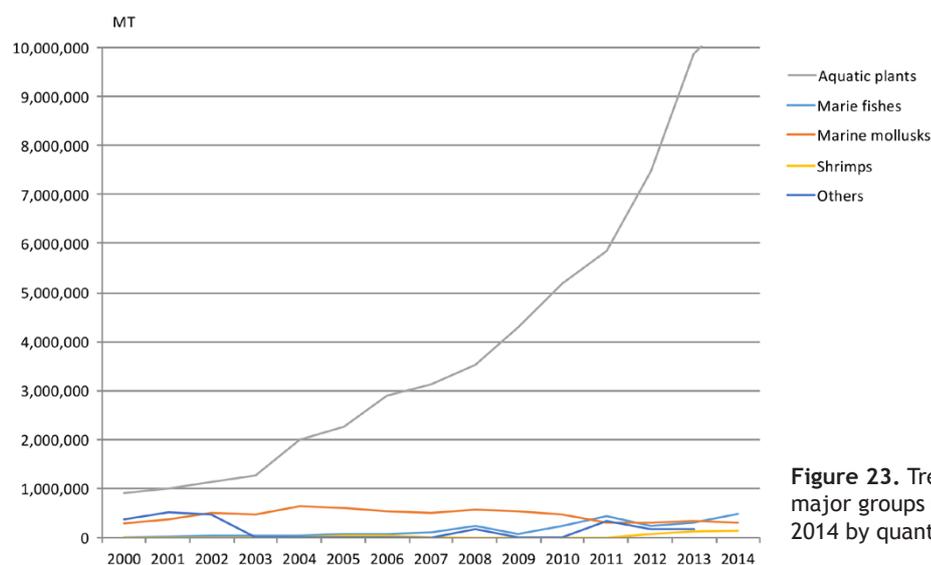
Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

28 and Figure 22) and value by about US\$ 198 million/year (Table 29). In 2014, Indonesia contributed the highest production quantity, accounting for 76% of the region’s total mariculture production, followed by Philippines (15%), Viet Nam (4%), Malaysia (2%), and Thailand (2%). In terms of production value, Indonesia also led the countries with the value of its mariculture production contributing about 55% to the region’s total, followed by the Philippines (22%), Myanmar (9%), Malaysia (8%), and Thailand (6%%), while the remaining countries contributed less than 1% to the region’s total mariculture production value.

The mariculture production of Southeast Asia comes from major groups of species, namely: aquatic plants, marine fishes, marine mollusks, shrimps, and others. In terms

of quantity, the aquatic plants contributed the largest production to the region’s total mariculture production which had significantly increased during the period 2000-2014 at about 704,093 metric tons/year (Table 30 and Figure 23).

The mariculture production of the Southeast Asian countries by major groups of species in 2014 is shown in Table 31, of which more than 50% could be reported at species level. The data indicated that Indonesia contributed the largest amount of aquatic plants particularly *Eucheuma* spp., followed by the Philippines which is *Kappaphucus alvarezii*. For marine mollusks group, Thailand provided the highest production of green mussels (*Perna viridis*) followed by blood cockles (*Anadara granosa*). Specifically in 2014, aquatic plants contributed 91% to the total



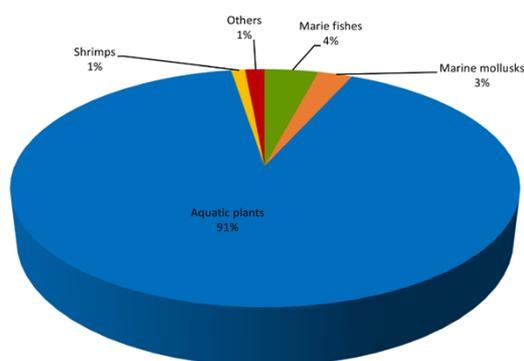
**Figure 23.** Trends of mariculture production of major groups of species of Southeast Asia in 2000-2014 by quantity

**Table 31.** Production of major groups of mariculture species of the Southeast Asian countries in 2014 by quantity (metric tons)

Major groups of species	Brunei Darussalam	Cambodia	Indonesia	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
<b>Aquatic plants</b>			<b>8,971,463</b>	<b>245,332</b>	<b>2,100</b>	<b>1,549,040</b>				<b>10,767,934</b>
<i>Eucaema denticulatum</i>	...	...	...	...	...	113,127	...	...	...	113,127
<i>Eucaema</i> spp.	...	...	8,971,463	...	...	...	...	...	...	8,971,463
<i>Caulerpa</i> spp.	...	...	...	...	...	1,199	...	...	...	1,199
<i>Kappaphycus alvarezii</i>	...	...	...	245,332	2,100	1,434,714	...	...	...	1,682,145
<b>Marine mollusks</b>			<b>44,596</b>	<b>42,649</b>		<b>41,127</b>	<b>511</b>	<b>183,569</b>		<b>312,452</b>
Marine mollusks <i>nei</i>	...	...	44,596	...	...	10	43	...	...	44,649
<i>Perna viridis</i>	...	...	...	1,415	...	18,762	467	117,014	...	137,658
<i>Anadara granosa</i>	...	...	...	40,454	...	...	...	53,716	...	94,170
<i>Crassostrea</i> spp.	...	...	...	780	...	22,355	1	12,839	...	35,975
<b>Marine fishes</b>	<b>163</b>	...	<b>87,001</b>	...	...	<b>230,162</b>	<b>3,648</b>	<b>19,163</b>	<b>146,100</b>	<b>413,135</b>
Marine crustaceans (shrimps)	...	...	...	...	42,000	...	...	...	84,200	126,200
Others	...	7,416	138	...	15,605	...	43	...	223,800	247,002
<b>Total</b>	<b>163</b>	<b>7,416</b>	<b>9,029,843</b>	<b>287,980</b>	<b>287,980</b>	<b>1,820,533</b>	<b>4,252</b>	<b>202,732</b>	<b>454,100</b>	<b>11,866,723</b>

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

quantity of mariculture production in the Southeast Asian region (Figure 24).



**Figure 24.** Percentage of production of major groups of mariculture species of Southeast Asia in 2014 by quantity

## 5.2 Brackishwater Aquaculture

The total brackishwater aquaculture production of the Southeast Asian region had increased from 1,115,635 metric tons in 2000 to 3,109,068 metric tons in 2014, accounting for an average increase of 142,388 metric tons/year (Table 32 and Figure 25). During the past 15 years, Indonesia has been the region's top producer with an average increase in production of 144,000 metric tons/year, followed by Malaysia at 7,834 metric tons/year.

Similarly, the production value also increased at an average of US\$ 235 million per year (Table 33). In terms of average value of the region's brackishwater aquaculture production in 2014, Singapore reported the highest average value of US\$ 26,495/metric ton, followed by Brunei Darussalam

**Table 32.** Brackishwater aquaculture production of the Southeast Asian countries from 2000 to 2014 by quantity (metric tons)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	41	20	430,020	...	16,119	4,964	241,455	55	317,263	96,433	1,106,370
2001	31	143	510,744	...	27,232	5,473	268,120	40	287,928	...	1,099,711
2002	52	53	473,128	...	25,143	6,550	254,167	107	276,008	...	1,035,208
2003	52	90	501,977	...	26,382	18,421	254,744	30	341,878	...	1,143,574
2004	598	590	480,046	...	31,011	11,970	262,554	71	377,388	339,555	1,503,783
2005	537	100	643,975	...	33,547	250,407	277,230	35	414,926	287,200	1,907,957
2006	60	120	629,609	...	35,547	60,000	281,316	34	508,150	309,000	1,823,836
2007	611	...	629,797	...	35,258	48,303	294,495	...	535,834	500,500	2,044,798
2008	...	...	691,432	...	51,119	...	303,244	...	805,300	501,600	2,352,695
2009	354	75	1,080,700	...	69,296	2,926	308,440	...	558,444	554,397	2,574,632
2010	293	...	1,416,038	...	128,387	3,122	304,276	...	583,111	...	2,435,227
2011	159	...	1,531,456	...	103,758	51,965	336,159	...	533,653	...	2,557,150
2012	...	...	1,708,110	...	...	...	330,781	96	599,647	...	2,638,634
2013	456	91	2,362,480	...	85,941	1,969	369,591	389	329,035	...	3,149,952
2014	592	...	2,446,031	...	125,801	1,845	254,692	200	279,907	...	3,109,068

Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

**Table 33.** Brackishwater aquaculture production of the Southeast Asian countries from 2000 to 2014 by value (US\$ thousand)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	...	...	731,798	...	125,236	...	534,739	430	2,206,325	...	3,631,332
2001	...	...	902,128	...	201,579	...	534,699	386	1,875,872	...	3,547,229
2002	...	...	1,118,924	...	167,105	...	485,225	969	1,248,738	...	3,055,403
2003	...	...	1,139,019	...	165,789	...	457,412	313	1,081,912	...	2,904,025
2004	2,695	767	1,529,358	...	173,158	...	490,853	593	1,175,007	1,146,005	4,566,961
2005	...	...	1,483,289	...	172,341	...	535,451	374	897,455	1,463,200	4,616,652
2006	...	...	1,736,275	...	162,295	...	611,344	625	...	...	2,602,799
2007	3,212	...	1,672,408	...	165,797	193,212	714,106	...	1,523,423	1,692,500	6,038,269
2008	...	375	1,840,902	...	209,481	641,278	831,073	...	1,602,685	467,450	5,717,512
2009	5,161	754	2,156,102	...	271,014	...	886,256	...	1,717,645	1,974,429	7,160,596
2010	4,800	...	3,409,438	...	506,555	...	481,441	...	2,066,328	...	6,468,562
2011	890	...	2,657,156	...	497,955	1,592	1,044,438	...	1,935,375	...	6,137,406
2012	...	...	2,643,864	...	...	...	1,040,218	717	2,363,096	...	6,047,895
2013	2,690	...	4,234,648	...	488,518	262,169	1,204,447	6,752	2,019,567	...	8,281,791
2014	7,130	...	3,526,200	...	737,340	1,600	1,040,667	5,299	1,610,425	...	6,928,661

