NON DETRIMENTAL FINDINGS FOR SILKY SHARK *Carcharhinus falciformis*

INDONESIAN INSTITUTE OF SCIENCES
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CHAPTER-1

INTRODUCTION

1.1. Background

Shark and ray (Elasmobranch) fishery is one of the most important fisheries in the world. FAO data reported that the total catch of Elasmobranchs in the world in 1994 reached 731 thousand tons of which Asian countries contributed around 60%. Furthermore, four Asian countries i.e. Indonesia, India, Japan and Pakistan contributed around 75% of the total catch of sharks and rays in Asia in 2002 (Bonfil 2002).

Indonesia is known as the country with the largest shark and ray fishery production in the world, with the total number of the catch over 100,000 tons per year, or about 13% of the total global catch. Since the last two decades, Indonesian total production of shark and ray (Elasmobranch) fisheries has shown a significant increasing trend.

The main product of shark and ray fisheries in Indonesia is the shark fins. The high price of shark fins in the international market has triggered the increase of shark fishing activities. Present population status of some high value species of sharks in many countries including Indonesia has indicated the decreasing trend. This condition is believed to threat the sustainability of natural stocks especially when the regulation on controlling the catch is still lacking (Daley *et al.*, 2002). Sharks generally have slow growth rates, long life span, slow advance to sexual maturity and produce small number of pups (Coleman, 1996; Camhi *et al*, 1998; Bonfil, 2002; Cavanagh *et al.*, 2003). Their biological characteristics make sharks are susceptible to the high mortality because of fishing activities (Hoenig and Gruber, 1990). Over exploitation on sharks will easily lead to their extinction comparing to other fish species. Therefore, shark population can only be maintained by controlling the level of capture (Camhi *et al.*, 1998; Musick, 2003; Cortes, 2000). Some areas in Asia are believed to have suffered from over-exploitation. The South China Sea and some Indonesian territorial waters have reached the Index of Relative

Production (IRP) for Elasmobranchii >10, which means that those areas have been considered as fully, or even, over-exploited (Bonfil, 2002).

Sharks have been fished in Indonesia since 1970s, initially as bycatch in tuna longline fishery. Shark fishing activities began to increase and became more popular following the increasing of shark fins price in global market in 1988. Since then, sharks became one of targets in Indonesian capture fisheries, particularly in artisanal fisheries (Anung and Widodo, 2002). Most of shark products are processed and marketed locally, especially for meat and skin. The shark fin products are usually dried and marketed to major cities in Indonesia, then being exported to Asian countries such as Hong Kong, Singapore and Japan (Suzuki, 2002).

As a response of global shark conservation, Indonesia has issued the National Plan of Action for Sharks (NPOA-Sharks) since 2010, adopting from the International Plan of Action for Conservation and Management of Sharks (IPOA Sharks) which developed by FAO. The NPOA addressed some key aspects of management measures including reviewing the status of elasmobranch fisheries, managing data collection, research improvement, and public awareness for conservation, that need to be taken by the government and other stakeholders at national and local level (Fahmi and Dharmadi, 2013b).

Since 2000, sharks have been listed as one of endangered animals that need to be controlled for their international trades through the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) regulation. Indonesia has been an active CITES member since 1978 and is obliged to follow the provisions set out in the convention concerning the trade in animal species listed on CITES appendices. According to CITES, the capture of species listed on Appendix II from natural habitats for the purpose of international trade is still permitted under strict control. CITES provisions related to international trade of species on Appendix II list stipulate that: (1) Exports are only permitted after official permit is issued by the Management Authority; and (2) the Management Authority only issues permits for international trade following a

recommendation from the Scientific Authority. In Indonesia, the scientific authority is delegated to the Indonesian Institute of Sciences (LIPI).

Up to present, twelve shark species have been listed in the CITES Appendix II. The last CITES Convention of the Parties (CoP) in 2016 was decided to add four shark species into the CITES Appendix II list, i.e. all threshers sharks (3 species of *Alopias* spp.) and the silky shark (*Carcharhinus falciformis*). Two species of the thresher sharks and the silky shark are found in Indonesian waters. Therefore, a total of 10 shark species listed in CITES that occur in Indonesia including the whale shark (*Rhincodon typus*), white shark (*Carcharodon carcharias*), basking shark (*Cetorhinus maximus*), three hammerhead sharks (*Sphyrna lewini, S. mokarran* and *S. zygaena*), the oceanic whitetip shark (*Carcharhinus longimanus*) and two species of threshers shark (*Alopias pelagicus* and *Alopias supercilliosus*). The whale shark has been fully protected in Indonesia since 2013 under the Decree of the Minister of Marine Affairs and Fisheries No. 18 of 2013. Meanwhile, the white shark and basking shark are not regulated by the Indonesian government because those species are basically not Indonesia's indigenous species, as they are known to occur in Indonesian waters very occasionally (Fahmi and Dharmadi, 2014; Fahmi and White, 2015). On the otherhand, hammerhead and the oceanic whitetip sharks are still utilised only for local consumption, and there is export ban regulation for those species under the Decree of the Minister of Marine Affairs and Fisheries No. 5 of 2018.

The silky shark (*Carharhinus falciformis*) is one of the most common shark species in Indonesia. This species is captured in a large number every year and well utilized for both local and international markets. All body parts of silky sharks are traded including fins, meat, bones, skin and teeth and many other derivates products as explained elsewhere in this document. To address this, the utilization of this species in Indonesia must be regulated by a management mechanism according to the CITES rules.

The Non-Detriment Findings (NDF) document for silky shark (*Carharhinus falciformis*) is an instrument endorsed by CITES convention that is used as the basis for managing the fishery and trades of this species. As a scientific consideration issued by the scientific

authority, this document must be provided by each CITES member country prior to conduct the international trade of species listed in CITES Appendix II.

1.2. Objectives

The Non-Detriment Findings (NDF) document for Silky shark is an analysis document concerning the management of the silky shark (*Carharhinus falciformis*) in Indonesia. This NDF is issued by the Indonesian Scientific Authority as the basis for policy recommendations for the Management Authority in determining the direction of sustainable management of CITES Appendix II shark fisheries in this country.

1.3. Scope

The Non-Detriment Findings (NDF) document for silky shark (*Carharhinus falciformis*) contains of up-to-date information about the status of the silky shark (*Carharhinus falciformis*) fisheries in Indonesia, providing information on biological aspects, fisheries, socio-economics, and management options or recommendations based on the latest relevant data. The data presented in this document were taken from various literatures, catch data and research findings in Indonesia.

CHAPTER-2

BIOLOGICAL AND VULNERABILITY ASPECTS

2.1. *Carcharhinus falciformis*

2.1.1. Biological Data

Taxonomy

Class	Chondrichthyes	
Ordo	Carcharhiniformes	
Family	Carcharhinus	
Spesies	*Carcharhinus falciformis* (Müller and Henle, 1839)	
Local names	English	Silky shark
	Indonesian	Hiu lanjaman
	Local language	Hiu kejen, cucut lanyam, lonjor, mungsing

Life history characteristics

Age at maturity:	More than 12 years females, 10 years males (Bonfil *et al.,* 1993) 5-6 years females and 6-7 years males (Oshitani *et al.* 2003) 8-10 years females, 9.3 years males (Joung *et al.* 2008) 14-16 years females, 13-14 years males (Hall *et al.* 2012)
Size at maturity:	232-245 cm females, 225 cm males (Bonfil *et al.,* 1993) 213-230 cm females, 187-217 cm males (Compagno, 1984) 200-206 cm males (Oshitani *et al.* 2003) 216-223 cm females, 183-204 cm males (White *et al.* 2006) 213-230 cm females, 183-217 cm males (Fahmi and Sumadhiharga, 2007) 201-223 cm males, 224-231 cm females (Varghese *et al.*, 2015)
Median size at maturity (L_{T50}):	213 cm females, 256 cm males (Joung *et al.* 2008) 215 cm females, 207.6 cm males (Hall *et al.* 2012) 226.5 cm females, 217 cm males (Varghese *et al.*, 2015) 159 cm (Simeon *et al.*, 2017)

Pup size:	76 cm (Bonfil *et al.*, 1993) 55-72 cm (White *et al.* 2006) 79-82 cm females, 79-83 cm males (Hall *et al.* 2012) ~50 cm (Simeon *et al.*,2017)
Maximum age:	28.6 years males, 35.8 years females (Joung *et al.*, 2008) 20 years males, 19 years females (Hall *et al.*, 2012)
Maximum size:	287 cm (Oshitani *et al.*, 2003) 245 cm TL for males, 280 cm TL for females (Fahmi and Sumadhiharga, 2007) 332 cm TL (Joung *et al.*, 2008) 242 cm TL for males, 263 cm TL for females (Hall *et al.*, 2012) 370 cm females, 319 cm males (Damora and Yuneni, 2016) 345 cm TL (Simeon *et al.*, 2017) 297 cm (Sentosa, 2017)

Reproductive Characteristics

Maximum annual pup production:	15 pups every one or two years (Last and Stevens, 1994) 16 pups (White *et al.*, 2006) (annual cycle)
Fecundity:	1-16 pups (White *et al.*, 2006) 12-41 pups for every pregnancy (Baum *et al.*, 2007) 3-13 pups (Varghese *et al.*, 2015)
Intrinsic rate of population increase (r):	0.05 years (Cortés, 2002) 0.048 years (Beerkircher *et al.*, 2003) 0.043 years (Smith *et al.*, 2004)
Growth rate (von Bertalanffy k):	0.07 (Branstetter, 1987) 0.10 (Bonfil *et al.*, 1993) 0.15 (Oshitani *et al.*, 2003) 0.07 (Hall *et al.*, 2012) 0.10 ((Varghese *et al.*, 2015) 0.14 (Grant *et al.*, 2018)

2.1.2. Distribution

Silky shark (*Carharhinus falciformis*) is one of the most common shark species in Indonesian waters that is distributed in circumtropical waters. Its distribution including the Indian and Pacific Oceans, South China Sea, Banda Sea, and most of waters around the islands of Sumatra, Java, Kalimantan, Sulawesi, Nusa Tenggara, Molluccas and Papua

(White *et al.*, 2006; Fahmi and Dharmadi, 2013a; 2013b). Its juvenile often caught as bycatch in the Indian Ocean, the South China Sea and the Makassar Strait, and sometimes caught in shallow waters such as the Java Sea (Fahmi and Dharmadi, 2013b). The sub-adult to adult sharks are usually caught from the Indian Ocean almost along the year, but often caught in larger amount from coastal waters close to islands (e.g. Flores Sea) in the period June-July (Fahmi and Dharmadi, 2013b; Simeon *et al.*, 2018).

2.1.3. Habitat

The Silky shark is a circumtropical oceanic and coastal-pelagic species. It is most often found near the edge of continental and insular shelves at depths of 200 m or more in the epipelagic zone although it occurs from the surface to a depth of at least 500 m offshore (Last and Stevens, 2009). It is often associated with islands, near insular slopes and over deepwater reefs preferring warmer waters (about 23°C). Smaller sharks are often found in coastal nurseries and adults further offshore over deeper water. In pelagic habitats, the Silky shark is often associated with drifting materials on the surface (Filmalter *et al.*, 2011). The silky shark generally leaves coastal nursery grounds and moves offshore to oceanic waters as sub-adults, frequently joining tuna schools on which they seem to feed (Branstetter, 1987). Ontogenetic diet shifts occur from lower trophic position to higher trophic positions when the silky shark matures (Rabehagasoa *et al.*, 2012).

2.1.4. Conservation Status

This species has been listed on the IUCN Redlist as Vulnerable and listed on CITES appendix II.

CHAPTER-3

FISHERY ASPECTS

3.1. Production

Data and information on fishery production such as the quantity of fish caught by fishers, aquaculture products and their economic values, are regularly published by the Ministry of Maritime Affairs and Fisheries every year in the Indonesian Fisheries Statistics Book. This book is the only data source officially used today as the basis for fisheries management in Indonesia. The data are gathered from various sources including the Central Bureau of Statistics (BPS), Provincial and District Fisheries Agencies, Ministry of Trade and Agencies under the Ministry of Maritime Affairs and Fisheries.

From 2002 to 2014, shark catch data in the national fisheries statistics were divided into five group, i.e. thresher sharks (*Alopias spp*, Family Alopidae), requiem sharks (all species under Family Carcharhinidae), mako shark (*Isurus spp*, Family Lamnidae), hammerhead shark (*Sphyrna spp.*, Family Sphyrnidae), and the group of dogfish sharks that comprise Squalidae and Centrophoridae (Order Squaliformes). The catch data of the silky shark was a part of requiem sharks data (Carcharhinidae). However, since 2015, the requiem shark catch data have been distinguished into five groups, i.e. the silky sharks, oceanic whitetip shark, blue shark, tiger shark and other requiem sharks. According to the Indonesian fisheries statistical data, the total catch of requiem sharks (Carcharhinidae) was fluctuated but showing an increase trend from 2005-2013. Since then, the catch declined up to 17% in 2015 (Figure 3.1).

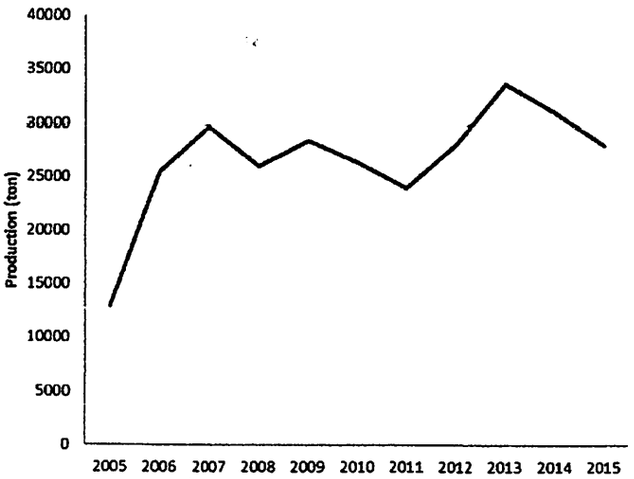

Figure 3.1. Total catch of requiem sharks in Indonesia from 2005 to 2015

Carcharhinus falciformis is known to contribute a large number of requiem sharks captured in Indonesian shark fisheries, both as target and bycatch (Blaber *et al.*, 2009; Fahmi and Dharmadi, 2013b; 2015). *Carcharhinus falciformis* is the second of Carcharhinid species that contributed most in the pelagic tuna long line fisheries in the eastern Indian Ocean fishing region, but the most dominant one in the tuna gillnet fishery (Figure 3.2). Moreover, this species is also the most commonly caught in the targeted shark fishery using drift longlines in the eastern Indian Ocean region, contributing to more than 40% of the total shark catch (Fahmi and Dharmadi, 2015). In 2015 of Indonesian fisheries statistical data, the silky sharks comprised for more than a half of requiem sharks recorded (Figure 3.3).

