3. MARINE SPECIES UNDER INTERNATIONAL CONCERN

3.1 Sharks and Rays

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The class of chondrichthyans contains the cartilaginous fishes that have skeletons primarily composed of cartilage. The chondrichthyans are divided into two subclasses; Elasmobranch (sharks and batoids (rays and skates)) and Holocephali (chimaeras). The Southeast Asian region has a rich biodiversity of elasmobranch species. It has been recorded that at least 196 species of sharks, 160 species of rays, 30 species of skates, and four chimaeras inhabit the Southeast Asian region from freshwater environments to the deep seas. New species are continuously discovered, the number could increase in the future and some recorded species may turn to extinct species.

In the Southeast Asian region, Indonesia recorded the highest diversity of sharks with 118 species from seven orders and 27 families followed by the Philippines with 96 species (nine orders and 27 families), Thailand 76 species (8 orders and 21 families), Vietnam 70 species (7 orders and 23 families), Malaysia 70 species (7 orders, 19 families), Myanmar 64 species (8 orders and 19 families), Brunei Darussalam 45 species (6 orders and 15 families), and Cambodia with 26 species from 5 orders and 10 families. For batoids (rays and skates), Indonesia also recorded the highest number with 106 species and 17 families followed by Malaysia (91 species; 14 families), Philippines (68 species; 18 families), Thailand (84 species; 12 families), Cambodia (55 species; 14 families), Myanmar (87 species; 10 families), Viet Nam (54 species; 12 families), Brunei Darussalam (36 species;11 families), and Lao PDR with 3 species and one family. Information on chimaeras however is still scanty. Indonesia recorded 4 species of Chimaerids while the Philippines recorded 3, Thailand 2, and Malaysia recorded only one species. The numbers of species of sharks, batoids, and chimaeras found in nine Southeast Asian countries are shown in **Table 1.** Many species still need to be confirmed and most probably misidentified.

Table 1. Number of sharks, batoids, and chimaeras in the Southeast Asian countries

Country	Number of species		
	Sharks	Batoids	Chimaeras
Brunei Darussalam	45	36	0
Cambodia	26	55	0
Indonesia	118	106	4
Lao PDR	0	3	0
Malaysia	70	91	1
Myanmar	64	87	0
Philippines	96	68	3
Thailand	76	84	2
Viet Nam	70	54	0

In general, data collections and sharks and rays studies are limited in many countries in the region such as Brunei Darussalam, Myanmar, Cambodia, and Vietnam. Only a few countries

such as Indonesia, Malaysia, and Thailand have the historical data and more comprehensive studies on this group of fish. Most countries in this region are still recording the landing of sharks and rays by group (sharks and rays) not up to species level. Some countries still did not include sharks and rays landing in their national statistics. Other information such as biological data, stock structure, the spatial and temporal distribution of sharks and rays are still lacking in some countries.

SEAFDEC reported that the total landing of sharks and rays of the AMSs in 2018 was approximately 46,235 and 121,538 metric tons, respectively (SEAFDEC, 2020), showing a decrease in the harvest of sharks and rays in Southeast Asia of about 66.48% and 8.93%, respectively over an eleven-year period. Information on the production trends of major species of sharks and rays in the AMSs as reported in the Fishery Statistical Bulletin of Southeast Asia (SEAFDEC 2010 - 2020) are shown in **Table 2** and **Table 3**, respectively.