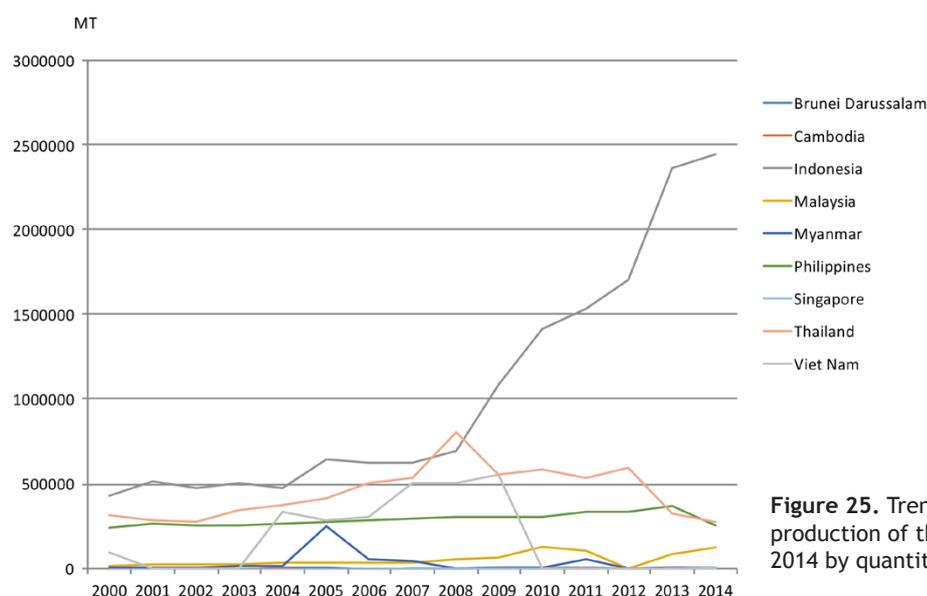
Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

at US\$ 12,045/metric ton, Malaysia at US\$ 5,860/metric ton, Thailand at US\$ 5,755/metric ton, Philippines at 4,085/metric ton, Indonesia at US\$ 1,440/metric ton, and Myanmar at US\$ 865/metric ton. It should be noted however that Cambodia and Viet Nam were not able to report the values of their respective brackishwater aquaculture productions in 2014 (**Table 33**).

In Southeast Asia, the major groups and species cultured in brackishwater include aquatic plants such as *Gracilaria* spp., crustaceans such as banana prawn (*Penaeus merguensis*), giant tiger shrimp (*P. monodon*), whiteleg shrimp (*P. vannamei*), and other shrimps, as well as fishes

such as milkfish (*Chanos chanos*) and marine fishes, and others. As shown in **Table 34**, aquatic plants provided the highest contribution to the total brackishwater aquaculture production in 2014 in terms of quantity at 36% followed by milkfish which contributed 24%, whiteleg shrimp at 23%, and giant tiger shrimp at 6%.

In terms of value, whiteleg shrimp contributed the highest value of about 64% followed by milkfish at 33%, and giant tiger shrimp at 28%. Although aquatic plants had the highest production volume (36%), its contribution in terms of value was only 2% (**Figure 26**).

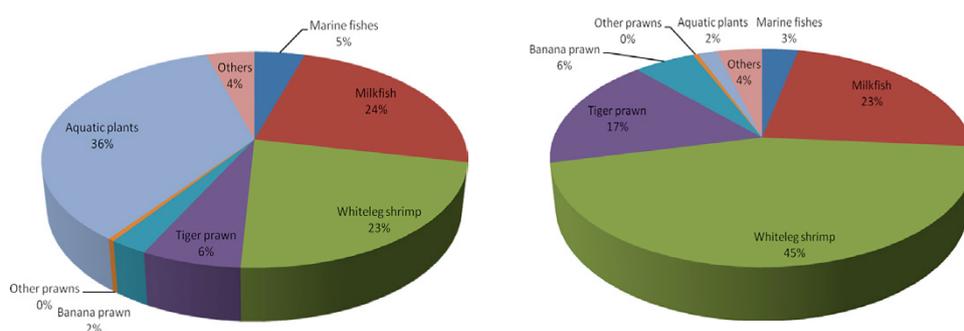


**Figure 25.** Trends of brackishwater culture production of the Southeast Asian countries in 2000-2014 by quantity

**Table 34.** Production of major groups of species of brackishwater aquaculture of Southeast Asia from 2000 to 2014 by quantity (metric tons)

Year	Major group of species								Total
	Aquatic plants ( <i>Gracilaria</i> spp.)	Crustaceans			Fishes		Others		
		Banana prawn ( <i>P. merguensis</i> )	Tiger shrimp ( <i>P. monodon</i> )	Whiteleg shrimp ( <i>P. vannamei</i> )	Other shrimps	Marine mollusks	Milkfish ( <i>Chanos chanos</i> )		
2000	...	...	511,867	...	118,392	408,827	67,120	164	1,106,370
2001	...	...	450,522	...	203,111	421,119	24,959	...	1,099,711
2002	...	...	439,532	...	69,396	425,892	100,388	...	1,035,208
2003	...	...	406,519	132,365	76,145	430,903	95,659	1,983	1,143,574
2004	...	320,429	478,865	...	143,165	448,910	111,743	671	1,503,783
2005	...	...	604,511	...	284,075	473,924	139,447	6,184	1,907,957
2006	33,321	399,816	427,467	...	837,503	439,706	64,790	21,049	1,823,836
2007	...	...	429,295	...	963,106	498,437	153,826	134	2,044,798
2008	...	78,087	522,326	745,948	224,545	...	174,413	607,376	2,352,695
2009	171,868	64,534	383,696	571,000	462,671	260,610	552,667	107,586	2,574,632
2010	517,605	87,905	243,174	767,653	31,650	683,990	81,521	21,729	2,435,227
2011	630,788	73,404	234,053	762,045	17,291	735,667	12,115	91,787	2,557,150
2012	776,177	64,258	188,870	825,169	1,419	756,842	25,899	...	2,638,634
2013	977,635	65,285	297,468	695,665	129,224	853,523	131,152	...	3,149,952
2014	1,106,065	74,838	197,571	699,776	12,997	738,605	142,756	136,460	3,109,068

**Source:** Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)



**Figure 26.** Production of major groups of species from brackishwater aquaculture of Southeast Asia in 2014 by quantity (left) and value in US\$ (right)

**Table 35.** Production of major groups of species of brackishwater aquaculture of the Southeast Asian countries in 2014 by quantity (metric tons)

Major groups of species	Brunei Darussalam	Indonesia	Malaysia	Myanmar	Philippines	Singapore	Thailand	Total
<b>Aquatic plants</b>	...	1,105,529	...	...	536	...	...	<b>1,106,065</b>
<b>Crustaceans</b>								
Banana prawn	...	15,634	57,181	...	1,827	...	196	<b>74,838</b>
Tiger shrimp	...	129,231	4,205	...	47,843	...	16,292	<b>197,571</b>
Whiteleg shrimp	...	428,905	...	...	7,626	...	263,245	<b>699,776</b>
Other shrimps	591	11,031	...	...	1,151	50	174	<b>12,997</b>
<b>Fishes</b>								
Milkfish	...	577,464	...	...	161,141	...	...	<b>738,605</b>
Marine fishes	...	102,321	34,016	1,695	4,653	71	...	<b>142,756</b>
<b>Others</b>	1	75,916	30,399	150	29,915	79	...	<b>136,460</b>
<b>Total</b>	<b>592</b>	<b>2,446,031</b>	<b>125,801</b>	<b>1,845</b>	<b>254,692</b>	<b>200</b>	<b>279,907</b>	<b>3,109,068</b>

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

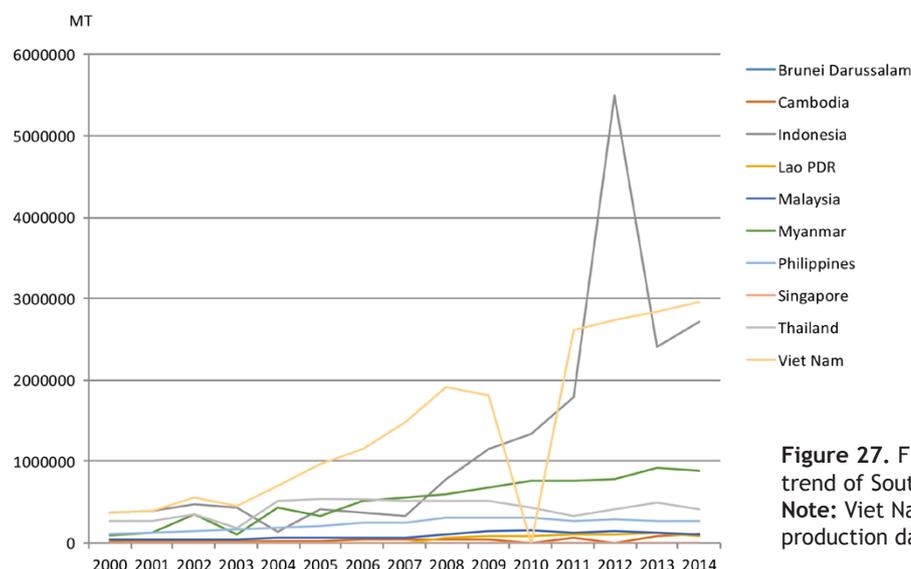
In terms of the production quantity of brackishwater aquaculture in 2014 by Southeast Asian country and by major groups and species, Indonesia contributed the highest to the region’s total production from its production of aquatic plants at 99.9%. This was followed by Indonesia and the Philippines from their milkfish (*Chanos chanos*) production, which accounted for about 78.0% and 22.0%, respectively. Moreover, from its production of the whiteleg shrimp, Indonesia is the largest producer providing about 61.0% to the region’s total brackishwater aquaculture production (Table 35).