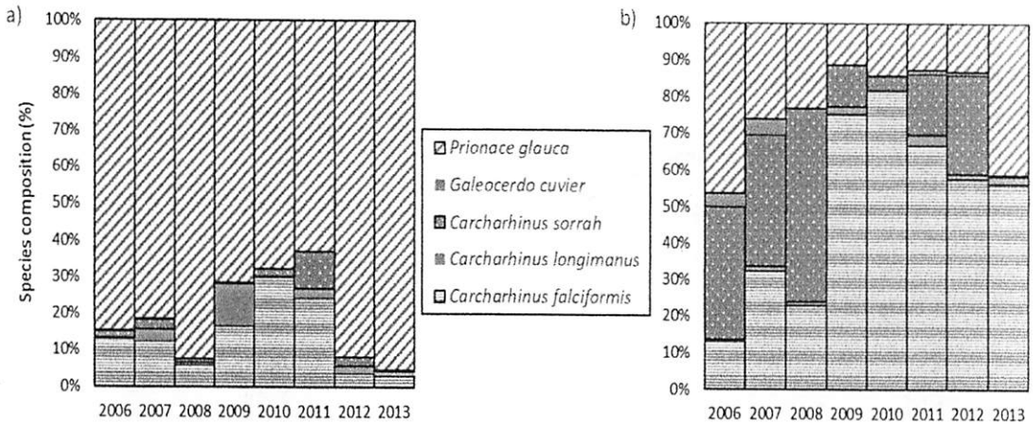

Figure 3.2. Species composition of requiem sharks caught in (a) longline and (b) gillnet tuna fisheries in the eastern Indian Ocean fishing region (Fahmi and Dharmadi, 2015).

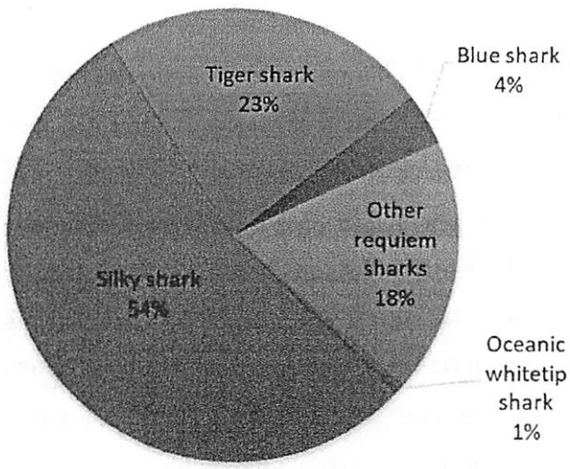

Figure 3.3. Species composition of requiem sharks in Indonesian fisheries statistical data of 2015

3.2. Fishing Gear

In Indonesian waters, the silky shark (*Carcharhinus falciformis*) are commonly caught by either fishing lines or nets. Here are some types of fishing gear that are used to catch this species :

a. Drift/Surface Longline

This type of fishing gear is specifically intended to capture various shark species. As this gear is generally set at the surface layer, fishers often call it surface shark line or "ngambangan" (floating line).

b. Tuna Drift Gillnet

Drift gillnet is a type of fishing net that is used to catch tuna and skipjack tuna, but some species of sharks, including the silky shark, are also often caught. With a relatively large mesh size, it is considered as a more selective gillnet compared to other types of fishing nets that catch more juvenile size.

c. Tuna Longline

The tuna longline is intended to catch skipjack tuna and used by fishers who are mostly based in Palabuhanratu, Cilacap, Benoa and Bitung. In general, this fishing gear is used in the Indian Ocean fishing region. Although this gear is intended to catch the skipjack tuna fish, some adult and mature oceanic sharks like the silky shark (*Carcharhinus falciformis*) are also occassionally caught. Based on bycatch related studies on tuna longline fisheries in Cilacap (Central Java), Benoa (Bali) and Bitung (North Sulawesi), the probability of silky sharks being caught is higher than hammerheads, shortfin makos and tiger sharks, but lower than blue sharks (Fahmi and Dharmadi, 2015); Zainudin *et al.*, 2017).

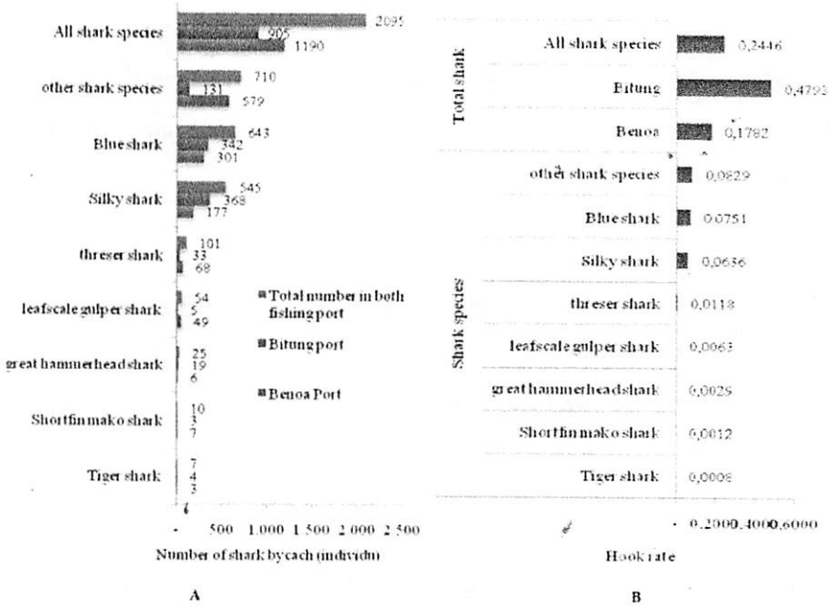

Figure 3.4. The number of catch and hook rate of sharks caught by tuna longline fleets based in Benoa and Bitung from 2006 to 2014 (Zainudin *et al.*, 2017)

3.3. Fishing ground

Carcharhinus falciformis is a coastal and oceanic pelagic shark that often caught by artisanal and commercial fishing fleet in almost all Indonesian waters. According to the Indonesian fisheries statistics, the requiem sharks (which the silky shark is one of the most abundant species) encounter almost all Indonesian fisheries management area (FMA). From eleven FMAs (Figure 3.5), the silky sharks are suggested to be caught in at least seven FMAs, including FMA 711, 572, 573, 713, 714, 716 and 717 (Fahmi and Dharmadi, 2013b).

It was identified that silky sharks were recorded in the highest abundance in some areas such as the Flores Sea, Makassar Strait, Bali Strait, the Eastern of Indian Ocean (Fahmi and Dharmadi, 2013). This species is also caught more in coastal areas rather than offshore waters (Simeon *et al.*, 2018). Sub-adult Sharks commonly caught by drift longline in

Makassar Strait and the Flores Sea, while the adults commonly caught by surface longline in the continental shelf (Fahmi and Dharmadi, 2013b; 2015; Simeon *et al.*, 2018, Simeon *et al.*, 2016).

Figure 3.5. Fisheries Management Areas (FMAs) of Indonesia

3.4. Abundance

The abundance of silky shark population in all Indonesia waters has not been assessed yet. The assessment was done only for the eastern Indian Ocean population, based on the data from both artisanal and commercial fisheries. In general, the catch of silky sharks in tuna fishery increased from 2008 to 2015, but then decreased since 2016 (Jatmiko *et al.*, 2018; Figures 3.6.). On the other hand, the catch of silky sharks from the targeted fishery increased in from 2015 to 2016 (Simeon *et al.*, 2018; Figures 3.7.).

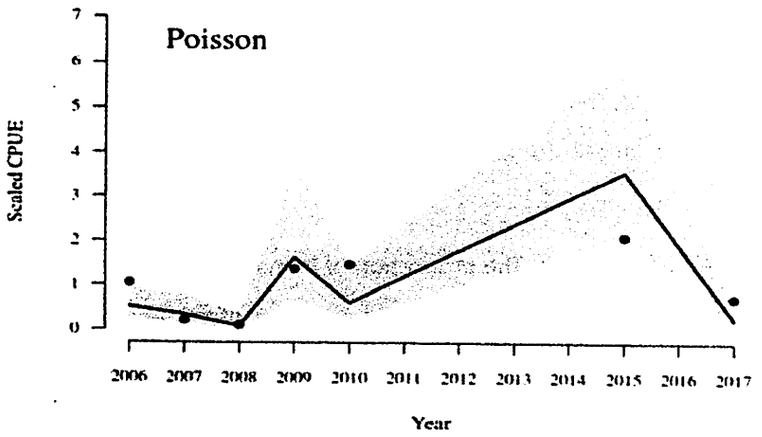

Figure 3.6. CPUE of Silky sharks from tuna fishery (Source: Jatmiko *et al.*, 2018)

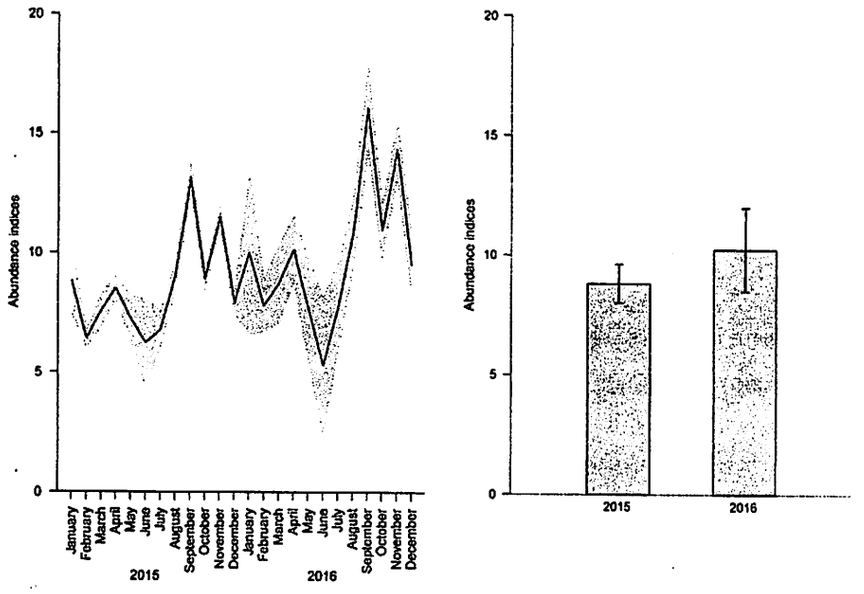

Figure 3.7. CPUE of targeted Shark fishery (Source: Simeon *et al.*, 2018)

Tanjung Luar is one of traditional Shark landing centers for fishers operating in in FMAs 573, 712, and 713. Silky shark (*Carcharhinus falciformis*) landed from 2014 to 2016 by Simeon *et al.* (2017) in Tanjung Luar showed that in terms of the length frequency

distribution, 47% of Silky shark (*Carcharhinus falciformis*) were caught before attaining maturity (<Lm), 47% were caught at mature age, 5% were caught in post mature size. It shows that the distribution of *C. falciformis* population in FMA 573, 712, and 713 is varied from small to adult sizes, which calls for good fisheries management to ensure its viability.

The size composition are varied among areas. The proportion of immature sharks in the catch composition of silky sharks has been also reported in many literatures from several areas (Fahmi and Sumadhidarga, 2007; Chodrijah and Faizah, 2015; Setiawan and Nugroho, 2015). The average length of silky shark in Tanjung Luar varied based on the fishing gear (Figure 3.8.). Surface long line captured silky shark larger than bottom longline, except in 2016 (both sexes) and has decreased in 2017 (male). Female silky shark is captured smaller than male, either by bottom long line or surface long line.

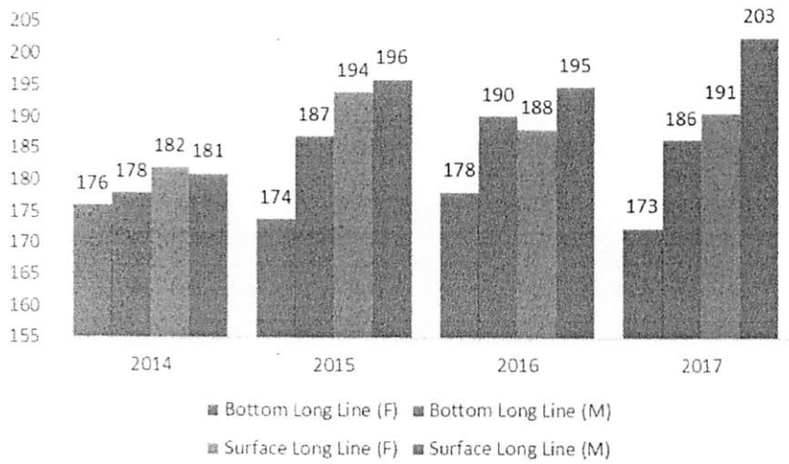

Figure 3.8. Average length based on fishing gear in Tanjung Luar Fishing Port, West Nusa Tenggara (Source: WCS unpublished data 2018)

3.5. Silky Shark Fishing Season

In general, silky shark fishing activities last throughout the year long without being restricted by season, but certain months when catch volumes are higher are usually

considered as the fishing season. The months from April to October considered as the shark fishing seasons for the Indian Ocean Fisheries Management Zones (FMA 572 and 573), while in the areas off the south of Nusa Tenggara (FMA 573), every month is considered as the fishing season. Catches tend to increase from February to September when they reach the peak before declining well into December.

In Cilacap and Palabuhanratu, the silky shark catches made by tuna longline vessels operating in the Indian Ocean (off the south of Java) peak in July to October, with the lowest catches recorded from November to January. In general, silky shark fishing season in the Indian Ocean and South Java Sea lasts between June and September.

CHAPTER-4

UTILIZATION ASPECTS

4.1. Sosio-economics

As a resources, silky sharks are known as the main source of income for certain communities, including fishers, middlemen, sellers, and fish processor. Some people in regions where sharks are the targeted catches, known depend fully on them. One example can be seen in local fish traders such as in Indramayu-West Java, which is only involved in salted shark meat, started collecting and selling shark fins since 1986 (Suzuki, 2002). In the last few decades, shark fishing trend has been grown from small-scale longline fishery to commercial fishery targeting Carcharhinids, both as the target and bycatch. Shark fin exporters provide loans and capital to local fishers to increase their shark catches. Hence, silky shark fishery is one of the important commodity for particular communities that has a positive impact on their welfare. Unfortunately, they have gradually shifted their view of silky shark from originally as an incidental bycatch to becoming the expected bycatch. Although the silky shark are not the target, they are an important catches component, nonetheless.

4.2. Post-fishing Processing

Shark catches in several regions in Indonesia are handled in a way that does not pay attention to quality. Sharks caught using drift and bottom longlines in Tanjung Luar, for example, were often landed in unfresh condition. This is due to the fact that apart from the operating time in the sea between 7-21 days, ice supplies that were carried along were inadequate. Similar conditions were also found in other shark landing sites such as Muara Angke, Muara Baru, Palabuhan Ratu, Cilacap, Kupang, Muncar and many other sites. Fishermen generally do not pay much attention to the freshness of the shark meat. Nevertheless, the level of freshness of sharks landed still counts economically. reported the weight composition of sharks' body parts as follows: head (22%), gut contents or

innards (20%), liver (7%), bone (4%), fin (5%), skin (7%), and meat (35%) (Kreuzer and Ahmed, 1978, WCS unpublished data 2018).

The treatment given to shark products was generally similar at several shark landing sites either in Jakarta, West Java, East Java or West Nusa Tenggara. In general, sharks were sold in whole by the vessel owner or patron, then the buyers will sell them in parts to consumers or exporters. The main target of shark products is the fins as it has the highest economic value compared to the other body parts. Shark fishers in several regions in Indonesia, such as East Nusa Tenggara, are generally only interested in the fin and practice shark finning at the sea.