Table 2. Production of sharks in the Southeast Asian countries from 2008 to 2018 by quantity (Metric tons)

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Brunei Darussalam	29	15	19	N/A	N/A	6	N/A	N/A	N/A	N/A	N/A
Indonesia	125,336	40,960	49,651	59,403	45,651	56,720	57,521	45,510	29,569	7,484	38,284
Malaysia	7,346	7,236	6,793	14,735	6,536	7,833	8,004	7,624	6,078	6,791	5,631
Philippines	2,380	2,635	2,798	2,556	2,300	2,129	1,955	1,850	2,116	1,939	1,941
Singapore	17	20	10	29	24	24	59	39	6	4	12
Thailand	2,834	2,826	2,936	2,574	2,338	2,064	2,308	981	628	1,039	367
Total	**137,942**	**53,692**	**62,207**	**79,297**	**56,849**	**68,776**	**69,847**	**56,004**	**38,397**	**17,257**	**46,235**

Source: *SEAFDEC (2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017a, 2017b, 2019, 2020)*

Table 3. Production of rays in the Southeast Asian countries from 2008 to 2018 by quantity (Metric tons)

Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Brunei Darussalam	69	56	63	N/A	N/A	47	N/A	N/A	83	74.45	89
Indonesia	113,012	44,660	44,478	45,084	56,403	56,067	61,953	65,460	97,045	27,265	104,559
Malaysia	11,642	15,031	13,770	13,021	15,612	15,774	17,275	129,908	1,281	13,311	12,848
Philippines	2,370	2,591	2,713	2,501	2,276	2,163	1,918	1,788	2,081	1,888	1,781
Singapore	117	143	105	112	115	93	77	58	46	63	56
Thailand	6,245	6,219	6,089	5,646	4,296	4,195	4,445	3189	304	4085	2,205
Total	**133,455**	**68,700**	**67,218**	**66,364**	**78,702**	**78,339**	**85,668**	**200,403**	**100,840**	**46,686**	**121,538**

Source: *SEAFDEC (2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017a, 2017b, 2019, 2020)*

The highest catch composition of rays and sharks among the participating countries was reported by Indonesia (5% and 21%, respectively). As reported by the participating countries, the landing ranged from 0.6 to 5.15% for rays, 0.2 to 21 % for sharks, and 0.002 to 0.3% for skates. It should be noted that the landing of skates was recorded only in Myanmar, Indonesia, and Viet Nam.

FAO data indicate that Indonesia is the world's largest shark producer (Lack and Sant, 2009), contributing around 12.3% of total world production. However, shark production in Indonesia only contributes about 2% of their total marine fishery production. Most sharks landed in Indonesia are bycatch in artisanal fisheries using various types of fishing gear, such as gillnets, longlines, seine-nets, and bottom trawl nets (Fahmi and Dharmadi, 2013).

Shark habitats in the Southeast Asian region are mostly located within continental/ insular shelves (SHL) and continental/insular slope (SLO) that are now heavily exploited by

traditional and modern fishing gears. The exploitation of juvenile sharks is a common phenomenon in all countries in the region, especially as bycatch in the trawl fishery. Since all countries have tropical multispecies fisheries, it would be impossible to focus on individual resources or specific mono-species stock of fish. Management of fisheries resources in this region is now implemented as a whole. All countries should take action to incorporate shark management measures within their national fisheries management policy and framework for the sustainable utilization of this resource.

The stock population of some widespread species might be shared among countries in the region. Therefore, their fisheries should be considered to be managed at the regional level, and not under a particular country. However, accurate information on the biodiversity of shark and ray species in the Southeast Asian region is still limited.

Information on the trends of marketing and trade as well as the competitiveness of sharks and rays at national and regional levels in the Southeast Asian region compared to its trade partners in the world are very important to provide an indication of the extent of commercialization activities of these commodities.

SEAFDEC/MFRDMD in collaboration with the Center for Fisheries Research, Indonesia conducted marketing and trade surveys in Java and Sumatera, Indonesia on 31 July-15 August 2018 and in Kalimantan, Indonesia in 1-16 September 2019. The surveys found that there was a high diversity of products produced from sharks and rays excluding fin, such as meat, skin, cartilages, teeth, intestine, and stomach. The resources of sharks and rays generated massive livelihood for coastal communities of not only direct beneficiaries *i.e.* fishers, boat owners, exporters, collectors, wholesalers, retailers, and processors but also various labour workers in different levels of marketing channels such as factories, ports, and transportation workers. The salted meat of sharks and rays is popular among the mountain communities across Indonesia, due to its affordability and durability of storage. Sharks and rays are important for food security not only for coastal communities but also terrestrial/mountain communities (Dharmadi *et al*., 2020).