### 5.3 Freshwater Aquaculture

Inland fisheries and aquaculture play a significant role in providing food security for household consumption and improving livelihoods of rural populace in several countries of the Southeast Asian region. The Lower Mekong Basin (Figure 16) is likewise regarded as one of the most important environments for freshwater aquaculture in the region. According to MRC (2002), Cambodia, Lao PDR, Thailand, and Viet Nam, the

countries that comprise the Lower Mekong Basin, had been engaged in aquaculture in the Lower Mekong Basin with diverse activities that encompass breeding, rearing and sale of fish fry and fingerlings, and growing of wild and cultured fingerlings in enclosed or semi-enclosed water bodies such as ponds, rice fields, and fish cages.

The development of freshwater aquaculture in the Lower Mekong Basin however, had not been evenly distributed as most aquaculture activities are taking place in the Mekong Delta of Viet Nam and Thailand. As a result, freshwater aquaculture productions of Cambodia and Lao PDR are very minimal. Moreover, the statistical data reported by the countries in the Lower Mekong Basin could have been underestimated resulting in low recognition of the importance of small-scale freshwater aquaculture, making it necessary for fisheries data collection to be efficiently carried out. Being widespread in the Lower Mekong Basin, freshwater aquaculture activities had gained some degree of growing importance as source of food and income for rural households.



**Figure 27.** Freshwater aquaculture production trend of Southeast Asia in 2000-2014 by quantity  
**Note:** Viet Nam was not able to provide its production data from freshwater aquaculture in 2010

In 2014, the total production from freshwater aquaculture in the region was reported to be 7,558,040 metric tons accounting for about 33% of the region's total aquaculture production as shown in **Figure 21**. Viet Nam had the highest production from freshwater culture at 2,959,200 metric tons, followed by Indonesia at 2,711,250 metric tons, and Myanmar at 895,491 metric tons (**Table 36**).

The trend of freshwater aquaculture production in the Southeast Asian countries from 2000 to 2014 as shown in **Figure 27** indicates a large increase of approximately 447,652 metric tons annually. In terms of value, production

from freshwater aquaculture provided 43% to the region's total aquaculture production value (**Figure 21** and **Table 37**).

In 2014, Singapore posted the highest average value at US\$ 10,780/metric ton followed by Malaysia at US\$ 2,035/metric ton, Thailand at US\$ 1,840/metric ton, Myanmar at US\$ 1,780/metric ton, Philippines at US\$ 1,635/metric ton, Indonesia at US\$ 1,590/metric ton, Lao PDR at US\$ 1,200/metric ton, and Brunei Darussalam at US\$ 630/metric ton. Cambodia and Viet Nam were not able to report the values of their respective countries' freshwater aquaculture productions in 2014.

**Table 36.** Freshwater aquaculture production of the Southeast Asian countries from 2000 to 2014 by quantity (metric tons)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	19	14,002	367,831	...	50,689	93,948	112,033	160	271,010	381,222	1,290,914
2001	38	13,463	401,030	...	43,456	115,793	123,666	702	279,697	390,820	1,368,663
2002	90	17,886	472,974	...	46,403	356,230	147,375	602	361,124	559,960	1,962,644
2003	89	14,133	429,166	...	49,947	114,716	160,678	616	183,311	448,710	1,401,366
2004	110	20,170	137,766	...	55,557	426,000	180,875	549	523,709	703,827	2,048,563
2005	129	25,500	407,047	...	62,006	323,779	198,890	602	539,474	966,300	2,523,727
2006	140	40,770	381,946	...	61,653	514,990	244,903	425	527,414	1,162,527	2,934,768
2007	63	33,570	327,171	...	70,064	556,354	244,903	345	525,100	1,485,500	3,243,070
2008	...	38,350	786,386	64,300	95,846	605,552	311,059	283	525,500	1,918,300	4,345,576
2009	34	45,000	1,162,300	75,000	152,631	670,773	308,294	280	520,639	1,812,900	4,747,851
2010	19	...	1,347,183	82,100	155,398	772,396	308,093	403	432,378	...	3,097,970
2011	13	69,380	1,791,681	95,600	122,489	761,697	279,008	526	338,800	2,612,100	6,071,294
2012	...	...	5,491,518	101,895	152,554	785,733	283,292	459	408,944	2,736,400	9,960,795
2013	16	85,276	2,411,991	124,085	132,892	922,256	276,630	1,018	489,992	2,847,100	7,291,256
2014	7	112,639	2,711,250	90,355	110,784	895,491	262,380	810	415,124	2,959,200	7,558,040

*Source:* Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a), and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

**Table 37.** Freshwater aquaculture production of the Southeast Asian countries from 2000 to 2014 by value (US\$ thousand)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	...	...	217,067	...	80,263	...	118,147	3,564	209,990	...	629,028
2001	...	...	347,392	...	65,263	...	106,139	2,522	206,769	280,191	1,008,429
2002	...	...	440,725	...	62,368	...	114,794	1,799	253,349	316,039	935,923
2003	...	...	443,349	...	63,421	...	132,546	1,861	317,492	379,767	1,338,492
2004	398	36,813	269,851	...	67,105	...	162,960	1,744	479,587	1,055,741	2,075,298
2005	...	...	332,412	...	77,329	...	185,546	2,450	358,509	859,850	1,822,566
2006	...	...	384,658	...	79,781	...	257,325	1,471	532,252	...	1,255,362
2007	...	52,738	342,329	...	101,159	1,669,191	349,629	1,072	611,169	2,662,750	5,779,567
2008	...	57,525	1,398,411	91,141	139,556	141,288	387,286	1,180	462,616	2,656,500	4,716,200
2009	...	67,500	1,735,852	111,801	204,058	644,260	418,956	1,242	633,148	2,719,350	6,583,413
2010	150	...	2,134,415	...	252,161	724,138	419,786	1,660	654,223	...	4,186,533
2011	41	118,780	3,434,552	...	231,579	736,975	404,200	2,053	558,234	...	5,486,414
2012	14	...	3,642,789	...	332,268	1,134,881	462,132	1,941	748,750	...	6,322,775
2013	93	...	4,303,479	...	279,508	1,434,418	448,171	3,119	935,819	...	7,404,607
2014	44	...	4,309,238	108,426	225,606	1,595,222	429,249	8,733	763,570	...	7,440,088

*Source:* Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a), and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

**Table 38.** Production of major groups of species from freshwater aquaculture of Southeast Asia from 2000 to 2014 by quantity (metric tons)

Year	Major group of species							Total
	Carp, barbells and other cyprinids	Catfishes	Freshwater crustaceans	Gouramis	Freshwater fishes <i>nei</i>	Tilapia and other cichlids	Others	
2000	342,185	235,689	19,949	...	125,393	244,664	323,034	1,290,914
2001	409,066	148,962	14,140	43,350	200,486	281,880	270,779	1,368,663
2002	447,496	171,717	16,696	49,661	122,278	367,489	787,307	1,962,644
2003	629,864	252,733	29,024	67,373	38,387	373,653	10,332	1,401,366
2004	551,173	278,865	37,648	...	96,465	380,584	703,828	2,048,563
2005	300,195	667,154	46,141	44,418	921,116	504,195	40,508	2,523,563
2006	495,534	756,841	32,294	44,971	1,006,699	530,852	67,577	2,934,768
2007	428,692	1,160,620	113,873	32,233	922,542	575,560	9,550	3,243,070
2008	680,758	1,674,598	37,378	37,883	620,456	615,705	678,698	4,345,576
2009	210,735	1,334,894	35,637	37,438	1,994,409	540,508	594,230	4,747,851
2010	1,080,784	520,891	30,458	92,854	414,999	957,984	...	3,097,970
2011	1,147,753	697,138	24,680	97,505	3,016,225	1,083,395	4,598	6,071,294
2012	4,597,741	908,048	428,323	124,198	2,569,582	1,226,926	105,977	9,960,795
2013	1,336,381	1,079,440	510,616	137,358	2,593,036	1,385,695	248,730	7,291,256
2014	1,341,130	1,211,575	567,299	160,093	2,587,773	1,537,799	152,372	7,558,040

Source: Fishery Statistical Bulletin for the South China Sea Area 2000-2007 (SEAFDEC, 2005a; SEAFDEC, 2006; SEAFDEC, 2008a; SEAFDEC, 2008b; SEAFDEC, 2009a; SEAFDEC, 2010a); and Fishery Statistical Bulletin of Southeast Asia 2008-2014 (SEAFDEC, 2010b; SEAFDEC, 2011; SEAFDEC, 2012a; SEAFDEC, 2013; SEAFDEC, 2014; SEAFDEC, 2015a; SEAFDEC, 2016a)

**Table 39.** Production of major groups of species from freshwater aquaculture of the Southeast Asian countries in 2014 by quantity (metric tons)