The same practice is also performed by the tuna-skipjack longline fishers operating in the Indian Ocean when the catch of tuna-skipjack is more than sharks. Shark fins are usually sold in dry condition, after being dried under the sun for several days. Traditional processing of shark fins starts with drying the fresh fins under the sun for approximately one week until they are completely dry. Thereafter, they are cleaned from skin elements and other particles such as sand, dust and other dirts. The next step is to clean these fins further by soaking them in fresh water for four to five days until they become tender, before boiling them for half an hour until they swell and the skin layer is separated from the meat fiber. The fin fiber extracted is used as the raw material for shark fin soup.

4.3. The Chain of Trade

In general, the chain of trade for silky shark in Indonesia is long and complex, starting from the fishers, middlemen, processing units, exporters to importing countries, with the middlemen being the most complex element. The shark meat and innard commonly consumed in domestic market, and fins commonly exported as high value commodity (Fahmi and Dharmadi, 2013b; WCS unpublished data 2018), trade flow mechanism in Indonesia can be seen in Figure 4.1 below with the trade chain at middlemen level simplified.

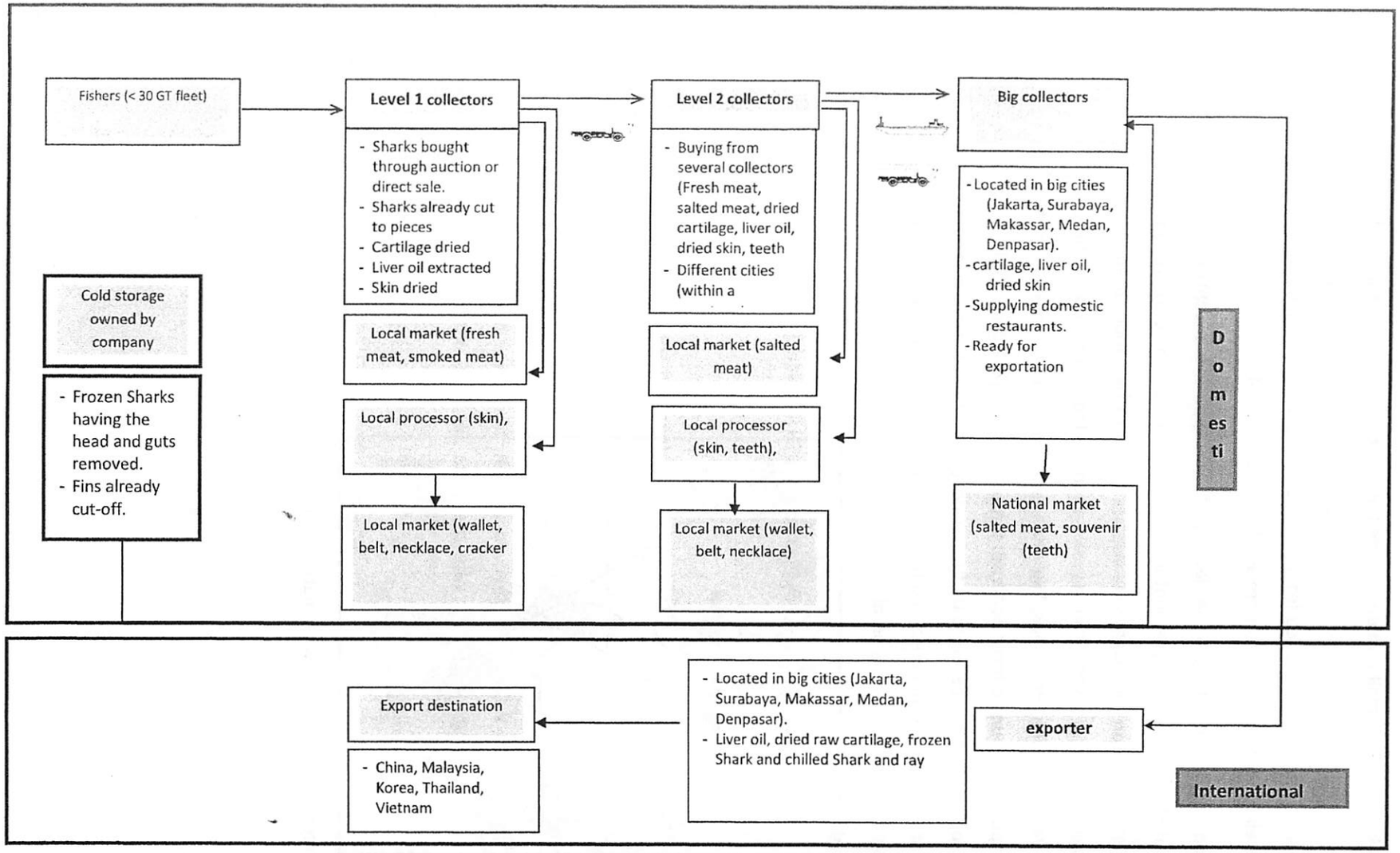

Figure 4.1. General pattern of trade in non-fin commodities – domestic and international export (Source : WCS unpublished data 2018)

Several international airports, such as Jakarta, Surabaya, Denpasar and Medan, are used by shark exporters to send their products abroad. Shark products from Cilacap are generally exported through Jakarta, with a small portion exported by sea transports to Japan, while those from Lombok (Tanjung Luar) are sent through Surabaya and Jakarta. The main countries where Shark products are exported from Indonesia include Japan, China, Taiwan and Hong Kong, as well as South Korea, Singapore and Malaysia (Figure 4.2).

The aforementioned major airports can be leveraged to support the control and monitoring system of Shark fishery management in Indonesia by establishing control and monitoring system at exit points for Indonesian shark products to be exported abroad. Shark products provided by fishing vessels in several regions in Indonesia such as those landed in Juwana, Pati, Rembang, Pontianak, Wakatobi and several other areas are not only intended for exports, but also to meet domestic consumer needs (Zainudin, 2011). To deal with this, a proper method is needed to be further developed to obtain specific data and information of Shark products that are marketed domestically and internationally so as to obtain results that can help answer the problems in shark marketing.

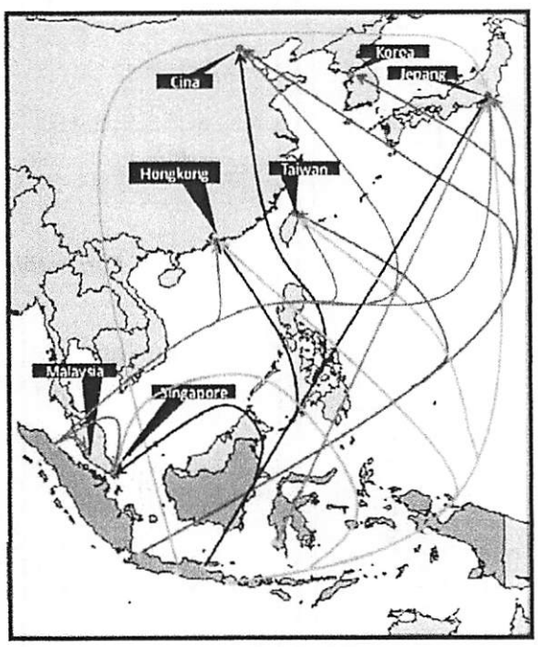

Figure 4.2. International trade flow of Shark products (Zainudin, 2011)

Silky shark products are traded along with other shark products. The fins are commonly put together with other requiem shark species based on the large size of the dorsal fin, which make their economic values relatively high. However, it is difficult to distinguish shark fin products by species when they are not attached to the body anymore due to their similarity in morphology of more than 20 is look alike species. There were some probability that silky sharks product could be include in 67% unidentified species product which exported. Identification issue was the biggest challenge for Indonesia to manage utilization of this species. However, in order to estimate the total length of the silky shark based on the size of dorsal fin product, an equation on relationship between total dorsal fin size and total length is used (Figure 4.3). The dorsal fin size is measured from the origin of dorsal fin base to the apex (tip of the fin).

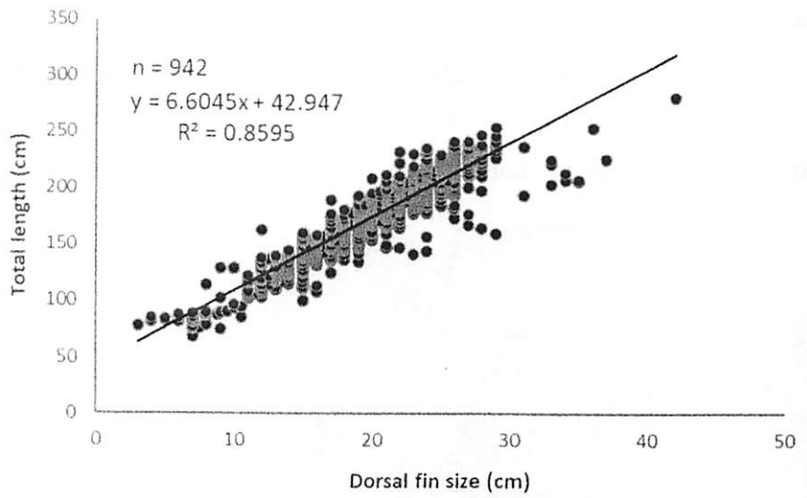

Figure 4.3. Relationship between dorsal fins size and total length of silky shark, *Carcharhinus falciformis* (LIPI, 2018-data processed)

4.3. Consumption

There is considerable qualitative and anecdotal evidence of domestic consumption of shark products in Indonesia, but limited quantitative data on the magnitude of the domestic market. Available information suggests that there are at least three types of consumers of shark and ray products in indonesia, depending on the product, geography and demographic group. Broadly, these groups are: luxury consumers, traditional consumers and passive consumers. Total volumes and values of these market segments are still not

well understood. Several regions in Indonesia were identified as centre of traditional and passive shark and ray product consumption.

Regions with traditional consumption are usually located in coastal areas, associated with shark fisheries. In these areas, shark meat provides a source of cheap, readily available animal protein and micronutrients, and therefore plays a role in food security. In some locations, shark consumption may be a tradition passed down through generations, with local beliefs relating to health and wellness benefits, or taste preferences. Passive consumption occurs in areas far from the coast, where people consume Shark meat salted or as fillets. In these cases Shark is marketed as generic fish (often salted fish, ikan asin), and people are not aware of the species of origin.

Based on anecdotal information, and semi-structured interviews with traders, the regions with the highest levels of Shark consumption in Indonesia are Java, Aceh and Lombok. Other regions such as Kalimantan, East Nusa Tenggara, and Papua were also identified as shark consuming regions, albeit less in volume. The type of shark consumption in these regions is dominated by traditional consumption of various meat products.

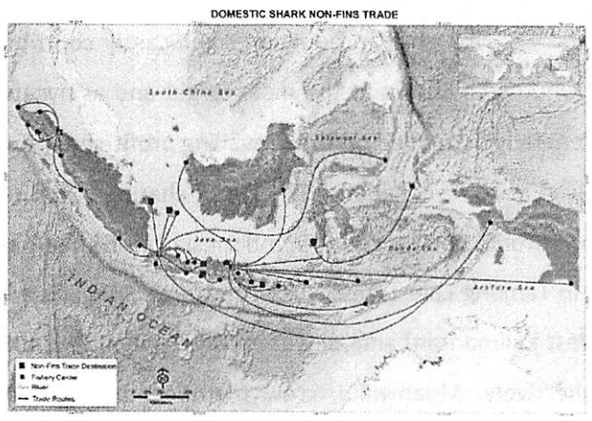

Figure 4.4. Trade chain for domestic trade in non-fin Shark commodities in Indonesia (Source: WCS unpublished data 2018)

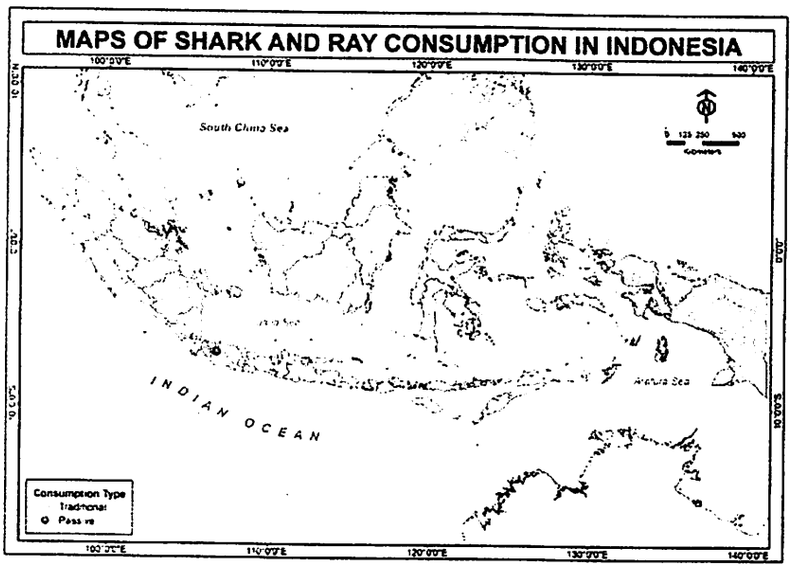

Figure 4.5. Shark and ray consumption distribution with categories (Source: Booth *et al.*, 2018).

4.4. Economic Values

A study of socio-economic aspects of shark fisheries was carried out in 2004-2005 in several regions in Indonesia. The results showed that shark production significantly contributed to the income of fishers, both those who catch Sharks as the main target and as bycatch. The income received by these fishers generally depended on the prevailing profit-sharing system, though wage system was also found in some locations. The profit-sharing system that is generally applicable in several Shark production locations in Indonesia can be seen in Table 4.1. For example, a crew member in Tanjung Luar (West Nusa Tenggara), Sungai Liat (South Kalimantan), and Sungai Kakap (West Kalimantan) annually earn IDR. 20.8 million, IDR. 24.1 million, and IDR. 8,5 million respectively. Meanwhile, crew members fishing sharks as bycatch in Kedonganan (Bali) and Batang (Central Java) each earn IDR. 27.7 million and IDR. 22.4 million annually (Table 4.2.)

Table 4.1. Profit-sharing system in several Shark producing locations in

Location	Profit-sharing system			
	Owner	Captain	Crew	Remarks
Tanjung Luar	⅓ of profit	⅓ of profit shared evenly among a number of crews + addition from owner(s)	⅓ of profit shared evenly among crews	Supplement for the captain (≈1 share of crew) set aside from owner(s)' s share
Kedonganan	½ of profit	-	½ of profit	Vessel operated only by

Location	Profit-sharing system			
	Owner	Captain	Crew	Remarks
Muara Angke	9/10 of profit	1/10 of profit	Rp. 18000/day	owner(s) and crews Wage of crew counted as operational cost
Sungai Liat	½ of profit	½ of profit shared evenly among a number of crews + addition from owner(s)	½ of profit shared evenly for a number crews	Supplement for the captain (≈½ share of crew) set aside from owner's share
Sungai Kakap	⅔ of profit	⅓ of profit shared evenly among a number of crews + addition from owner(s)	⅓ of profit shared evenly for a number of crews	Supplement for the captain (≈½ share of crew) set aside from owner(s)'s share

Source: LIPI (2005)

Table 4.2. Annual income of Shark fishers in several locations

Location	Income based on employments status (in thousands of rupiah/year)			Remarks (trip/year)
	Owner	Captain	Crew	
Tanjung Luar (Lombok)	146.076	41.734	20.860	14
Kedonganan (Bali)	27.720	-	27.720	240
Muara Angke (Jakarta)	25.352	4.472	4.320	4
Sungai Liat (Bangka)	132.864	36.240	24.144	48
Sungai Kakap (KalBar)	37.500	12.800	8.500	10

Source: LIPI data (2005)

The income difference made by shark fishers in these locations was related to the frequency of fishing activities. Incomes based on the types of Shark product business in several locations were also different. Fish salting business provided higher income (IDR. 32 million/ year) than Shark fillet business which generated IDR. 17 million/ year (Table 4.3).

