

Figure 51. Percentage of production of major types of fishing gears used for catching mackerels in the South China Sea in 2008 (above), and trends of production of major types of fishing gears used for catching mackerels in the South China Sea in 1999-2008 (below) by quantity

1.1.4 Anchovies

Anchovies (Family Engraulidae), like other small pelagic fishes, are widely distributed in the Southeast Asian region. Anchovies are found in the neritic zone or shallow coastal waters. Anchovies mainly feed on planktonic crustaceans. Their breeding period is throughout the year with peaks during the first part of northeast monsoon from October to January in Manila Bay, and from February to April and July to December in the Gulf of Thailand (SEAFDEC, 2012b). Shorthead anchovy (*Engraulis heteroloba*) and Indian anchovy (*Stolephorus indicus*) are the two dominant species found in the Southeast Asian region. In this region, anchovies are caught mainly by purse seine operating during day time, while purse seine using luring lights, bamboo stake traps, luring light lift-nets, set bag nets, stationary traps, push nets, and trawl nets are operated during night time. Fishing grounds are located in the South China Sea and Andaman Sea, and stocks of anchovies are believed to be transboundary in the Southeast Asian

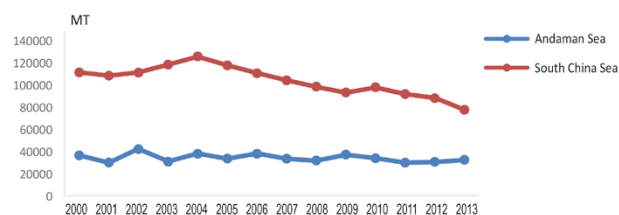


Figure 52. Total catch of anchovies from the South China Sea and Andaman Sea by quantity from 2000-2013

Source: SEAFDEC (2002-2013); SEAFDEC/MFRDMD (2000); SEAFDEC/MFRDMD (2015a); and Department of Fisheries Malaysia (2000-2014)

waters; however, information on its status as shared stocks is limited.

In comparing the production trends of anchovies from 2000 to 2013 between the two fishing grounds, it was found that the South China Sea had higher production compared to the Andaman Sea (Figure 52). While the production trend in the South China Sea was gradually decreasing, the production trend in Andaman Sea seemed to be stable and consistent. Indonesia, Malaysia, Philippines, Singapore, and Thailand are the countries that catch anchovies in the South China Sea. On the other hand, the countries fishing for anchovies in the Andaman Sea are Indonesia, Malaysia, Myanmar, and Thailand.

The trends of the production values were also compared between the two fishing grounds. While the trend of the production values from the South China Sea fluctuated but gradually increased, in the Andaman Sea, the values appeared to be stable and consistent (Figure 53). The highest production value was observed in the South China Sea in 2011 at US\$ 474,253 and the lowest production value recorded in 2003 in the Andaman Sea was estimated at US\$ 16,307.

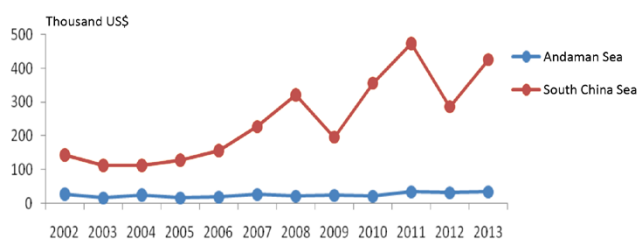


Figure 53. Value of the production of anchovies in the South China Sea and Andaman Sea from 2002 to 2013 (US\$)

Note: South China Sea (SCS) countries: Thailand, Malaysia, Indonesia, Philippines and Singapore
Andaman Sea (AS) countries: Thailand, Malaysia and Indonesia

Source: SEAFDEC (2002-2013)

The annual production of anchovies in the Southeast Asian region is compiled based on available information contributed by six member countries, namely: Indonesia, Malaysia, Myanmar, Philippines, Singapore, and Thailand. Since 2002, Indonesia dominated the highest landings, followed by Thailand, Philippines, and Malaysia (Table 56). Meanwhile, Singapore and Myanmar recorded the lowest production of anchovies. The highest production (207,450 metric tons) was observed in Indonesia in 2009 while the lowest production (17 metric tons) was recorded in Singapore in 2005.

In Cambodia, the fishing grounds for anchovies are concentrated around Koh Sdach in Koh Kong, Tomnop Rolok in Preah Sihanouk and Kampong Bay in Kampong (Figure 54).