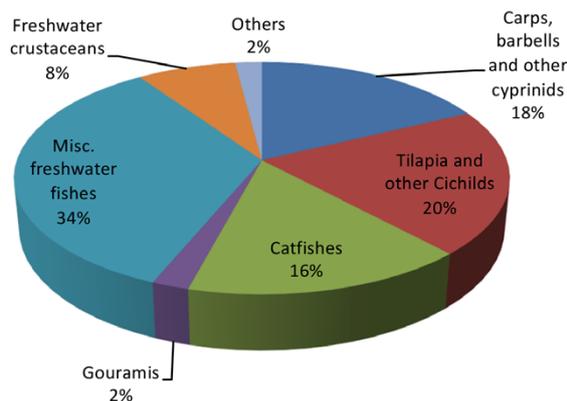
Major groups of species	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
Common carp	...	...	434,177	...	1,795	27,057	...	...	1,890	...	464,919
Catfishes, hybrid	...	...	...	...	...	...	...	...	113,832	...	113,832
Nile tilapia ( <i>O. niloticus</i> )	3	...	947,113	...	...	...	164,814	58	189,947	...	1,301,935
Torpedo-shaped catfishes ( <i>Clarias</i> spp.)	3	...	677,917	...	46,122	9,019	3,632	...	...	...	736,693
Roho labeo ( <i>Labeo rohita</i> )	...	...	...	...	...	586,241	...	...	830	...	587,071
Giant river prawn	...	...	1,809	...	475	800	9	...	16,906	547,300	567,299
Pangas catfish	...	...	418,002	...	...	18,038	...	...	...	...	436,040
Tilapias <i>nei</i>	...	...	...	...	31,203	46,899	75,772	...	...	...	153,874
Giant gourami	...	...	118,776	...	...	...	126	2	3,212	...	122,116
Misc. freshwater fishes	1	112,639	113,456	90,355	31,189	207,437	18,027	750	88,507	2,411,900	3,074,261
<b>Total</b>	<b>7</b>	<b>112,639</b>	<b>2,711,250</b>	<b>90,355</b>	<b>110,784</b>	<b>895,491</b>	<b>262,380</b>	<b>820</b>	<b>415,125</b>	<b>2,959,200</b>	<b>7,558,040</b>

Source: Fishery Statistical Bulletin of Southeast Asia 2014 (SEAFDEC, 2016a)

In the Southeast Asian region, more than 30 major groups and species are being cultured in freshwater environment, about one-half of which are non-indigenous fish species such as tilapia, roho labeo, African catfish, giant freshwater prawn, and so on. Several countries however reported their production by major groups only such as freshwater fishes *nei* without providing the details at species level. Nonetheless, the report on the freshwater aquaculture production of major groups and species during the past 15 years indicated that tilapia and other cichlids group provided the largest production, followed by carps,

barbells, and other cyprinids group, and catfishes group (Table 38).

Figure 28 shows that in 2014, misc. freshwater fishes *nei* accounted for 34% of the region's total production from freshwater aquaculture, followed by tilapia and other cichlids group accounting for 20%. It is also notable that the production of tilapia group in the region had increased by more than six times from 2000 to 2014 (Table 38). Carps, barbells and other cyprinids had the third highest production accounting for 18% of the region's freshwater



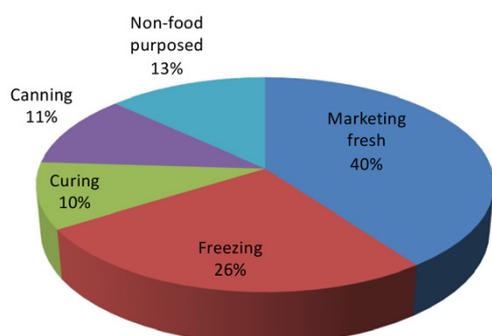
**Figure 28.** Percentage production of major groups of species in freshwater aquaculture production of Southeast Asia in 2014 by quantity

aquaculture production with roho labeo (*Labeo rohita*) having the highest production within the group (44%). The next group is catfishes accounting for 16%

In terms of quantity, the production of major groups and species from freshwater aquaculture of the Southeast Asian countries in 2014 indicated that Nile tilapia (*Oreochromis niloticus*) provided the highest production accounting for about 17.0% of the total production of the region with Indonesia producing 73.0% of the total production. Torpedo-shaped catfishes (*Clarias* spp.) came next providing 10.0%, produced mainly by Indonesia, Malaysia, Myanmar, Philippines, and Brunei Darussalam. Roho labeo (*Labeo rohita*) provided 8.0% with Myanmar contributing 99.8% to the total production (Table 39).

## VI. FISH PROCESSING INDUSTRY

After harvesting, fish processing industries, processors, and wholesalers are the next link in the supply chain before wild caught and farmed fish and seafood continue on their journey to the consumers' plates. According to FAO (2014a), over 87% (146 million metric tons) of the global fish production in 2014 was used for human consumption. Of the portion not consumed by humans, 21 million metric tons was destined for non-food products, of which 76% (15.8 million metric tons) was processed into fishmeal and fish oil, with the remaining portion either



**Figure 29.** Percentage of disposition of the world fisheries production

sold live as aquarium fishes, used as bait or as live feed for aquaculture and other animal husbandry pursuits, or used for pharmaceutical applications. Of the fish destined for human consumption in 2014 (Figure 29), around 40% reached the market as live and fresh fish, 26% as frozen fish, and 11% and 10% as cured and canned or preserved products, respectively.

During the past few decades, the Southeast Asian region has played the major role of providing fish and seafood for the market in the world. As global trade in fish and seafood has increased, basic processing systems like filleting and de-heading had been more actively practiced in the region where labor is cheaper compared with that in other regions, just like much of the world's manufacturing processes. The fish processing industry has been identified as one of the most sustainable industrial sectors that contribute to countries' economies in the Southeast Asian region even if most of processed fish products are consumed domestically. Nevertheless, a good portion of the higher quality and higher value products is exported mainly to Japan, China, Hong Kong, US, EU, Australia, and Canada, among others. The main species processed are freshwater fishes as well as marine fishes that mostly come in the form of dried and frozen products. Fishes are also processed into salted-dried, smoked, frozen, canned, and steamed products to increase their shelf-life. In addition, most fishes are also used to produce the most significant traditional fish products of the region, *i.e.* fermented fish and fish sauce. As for the region's data on the disposition of the region's fisheries production, only three countries provided the relevant information, namely: Brunei Darussalam, Myanmar, and Singapore as shown in Table 40.

**Table 40.** Disposition of fisheries production of the Southeast Asian countries in 2014 by quantity (metric tons)

Disposition	Brunei Darussalam	Myanmar	Singapore	Total
Marketing fresh	...	1,292,359	6,696	1,299,055
Freezing	903	...	...	903
Curing	75	3,098,993	...	3,099,068
Canning	3	...	...	3
Non-food purposes	3,088	656,178	...	659,266
<b>Total</b>	<b>4,069</b>	<b>5,047,530</b>	<b>6,696</b>	<b>5,058,295</b>

Source: FAO Fishery and Aquaculture Information and Statistics Service

FAO (2014a) indicated that the utilization and processing of fish in Southeast Asia still need to be improved especially in the areas of marketing and transportation of live fish as well as on the aspects of innovations in refrigeration, ice-making, and packaging to ensure the products' integrity and allow expansion of fish distribution either in fresh, chilled or frozen forms. The report also indicated that several countries in the region still lack adequate infrastructures and services including hygienic

landing centers, electricity, potable water, roads, ice, cold rooms, and refrigerated transport systems. Being associated with the region’s tropical temperatures, the absence of these factors would usually lead to very high post-harvest losses and quality deterioration, with subsequent risks on the part of consumers’ health.

In recent decades however, the complex patterns of globalization have transformed the fish processing sector, making it more heterogeneous and dynamic. While the fish food sector has been increasingly globalized with supermarket chains and large retailers emerging as important players in setting requirements for the products, processing has become more intensive, geographically concentrated, vertically integrated with producers to enhance the product mix, obtain better yields, and respond confidently to the evolving quality and safety requirements imposed by importing countries.

## VII. FISH TRADE

In spite of the apparent stagnation of the world’s total fish production during the last decade, international trade in fish and fishery products has continued to expand. In the midst of the long-term trend of stable capture fisheries production and steady growth of the global aquaculture

sector that continued to prevail specifically in 2013, the world’s consumption of fish also continued to grow, reaching almost 20 kg per capita. However, the value of global trade in fish and fishery products decreased significantly, contrary to the expected long-term trend. While the export volume of fish products reached 36.4 million metric tons in 2013 or 22.4% of world’s total fisheries production, the total import accounted for about 35.2 million metric tons or 21.6% of the total fisheries production (**Table 41**). In the Southeast Asian region, the export of fish and fishery products in 2013 represented about 5,398,267 metric tons or 13.5% of the region’s fisheries production, while import was 3,237,406 metric tons, posting a trade balance of 2,160,861 metric tons.

### 7.1 Global Trading of Fish and Fishery Products

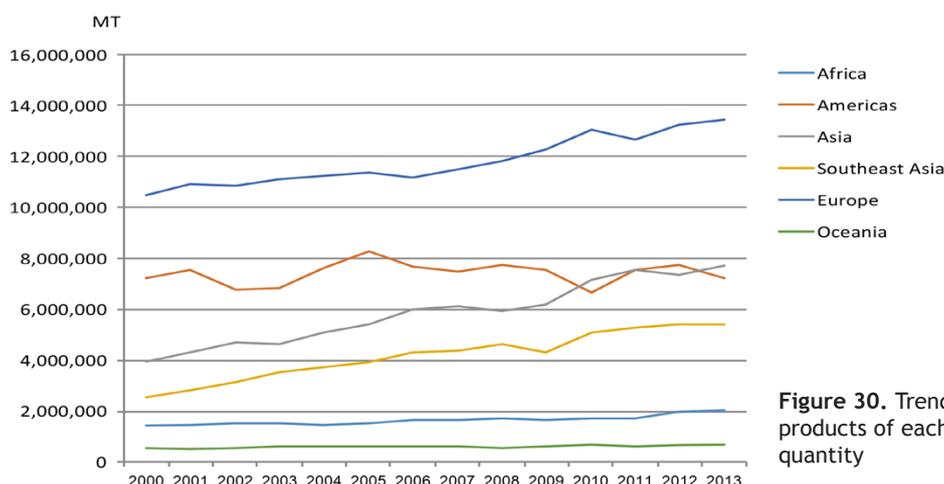
The international trade in fish and fishery products in 2000-2013 did not expand faster than the previous years. The slower growth could have been caused by reduced world catches, higher interest rates on investments, and unfavorable economic conditions in key markets. As shown in **Table 42** and **Figure 30**, the world’s export of fish and fishery products increased in terms of quantity by about 790,333 metric tons/year, and in terms of value by about US\$ 6,405 million annually as indicated in **Table 43**.