The implication of this socio-economic study of shark fisheries is that efforts can be directed towards creating added values and formulating technical mechanisms to lower production, which is important for the development of the National Plan of Action for Sharks and Rays (NPOA Sharks and Rays) (Purnomo and Apriliani, 2007). Lowering production and increasing added values can be done by improving the processing quality. As stated earlier, the economic analysis pointed to the conclusion that shark commodities have contributed significantly to the income of fishers who either catch sharks as a target or bycatch.

Table 4.3. Incomes based on product type

Type of activity	Location	Estimated income (IDR/person)
Shark salting	Pangkal Pinang, Bangka Belitung	32.000.000/year
Shark meat cutting	Pangkal Pinang, Bangka Belitung	17.000/kg
Retailer	Muara Kintap, South Kalimantan	65.000/day
Wholesaler	Kurau, South Kalimantan	2.265.000/month
Porter service	Tanjungluar, Lombok	1.000/person/fish
Unloading labour	Muara Angke, Jakarta	300/fish
Cart service	Muara Angke, Jakarta	8.000 /cart
Loading labour	Muara Angke, Jakarta	20.000/truck

Sumber: data LIPI (years 2005)

The fact shark fishers needs to get a special consideration from stakeholders towards shark implementation management in Indonesia. With international pressures to conserve shark populations in nature, the Indonesian government is required to implement conservation efforts and limit shark catches. For this reason, the government needs to study further the implications of regulations that will limit or tighten Shark fishing activities among the fishers who are directly involved with the commodity. In addition, it is necessary to provide alternative livelihood beside shark fishery without changing the work pattern and culture of these fishers if restrictions are imposed in fisheries management zones in Indonesia.

CHAPTER-5

CURRENT MANAGEMENT EFFORTS

5.1. NPOA Shark Implementation

Since 2010, Indonesia has established the National Plan of Action for The Conservation and Management of Sharks (NPOA for Sharks and Rays) for the period 2010-2014. The NPOA consists of some following main programs, i.e. : (1) Reviewing the status of shark fisheries in Indonesia; (2) Improving data collection methods and data processing; (3) Strengthening the shark and ray research; (4) Management improvements; (5) Raising awareness of the vulnerability of sharks and rays; and (6) Institutional strengthening (Dharmadi *et al.*, 2015).

Many program activities were conducted over this period of time in the framework of NPOA mandate implementation, including: improvement in shark data collection format in terms of shark grouping from initially 1 to 5, stationing enumerators in shark landing sites in Indonesia, research on elasmobranch diversity in Indonesia, research on biological and fishery aspects, stationing observers in tuna fishing vessels, protection of sharks that are prone to extinction, information dissemination and public awareness raising activities and writing a book on the current status of shark fisheries in Indonesia.

The need for shark management at the global and national level also gave the support to develop the sharks and rays NPOA for the second period that takes into account the lessons learned from the 2010–2014 NPOA and the latest developments. NPOA 2010-2014 focused on data record, preliminary research, building awareness, institutional strengthening, and monitoring evulation.

The 2016-2020 NPOA for Sharks and Rays has several main objectives in a bid to improve sharks and rays management in Indonesia. The responsibilities attached to these objectives are shared among the relevant institutional stakeholders based on their tasks and functions. Government partners such as academics and NGOs are also expected to contribute to the management of Sharks and rays in Indonesia. The main objectives of the NPOA in this period include: (1) Preparing national regulations on sharks and rays management; (2) Implementing international regulations concerning sharks and rays management; (3) Improving the catch data acuracy of sharks and rays; (4) Protecting/ regulating the

exploitation of certain sharks and rays species that are prone to extinction, (5) Strengthening sharks and rays research efforts; and (6) Increasing stakeholder's understanding in sharks and rays management.

5.2. Fishing Regulation

Fishing vessel which operated in all Indonesian territorial waters must be registered and/ or have a permit issued by the government, both at national and local levels. Specifically, Existing regulations related to the shark management include:

1) **Ministry of Fisheries and Maritime Affairs Regulation No.12 of 2012 on High Seas Fishing Business,**

   The substance and conservation measures regulated in this regulation relating to shark resources management include: (1) prohibition of capturing juvenile and pregnant sharks, (2) obligation to release thresher sharks caught alive, and (3) obligation to land whole shark at the fishing port.

   Prohibition of taking juvenile and pregnant sharks maintains resources sustainability as it means that sharks are given the opportunity to regenerate. One of the issues found in shark fisheries is shark finning, and this regulation seeks to ensure that sharks are not caught only for their fins, but also their other body parts. On the other hand, this regulation is also expected to reduce the number of bycath sharks taken in due to the limited vessel capacity. Nevertheless, this regulation is intended only for high seas fishery. More generate regulation that can cover all shark-related fishery is needed for management improvement.

2) **Ministry of Fisheries and Maritime Affairs Regulation No.Per.18/MEN/2010 on Fishing Log Book.**

   This regulation obliges every fishing vessel which has the SIPI (Fishing License) to fill out the fishery log book, which among others, contains reports on fish species caught including silky shark. Specifically for sharks, pictures of some common shark species are also provided along with this log book as a guide and to facilitate fishers for data recording.

3) **Ministry of Fisheries and Maritime Affairs Regulation No.1/Permen-KP/2013 on the Fishing Vessel and Fish Transportation Vessel Observers.**

As the personnel assigned to monitor fishing vessels are better known as observers, this regulation is also known as Ministerial Regulation on Observers. Monitoring activities to obtain objective and accurate data on fishing and fish transporting obtained directly on board of both fishing and fish carrying vessels.

For vessels operating in the high seas, stationing observers are only obligatory for those using purse seines and longlines. Meanwhile, vessels carrying out fishing activities in Indonesian FMA zones are obliged to station observers when they use the following gears: lines, surrounding nets, lift nets, gill nets, seine nets and mini trawls.

5.3. Protection Efforts – Critical Habitat Protection

It is generally understood that coral reefs, seagrass beds and mangrove forests are spawning areas for various types of fish. Up to present, Indonesia has established around 15.7 million hectares of conservation area, one function of which is to protect spawning and nursery grounds for various types of fish, including sharks.

In addition to the development of marine conservation areas, several local governments in Indonesia, particularly Raja Ampat Regency in West Papua Province and West Manggarai Regency in East Nusa Tenggara Province have issued local regulations concerning the prohibition of shark fishing in the area under their jurisdiction. The decision by these provinces to ban shark fishing is also made under marine tourism considerations as sharks are one of the diving attractions in these regions.

5.4. Awareness Programs and Supervision

As a respond for shark listing on CITES Appendix II, the Ministry of Marine Affairs and Fisheries as the party authorized in fishery management is responsible to provide the information on the management of those listed sharks to relevant stakeholders such as: fishers, traders, quarantine officers, supervision officers and relevant regional governments. In 2013, public consultation activities have been conducted involving fishers

in several locations (Aceh, Sibolga, Tanjung Luar, Jakarta) on the provisions of CITES concerning international trade of shark listed on CITES appendix II and the issue of look-alike species. Socialization activities specifically aimed to exporters were only conducted in Surabaya – East Java. Other locations such as North Sumatra, NTB, Sulawesi and Jakarta were covered in 2014. Furthermore, as a follow up to the results of the 17th CITES CoP, awareness program and public consultation sessions on the development of shark and ray management policies were held in 2017 in Aceh, Jakarta, Cilacap, Banyuwangi, Surabaya, Denpasar, NTB, Pontianak, Makassar and Sorong.

CHAPTER-6

NDF'S RECOMMENDATION

Based on the data and information presented in the previous sections in this document, to maintain the viability of silky sharks in their natural habitat and to reduce the threat of species extinction from international trade in accordance with CITES provisions, the Management Authority needs to take the following NDF steps:

6.1. Preparing of Sharks Production Data and Potentials for Every Spesies/Genus listed on Appendix II CITES;

From 2005 to 2014, shark production data in the national fisheries statistics are categorized into five major groups, i.e.: (1) Alopiidae, thresher shark / *Alopias* spp; (2) Carcharhinidae, requiem sharks / several species of the genus *Carcharhinus*; (3) Lamnidae, mako shark/ *Isurus* spp; (4) Sphyrnidae, hammerhead shark/ *Sphyrna* spp; and (5) Squalidae and Centrophoridae, dogfish sharks group. In order to facilitate the data requirement for CITES list species, since 2015, the group of requiem sharks has been devided into four species and one group, i.e.: the oceanic whitetip shark *Carcharhinus longimanus*, the silky shark *Carcharhinus falciformis*, the tiger shark *Galeocerdo cuvier*, the blue shark *Prionace glauca*, and other requiem sharks group. In addition, all captured shark CITES species that must be recorded completely, including the size, sex, fishing location and other related information, in order to collect production data and catch per unit effort (CPUE). However, there are some potential problems encountered in collecting these data, such as the large number of fish landings, limited personels, and limited capacity of the field data collectors in identifying different shark species due to similarity in their characteristics. A guideline featuring different sharks along with their characteristics and data collection format have been provided to address this issue. Nevertheless, trainings on shark identification is still needed. At the initial stage, the data collection is prioritized to be carried out at shark landing sites by trained enumerators.

Assessment for silky shark population is also needed to improve the data collection in capture fisheries. The data from this assessment will serve as an important input for a better policy making. In addition, the silky sharks are performing migration, even crossing national

boundaries. This type of shark migration needs to be treated with a population study at regional level, so that fishing quota regulation can also be imposed regionally.

6.2. Regulations on size limitation for captured sharks;

Many silky sharks that are caught and landed in Indonesia were still in juvenile and sub-adult stage, or in immature condition. This condition becomes a major concern for its conservation status. In order to minimize the capture of imature silky sharks, it is necessary to improve the selectivity of fishing gear used by the fishermen, installing shark excluder device for non-targeted shark fishing gear, and managing the fishing area. In addition, it is also important to improve the knowledge and awareness of fishing communities to act appropriately when small-size sharks are caught in their fishing gear by releasing them back to the sea.

Restricting in the size of silky shark that are allowed to be caught is one of the important instruments in maintaining the sustainability of shark resources. The captured silky sharks should ideally be those in adult size, which they presumably have had the opportunity to reproduce for the sustainability.

One of regulation about concerning procedures for the exploitation of fish species and fish genetics had been done, i.e Regulation of the Minister of Marine Affairs and Fisheries 4/2010. This regulation focuses on the procedures for limited utilization of protected fish species and species of fish, including Sharks, for which international trade is regulated by the CITES convention. Other regulations that can be made related to the size limitation, e.g.: 1) a regulation to control the shark trade. Only mature sharks that are allowed for trade, both in national and international markets. Whilst immature sharks, which are not meet the size limit requirement, could not be traded but they can only be consumed locally; 2) a regulation for the tuna gillnet fishery to avoid capturing immature sharks and have obligation to release them back to the sea. All regulations can be implemented if they are accompanied by a strick law enforcement.

6.3. Protection of critical habitat (mating and nursery grounds)

Another instrument that can be implemented to preserve silky shark is by protecting some of their critical habitats (mating and nursing habitats). Looking at the development in the regulations being passed and the high commitment of the current Indonesian government,

there is a reason to be optimistic that habitats for silky sharks at their critical phases can be designated as conservation areas. The constraint that may be faced in the development of these conservation areas is the limited data and information about the location of the mating and nursing grounds of these species, hence there is a need to conduct more research related to this issue for related research institutions.

6.4. Control over exploitation rate through permit mechanism

Export demands for sharks, especially the fins are quite high. It is necessary to regulate a mechanism (fin size) in their exploitation. Before silky shark were listed on in Appendix II of the CITES, there were no specific regulations available concerning the international trade of shark fins. Licensing is needed to facilitate the monitoring of the utilization of sharks, especially those listed on CITES Appendix II. The first step that can be taken is by registering all shark exporters as well as domestic middlemen and traders. With the domestic stocking and exports of shark fins including those of silky shark only allowed for registered businessmen, the monitoring task will be easier to do.

One of the obstacles that may be faced in controlling this rate of exploitation is the difficulty in species identification. To be able to anticipate this problem, a guide to the introduction of silky shark has been produced (covering information about the entire body these species including their fins in fresh, dry and ready to export conditions) and its distributed to Technical Implementation Unit under MMAF and used by observers. This introduction needs to emphasize on the fin characteristics, because it accounts for the majority of shark body parts exported. Training for officers has been done to be provided, but we need to improve more quantity and quality of officers, so they can perform their controlling task, both when the sharks are landed and when the fins are traded.

In relation to the shark fin trade for CITES listed species, it is required to separate CITES shark species products from other non-CITES shark species since in the first landing site and labelled appropriately. The most ideal market system for CITES species product is registering each individual with unique barcode number. This barcode number will be used as an identification of the CITES product until the export level. Therefore, the international trade for the fins of CITES shark species should be sold per individual as one set with barcode number attached. However, this ideal mechanism is almost imposible to be implemented in Indonesia in the near

future due to this mechanism requires an integrated online-based system and only suitable for a big capital industrial business. The most possible option for CITES shark fins trade in Indonesia is implementing CITES regulation to all shark fins that look alike the CITES species product. All shark fins from the requiem sharks (Carcharhinidae) should be traded using CITES mechanisms to ensure their legallity, traceability and sustainability.

6.5. Shark-finning ban

Sharks-finning is the activity of capturing sharks with the intention of only taking the fins by cutting them off and throwing the rest of the body at sea, a practice that potentially affect silky shark, given their comparatively large fins. These fins are often cut off when the sharks are still alive, a practice considered cruel, indeed, but also a waste of resources. A shark's fin is only about 5% of the total weight of a shark, meaning that 95% of the shark's biomass is wastefully discarded at sea. To be able to stop this practice, there is a need for a national policy that prohibits sharks-finning actions and requires that all sharks caught be landed whole (body with fins still attached) at fishing ports. This policy is believed to not only decrease the number of sharks captured (vessel's hold capacity is generally limited and reserved for target fish, such as tuna), but also promote the use of shark's other body parts to be processed into products of economic values. It goes without saying that this policy of landing sharks in whole is only applicable to sharks that are of adult size or not protected by the law. When they are accidentally captured, pregnant and juvenile of silky shark must always be released back into nature alive.

6.5. Limiting the amount of catches through quota system;

Quota is defined as the maximum number (biomass) of fish that can be captured/caught without jeopardizing their viability. Knowledge of the biological aspects of silky shark obtained is an important matter to know to determine the capture fishing quota besides the data and information about the status of the population to be exploited.

Specifically for silky shark listed on CITES appendix II, in the short term catch quota restrictions can serve as a basic step in limiting capture fishing rate, but in the long run quota regulation should be based on population potential database. As of now, the only available data are those

of production (number of fish caught) under five different groups as previously explained, which is not sufficient to determine fishing quota.

Another element worth considering is the mechanism and effectiveness of supervision at the field level. The capture quota set out will not be effective when the supervision capability is not yet optimal, traceability system is non-existent, and information about the origin of fishery products is not yet recorded properly down to individual level. This is a problem that stems from the fact that the extent of the territorial waters to monitor is not dealt with a sufficient number of supervising personnel at the field level. The fact that most sharks are caught as bycatch will also make it difficult to enforce fishing quota.