Table 56. Production of anchovies from different fishing grounds of the Southeast Asian countries from 2000 to 2014 by quantity (metric tons)

Year	Indonesia		Malaysia		Myanmar: SCS	Philippines: SCS	Singapore: SCS	Thailand	
	Natuna Sea (SCS)	Malacca Strait (AS)	West Coast (AS)	East Coast+SS+LB (SCS)				Gulf of Thailand (SCS)	Indian Ocean (AS)
2000	...	...	11,184	11,332	...	...	...	107,706	25,990 ¹
2001	...	...	7,934	9,789	...	...	...	...	...
2002	101,372	67,581	14,997	8,677	...	74,095	54	123,841	27,890
2003	96,685	64,456	10,357	9,963	...	71,101	25	132,550	21,110
2004	92,887	61,924	14,652	8,798	...	71,498	24	139,326	23,911
2005	91,156	60,770	10,000	6,887	...	68,947	17	135,140	24,545
2006	99,014	66,010	10,441	8,799	4,505	70,568	36	125,919	31,865
2007	105,313	70,209	10,129	13,847	1,978	76,041	32	118,886	26,701
2008	118,670	81,005	9,167	9,136	5,024	73,235	...	119,964	24,110
2009	140,200	67,250	6,530	11,813	6,188	81,842	...	120,186	23,870
2010	122,379	53,347	7,082	9,331	6,973	80,183	...	107,944	29,216
2011	127,384	77,327	4,952	11,573	7,873	75,867	...	114,157	30,220
2012	122,674	80,546	5,272	12,186	5,031	71,165	...	111,563	31,563
2013	108,108	82,986	4,762	14,062	4,205	68,425	...	102,465	31,480
2014	...	...	5,687	17,409	2,156	...	...	...	...

SCS: South China Sea; AS: Andaman Sea; SS: Sabah-Sarawak; LB: Labuan; ... = not available

Source: SEAFDEC (2002-2013); SEAFDEC/MFRDMD (2000); SEAFDEC/MFRDMD (2015a); and Department of Fisheries Malaysia (2000-2014)

**Figure 54.** Fishing grounds of anchovies and tunas in Cambodia

Source: SEAFDEC/TD (2016)

In Malaysia, anchovies are caught in the shallow coastal waters of Tanjung Dawai in Kedah and Tukun Motor Bakar in Kelantan, and in the vicinity of the archipelago such as Pulau Pangkor in Perak, Langkawi in Kedah, and Perhentian in Terengganu-Kelantan border (**Figure 55**). In the East Coast of Peninsular Malaysia (ECPM) in the South China Sea, the landing sites are in Kelantan and in Sabah. High landings of anchovies were recorded during February-April in the West Coast of Peninsular Malaysia (WCPM). Whereas, in the ECPM, particularly in Kelantan, two phases of high landings were recorded, *i.e.* beginning of April to June, and from September to October. Overall, Kedah in the WCPM in the Andaman Sea is the major contributor which accounted for 40% of total landings (Faisal, 2015).

In the Gulf of Thailand (**Figure 56**), the fishing grounds of anchovies are identified in four areas, namely: Southern Gulf of Thailand (SGOT), Middle Gulf of Thailand (MGOT), Northern Gulf of Thailand (NGOT), and Eastern Gulf of Thailand (EGOT). SGOT comprises the Provinces of Narathiwat, Pattani, Songkla and Nakhon Si Thammarat; MGOT the Provinces of Surat Thani, Chumphon and Prachuap Khiri Khan; NGOT the Provinces of Petchaburi, Samut Songkhram, Samut Sakhon, Samut Prakan and Chonburi; and EGOT the Provinces of Rayong, Trat and Chanthaburi.

**Figure 55.** Fishing grounds of anchovies in Malaysia

Source: SEAFDEC/TD (2016)

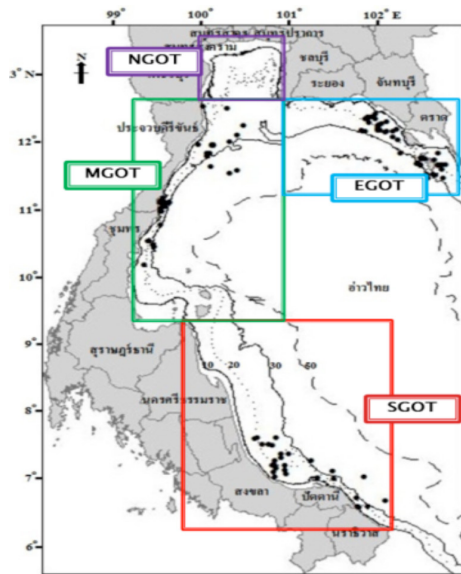


Figure 56. Fishing grounds of anchovies in the Gulf of Thailand

Source: Khemakorn et al. (2016)

Different types of fishing gears are used for catching anchovies in the various fishing grounds in the Gulf of Thailand (Figure 57). For small cast nets, the fishing grounds are confined in areas 5 to 10 nautical miles from the shoreline with water depth between 10 to 30 m, especially in Ko Kut in Trat Province, Leam Sing in Chantaburi Province, and Bang Saphan and Nathip in Prachuap Kirikhan.