**Table 41.** World fisheries trade of fish and fishery products of each continent in 2013 by quantity (metric tons). Southeast Asia is excluded from Asia data

	Total fisheries production	Trade of fish and fishery products		Trade balance (Export-import)
		Export	Import	
<b>World</b>	<b>162,646,576</b>	<b>36,410,597</b>	<b>35,202,954</b>	<b>1,207,643</b>
Africa	9,458,639	2,021,364	3,297,706	-1,276,342
Americas	21,981,502	7,186,282	4,633,127	2,553,155
Asia*	113,295,522	7,710,646	13,313,669	-2,365,617
Southeast Asia	40,040,915	5,398,267	3,237,406	2,160,861
Europe	16,435,139	13,440,925	13,513,167	-72,242
Oceania	1,393,499	653,113	445,285	207,828

Source: FAO Fishery and Aquaculture Information and Statistics Service

\* Asia does not include data of Southeast Asia



**Figure 30.** Trend of export of fish and fishery products of each continent from 2000 to 2013 by quantity

**Table 42.** Export of fish and fishery products of each continent from 2000 to 2013 by quantity (metric tons)

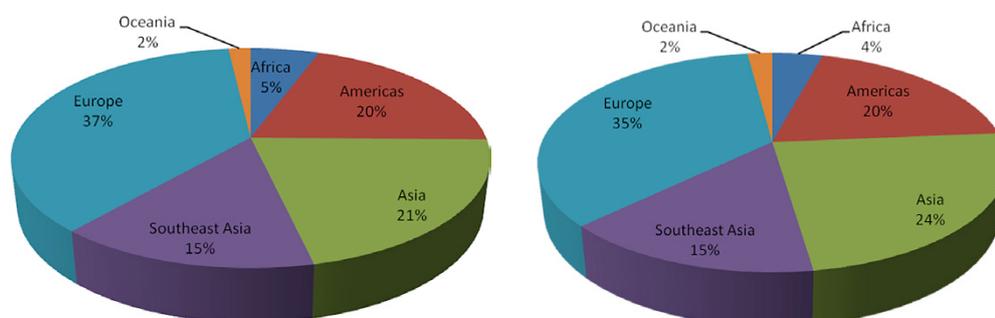
Year	World Total	Continents					
		Africa	Americas	Asia*	Southeast Asia	Europe	Oceania
2000	26,136,271	1,430,091	7,235,221	3,936,967	2,539,163	10,478,012	516,817
2001	27,539,628	1,464,989	7,566,236	4,315,238	2,804,753	10,882,619	505,884
2002	27,523,730	1,521,723	6,779,439	4,678,535	3,144,459	10,823,335	567,239
2003	28,169,990	1,532,714	6,809,435	4,644,624	3,502,744	11,096,611	583,862
2004	29,784,741	1,432,058	7,624,736	5,104,928	3,751,037	11,247,828	624,154
2005	31,100,377	1,524,564	8,273,622	5,377,442	3,915,636	11,375,252	633,861
2006	31,406,006	1,648,549	7,672,787	6,000,119	4,321,512	11,152,719	610,320
2007	31,735,135	1,627,755	7,469,906	6,144,044	4,362,045	11,518,041	613,344
2008	32,314,837	1,687,927	7,737,109	5,922,067	4,606,164	11,803,067	588,503
2009	32,590,812	1,674,224	7,573,871	6,198,749	4,285,454	12,279,281	579,233
2010	34,337,688	1,717,493	6,654,957	7,175,248	5,089,710	13,049,555	650,725
2011	35,363,360	1,740,950	7,561,803	7,544,526	5,246,745	12,634,866	634,470
2012	36,335,779	1,951,906	7,714,407	7,375,452	5,389,839	13,244,902	659,273
2013	36,410,597	2,021,364	7,186,282	7,710,646	5,398,267	13,440,925	653,113

Source: FAO Fishery and Aquaculture Information and Statistics Service  
 \* Southeast Asia data excluded from Asia data

**Table 43.** Export of fish and fishery products of each continent from 2000 to 2013 by value (US\$ thousand)

Year	World Total	Continents					
		Africa	Americas	Asia*	Southeast Asia	Europe	Oceania
2000	55,835,627	2,739,300	13,260,973	10,384,990	8,811,103	18,727,227	1,912,625
2001	56,664,140	2,879,692	13,799,946	10,355,114	8,737,880	19,083,132	1,808,376
2002	58,758,186	3,129,263	13,508,253	10,928,613	8,723,050	20,567,480	1,901,527
2003	64,263,355	3,452,866	14,796,346	11,591,057	9,138,397	23,343,683	1,941,006
2004	72,083,379	3,388,833	16,021,025	14,108,921	10,076,565	26,369,525	2,118,510
2005	79,242,815	3,838,723	17,791,996	15,420,204	11,053,071	28,961,231	2,187,590
2006	86,671,876	4,004,119	19,113,835	16,731,280	12,510,156	32,139,612	2,172,874
2007	94,501,423	4,582,178	19,765,897	18,000,239	13,692,488	36,157,954	2,302,667
2008	103,082,420	4,998,878	21,391,193	18,999,039	16,136,715	39,228,038	2,328,557
2009	97,095,957	4,808,051	19,298,621	19,290,169	14,989,666	36,491,325	2,218,125
2010	111,423,636	4,974,482	20,986,348	24,243,846	17,436,472	41,226,682	2,555,806
2011	130,430,587	5,177,642	25,477,480	30,064,733	20,440,758	46,482,527	2,817,447
2012	130,379,186	5,473,575	25,498,158	31,044,193	20,969,230	44,537,388	2,856,642
2013	139,100,557	5,801,536	27,098,573	33,412,151	21,037,918	48,912,139	2,838,240

Source: FAO Fishery and Aquaculture Information and Statistics Service  
 \* Southeast Asia data excluded from Asia data

**Figure 31.** Percentage export of fish and fishery products from each continent in 2013 by quantity (left) and value (right)

**Table 44.** World's top ten exporters and importers of fish and fishery products in 2013 by value (US\$ million)

Exporter	Export value (US\$ million)	Importer	Import value (US\$ million)
1. China	19,539	1. USA	18,975
2. Norway	10,368	2. Japan	15,318
<b>3. Thailand</b>	<b>7,057</b>	3. China	7,982
<b>4. Viet Nam</b>	<b>6,887</b>	4. France	6,507
5. USA	5,963	5. Spain	6,391
6. Chile	4,985	6. Italy	5,733
7. Denmark	4,664	7. Germany	5,414
8. India	4,602	8. UK	4,495
9. Canada	4,364	9. Sweden	4,486
10. Spain	3,947	10. China. Hong Kong	3,800

Source: FAO Fishery and Aquaculture Information and Statistics Service

Europe is the largest exporter of fish and fishery products during the past decade, and in 2013, Europe's export of fish and fishery products accounted for about 37% in terms of quantity and 35% in value of the world's total export of fish and fishery products (**Table 43** and **Figure 31**). Meanwhile, the Southeast Asian region's share of the export accounted for 15% of global export quantity and 15% of the world's export value. In the Asian continent, China is the largest exporter contributing about 14% to the global export value, while Norway provided about 7%. Among the Southeast Asian countries, Thailand exports fish products the value of which contributed 5% to the world's total while Viet Nam provided about 5% as well (**Table 44**).

**Table 45.** Import of fish and fishery products of each continent from 2000 to 2013 by quantity (metric tons)

Year	World Total	Continents					
		Africa	Americas	Asia*	Southeast Asia	Europe	Oceania
2000	26,499,629	1,582,539	3,282,251	8,212,939	1,759,366	11,315,052	347,482
2001	27,956,060	1,862,582	3,347,551	8,466,725	1,895,859	12,042,187	341,156
2002	28,102,257	1,734,558	3,351,954	8,869,107	2,031,713	11,766,050	348,875
2003	28,589,655	1,861,137	3,600,355	8,273,991	2,024,873	12,475,562	353,737
2004	30,295,948	2,285,897	3,817,751	9,284,761	2,176,697	12,345,191	385,651
2005	31,946,828	2,430,583	3,857,808	9,778,187	2,595,730	12,912,174	372,346
2006	32,635,945	3,085,191	4,038,905	9,405,792	2,707,607	13,009,907	388,543
2007	33,159,128	2,963,225	4,175,390	9,382,290	2,649,850	13,600,029	388,344
2008	33,277,854	2,967,164	4,205,517	9,462,675	2,813,392	13,430,748	398,358
2009	33,740,748	3,264,745	4,150,794	9,339,944	2,994,016	13,621,291	369,958
2010	34,945,720	3,463,550	4,456,480	9,895,994	3,056,996	13,682,311	390,389
2011	35,923,083	4,000,273	4,567,130	10,363,688	3,169,355	13,408,413	414,224
2012	35,554,233	3,400,597	4,556,080	10,354,080	3,191,530	13,592,762	459,184
2013	35,202,954	3,297,706	4,633,127	10,076,263	3,237,406	13,513,167	445,285

Source: FAO Fishery and Aquaculture Information and Statistics Service  
\* Southeast Asia data excluded from Asia data