CHAPTER-7

CLOSING

Considering the available data and the conditions of shark fisheries in Indonesia within the last decade, the NDF analysis following the NDF guidance for Elasmobranch species (see Appendix), and the existing and ongoing management measures that have been taken by the government, LIPI (Indonesian Institute of Sciences) as a scientific authority of Indonesia, found that the silky shark population in Indonesian waters has not been facing a serious threat if they are managed properly. Therefore, a positive NDF can be issued with conditions. International trade for silky shark product can be made if the management authority has fulfill all recommendations as mentioned in Chapter 6.

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APPENDIX

CITES Non-Detriment Findings (NDF) Guidance for Silky shark in Indonesia

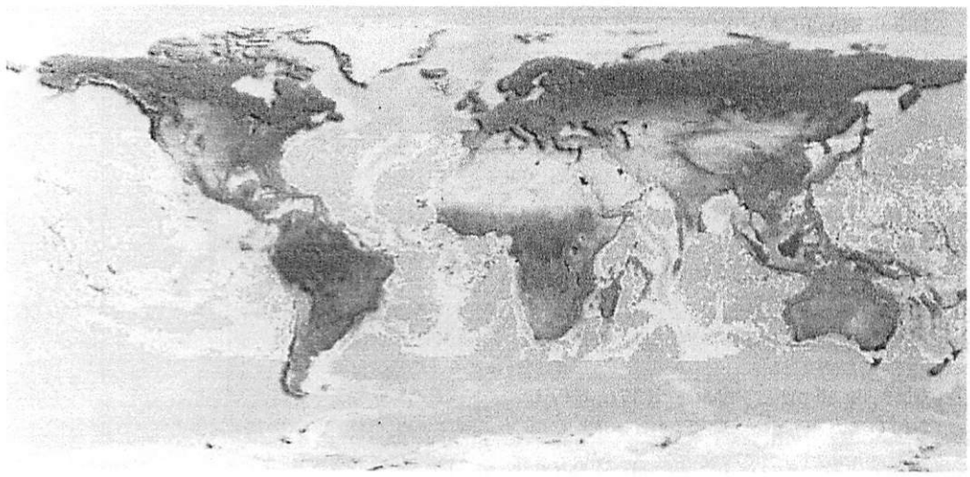
<table>
<tr><th colspan="4">Worksheet for Step 1</th></tr>
<tr><th colspan="4">Question 1.1 (a)
Is the specimen subject to CITES controls?
(How did you identify the species?)</th></tr>
<tr><td colspan="4">See pages 64–65 of Annex 1 for additional Guidance Notes on completing this Worksheet.</td></tr>
<tr><td>Species Name</td><td>Product Form</td><td>CITES Appendix</td><td>Source of Identification</td></tr>
<tr><td>Carcharhinus falciformis</td><td>Fins: dried (whole/striped)
Cartilage: dried/powder
Skins: dried
Meat: dried/frozen/salted
Teeth : accessoris
Liver: oil</td><td>II</td><td>• Visual identification base on morphology.
• DNA test.</td></tr>
<tr><td colspan="4"><u>NEXT STEPS</u></td></tr>
<tr><td rowspan="3">In view of the above, is the specimen subject to CITES controls?
Consult 'Decision and Next Steps' guidance in Annex 1</td><td>YES</td><td colspan="2">GO TO Question 1.1 (b)</td></tr>
<tr><td>NOT CERTAIN</td><td colspan="2">Describe concerns in more detail below, and GO TO Question 1.1 (b)</td></tr>
<tr><td>NO</td><td colspan="2">NDF is not required</td></tr>
<tr><td>Concerns and uncertainties:</td><td colspan="3"></td></tr>
</table>

Worksheet for Step 1 (continued)		
Question 1.1 (b) **From which stock will the specimen be taken/was the specimen taken?** **(Can origin and stock be confidently identified)**		
See pages 66–67 of **Annex 1** for additional Guidance Notes on completing this Worksheet.		
	Description/comments	**Sources of information**
Ocean basin	Silky shark has a circumglobal distribution in tropical waters.	Last and Stevens, 2009 IUCN website (http://www.iucnredlist.org)
Stock location/ distribution/ boundaries (attach a map in Annex 1)	See Chapter 2 page 6-7; See chapter 3 page and 12-13	See Chapter 2 page 6-7; See chapter 3 page and 12-13
Is this a shared stock (i.e. occurring in more than one EEZ[1] and/or the high seas)?	Yes, there is a possibility of homogenity stock among adjacent countries such as Australia, Timor Leste, Malaysia, Fipilina, Papua New Guinea and Palau. Genetic studies found that in the Pacific, there are potentially three stocks; one stock in the western Pacific and two stocks in the eastern Pacific (north and south) separated by the equator There is no quantitative stock assessment or basic fishery indicators currently available for silky shark in the Indian Ocean therefore the stock status is uncertain.	Based on official record (Logbook and Data base MMAF) Blaber *et al.*, 2009 Ovenden *et al.*, 2008 Aires-da-Silva *et al.*, 2014 IOTC website (www.iotc.org)
If the stock occurs in more than one EEZ, which other Parties share this stock?	Occurs across Indo-West Pacific. In the Indo-Pacific includes Myanmar, Thailand, Viet Nam, China (including Chinese Taipei), Japan, Philippines, Australia (all CITES Parties) and Pacific Island countries (majority of which are CITES Parties, or Competent Authorities Indian ocean has no clear status stock, so it is possibility of homogeneity stock among countries in Indian Ocean such as Australia, Malaysia, Bangladas, Myanmar, Sri Lanka, Bahrain, UEA, India, Irak, Iran,	IUCN Brouwer and Harley, 2016 Baum *et al.*, 2007 Simpfendorfer and Rigby, 2016

[1] Exclusive Economic Zone

	Israel, Kuwait, Maldives, Oman, Pakistan, Qatar, Singapore, Thailand, Timor Leste, Yaman, Yordania, South Africa, Djibouti, Eritrea, Kenya, Komoro, Madagascar, Maurutius, Egypt, Mozambic, Seychelles, Somalia, Sudan, and Tanzania.	
If high seas stock, which other Parties shark this stock?	Depends which high seas area specimens for export are captured. (see data from WCPFC, IOTC, CCSBT and country member of RFMO and IOTC).	
Which, if any, RFB[2](s) cover(s) the range of this stock?	In Indo-Pacific region- WCPFC and IOTC. Globally all other RFMOs- IATTC, ICCAT, NAFO, GFCM, CCBST, SEAFO.	Simpfendorfer and Rigby, 2016
Are all Parties listed above (which fish or share the stock concerned) members of the relevant RFBs?	In the Indo-Pacific, yes (except Myanmar and Viet Nam) India-IOTC Myanmar- none (as far as can ascertain) Thailand -IOTC Viet Nam - none (as far as can ascertain) China - WCPFC, IOTC, IATTC, ICCAT Japan - WCPFC, IOTC, IATTC, ICCAT Sri Lanka-IOTC Philippines- WCPFC, IOTC, ICCAT Pacific Island countries- WCPFC	WCPFC website (http://www.wcpfc.int) IOTC website http://www.iotc.org/
Are there geographical management gaps?	High seas	
How reliable is the information on origin?	Most reliable. Data official from published journal and government.	
NEXT STEPS		
Is information on origin sufficiently detailed for Question 1.2 to be answered?		YES
Consult "Decision and Next Steps" guidance in **Annex 1**. **(Apply this answer at end of Question 1.2)**		NO

[2] Regional Fisheries Body



Annex 1. Distribution map of *Carcharhinus falciformis* (Source: Computer generated distribution maps for *Carcharhinus falciformis*, silky shark with modelled year 2100 native range map based on IPCC A2 emissions scenario. www.aquamaps.org, version of Aug. 2016. Web. Accessed 27 Nov. 2017).

	Highly distributed,
	Moderate distributed
	Low distributed

Worksheet for Step 1 (continued)		
Question 1.2 **Was (will) the specimen (be) legally obtained and is export allowed?**		
See pages 67–68 of **Annex 1** for additional Guidance Notes on completing this Worksheet.		
Is the species:	**Description/comments**	**Sources of information**
Protected under wildlife legislation, a regional biodiversity Agreement, or (for a CMS[3] Party) listed in CMS Appendix 1?	CITES Appendix II, CMS Appendix II (note: Indonesia is not a party of CMS). There has not been any regional arrangement involving Indonesia that is particularly mentioned the protection silky shark species.	CITES website (https://cites.org/eng/prog/shark) CMS website (http://www.cms.int/en/page/appendix-i-ii-cms)
Sourced from illegal fishing activities (e.g. in contravention of finning regulations, or where a TAC[4] is zero or exceeded)?	Shark finning potentially still occurred in high seas (Tuna vessel).	Based on local information and fisher report. Jaiteh *et al.*, 2016a
Taken from a no-take marine protected area or during a closed season?	Zero. All no-take MPA strictly prohibited. Indonesia implemented multi-utilization MPA through zoning system with no take zone and limited utilization zone. It is prove that MPA have benefits to sharks and rays population recovery.	Conservation in Indonesia (PP. No 60/2017, Ministerial regulation no 17/2008). Jaiteh *et al.*, 2016b
Taken in contravention of RFB recommendations, if any?	Zero Most silky shark are harvested form territorial water. Indonesia has adopted RFB's provisions into national legislation. Note : IOTC has no regulation for silky shark **WCPFC resolution**	Ministerial regulation no 12/2012. Ministerial regulation no 30/ 2012 Ministerial decree no 107/2015 IOTC website (www.iotc.org) WCPFC (https://www.wcpfc.int/)
Listed as a species whose export is prohibited?	**Since October 2017 export permit for silky shark could not issued**	Director Conservation Marine and Biodiversity Decree No.2078/PRL.5/X/2017, Directorate General of Marine Spatial Management.
Of concern for any other reason?	No NDF formulation. There were unrecorded data in some location (ex. outer island),	Ministerial regulation no 12/2012. Ministerial regulation no 30/ 2012 Ministerial decree no 57/2014

[3] Convention on Migratory Species
[4] Total Allowable Catch

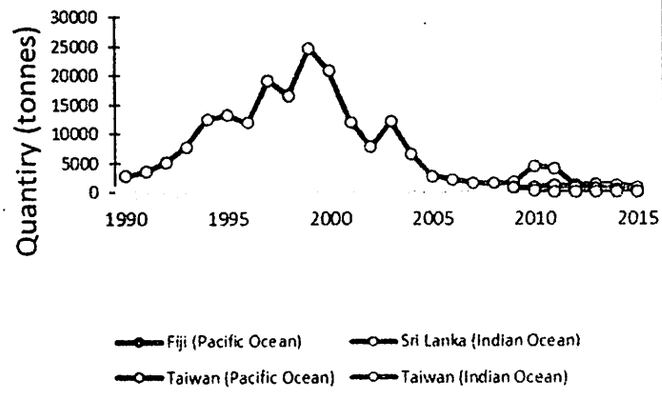
	but transhipment and shark finning had prohibited by government regulation.	
NEXT STEPS		
In view of the above and the final section of the Worksheet for Question 1.1(b), was the specimen legally acquired and can exports be permitted? Consult "Decision and Next Steps" guidance in **Annex 1.**	YES	**GO TO Question 1.3**
	SOME DOUBT (Concern shark as high seas commodity)	Describe concerns in more detail below, and **GO TO Question 1.3**
	NO	Export cannot be permitted, **NDF is not required**
Concerns and uncertainties:	Silky shark is banned to export in certain periods, but domestic utilization still occurs. Data recording on illegal fishing such as shark finning is still not done comprehensively due to the limited access.	

Worksheet for Step 1 (continued)		
Question 1.3 **What does the available management information tell us?**		
See pages 69 and Table A of **Annex 1** for additional Guidance Notes on completing this Worksheet.		
Part 1. Global-level information		
	Description/comments	**Sources of information**
Reported global catch	Total catches of the silky shark reported to FAO are mainly from Sri Lanka (Western Indian Ocean) the FAO catch less than 4,000 tonnes (t) from 2005-2009 before doubling in 2010 and 2011. Catches then decreased to ~5,000 t in 2012 and 2013.	FAO, 2015
Species distribution	See chapter 2 page 6-7	See chapter 2 page 6-7
Known stocks/populations	Silky shark population structure is poorly understood. Genetic studies found that in the Pacific, there are potentially three stocks: one stock in the western Pacific and two stocks in the eastern Pacific (north and south) separated by the equator Indices of relative abundance for the silky shark in the eastern Pacific Ocean (EPO), developed from purse-seine catch-per-set, were updated with data from 2016. The index for all silky sharks north of the equator (north EPO) shows a large decrease in 2016 relative to 2015 A stock assessment for the Western Central Pacific Ocean (WCPO) estimated that the 2009 fishing mortality of Silky shark exceeded the fishing mortality producing maximum sustainable yield by over four times This level of fishing mortality is estimated to have depleted the total stock biomass by 70% from the theoretical virgin stock biomass and is indicative that overfishing has occurred Genetic studies found that in the Pacific, there are potentially three stocks; one stock in the western Pacific and two stocks in the eastern Pacific (north and south) separated by the equator There is no population study available for silky shark in the Indian Ocean therefore the stock structure is uncertain or not assessed yet Population of silky shark appear to be isolated in relatively small spatial scale, at least in the Indo-Pasific	Lennert-cody *et al.*, 2017 Rice and Harley, 2013 IUCN website (www.iucnredlist.org) Clarke *et al.*, 2012
Main catching countries	Iran, Sri Lanka, Taiwan, Angola (Angola, Cabinda); Anguilla; Antigua and Barbuda; Australia (Coral Sea Is. Territory, Northern Territory, Queensland, Victoria, Western Australia); Bahamas; Bangladesh; Barbados; Belize; Benin; Brazil (Rio de Janeiro, São Paulo); Brunei Darussalam; Cambodia; Cameroon; China; Colombia (Colombia (mainland), Colombian Caribbean Is.); Comoros; Congo; Congo, The Democratic Republic of the;	IOTC website (www.iotc.org) IUCN website (www.iucnredlist.org)

	Costa Rica (Cocos I., Costa Rica (mainland)); Côte d'Ivoire; Cuba; Djibouti; Dominica; Dominican Republic; Ecuador (Ecuador (mainland), Galápagos); Egypt; El Salvador; Equatorial Guinea (Annobón, Equatorial Guinea (mainland)); Eritrea; French Guiana; Gabon; Gambia; Ghana; Grenada; Guadeloupe; Guatemala; Guinea; Guinea-Bissau; Guyana; Honduras (Honduran Caribbean Is., Honduras (mainland)); Hong Kong; India (Andaman Is., Laccadive Is., Nicobar Is.); Indonesia (Bali, Jawa, Sulawesi, Sumatera); Iran, Islamic Republic of; Jamaica; Kenya; Liberia; Madagascar; Malaysia (Sabah, Sarawak); Martinique; Mauritania; Mexico (Baja California, Campeche, Colima, Guadalupe I., Veracruz, Yucatán); Montserrat; Morocco; Mozambique; Myanmar (Coco Is., Myanmar (mainland)); New Caledonia; New Zealand (North Is., South Is.); Nicaragua (Nicaragua (mainland), Nicaraguan Caribbean Is.); Nigeria; Oman; Pakistan; Panama; Papua New Guinea (Bismarck Archipelago, North Solomons, Papua New Guinea (main island group)); Peru; Philippines; Portugal (Madeira, Portugal (mainland)); Puerto Rico (Puerto Rico (main island)); Saint Lucia; Saint Vincent and the Grenadines; Saudi Arabia; Senegal; Sierra Leone; Somalia; Spain (Canary Is., Spain (mainland)); Sri Lanka; Sudan; Suriname; Taiwan, Province of China; Tanzania, United Republic of; Thailand; Togo; Trinidad and Tobago; Turks and Caicos Islands; United States (Florida, Georgia, Hawaiian Is., Louisiana, Massachusetts, New Jersey, New York, North Carolina, Rhode Island, South Carolina, Texas, Virginia); Venezuela, Bolivarian Republic of (Venezuela (mainland)); Viet Nam; Virgin Islands, British; Western Sahara; Yemen (North Yemen, Socotra, South Yemen)	
Main gear types by which the species is taken	See chapter 3 page 11-12	See chapter 3 page 11-12
Global conservation status	See chapter 2 page 7	See chapter 2 page 7
Multilateral Environmental Agreements	CITES Appendix II, reservation by Japan (WCPFC CITES Party) CMS Appendix II, reservation by Australia Sharks MoU Annex 1	CITES (cites.org/eng/prog/shark/index.php) CMS (www.cms.int/en/species) Sharks MoU (www.cms.int/sharks/en/mos2)
Part 2. Stock/context-specific information		
Stock assessments	Notwithstanding the difficulties inherent in the input data, the size composition data shows consistent declines over the period	Rice and Harley, 2013 IOTC website