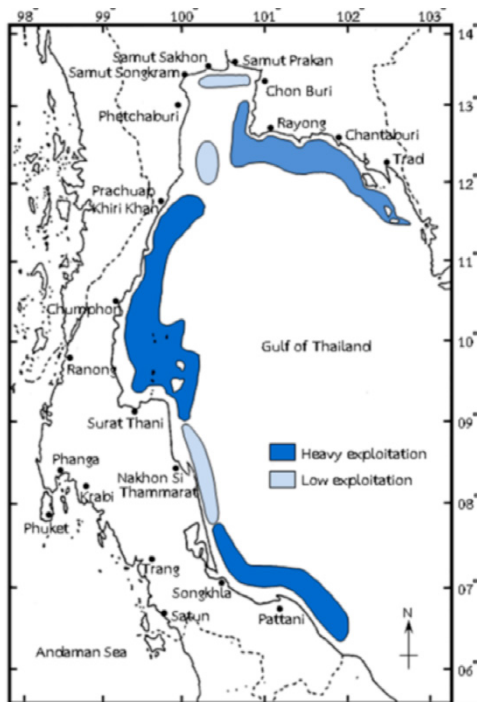


Figure 57. Distribution and level of exploitation of anchovies in the Gulf of Thailand

Source: SEAFDEC/TD (2016)

For medium cast nets, the fishing grounds are located between 5 to 10 nautical miles from the shoreline and in deeper waters at 10-50 m located between Rayong and Trat Provinces and between Prachuap Kirikhan to Narathiwat Provinces. Meanwhile, the daytime purse seines are used in areas farther out of the sea between 5 to 25 nautical miles from the shoreline and concentrated between Rayong and Chonburi and Prachuap to Nakorn Srithammarat. For purse seine with luring lights, the fishing grounds are located in deep water areas and confined in Ko Kut in Trat Province and Prachuap Kirikhan Province.

In Viet Nam, anchovies are very important fishery resource, where the total biomass recorded in 2013 was about 140,000 metric tons. Shorthead anchovy (*Engrasicholina heteroloba*) contributed 60% to the total production. Most of anchovies are caught from Phu Quoc and Tho Chu islands in Kien Giang (Figure 58) using purse seines and pelagic pair trawls. For pelagic pair trawl, anchovies comprised an estimated 58% of the trash fish caught where 33% of anchovies' composition comprised the shorthead anchovies. Trash fish represent 57% of the total catch by pelagic pair trawl (Bat and Cuong, 2016).

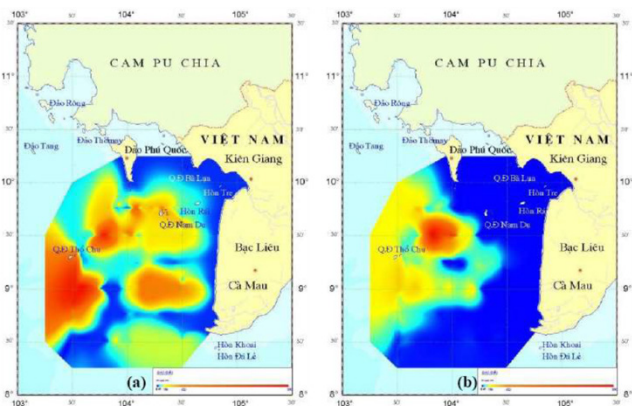


Figure 58. Distribution of anchovies in Viet Nam during (a) southwest and (b) northeast monsoons

Source: Bat and Cuong (2016)

Every Southeast Asian country has its distinctive post-harvest utilization methods for anchovies. In Thailand, anchovies are used for the production of fish sauce (39%), dried and other products for export (59%), and processed as fish paste and fish meals (about 2%). Fresh anchovy is sold according to size of vessels (Nasuchon, 2005). The price of the catch from vessels less than 12 m in length is about Thai Baht (THB) 70/kg for dry products (THB 1.00 = US\$ 0.029 (as of June 2017)). Meanwhile, the price of catch from vessels 12-16 m in length is THB 50-60/kg and the catch is mainly used to produce fish meal and fish sauce. The difference in prices is determined by the different species of anchovies caught (Wanchana, 2016).

In Kelantan, Malaysia the average price for fresh anchovy is about Malaysian Ringgit (RM) 1.50/kg (RM 1.00 = US\$ 0.23 (as of June 2017)). Meanwhile, less quality fresh anchovies are processed into fish sauce, locally called “budu”. The most abundant anchovy species landed in Genting, Tumpat is *Encrasicholina punctifer*, locally called “bilis tembaga hitam”. Dried products of this species are sold for RM 12/kg (Faisal, 2015). In Viet Nam, anchovies are sold at local markets and processed into commercial products such as fish sauce, dried and fish milk (Bat and Cuong, 2016).