Since 2013, DNA samples were collected from various locations throughout the region. The locations showed in **Figure 1**. A total of 145 sharks, 250 rays, and 20 skate specimens were successfully sequenced for DNA barcoding comprising 39 species of sharks, 42 species rays, and five skates. Using DNA barcoding, all samples identified at first as *Neotrygon kuhlii* were confirmed as *N. varidens* and *N. caeruleopunctate* according to DNA sequence by Last *et al.* (2016). DNA barcoding showed excellent progress to support and verify the findings by a taxonomist, usually using morphometric and meristic data. MFRDMD had submitted the DNA barcodes for 34 species of sharks and 43 species of rays to the Barcode of Life Data System (BOLDSYSTEM) with six new records which can be accessed globally.

Figure 1: Locations of the DNA sampling collected for sharks, rays and skates.

Box 1. Issues and concerns on sharks and rays in the region
a. Information on trends in species composition of shark productions b. Information on utilization of shark fins and shark meat not recorded in international trade c. Information on global utilization of products other than shark fins and shark meat d. Limitations of shark/chondrichthyan trade statistics

Box 2. Future Challenges
a. Enhancing understanding of stakeholders b. Establishing management/conservation measures c. Continuing capacity building programs (species ID, NDF development, etc.), research (DNA toolkit, stock status using data-poor, etc.), study socio-economic d. Improving information on sharks (regional/national statistics, trade, etc.) e. Developing regional common position to safeguard fisheries sector, particularly small-scale sectors

Source: Worawit, 2020

The first IUCN global assessment in 2014 for 1,199 species in the Class Chondrichthyes concluded that one-quarter (24 %) of species were threatened. Recently reassessment identified 391 (32.6 %) species that are threatened with extinction. However, when this percentage of threat is applied to Data Deficient species, more than one-third (37.5 %) of chondrichthyans are estimated to be threatened (Dulvy *et. al*., 2021).

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) promotes the conservation and protection of species of wild animals and plants considered endangered to ensure that their international trade does not threaten the survival of the species in the wild. CITES has been protecting large numbers of species of animals and plants against over-exploitation through international trade by listing these in the CITES Appendices. Once species are listed in Appendix I, II, or III of CITES, depending on the level of endangerment, the member countries of CITES are obliged to take the required actions with respect to international trade.

Recently, the pressure on the international trade of sharks and rays is growing. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) promotes the conservation and protection of endangered species of sharks, rays, and skates to ensure that their international trade does not threaten the survival of the species in the wild. Until 2021, 14 species of sharks and 32 species of rays were listed under CITES Appendices. They are basking shark (*Cetorhinus maximus*), whale shark (*Rhincodon typus*), great white shark (*Carcharodon carcharias*), porbeagle shark (*Lamna nasus*), oceanic whitetip shark (*Carcharhinus longimanus*), scalloped hammerhead shark (*Sphyrna lewini*), smooth hammerhead shark (*Sphyrna zygaena*), great hammerhead shark (*Sphyrna mokarran*), silky shark (*Carcharhinus falciformis*), pelagic thresher (*Alopias pelagicus)*, bigeye thresher (*A. superciliosus),* thresher shark (*A. vulpinus*), shortfin mako shark (*Isurus oxyrinchus*), and longfin mako shark (*I. paucus*). All those sharks species were listed in Appendix II. For rays, all five species of sawfishes (family Pristidae) were listed in Appendix I, all nine species of mobula rays, all three species of manta rays, all six species of giant guitarfishes (*Glaucostegus* spp.), and all ten wedgefishes (Rhinidae spp.) listed in Appendix II (**Table 2**). Some species such as scalloped hammerhead sharks (*Sphyrna lewini*), mobula rays, and thresher sharks are considered as common species in some countries in the region. Countries need to conduct NDFs study if the products of those species are for export purposes.