	1995-2009 which is coupled with increasing fishing mortality, and a recently declining CPUE trend in West Pacific Ocean No stock assessments for the Indian Ocean Stock have been done. Due to the lack of data, a stock assessment is currently not feasible. To estimate a global population trend, the three generation population trends estimated from standardized CPUE data for each region (and the spawning biomass from the WCPO) were weighted according to the relative size of each region's surveyed area. This assumed that Silky shark is evenly distributed throughout its surveyed range. For the Eastern Central and Southeast Pacific, the estimated declines in the north (60% and 17%; with and without 1994 data respectively) and the 99% decline for the south were used for the Western Central Pacific Ocean, a 34% decline was used; and in the Atlantic Ocean, as the three generation decline estimates data were so similar, the average of the two estimated declines was used, that is, 97%. The estimated weighted global population trend is a 47-54% decline over the equivalent of three generation spans. This is a best estimate based on the most reliable data currently available from each region.	(www.iotc.org) IUCN website (www.iucnredlist.org) Aires-da-Silva *et al.*, 2014; Cortés, 2002; Rice and Harley, 2013; Cortés *et al.*, 2007
Main management bodies	WCPFC for the Indo-West Pacific stock in the Western and Central Pacific Ocean, IOTC in the Indian Ocean, CCSBT Other global areas, IATTC, ICCAT, NAFO, CCBST, GCFM, SEAFO	Lack, *et al.* 2014; Simpfendorfer and Rigby, 2016
Cooperative management arrangements	Silky shark is a highly migratory species and the relevant RFMOS are: WCPFC, IATTC, ICCAT, IOTC, and NAFO. Within the Pacific Ocean, SPC and FFA are also involved in data management and monitoring and surveillance. Silky shark usual caught with blue shark which caught as by catch in high seas fisheries. An advisory body (Council of Regional Organisations in the Pacific) facilitates cooperation between RFMOs. The ABNJ project is also aiming to improve cooperation between tuna RFMOs.	UNCLOS Annex 1 www.un.org/unlcos/annex1; http://www.commonoceans.org/home/en/ Lack *et al.*, 2014, Clarke and Nichols 2015, Simpfendorfer and Rigby 2016
Non-membership of RFBs	The main catching country of silky (general) in the Indo-West Pacific is Taiwan, which is a member of WCPFC. Countries in the Indo-West Pacific where this species occurs are all members of WCPFC or IOTC except Myanmar and Viet Nam. The main catching country of silky (general) in the Indian Ocean is Iran and Sri Lanka, both of them are member of IOTC.	FAO, 2017
Nature of harvest	Taken as target, by product and bycatch. Fishing effort is not evenly spread across Indo-West Pacific stock; Overall, there were 20 species of shark caught in west Indian Ocean by Indonesia fishers and Silky shark contributed 13% of shark catches.	Baum *et al.*, 2007, FAO 2017 Dharmadi *et al.*, 2016

	The main catching country of silky (general) in the Indian Ocean is Iran and Sri Lanka. Number of nature harvest in Indian Ocean ~3000 t. The Silky shark is the second most caught species of shark globally, after the Blue Shark (*Prionace glauca*). The Silky shark is both targeted or caught as incidental (bycatch) by longline fisheries and purse seine fisheries (especially those using drifting fish aggregating devices [FADs]) as well as by artisanal fisheries. FADs are made of a floating object and nets that lie vertical in the water column to attract schools of fish. The Silky shark, as well as other species, is easily entangled in the nets; and there have been large increases in the use of FADs since 1996 Whether they are targeted or an incidental catch, the Silky shark is often either retained for its meat and fins where regulations allow, or released with high mortality rates apparent in the tropical purse seine fisheries. Total catches of the Silky shark reported to FAO are mainly from Sri Lanka (Western Indian Ocean) with the FAO catch less than 4,000 tonnes (t) from 2005-2009 before doubling in 2010 and 2011. Catches then decreased to ~5,000 t in 2012 and 2013	IOTC website (www.iotc.org) IUCN website (www.iucn.org) Hutchinson *et al.*, 2015; Leroy *et al.*, 2013; Oliver *et al.*, 2015 FAO 2015 Fahmi and Dharmadi, 2015
Fishery types	1. Small scale fisheries: by catch and target 2. Fishing gear which used : handline, bottom longline, drift longline, gillnet, purse seine. 3. Scale of fisheries: small scale (territorial) and commercial (high seas in Indian Ocean)	Fahmi and Dharmadi 2013; 2015 Dharmadi *et al.*, 2002
Management units	In the Pacific region, the main body responsible is WCPFC. In Indian Ocean region, the main body responsible is IOTC. Gaps in regional management are in the Areas Beyond National Jurisdiction (ABNJs). And CCSBT National level: (Ministry of Marine Affairs and Fisheries)	WCPFC website : www.wcpfc.int IOTC website : www.iotc.org CCSBT website : www.ccsbt.org MMAF website : http://kkp.go.id/
Products in trade	Fins are the main product. In some cases, meat, skin, cartilage , liver, and jaws are also traded. Export volume of sharks fins are increasing from 2014 – 2016. By 2016, total 800,15 Tonnes of shark fins is exported.	CITES 2013a, Field *et al.*, 2009 Ministry of Marine Affair and Fisheries 2017.
Part 3. Data and data sharing		
Reported national catch(es)	See chapter 3 page 8-10	See chapter 3 page 8-10
Are catch and/or trade data available	Added IOTC catch 2015 ~3200 t, Trade data reported by some Pacific countries to FAO.	IOTC website (www.iotc.org)

from other States fishing this stock?		
Reported catches by other States	 Based on FAO's only three countries that reported catches of silky shark in the Pacific and Indian Ocean, i.e. Fiji, Taiwan and Sri Lanka. It also showed the dramatic decline of this species	FAO. 2017. Fishery and Aquaculture Statistics. Global capture production 1950-2015 (FishstatJ). In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 2017. www.fao.org/fishery/statistics/software/fishstatj/en
Catch trends and values	See chapter 3 page 9	See chapter 3 page 9
Have RFBs and/or other States fishing this stock been consulted during or contributed data during this process?	No	

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NEXT STEPS

The information collated in the above worksheets can now be passed to the Scientific Authority, so that the NDF process can begin with Step 2

1.3. Compile Information on Management Context

The silky shark is taken in very large numbers in target and bycatch fisheries and is an economically important retained and utilised catch of large tropical oceanic pelagic fisheries. Products from these fisheries supply international market demand for shark fins. Silky shark fins are very distinctive, identified at species level by the dried marine products industry, and of high quality and value. In the early 2000s, the species comprised around 3.5% of the international shark fin trade – By 2013, the proportion of silky shark fins in the market had increased to levels as high as 7.47% (median 4.67). This shows that current global management of this species is insufficient, and that despite global declines the demand for this species fins continues to rise, and without proper regulation these declines will continue (Prop. 42, CITES CoP17).

Global capture production from FAO showed that production of Silky shark was increasing from 1990 until 2000 by 400%. From 2000 until 2014, global production of Silky shark was decreasing and stable under 10.000 tonnes per year.

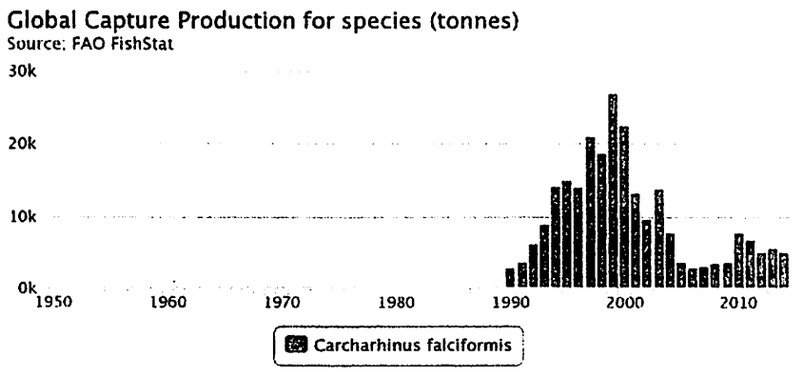

Figure 2. Global Capture Production of *Carcharhinus falciformis* 1990-2014 (FAO Global Capture Production, 2014)

Worksheet for Step 2		
Question 2.1 **What is the level of intrinsic biological vulnerability of the species?**		
• See pages 73–75 of **Annex 1** for additional Guidance Notes on completing this Worksheet. • In the Worksheet below, circle **the level of vulnerability** associated with each **Intrinsic Biological Factor**. Default indicator/metric figures for listed shark and ray species are provided in **Annex 4** (pages 111-131). These may be inserted here, but they are derived from international standardised data and may not reflect local stock characteristics. Wherever possible, verified local data on stocks should be utilised.		
Intrinsic biological factors *(see page 73 of the Guidance Notes)*	**Level of vulnerability** *(circle or highlight as appropriate)*	**Indicator/metric** *(see page 73 of the Guidance Notes)*
a) Median age at maturity	Low	
	Medium	See chapter 2 page 5
	High	
	Unknown	
b) Median size at maturity	Low	
	Medium	See chapter 2 page 5
	High	See chapter 2 page 5
	Unknown	
c) Maximum age/longevity in an unfished population	Low	
	Medium	See chapter 2 page 5
	High	See chapter 2 page 5
	Unknown	
d) Maximum size	Low	
		See chapter 2 page 6

	Medium	
	High	See chapter 2 page 5
	Unknown	
e) Natural Mortality rate (M)	Low	
	Medium	
	High	0.36 $year^{-1}$ -Indonesia (Simeon *et al.*, 2017) 0.49 $year^{-1}$ -Indonesia (Chodrijah *et al.*, 2017)
	Unknown	
f) Maximum annual pup production (per mature female)	Low	See chapter 2 page 6
	Medium	
	High	
	Unknown	
g) Intrinsic rate of population increase (r)	Low	
	Medium	
	High	See chapter 2 page 6
	Unknown	
h) Geographic distribution of stock	Low	See chapter 2 page 6
	Medium	
	High	
	Unknown	
i) Current stock size relative to historic abundance	Low	
	Medium	(Rice and Harley, 2013)
	High	
	Unknown	
j) Behavioural factors	Low	
	Medium	

	High	See chapter 2 page 7
	Unknown	
h) Trophic level	Low	
	Medium	
	High	Froese and Pauly, 2015 Simeon *et al.*, 2017
	Unknown	

SUMMARY for Question 2.1

Intrinsic biological vulnerability of species

Provide an assessment of the overall intrinsic biological vulnerability of the species (tick appropriate box below). Explain how these conclusions were reached and the main information sources used.

High	Medium	*Low*	*Unknown*

Explanation of conclusion and sources of information used:

The silky shark, *Carcharhinus falciformis* is a member of the requiem or gray sharks of the family Carcharhinidae , reaching up to 330 cm total length (TL). The silky shark is one of the most common semipelagic sharks found in coastal and oceanic waters of all tropical oceans.

In the Pacific, silky sharks seem to move from the equator toward slightly higher latitudes during summer (Strasburg, 1958), and it is possible that this pattern of movement also occurs in other silky populations. In the Indian Ocean, adult silky sharks (including pregnant females) concentrate in the Gulf of Aden during the late spring and summer, but decrease in numbers during the rest of the year.

Most of the intrinsic biological factors are ranked as a medium until high vulnerability. In Indian Ocean (South of Java) silky sharks reach sexual maturity 159 – 216 cm (White *et al.*, 2006; Indonesia). Some refences showed that females generally more vulnerable than males. Juveniles found schooling and commonly associate with drifting fish aggregating devices, so its more vulnerable to fishing pressure.

Chodrijah, U., Jatmiko, I. and Sentosa, A.A. 2017. Population parameters of silky shark (*Carcharhinus falciformis*) in the South of West Nusa Tenggara Waters. *BAWAL*. 9(3): 175-183.

Froese, R. and Pauly, D. Editors. 2018. FishBase. World Wide Web electronic publication. www.fishbase.org, version (06/2018)

Rice, J., and Harley, S. (2013). *Updated Stock Assessment of Silky sharks in the Western and Central Pacific Ocean. WCPFC-SC9-2013/SA-WP-03*.

Simeon, B. M., Agustina, S., Muttaqin, E., Yulianto, I., and Ichsan, M. (2017). *Wildlife Conservation Society : Technical Report Sharks and Rays Fisheries in West Nusa Tenggara*. Bogor, Indonesia.

White, W. T., Last, P. R., Stevens, J. D., Yearsley, G. K., Fahmi, and Dharmadi. (2006). *Economically Important Sharks and Rays of Indonesia. Australian Centre for International Agricultural Research*.

NEXT STEPS
• Go to **Section 2.2**

Worksheet for Step 2 (continued)		
Question 2.2 **What is the severity and geographic extent of the conservation concern?**		
• See pages 76–80 of **Annex 1** for additional Guidance Notes on completing this Worksheet. • Based on existing stock assessments or conservation status assessments, evaluate the severity and geographic extent/scope of conservation concern, including reasons for the conclusions drawn and information on sources used. • In the Worksheet below, circle the **level of severity/scope of concern** associated with each **Factor** using the descriptions in the indicator column in **Table B** in the Guidance Notes (**Annex 1**). In the column entitled Indicator in the Worksheet below, note briefly the reason for this assessment of level of severity/scope of concern. Further explanation (including information on sources used) can be provided in the boxes entitled '*Comments*'.		
Conservation concern factors *(see page 78 of the Guidance Notes)*	**Level of severity/scope of concern** *(circle as appropriate)*	**Indicator/metric** *(see page 78 of the Guidance Notes)*
Conservation or stock assessment status	Low	
	Medium	IUCN – vulnerable, Fishing mortality indices 1.1 in Indian Ocean (Simeon *et al.*, 2017)
	High	Fishing mortality 2.3 indices in Indian Ocean (Chodrijah *et al.*, 2017)
	Unknown	No information is available on stock structure (IOTC 2016)
	Comments:	
Population trend	Low	
	Medium	• The population trend is stable and relevant indicators of abundance suggest that the stock is above 40% of historic baseline • The population trend is unmanaged, decreasing, and relevant indicators of abundance suggest that the stock is 40–70% of historic

		baseline • The population trend is increasing under management and relevant indicators of abundance suggest that the stock is above 30% of historic baseline. • Area of distribution shows signs of contraction or fragmentation/ population density is decreasing
	High	
	Unknown	
	Comments:	
Geographic extent/scope of conservation concern	Low	
	Medium	Identified threats affect the national/regional stock of the species
	High	
	Unknown	
	Comments:	

SUMMARY for Question 2.2

Severity and geographic extent of the conservation concern

Provide an assessment of the overall severity and geographic extent of the conservation concern for this species or stock (tick appropriate box below). Explain how these conclusions were reached and the main information sources used.