**Table 46.** Import of fish and fishery products of each continent from 2000 to 2013 by value (US\$ thousand)

Year	World Total	Continents					
		Africa	Americas	Asia*	Southeast Asia	Europe	Oceania
2000	61,001,766	958,107	13,091,324	22,277,564	1,948,460	22,050,937	675,374
2001	60,590,668	1,262,848	12,885,821	20,278,458	2,125,513	23,357,848	680,180
2002	63,081,526	1,236,951	13,122,293	21,119,273	2,281,302	24,599,079	722,628
2003	68,438,828	1,464,073	14,298,726	20,318,727	2,444,129	29,086,421	826,752
2004	76,776,293	1,671,461	15,043,481	23,814,925	2,960,543	32,368,625	907,258
2005	86,674,573	2,008,112	16,189,004	24,784,946	3,285,188	36,353,884	1,053,439
2006	92,142,015	2,405,730	18,042,360	25,325,104	3,496,203	41,730,998	1,141,620
2007	100,321,200	2,887,792	19,137,495	25,782,122	3,869,678	47,315,532	1,328,581
2008	109,580,946	3,096,671	20,526,871	28,717,002	4,828,956	51,014,733	1,396,713
2009	101,233,828	3,392,088	19,163,657	26,816,566	4,441,268	46,105,292	1,314,957
2010	112,707,347	3,588,779	21,597,323	31,352,265	5,005,693	49,614,449	1,548,838
2011	131,828,143	5,399,732	24,683,420	37,167,905	6,336,557	56,365,747	1,874,782
2012	130,737,326	5,333,764	24,994,381	37,980,410	6,883,034	53,525,284	2,020,453
2013	135,434,707	5,267,308	27,068,221	36,270,825	7,042,569	57,734,068	2,051,716

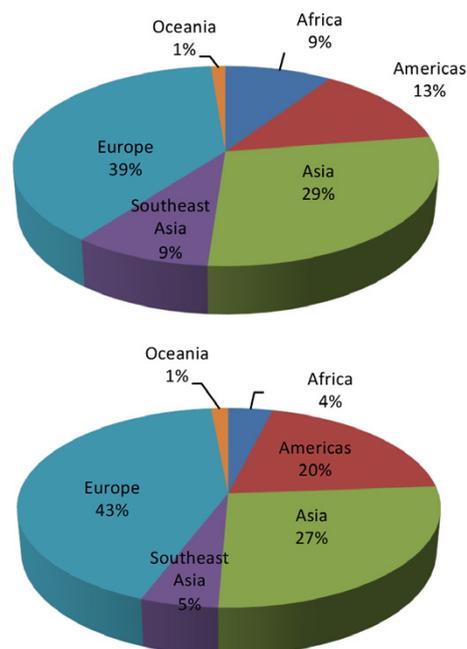
Source: FAO Fishery and Aquaculture Information and Statistics Service  
\* Southeast Asia data excluded from Asia data

On the other hand, the world's import of fish and fishery products during the past decade had increased in terms of quantity by about 669,487 metric tons/year (**Table 45**) and in value by US\$ 5,726 million annually (**Table 46**). In 2013, Europe imported the largest quantity representing 38% of the world's total import quantity and 43% of the world's total import value. The second largest importer is Asia (excluding Southeast Asia) contributing about 29% and 27% in terms of quantity and value, respectively (**Figure 32**), with the United States of America as the largest importing country with its value accounting for 14% followed by Japan that accounted for about 11% of the world's total import (**Table 44**).

According to Jesse (1984), the general pattern of fish trade between developed and developing countries in the world seemed to have three main patterns, *i.e.* a) most trading is among developed countries; b) little trading occurs among the developing countries; and c) in trading between two groups, the general tendency is fish and fishery products from developing countries are bound for developed countries. Thus, developing countries not only become important importer of fish and fishery products but are also more important exporter-producer of fish and fishery products.

## 7.2 Southeast Asian Export-Import of Fish and Fishery Products

The growth of international trade in fish and fishery products of the Southeast Asian countries had become remarkable during the past decade (**Table 47** and **Figure 33**). While each country in the region gave high priority to export-oriented fisheries development, the region's exports increased rapidly with export growth that outpaced those of developed countries. From 2000 to 2013, the total quantity



**Figure 32.** Percentage of import of fish and fishery products by each continent in 2013 by quantity (*above*) and value (*below*)

of exports from Southeast Asian countries has grown fast at about 219,931 metric tons/year.

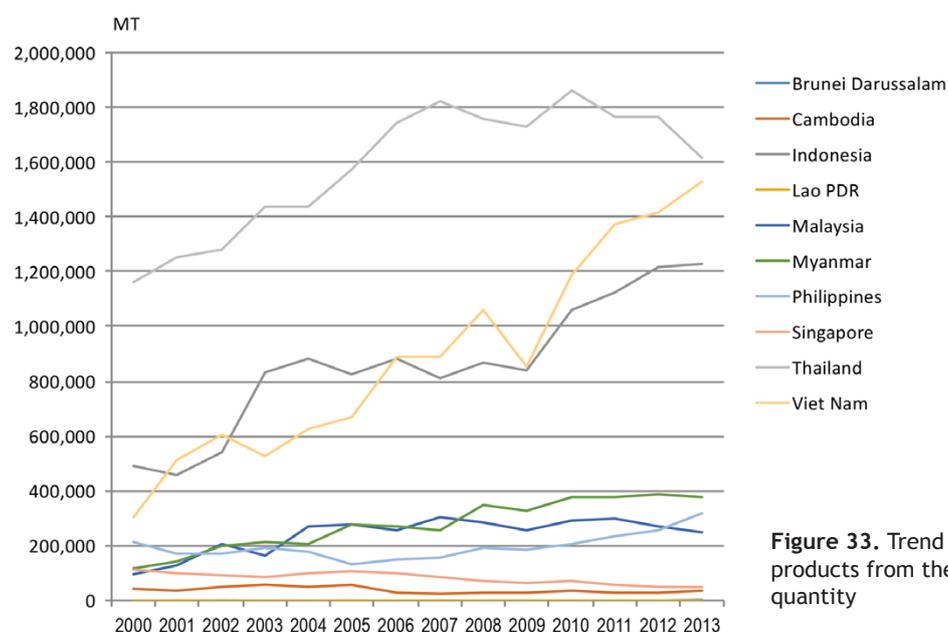
Together with the quantity, the export value of the region's fish and fishery products also increased rapidly from 2000 to 2013 at about US\$ 940,524 annually (**Table 48** and **Figure 34**).

In 2013, Singapore reported the highest average value of exported products at US\$ 7,900/metric ton followed by Viet Nam at US\$ 4,515/metric ton, Thailand at US\$ 4,365/metric ton, Philippines at US\$ 3,730/metric ton,

**Table 47.** Export of fish and fishery products of the Southeast Asian countries from 2000 to 2013 by quantity (metric tons)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	285	43,656	490,416	4	95,435	116,609	215,531	112,158	1,162,099	302,970	2,539,163
2001	149	38,424	457,913	30	126,229	144,623	171,361	102,137	1,250,204	513,683	2,804,753
2002	92	52,711	539,384	7	203,327	201,667	171,279	88,741	1,280,563	606,688	3,144,459
2003	144	56,876	830,383	24	160,262	212,999	188,789	87,811	1,440,364	525,092	3,502,744
2004	280	47,523	881,677	10	270,695	205,463	180,648	102,378	1,436,475	625,888	3,751,037
2005	452	53,266	825,076	0	275,006	278,675	131,789	109,564	1,570,762	671,046	3,915,636
2006	736	30,120	885,179	1	255,890	271,071	148,297	96,978	1,743,974	889,266	4,321,512
2007	568	24,100	814,303	0	303,461	259,054	159,406	86,493	1,823,612	891,048	4,362,045
2008	218	25,000	868,442	1	283,494	351,652	192,982	71,721	1,755,255	1,057,399	4,606,164
2009	229	30,000	839,803	2	257,413	324,710	183,801	66,030	1,732,874	850,592	4,285,454
2010	315	35,043	1,063,293	6	290,662	374,187	204,375	68,450	1,862,012	1,191,367	5,089,710
2011	420	30,000	1,122,149	9	295,022	373,898	231,711	57,218	1,762,955	1,373,363	5,246,745
2012	1,271	31,025	1,216,617	7	266,569	387,371	253,849	52,786	1,762,131	1,418,313	5,389,839
2013	1,498	32,000	1,228,475	9	246,024	376,848	317,973	47,906	1,618,684	1,528,850	5,398,267