Table 2: List of sharks and rays species listed in CITES species

Appendix I	
Sharks	Rays
	Pristidae (Sawfishes) 1. Largetooth sawfish (*Pristis pristis*) 2. Green sawfish (*Pristis zijsron*) 3. Smalltooth sawfish (*Pristis pectinate*) 4. Dwarf sawfish (*Pristis clavate*) 5. Narrow sawfish (*Anoxcypristis cuspidate*)
Appendix II	
Carcharhinidae (Requiem sharks) 1. Silky shark (*Carcharhinus falciformis*) 2. Oceanic whitetip shark (*Carcharhinus longimanus*) **Sphyrnidae (Hammerhead sharks)** 1. Scalloped hammerhead shark (*Sphyrna lewini*) 2. Great hammerhead shark (*Sphyrna mokarran*) 3. Smooth hammerhead shark (*Sphyrna zygaena*) **Alopiidae (Thresher sharks)** 1. Pelagic thresher (*Alopias pelagicus)* 2. Bigeye thresher (*Alopias. superciliosus)* 3. Thresher shark (*Alopias vulpinus*) **Cetorhinidae (basking sharks)** 1. Basking shark (*Cetorhinus maximus*) **Lamnidae (Mackeral sharks)** 1. Great white shark (*Carcharodon carcharias*) 2. Shortfin mako shark (*Isurus oxyrinchus*) 3. Longfin mako shark (*Isurus paucus*) 4. Porbeagle shark (*Lamna nasus*) **Rhincodontidae (Whale sharks)** 1. Whale shark (*Rhincodon typus*)	**Myliobatidae (Eagle and mobulid rays)** 1. Giant manta rays (*Manta birostris*) 2. Reef manta rays (*Manta alfredi*) 3. Mobula spp. 4. Longhorned pygmy devil ray (*Mobula eregoodootenkee*) 5. Atlantic devilray (*Mobula hypostoma*) 6. Spinetail mobula (*Mobula japanica*) 7. Shortfin devilray (*Mobula kuhlii*) 8. Giant devil ray (*Mobula mobular*) 9. Munk's devil ray (*Mobula munkiana*) 10. Lesser guinean devil ray (*Mobula rochebrunei*) 11. Box ray (*Mobula tarapacana*) 12. Bentfin devil ray *(Mobula thurstoni)* **Glaucostegidae (Guitarfishes)** 1. Blackchin guitarfish (*Glaucostegus cemiculus*) 2. Sharpnose guitarfish (*Glaucostegus granulatus*) 3. Halavi guitarfish (*Glaucostegus halavi*) 4. Widenose guitarfish (*Glaucostegus obtusus*) 5. Glaucostegus thouin (*Clubnose guitarfish*) 6. Giant guitarfish (*Glaucostegus typus*) **Rhinidae (Wedgefishes)** 1. Bottlenose wedgefish (*Rhynchobatus australiae*) 2. Giant guitarfish (*Rhynchobatus djiddensis*) 3. Taiwanese wedgefish (*Rhynchobatus immaculatus*) 4. Smoothnose Wedgefish (*Rhynchobatus laevis*) 5. African Wedgefish (*Rhynchobatus luebberti*) 6. Eyebrow Wedgefish (*Rhynchobatus palpebratus*) 7. Broadnose Wedgefish (*Rhynchobatus springeri*) 8. Clown Wedgefish (*Rhynchobatus cooki*) 9. Shark Ray (*Rhina ancylostoma*) 10. False Shark Ray (*Rhynchorhina mauritaniensis*)

Source: CITES, 2021

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