High	Medium	*Low*	*Unknown*

Explanation of conclusion and sources of information used:

Fishing mortality classified in high category 2.3 (*Chodrijah et al.*2017), however bias may occured due to unrepresentative sampling period and location (Case study : Tanjung Luar).

Chodrijah, U., Jatmiko, I. and Sentosa, A.A. 2017. Population parameters of silky shark (*Carcharhinus falciformis*) in the South of West Nusa Tenggara Waters. *BAWAL.* 9(3): 175-183.

CITES. 2013a. https://www.cites.org/eng/cop/16/prop/E-CoP16-Prop-43.pdf. Downloaded on 15 December 2015

IOTC Silky shark Supporting Information. www.iotc.org. Updated : December 2016. Downloaded : December 2017.

Simeon, B.M., Ichsan, M., Muttaqin, E., Agustina, S. 2017. Wildlife Conservation Society : Technical Report Sharks and Rays Fisheries in West Nusa Tenggara. 2017.

www.iucnredlist.org.

NEXT STEPS

- Go to **Step 3**

Worksheet for Step 3		
Question 3.1 **What is the severity of trade pressure on the stock of species concerned?**		
• See pages 81–84 of **Annex 1** for additional Guidance Notes on completing this Worksheet. • In the Worksheet below, circle the **level of severity** associated with each trade pressure **Factor** using the descriptions in the Indicator column in **Table C** in the Guidance Notes (**Annex 1**). In the column entitled **Indicator/metric** in the Worksheet below, note briefly the reason for this assessment of level of trade pressure severity. Consider **all products in both domestic and international trade.** • For each Factor, circle the **level of confidence** associated with each assessment of trade pressure severity. This involves an assessment of the **quality of the information** used to evaluate the severity of trade pressure on the stock of the species concerned. • In the box entitled '*Reasoning*', provide reasons to justify the evaluation of severity of trade pressure and assessment of confidence level (i.e. quality of information used). Here, comments/information should also be provided on: o the sources of information used to evaluate severity of trade pressure; o whether a precautionary approach was taken to the evaluation of trade pressure severity (e.g. due to a lack of robust trade information to inform the evaluation); o whether the evaluation of trade pressure was adjusted (i.e. severity increased to a higher level) to take into account high intrinsic biological vulnerability/conservation concern assessed in **Step 2**; o whether information is particularly lacking and, if so, how this data availability may be improved (see also **Section 6.1** of the Guidance Notes in **Annex 1** for further advice).		
Factor *(see page 84 of the Guidance Notes)*	**Level of severity of trade pressure** *(highlight or circle as appropriate)*	**Indicator/metric** *(see page 84 of the Guidance Notes)*
a) Magnitude of legal trade	Low	
	Medium	
	High	• Multiple uses in commercial trade (i.e. the species supplies several products to different types of markets) • Trade volume / market demand high in relation to abundance of species and part used • Trade volume / market demand increasing quickly, or decreasing in response to limited resource availability • High prices per unit product or rapid price increases; shortages of products in trade
	Unknown	
	Level of confidence *(circle as appropriate): (see page 83 of Guidance Notes)* High	

	Low Medium	
Reasoning (e.g. has this assessment involved the exercise of precaution, and/or has severity of trade pressure been increased in light of the assessment in Step 2?)		
b) Magnitude of illegal trade	High	• Good documentation of domestic and international trade • Trade chain transparent • Little concern about substitution for a look-alike species • Estimated harvest and estimated volume in legal domestic and reported export trade are approximately equal
	Medium	
	High	
	Unknown.	
	Level of confidence *page 83 of Guidance* Low Medium High	*(circle as appropriate): (see Notes)*
Reasoning (e.g. has this assessment involved the exercise of precaution, and/or has severity of trade pressure been increased in light of the assessment in Step 2?) Illegal trades are uneasy determined nor estimated, although layered export control capable of filtering and foiled some illegal attempts which makes the other actors more cautious. However, abundant shark exporters in collaboration with heaping supply od commodities, as well as the complexity of the procedures, could attract for more fraudulent practices.		
NEXT STEPS • Add notes in the Worksheet for **Section 6.1** on improvements in trade data availability/monitoring required to evaluate trade pressure under **Section 3.1**. • GO TO **Section 3.2** to evaluate fishing pressures.		

Worksheet for Step 3

Question 3.2
What is the severity of fishing pressure on the stock of species concerned?

- See pages 85–90 of **Annex 1** for additional Guidance Notes on completing this Worksheet.
- In the Worksheet below, circle the **level of severity** associated with each fishing pressure **Factor** using the descriptions in the Indicator column in **Table D** in the Guidance Notes (**Annex 1**). In the column entitled **Indicator/metric** in the Worksheet below, note briefly the reason for this assessment of level of fishing pressure severity. Consider **all fishing methods and gears that** interact with the shark stock concerned.
- For each Factor, circle the **level of confidence** associated with each assessment of fishing pressure severity. This involves an assessment of the **quality of the information** used to evaluate the severity of fishing pressure on the stock of the species concerned.
- In the box entitled '*Reasoning*', provide reasons to justify the evaluation of severity of fishing pressure and assessment of confidence level (i.e. quality of information used). Here, comments/information should also be provided on:
  - the sources of information used to evaluate severity of fishing pressure;
  - whether a precautionary approach was taken to the evaluation of fishing pressure severity (e.g. due to a lack of robust information to inform the evaluation);
  - whether the evaluation of fishing pressure was adjusted (i.e. severity increased to a higher level) to take into account high intrinsic biological vulnerability/conservation concern assessed in **Step 2**;
  - whether information is particularly lacking and, if so, how this data availability may be improved (see also **Section 6.1** of the Guidance Notes in **Annex 1** for further advice).

Factor *(see page 89 of the Guidance Notes)*	**Level of severity of fishing pressure** *(highlight or circle as appropriate)*	**Indicator/metric** *(see page 89 of the Guidance Notes)*
a) Fishing mortality (retained catch)	Low	
	Medium	• Moderate proportion of stock removed by all fishing activities • The fishing mortality (F) = 0.5–1.0 natural mortality (M) but is stable or falling
	High	
	Unknown	
	Level of confidence *page 88 of Guidance* Low Medium High	*(circle as appropriate): (see Notes)*

Reasoning (e.g. has this assessment involved the exercise of precaution, and/or has severity of fishing pressure been increased in light of the assessment in Step 2?)

Number of catches in Tanjung Luar increasing, and standardized CPUE increasing, F > 0.5, M>1 (Simeon *et al.* 2017). Silky sharks which catches in Muncar : F > 0.5 (Damora and Yuneni. 2015)

Damora , A., Yuneni R. 2015. Estimasi Pertumbuhan, Mortalitas Dan Eksploitasi Hiu Kejen (Carcharhinus falciformis) Dengan Basis Pendaratan di Banyuwangi, Jawa Timur. Prosiding Simposium Hiu dan

Pari di Indonesia. 2016. Kerjasama Kemeterian Kelautan dan Perikanan, Lembaga Ilmu Pengetahuan Indonesia, dan WWF Indonesia. Tim Editor : Dharmadi dan Fahmi. ISBN : 978-602-71086-2-2

Simeon, B.M., Ichsan, M., Muttaqin, E., Agustina, S. 2017. Wildlife Conservation Society : Technical Report Sharks and Rays Fisheries in West Nusa Tenggara. 2017.

b) Discard mortality	Low	
	Medium	
	High	Mortality rate of juvenile were estimated 66 % in pelagic longline (Beerkircher *et al.*, 2003) Purse seine (Poisson *et al.*, 2014) Stress response of this species to capture is severe (Eddy *et al.*, 2016)
	Unknown	
	Level of confidence *(circle as appropriate): (see page 88 of Guidance Notes)* Low Medium High	

Reasoning (e.g. has this assessment involved the exercise of precaution, and/or has severity of fishing pressure been increased in light of the assessment in Step 2?)

Extract P3: Mortality in fishery "The fishery-induced mortality for entangled sharks was 18%, while it was 85% for brailed sharks. As such, the overall fisheryinduced mortality was 81%

Beerkircher, L. R., Shivji, M. S., and Cortes, E. (2003). A Monte Carlo Demographic Analysis of the Silky shark (Carcharhinus falciformis): Implications of Gear Selectivity A Monte Cario demographic analysis of the silky shark CCorchorhinus fo / cifolJllis): implications of gear selectivity. *Fishery Bulletin*, *1*, 168–174.

Eddy, C., Brill, R., and Bernal, D. (2016). Rates of at-vessel mortality and post-release survival of pelagic sharks captured with tuna purse seines around drifting fish aggregating devices (FADs) in the equatorial eastern Pacific Ocean. *Fisheries Research*, *174*, 109–117. https://doi.org/10.1016/j.fishres.2015.09.008

Poisson, F., Filmalter, J. D., Vernet, A.-L., and Dagorn, L. (2014). Mortality Rate of Silky sharks (Carcharhinus falciformis) Caught in the Tropical Tuna Purse Seine Fishery in the Indian Ocean. *Canada Journal of Fisheries Aquatic Science*, *71*(6), 795–798. https://doi.org/https://doi.org/10.1139/cjfas-2013-0561

b) Size/age/sex selectivity	Low	
	Medium	Shark fisheries moderately selective for any size- age classes or female/male individuals (Simeon *et al.*, 2018).
	High	
	Unknown	
	Level of confidence *(circle as appropriate): (see page 88 of Guidance Notes)* Low **Medium** High	
Reasoning (e.g. has this assessment involved the exercise of precaution, and/or has severity of fishing pressure been increased in light of the assessment in Step 2?) Silky shark commonly caught by targeted fishery with longline which moderately selective for any size age classes for female and male individuals. Fishing gear unselective to particular sex. Simeon B.M., E.Muttaqin, U. Mardhiah, M.Ichsan, Dharmadi, A.P.Prasetyo, Fahmi, I.Yulianto. 2018. Increasing Abundance of Silky Shaks in the Eastern Indian Ocean : Good News or a Reason to be Cautious?. Fishes, 3(3),29. https://doi.org/10.3390/fishes3030029		
d) Magnitude of illegal, unreported and unregulated (IUU) fishing	Low	
	Medium	• Poor documentation of catches • Trade chain difficult to follow • Some concern about wheter estimated harvest and volume in legal domestic and reported export trade are approximately equal
	High	
	Unknown	
	Level of confidence *(circle as appropriate): (see page 88 of Guidance Notes)* Low **Medium** High	
Reasoning (e.g. has this assessment involved the exercise of precaution, and/or has severity of fishing pressure been increased in light of the assessment in Step 2?)		

Documentation and collecting data for shark landing is limited due to large and spead area. Beside that, limited human resources and budget. Meanwhile, IUU fishing has been one of Indonesia's most priority national action to promote responsible fisheries. Its vast water area with most potential of marine species (including shark) have attracting many illegal practices, especially around share stock water area (South China sea, Indian Ocean (southern Indonesia) and Pacific Ocean (North Eastern indonesia).

NEXT STEPS

- Add notes in the Worksheet for **Section 6.1** on improvements in fisheries data availability/monitoring required to evaluate fishing pressure under **Section 3.2**.
- GO TO **Section 4** to evaluate the extent to which existing management measures are effective in mitigating the risks/pressures/concerns identified in **Steps 2 and 3**.

Worksheet for Step 4		
Preliminary stage **Compile information on existing management measures**		
In the table below, provide a list of existing generic and species-specific management measures in place for the stock or population of the species concerned. Consider measures implemented at the **(sub-) national, regional and international level** (i.e. including any measures implemented by relevant RFBs). Include a brief description of each measure, the sources of information used and any other comments if appropriate. A table of commonly used generic and species-specific fisheries management measures is provided in **Annex 5** (page 132). It is **advisable to consult Annex 5 prior to completing the Worksheets in this section, in conjunction with context-specific fisheries management advice.**		
Existing management measures *(see Annex 5 for examples)*	**Is the measure generic or species-specific?**	**Descriptions/comments/sources of information**
NATIONAL		
Ministerial regulation of Marine Affairs and Fisheries no 33 2017	Specific to all sharks species including silky shark	SOP public service in conservation, fisheries and trading including recommedation shark species and rays trade product
Instruksi Bupati (major instruction) Manggarai no 1309/VIII/2013	Generic to all shark species	Banned for catching and trade of Sharks, Manta ray, Napoleon Wrasse, and other protected marine species (Sea turtle, Dugong, Seahorse, Dolphin, Black coral, Giant clam etc) in West Manggarai District, East Nusa Tenggara Province.
Instruksi Gubernur (Guvernor instruction) DKI Jakarta no 78 2014	Generic to all shark species	Banned for consumption shark and manta ray's product for government staff of DKI Jakarta province
Regulation of the Minister of Marine Affairs and Fisheries 12/PERMEN/2012 (capture fishery enterprises on the high seas); amended by 26/PERMEN-KP/2013 (capture fishery enterprises in regional fisheries management).	Generic to all sharks taken as bycatch in tuna fisheries (high seas and in RFMOs)	Sharks taken as bycatch in tuna fisheries should be landed whole at ports to reduce finning of sharks and discarding at sea. Pregnant shark and pups should be released. Thresher sharks *Alopias* spp. must be released alive if possible or landed and reported if dead (Dharmadi *et al.* 2015)

Ministerial regulation of Marine Affairs and Fisheries no 30 2010		Management plan and zoning system in Marine Protected Areas
Regency regulation of Raja Ampat, Indonesia Regency (2012), Regulation 9/2012	Generic to sharks and rays	Prohibits capture of sharks, rays and other species- protects
National Plan of Action for the Conservation and Management of Sharks	Generic to sharks and rays	- 2010 – 2014 by Directorate General of Capture Fisheries, Directorate of Fish Resources, Ministry of Marine Affairs and Fisheries. - 2016 – 2020 by Directorate General of Biodiversity Conservation marine resources, Ministry of Marine Affairs and Fisheries.
Regulation of the Minister of Marine Affairs and Fisheries 3/2010 and 4/2010	Generic to all protection of species, including sharks, listed on CITES Appendices	See Dharmadi *et al.* 2015 (Table 2)
Presidential Decree 39/1980 concerning the eradication of trawlers from Indonesian waters	Generic to all fish resources	National policy intended to maintain the sustainability of fish resources, including sharks.
Presidential Decree 85/1982 concerning obligation to use turtle excluder devices in the shrimp-trawl by catch reduction programme	Generic to all fish resources	Applies to operation of shrimp trawlers in Kai, Tanimbar, Aru and Irian Jaya waters, as well as the Arafura Sea, eastward of 130° E. This decree could be used to reduce by catch of sharks and rays.
REGIONAL/INTERNATIONAL		
WCPFC CMM2010-07	Generic to sharks (implemented January 2008)	Requires full utilisation of sharks, or live release of unused sharks, and maintenance of a 5% fin to carcass weight ratio (http://www.wcpfc.int/sharks)
WCPFC CMM2011-04	Specific to Oceanic whitetip sharks (OCS) (implemented January 2013)	Prohibits retention, transhipping, storing or landing of OCS and calls for release with as little harm as possible (http://www.wcpfc.int/sharks)
WCPFC CMM2012-04	Specific to Whale sharks (implemented January 2014)	Prohibits purse seine setting on a whale shark if it is sighted prior to the set and calls for safe release of the whale shark if it is inadvertently encircled in the net (http://www.wcpfc.int/sharks)
WCPFC CMM2013-05	Generic to sharks (issued December 2013)	Requires daily catch and effort reporting, including sharks, when vessels operate in the high seas

WCPFC CMM2013-08	Specific to Silky sharks (implemented July 2014)	Prohibits retention, transhipping, storing or landing of Silky sharks and calls for release with as little harm as possible (http://www.wcpfc.int/sharks)
WCPFC CMM2014-05	Generic to sharks (implemented July 2015)	Reduce use of wire traces and shark lines in tuna and billfish longline fisheries and dedicated shark fisheries require management plans (https://www.wcpfc.int/conservation-and-management-measures)
WCPFC CMM2015-07	Generic to all CMMs and hence also generic to sharks (effective only for 2016 and 2017, pending review)	WCPFC Compliance Monitoring Scheme (CMS) to ensure implementation and compliance with CMMs (https://www.wcpfc.int/conservation-and-management-measures)

NEXT STEPS

References

Dharmadi, Fahmi and Satria, F. 2015. Fisheries management and conservation of sharks in Indonesia. *African Journal of Marine Science*, 37 (2), 249-258.