Source: FAO Fishery and Aquaculture Information and Statistics Service

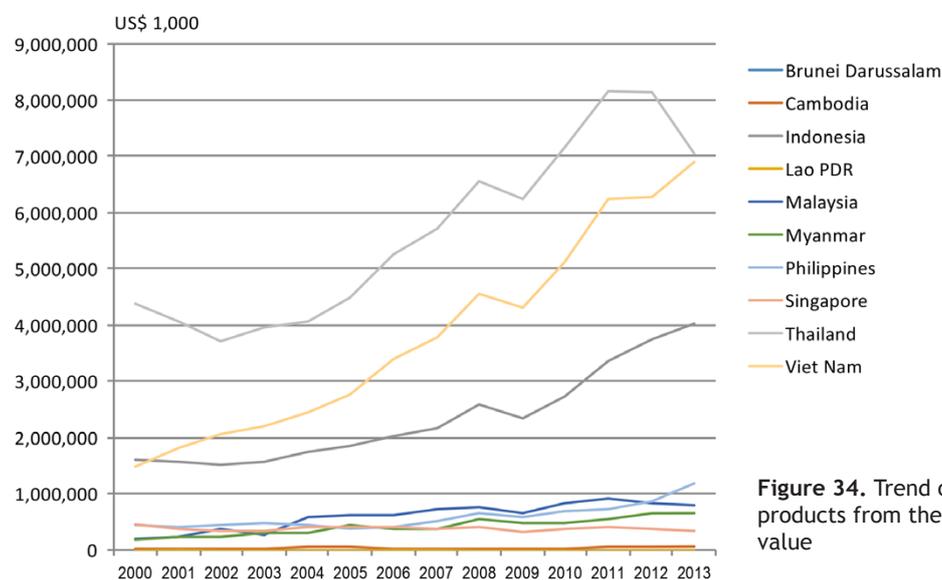


**Figure 33.** Trend of export of fish and fishery products from the Southeast Asian countries by quantity

**Table 48.** Export of fish and fishery products of the Southeast Asian countries from 2000 to 2013 by value (US\$ thousand)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	296	34,469	1,610,291	29	200,469	183,707	455,984	457,105	4,384,437	1,484,316	8,811,103
2001	334	32,114	1,560,078	78	220,126	218,291	420,184	388,184	4,075,341	1,823,150	8,737,880
2002	459	36,284	1,516,537	27	381,983	251,534	453,030	325,267	3,713,299	2,044,630	8,723,050
2003	706	37,816	1,579,783	26	256,197	317,382	464,463	335,331	3,943,194	2,203,499	9,138,397
2004	119	42,400	1,736,184	12	573,238	318,514	454,384	422,195	4,079,407	2,450,112	10,076,565
2005	3,503	48,551	1,845,883	17	619,653	460,089	380,094	427,544	4,502,821	2,765,366	11,053,071
2006	5,305	26,835	2,019,803	3	624,015	362,951	419,552	396,388	5,275,349	3,379,955	12,510,156
2007	5,038	23,285	2,170,876	3	738,535	358,065	499,539	385,455	5,721,525	3,790,167	13,692,488
2008	2,398	24,679	2,600,968	6	770,273	560,568	672,813	398,016	6,547,742	4,559,252	16,136,715
2009	1,441	30,362	2,350,376	7	657,479	483,230	585,044	321,098	6,248,891	4,311,738	14,989,666
2010	1,533	40,011	2,718,018	12	827,565	495,454	680,905	384,244	7,166,020	5,122,710	17,436,472
2011	1,266	60,000	3,360,852	17	916,456	555,515	711,155	416,096	8,159,613	6,259,788	20,440,758
2012	2,435	61,020	3,752,132	33	846,169	654,129	850,344	366,907	8,144,920	6,291,141	20,969,230
2013	4,311	62,500	4,025,167	28	800,030	652,840	1,185,788	338,942	7,067,700	6,900,612	21,037,918

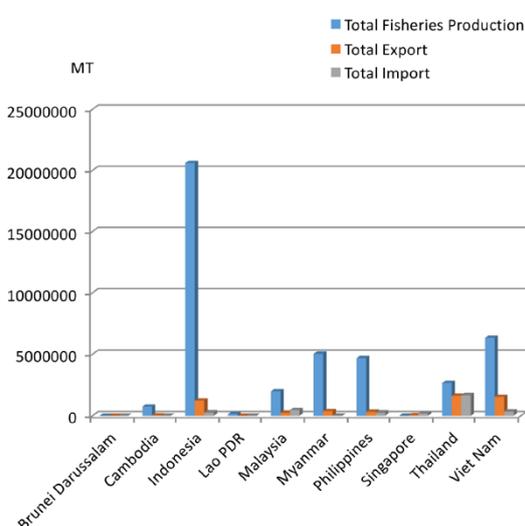
Source: FAO Fishery and Aquaculture Information and Statistics Service



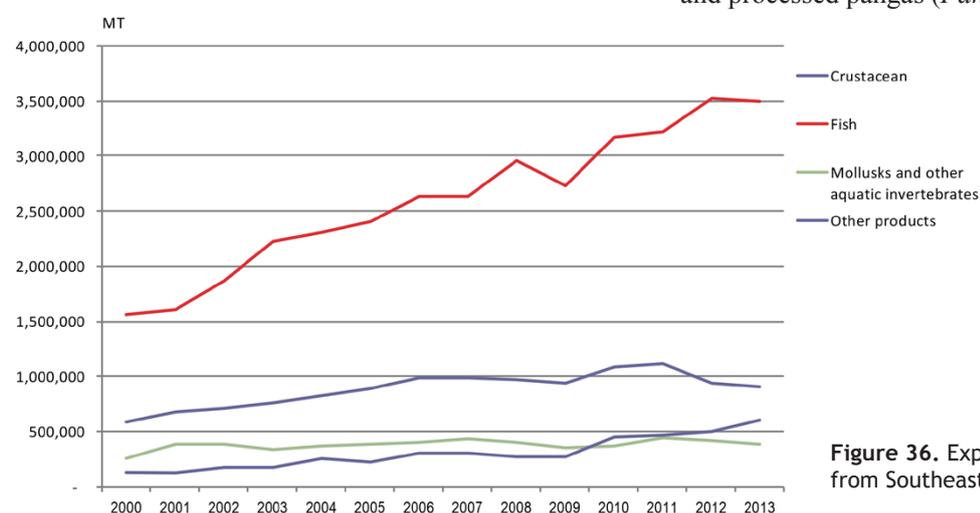
**Figure 34.** Trend of export of fish and fishery products from the Southeast Asian countries by value

**Table 49.** Trade of fish and fishery products of the Southeast Asian countries in 2013 by quantity (metric tons)

	Total fisheries production	Trade of fish and fishery products		Trade balance (Export-import)
		Export	Import	
Brunei Darussalam	3,431	1,498	13,956	-12,458
Cambodia	728,000	32,000	7,865	24,135
Indonesia	19,245,632	1,228,475	264,893	963,582
Lao PDR	164,228	9	5,995	-5,986
Malaysia	1,749,314	246,024	463,234	-217,210
Myanmar	4,715,840	376,848	9,528	367,320
Philippines	4,695,369	317,973	257,910	60,063
Singapore	7,210	47,906	206,906	-159,000
Thailand	2,900,591	1,618,684	1,667,847	-49,163
Viet Nam	5,831,300	1,528,850	339,272	1,189,578
<b>Total</b>	<b>40,040,915</b>	<b>5,398,267</b>	<b>3,237,406</b>	<b>2,160,861</b>

**Figure 35.** Trade of fish and fishery products in the Southeast Asian countries by quantity

Indonesia at US\$ 3,275/metric ton, and Malaysia at US\$ 3,250/metric ton. Meanwhile, Myanmar posted the lowest average value of exported products at US\$ 1,730/metric ton (Table 47 and Table 48).

**Figure 36.** Export of fish and fishery products from Southeast Asia (2000 to 2013) by quantity

In 2013, Thailand was the largest exporter of fish and fishery products representing about 56% of the country's total fisheries production by quantity. This was followed by Viet Nam, the quantity of which was about 26% of its total fisheries production (Figure 35).

As the largest exporting country, Thailand was also the largest importing country, posting a negative trade balance of 49,163 metric tons in 2013, followed by Malaysia with a negative trade balance of about 217,210 metric tons. Viet Nam posted a positive trade balance of 1,189,578 metric tons while Brunei Darussalam with the least fisheries production posted a negative trade balance at 12,458 metric tons and Singapore also with a high negative trade balance at 159,000 metric tons (Table 49).

Fish remained the most important exported fishery commodity accounting for 65% of the total export quantity of the region from 2000 to 2013, followed by crustaceans contributing 17% (Table 50, Figure 36 and Figure 37). In the case of Thailand as the largest exporter in the region, its major export fishery products included canned seafood and shrimps followed by Viet Nam with frozen shrimps and processed pangas (*Pangasius* spp.).

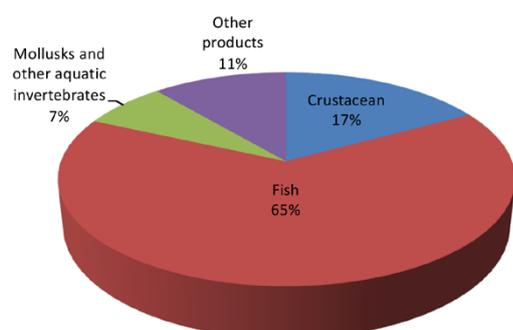
**Table 50.** Fish and fishery products exported by Southeast Asia from 2000 to 2013 by quantity (thousand metric tons)

Year	Major group of species								Total
	Fish								
	Fillets, frozen	Meat and fillets fresh or chilled	Meat, whether or not minced, frozen	Prepared or preserved (canned)	Dried, salted and smoked	Fresh or chilled, excluding fillets and meat	Frozen, excluding fillets and meat	Live	
2000	62.3	5.3	95.3	429.5	57.5	298.7	510.2	38.5	1,497.3
2001	87.9	7.7	128.9	567.5	74.8	302.9	395.4	40.3	1,605.4
2002	96.8	11.6	154.2	623.1	78.6	308.9	545.2	43.7	1,862.1
2003	106.8	14.7	151.1	730.8	88.7	309.4	786.4	42.7	2,230.6
2004	162.1	5.4	140.4	732.1	85.6	311.6	814.4	49.0	2,300.6
2005	211.4	7.4	181.5	826.8	125.0	297.4	705.1	48.2	2,402.8
2006	337.1	8.3	186.5	883.2	125.7	290.1	755.9	45.8	2,632.6
2007	296.0	31.4	198.1	894.8	127.5	314.3	734.6	37.2	2,633.9
2008	438.6	22.1	232.6	978.4	121.9	282.9	843.9	43.1	2,963.5
2009	301.7	24.0	199.2	998.2	122.9	253.9	780.8	44.9	2,725.6
2010	464.2	19.0	188.9	1,015.4	145.2	243.7	1,042.9	55.6	3,174.9
2011	516.3	18.5	189.9	1,066.4	138.3	224.6	1,018.9	52.6	3,225.5
2012	555.7	44.2	235.4	1,184.5	150.3	230.8	1,058.5	63.9	3,523.3
2013	638.1	28.4	169.8	1,207.7	143.4	231.3	995.9	84.9	3,499.5

(Cont'd)