Anchovy fishery in the Southeast Asian region especially in the South China Sea is very active. In order to assess the current status of anchovy resources, it is necessary that more surveys be conducted not only in the South China Sea but also in the Andaman Sea. The results could provide accurate and comprehensive information necessary for the management of the current stocks of anchovies. Considering the possibility that these resources are shared among neighboring countries in the South China Sea and Andaman Sea, regional management measures should be established and such effort needs serious consideration by all countries concerned.

1.1.5 Sardines

Sardines (Family Clupeidae) are important small pelagic fishes utilized for several fishery products such as canned, dried, smoked, boiled, and fermented (fish sauces), and are also marketed fresh by many countries such as Malaysia, Indonesia, and Philippines. Sardines are normally found in the coastal and offshore areas at water depths ranging from 30 to 70 m, feeding on phytoplankton and zooplankton. There are three common species of sardines found in the Southeast Asian region, namely: *Sardinella gibbosa*, *S. frimbriata*, and *S. albella*. Catching of sardines in the Gulf of Thailand depends on seasonal spawning with the peaks predicted in March-April and July-August. Purse seine is the main fishing gear used to catch sardines.

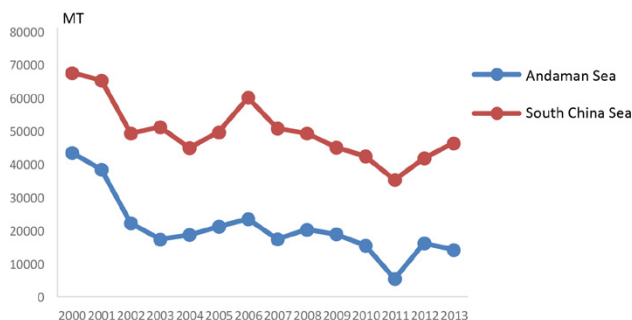


Figure 59. Production trends of sardines in the South China Sea (SCS) and Andaman Sea (AS) in 2000-2013 by quantity

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

The available statistical data on catch of sardines in Southeast Asia from 2000 to 2013 suggested that the trend of sardines catch from the South China Sea was about three times more than that of the Andaman Sea (Figure 59). Nonetheless, the total catches from these two fishing grounds seemed to be declining from 2000 until 2013 with some recoveries in 2006 and 2012.

The total production of the main sardine producing countries in the region seemed to have fluctuated during the period 2000-2013, with the total catch varying from 15,000 metric tons to 46,000 metric tons, with peaks noted in Malaysia in 2000 and Thailand in 2006 (Figure 60). The total catch of sardines was stable at about 40,000 metric tons in Thailand, while for Malaysia although the catch also fluctuated, this seemed to follow slight increasing trends in 2000 but decreased in 2011. Philippines showed increasing trend from more than 250,000 metric tons in 2000 to 313,000 metric tons in 2007. Likewise, the catch of Indonesia also increased from more than 280,000 metric tons in 2000 to 380,000 metric tons in 2007.

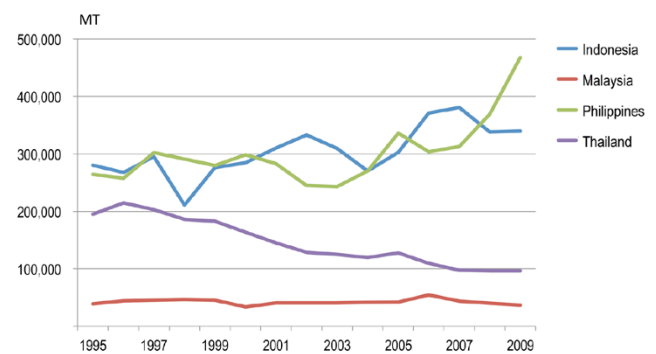


Figure 60. Production trends of sardines from main producing countries of Southeast Asia in 1995-2009 by quantity

Source: SEAFDEC (2012b)

1.2 Important Demersal Fishery Resources

The most economically important demersal fishes distributed from the coastal areas to the continental shelf slopes in the Southeast Asian region include the threadfin breams (Family Nemipteridae), lizardfishes (Family Synodontidae), bigeye snappers (Family Priacanthidae), croakers (Family Sciaenidae), and goatfishes (Family Mullidae), as well as other pelagic fishes including barracuda (Family Sphyraenidae). Considered as by-catch, these fishes are now being targeted and used as raw materials in the production of surimi not only in the region but also in the world, because of their properties and characteristics appropriate for processing into export-quality surimi.