Year	Major group of species									TOTAL
	Crustaceans				Mollusks and Other Aquatic Invertebrates				Others	
	Frozen	Not Frozen	Prepared or preserved (canned)	Total	Live, fresh or chilled	Other than live, fresh or chilled	Prepared or preserved	Total		
2000	417.3	43.1	127.6	588.1	17.4	213.0	27.6	258.0	129.8	2,473.2
2001	460.0	86.4	138.0	684.4	80.6	271.0	30.9	382.5	132.3	2,804.6
2002	489.9	80.4	141.0	711.3	71.4	289.1	33.6	394.1	177.2	3,144.7
2003	512.4	97.0	149.0	758.4	72.3	230.9	35.2	338.4	175.5	3,502.9
2004	565.7	84.1	171.3	821.1	52.9	268.9	54.0	375.8	253.7	3,751.2
2005	601.5	104.7	186.3	892.4	48.6	290.2	50.3	389.1	231.5	3,915.8
2006	661.5	89.3	241.3	992.1	22.8	320.4	54.8	398.0	298.8	4,321.5
2007	667.8	75.5	246.6	989.9	24.8	348.4	56.7	429.9	308.7	4,362.4
2008	639.1	70.4	263.2	972.7	31.8	320.2	53.3	405.3	264.6	4,606.1
2009	591.3	70.9	282.7	944.9	25.3	271.0	52.3	348.6	266.3	4,285.4
2010	702.1	65.7	316.9	1,084.7	20.2	311.4	44.9	376.5	453.7	5,089.8
2011	688.5	80.6	347.2	1,116.3	26.5	372.0	46.0	444.5	460.6	5,246.9
2012	558.5	86.1	302.2	946.8	24.1	338.2	52.6	414.9	504.9	5,389.9
2013	547.8	83.2	284.3	925.3	22.8	301.9	54.5	379.2	604.5	5,408.5

Source: FAO Fishery and Aquaculture Information and Statistics Service



**Figure 37.** Percentage of major commodities exported by Southeast Asia in 2013

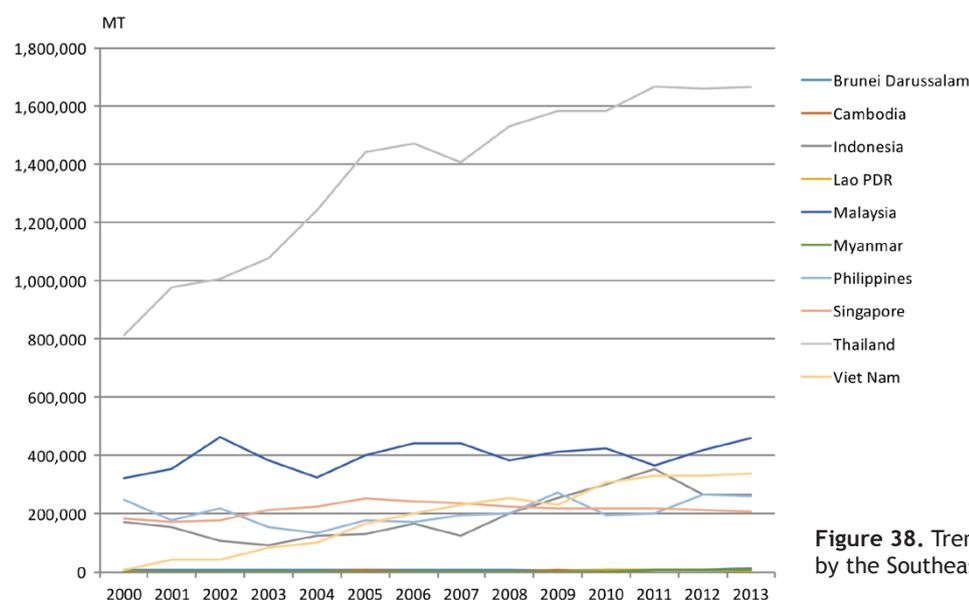
The quantity of fisheries import of the Southeast Asian region had been increasing from 2000 to 2013 at the rate of about 113,695 metric tons annually (Figure 38), posting a trade balance of about 2,160,861 metric tons in 2013 (Table 49 and Table 51).

The value of the fishery products imported by the Southeast Asian countries increased by about US\$ 391,855 annually from 2000 to 2013 (Table 52 and Figure 39). In terms of average value of imported products, Brunei Darussalam had the highest value at US\$ 3,675/metric ton

**Table 51.** Import of fish and fishery products by the Southeast Asian countries from 2000 to 2013 by volume (metric tons)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	6,642	3,174	171,349	2,510	322,923	415	248,407	182,377	813,789	7,960	1,759,366
2001	8,281	1,074	151,957	3,142	353,400	4,071	180,992	173,118	977,656	42,168	1,895,859
2002	6,483	1,267	110,035	2,725	464,172	464	217,069	177,869	1,006,347	45,282	2,031,713
2003	7,156	2,218	92,649	3,026	386,586	1,026	152,389	215,342	1,078,966	85,515	2,024,873
2004	9,094	3,071	126,826	3,943	325,116	1,648	134,375	227,405	1,240,567	104,652	2,176,697
2005	7,215	6,664	128,431	3,594	400,766	1,826	180,945	253,553	1,445,348	164,388	2,595,730
2006	7,694	3,731	165,195	3,028	440,135	1,354	170,834	244,644	1,470,636	200,356	2,707,607
2007	6,617	2,769	126,281	3,190	440,270	1,668	193,578	239,688	1,407,414	228,375	2,649,850
2008	6,505	2,167	198,980	3,884	386,051	2,400	200,331	225,704	1,533,690	253,680	2,813,392
2009	5,848	5,042	252,976	4,591	411,544	2,828	273,623	221,987	1,585,850	229,727	2,994,016
2010	7,181	4,265	300,157	5,561	424,032	4,840	195,037	220,791	1,586,764	308,368	3,056,996
2011	7,661	5,553	354,394	5,747	365,460	6,101	203,682	220,710	1,668,020	332,027	3,169,355
2012	9,926	7,169	269,422	5,731	417,029	7,122	268,477	213,305	1,662,765	330,584	3,191,530
2013	13,956	7,865	264,893	5,995	463,234	9,528	257,910	206,906	1,667,847	339,272	3,237,406

Source: FAO Fishery and Aquaculture Information and Statistics Service

**Figure 38.** Trend of quantity of fisheries import by the Southeast Asia in 2000-2013**Table 52.** Import of fish and fishery products by the Southeast Asian countries from 2000 to 2013 by value (US\$ thousand)

Year	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
2000	15,239	2,724	101,644	2,069	307,340	742	111,596	544,165	826,699	36,242	1,948,460
2001	13,379	467	93,730	2,170	336,705	1,389	71,362	473,241	1,072,925	60,145	2,125,513
2002	13,136	586	79,095	1,727	400,345	642	92,524	497,176	1,079,930	116,141	2,281,302
2003	11,847	3,090	75,903	2,333	377,504	1,685	86,405	599,269	1,134,471	151,622	2,444,129
2004	15,527	3,225	143,669	3,331	538,112	2,789	73,892	706,016	1,255,346	218,636	2,960,543
2005	17,316	9,602	106,330	3,310	530,863	3,186	103,680	776,389	1,457,936	276,576	3,285,188
2006	25,823	4,206	142,742	3,084	580,337	2,568	103,126	757,944	1,573,958	302,425	3,496,203
2007	20,987	3,144	118,966	3,675	644,881	2,905	132,922	818,704	1,750,024	373,470	3,869,678
2008	20,054	2,443	202,029	4,409	594,255	5,204	176,815	914,863	2,447,759	461,125	4,828,956
2009	20,374	4,630	234,531	4,120	683,818	6,505	203,336	824,248	2,026,369	433,337	4,441,268
2010	27,517	4,008	325,091	4,449	790,291	11,217	148,552	968,787	2,195,932	529,849	5,005,693
2011	32,605	5,197	410,213	6,126	998,720	15,727	193,314	1,160,247	2,788,193	726,215	6,336,557
2012	42,728	6,867	357,841	6,952	1,071,037	18,378	263,038	1,072,760	3,205,504	837,929	6,883,034
2013	51,302	7,396	378,379	7,554	1,070,210	22,893	278,737	1,070,573	3,238,545	916,980	7,042,569

Source: FAO Fishery and Aquaculture Information and Statistics Service

followed by Viet Nam at US\$ 2,705/metric ton, Myanmar at US\$ 2,405/metric ton, Malaysia at US\$ 2,310/metric ton. As for Thailand which is the largest importer among

the Southeast Asian countries, the value of its import was US\$ 1,940/metric ton while Lao PDR's import was the lowest at about US\$ 1,260/metric ton.

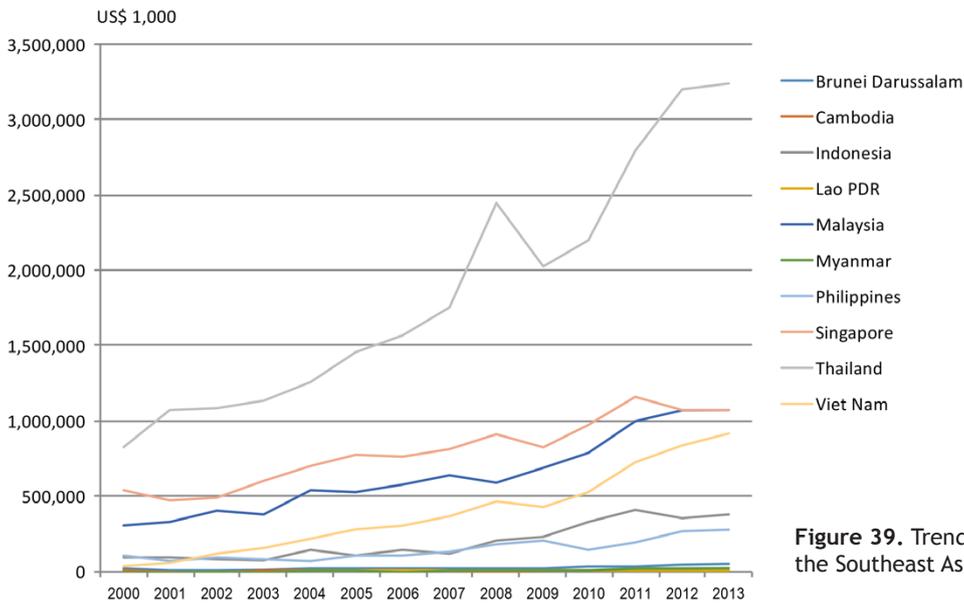


Figure 39. Trend of value of fisheries import by the Southeast Asian countries in 2000-2013 (US\$)