- GO TO **Question 4.1(a).**

Worksheet for Step 4 (continued)

Question 4.1(a)

Are existing management measures appropriately designed and implemented to mitigate the pressures affecting the stock/population of the species concerned?

- See pages 91–92 of **Annex 1** for additional Guidance Notes on completing this Worksheet.
- Firstly assess whether **appropriately designed** management measures are in place to mitigate the pressures affecting the stock/population of the species concerned:
  - From the **'Preliminary stage'** Worksheet above, transfer information on existing management measures into the Worksheet below, alongside the relevant fishing and trade pressure Factor(s) the measures(s) can help to mitigate (as evaluated in **Step 3**).
  - Use the information in the table of commonly used generic and species-specific fisheries management measures in **Annex 5** to determine which pressures the existing management measures in place can help to address/mitigate.
- Next, assess whether the existing management measures in place are being **implemented**:
  - In the column entitled "Relevant Monitoring, Control and Surveillance (MCS) measure(s)", include information on existing MCS measures that are relevant to the implementation of the existing management measures identified. **Annex 5** provides information on MCS measures that can help to secure compliance with commonly used fisheries management measures.
  - Second, based on the explanations provided in the column in the Worksheet below entitled "Overall assessment of compliance regime", make a judgement as to whether the existing management measure(s) identified is/are being implemented (i.e. adequately enforced/complied with).
  -

NOTE: in some circumstances where the fishing/trade pressure severity was assessed as "Low" for any of the Factors in **Step 3**, mitigation may not be required (see also the Guidance Notes for Question 4(a) in **Annex 1**). In such cases, "Not applicable" can be noted under the "Existing management measure(s)" and "Relevant MCS measure(s)" columns in the Worksheet (for that trade/fishing pressure Factor).

- Provide reasons to justify the assessments made in this Worksheet in the box entitled "Reasoning/comments", including any sources used.
- Where certain management measures are being implemented but others are not, this information can also be included under "Reasoning/comments". Also note down any considerations, issues or shortcomings relating to any of the management measures identified that will need to be kept in mind when completing the Worksheet for **Question 4.1(b)** below

Factor	**Existing management measure(s)**	**Relevant monitoring, control and surveillance (MSC) measure(s)**	**Overall assessment of compliance regime** *(tick as appropriate)*
TRADE PRESSSURE			

a) Magnitude of legal trade	Regulation of Ministerial Ministerial regulation of Marine Affairs and Fisheries no 33 2017	Strict procedure on exporting elasmobranch products DNA test is applied to visually unidentified products.	Unknown (no information on compliance).	
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	
			Good (comprehensive relevant compliance measures in place)	**√**
	Reasoning/comments (e.g. Are management measures being implemented to varying degrees? Which compliance measures are lacking?) Shark and ray exploitation was driven by international demand for shark fin. International trading not allow due to Ministerial regulation no 59/2014 jo Ministerial regulation no 34/ 2015 jo Ministerial regulation no 48/2016 concerning banning export for CITES appendix 2. Regulation was designed to reduce shark exploitation. Monitoring and surveilance for international implemented by MMAF with develop identification Standard Operational Procedure expecially for internatinal comodity species under Ministerial regulation of Marine Affairs and Fisheries no 33 2017 Limited quantity and capacity of personnel; skill on species identification unequal among officers; different understanding on policies within stakeholders; inadequate number of laboratory for DNA test. Look alike product.			
b) Magnitude of illegal trade			Unknown (no information on compliance)	
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	**√**
			Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments (e.g. Are management measures being implemented to varying degrees? Which compliance measures are lacking?) In several place i.e. export gate, information were recorded. Although in some remotes area, data recording were hard to be done.			

FISHING PRESSSURE				
a) Fishing mortality (retained catch)	Government Regulation on Conservation of Fish Resources Conservation (Generic). PP 60 2007. Minstry regulation on log book and observer on fishing fleet no 18 2010	Establishment of marine conservation area and zone of conservations. No catch is allowed in protected zone (core zone) under conservation area Logbook and observer are management measure to make sure that all fleet record all catch.	Unknown (no information on compliance)	
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	**V**
			Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments (e.g. Are management measures being implemented to varying degrees? Which compliance measures are lacking?) - Need improvement on sustainable management, coordination between center and district authority, integrated MCS activities. - Integrated database system is necessary. - Need more specific policy such as catch quota of specific species. - And improvement for log book and observer compliance and marine protected areas.			
Fishing mortality (retained catch)	Indonesian government through Ministry of Forestry and Environment and Ministry of Marine Affairs and Fisheries hade developed more than 17.000.000 Ha of MPA. This MPA could be as one of strategy for shark protection and reduce fishing pressure including shark	MCS undertaken by local Government	Unknown (no information on compliance)	
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	*V*
			Good (comprehensive relevant compliance measures in place)	

	District Government Regulation on Prohibition of Catching Sharks and Rays in Raja Ampat MPA (Class-specific)	MCS undertaken by technical unit under Directorate general of surveillance of marine and fisheries resources and management unit of Raja Ampat MPA.		
	Need enhancement on coordination between center and district governments, enhancement on monitoring data and report to the center government. Beside that national regulation on shark and ray fishing for shark pregnant and juvenile is needed.			
b) Discard mortality	Regulation of Capture Fisheries in the High seas includes prohibition finning practices (Article 40) (Generic)	MCS undertaken by Directorate General of MCS by sea patrols, Indonesia set up on board observer program, size specific boat.	Unknown (no information on compliance)	
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	**V**
			Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments (e.g. Are management measures being implemented to varying degrees? Which compliance measures are lacking?) Sharks thrown back after catches is known almost zero. Information is according to local knowledge and surveillance officers but Indonesia still have lack of quantitative data, national stock assessment, discard mortality assessment. In the future, government need to improve and develop monitoring instruments/devices.			
c) Size/age/sex selectivity	Regulation of Capture Fisheries in the High seas includes prohibition on catching shark juveniles and pregnant sharks	MCS undertaken by Directorate General of MCS by sea patrols	Unknown (no information on compliance)	
			Poor (limited relevant compliance measures in place)	**V**
			Moderate (some relevant compliance measures in place)	

	(related with tuna by-catch) (Article 40) (Order-specific)		Good (comprehensive relevant compliance measures in place)	
	Reasoning/comments (e.g. Are management measures being implemented to varying degrees? Which compliance measures are lacking?) National and field assessment data showed high number of shark juveniles got caught (not specifically related to tuna by-catch, and thus policy gap is occurred). Lack of: quantitative data; MCS instruments; No species-specific policy applied			
d) Magnitude of IUU fishing	Regulation of Capture Fisheries in the high seas (including commitment to combat IUU Fishing in compliance with RFMOs) Trans-shipment is prohibited	Strict policies on fishing operation in Indonesian waters and the high seas in terms of combating IUU Fishing. MCS performed by Directorate General of MCS, MMAF, Coast Guard, Police, and NAVY.	Unknown (no information on compliance)	
			Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	
			Good (comprehensive relevant compliance measures in place)	√
	Reasoning/comments (e.g. Are management measures being implemented to varying degrees? Which compliance measures are lacking?) All vessels operated in Indonesian waterS must be equipped with registered license. Article 53 (1) all vessels with high seas (EEZ) licenses could not operate fishing activities in inland water fishing grounds. Indonesia action to combat IUU fishing has been recognized globally.			
	National Strategic Plan	Integrated MCS	Unknown (no information on compliance)	

	of MMAF 2015-2019: Combating IUU Fishing is one of the main policies	(procurement plan for aircraft/enhancing surveillance technology; enhance regional cooperation; strengthen task force for IUU Fishing; destroy IUU vessels	Poor (limited relevant compliance measures in place)	
			Moderate (some relevant compliance measures in place)	
			Good (comprehensive relevant compliance measures in place)	✓
	260 illegal vessels have been destroyed by MMAF in 2016, ex. Case MV.Haniva in Ambon			
NEXT STEPS • **Go to Question 4.1(b)**				

Worksheet for Step 4 (continued)

Question 4.1(b)

Are existing management measures effective (or likely to be effective) in mitigating the pressures affecting the stock/population of the species concerned?

- See pages 93–94 of **Annex 1** for additional Guidance Notes on completing this Worksheet.
- From the **Worksheet for Question 4.1(a)** above, transfer information on existing management measures currently in place into the column in the table below entitled "Existing management measure(s)", alongside the relevant fishing/trade pressure Factor.

NOTE as above for **Question 4.1(a)**: in some circumstances where the fishing/trade pressure severity was assessed as "Low" for any of the Factors in **Step 3**, mitigation may not be required (see also the Guidance Notes for **Question 4(b)** in **Annex 1**). In such cases, "Not applicable" can be noted under the "Existing management measure(s)" and "Relevant MCS measure(s)" columns in the Worksheet (for that trade/fishing pressure Factor).

- In the relevant columns in the table below, for each management measure indicate with a tick in the appropriate box whether:
  1. Data are collected and analysed to inform management decisions?
  2. Management is consistent with expert advice?

- Based on the responses to these questions, make a judgement as to whether the management measures(s) identified is/are effective/likely to be effective. Provide reasons to justify this assessment. For example, is effectiveness being compromised by poor design of the management measures or by their inadequate implementation (see responses in the Worksheet for **Question 4.1(a)** above)? Include information on any sources used in the box entitled "Reasoning/comments".

- Note that for each fishing/trade pressure identified, there may be more than one management measure currently in place aimed at mitigating the pressure. When assessing whether the management of a particular fishing/trade pressure is effective/likely to be effective, the aim should be to consider the combined effect of all relevant measures in mitigating the pressure identified.

Factor	**Existing management measure(s)**	**Are relevant data collected and analysed to inform management decisions? (e.g. landings, effort, fisheries independent data)** *Tick as appropriate*	**Is management consistent with expert advice?** *(tick as appropriate)*

TRADE PRESSSURE					
a) Magnitude of legal trade	Regulation of directorate general PRL no 5 2016.	No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management		Not consistent	
		Some relevant data are collected AND analysed to inform management		Expert advice partially implemented	
		Comprehensive data collected AND analysed to inform management	**√**	**Consistent**	**√**
	Management measure(s) effective/likely to be effective? (circle as appropriate) YES Partially No Insufficient information				
	Reasoning/comments (e.g. Is effectiveness compromised by poor design and/or implementation, or is a greater diversity or amount of management required? What data are required to better inform and evaluate management decisions? How is management inconsistent with expert advice?) Indonesia has developed and implemented sufficient standard operational procedure on trading sharks and rays product.				
TRADE PRESSSURE					
b) Magnitude of illegal trade	Regulation of Directorate General Spatial Marine Management no 5 / 2016. Regulation of Directorate General Spatial Marine Management No 43/2017	No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management		Not consistent	

	Ministry regulation of Marine affairs and fisheries no 33/2017	**Some relevant data are collected AND analysed to inform management**	√	Expert advice partially implemented	
		Comprehensive data collected AND analysed to inform management		**Consistent**	√
	Management measure(s) effective/likely to be effective? (circle as appropriate) Yes **Partially** No Insufficient information				
	Reasoning/comments (e.g. Is effectiveness compromised by poor design and/or implementation, or is a greater diversity or amount of management required? What data are required to better inform and evaluate management decisions? How is management inconsistent with expert advice?) Illegal trade could be prevented by implementing sufficient SOP on trading sharks and rays product. Strong penalty have been imposed to illegal actors and supported by other relevant stakeholders.				
FISHING PRESSSURE					
a) Fishing mortality (retained catch)	**Government Regulation on Fish Resources Conservation (Generic)**	No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management	√	Not consistent	√
		Some relevant data are collected AND analysed to inform management		Expert advice partially implemented	
		Comprehensive data collected AND analysed to inform management		Consistent	
	Management measure(s) effective/likely to be effective? (circle as appropriate)				

<table>
<tr><td></td><td colspan="5">Yes Partially No Insufficient information</td></tr>
<tr><td></td><td colspan="5">Reasoning/comments (e.g. Is effectiveness compromised by poor design and/or implementation, or is a greater diversity or amount of management required? What data are required to better inform and evaluate management decisions? How is management inconsistent with expert advice?)

• Insufficient compliance in logbook system
• Management measure is applied to all non catch prohibited species (general). More data is needed due to vast of Indonesian waters.
• Need to be elaborated with stock assessment
• Need to provide specific measurement to the specific conserved species</td></tr>
<tr><td colspan="6">FISHING PRESSSURE</td></tr>
<tr><td rowspan="6">b) Discard mortality</td><td rowspan="4">Regulation on Capture Fisheries in the High seas includes prohibition finning practices (Article 40) (Generic)</td><td>No data OR data are of poor quality OR data are not analysed (adequately) to inform management</td><td></td><td>No expert advice on management identified</td><td></td></tr>
<tr><td>Limited relevant data are collected AND analysed to inform management</td><td></td><td>Not consistent</td><td>V</td></tr>
<tr><td>Some relevant data are collected AND analysed to inform management</td><td>V</td><td>Expert advice partially implemented</td><td></td></tr>
<tr><td>Comprehensive data collected AND analysed to inform management</td><td></td><td>Consistent</td><td></td></tr>
<tr><td colspan="4">Management measure(s) effective/likely to be effective? (circle as appropriate)
YES Partially No Insufficient information</td></tr>
<tr><td colspan="4">Reasoning/comments (e.g. Is effectiveness compromised by poor design and/or implementation, or is a greater diversity or amount of management required? What data are required to better inform and evaluate management decisions? How is management inconsistent with expert advice?)</td></tr>
</table>

	No discard, carcass is fully utilized. Information is according to local knowledge and surveillance officers that recorded in Tuna fisheries. Every year Indonesian government as IOTC/RFMO members had annually meeting and report. The implementation of MCS mechanism is in accordance with SOP				
FISHING PRESSSURE					
c) Size/age/sex selectivity	Regulation on Capture Fisheries in the High seas includes prohibition on catching shark juveniles and pregnant sharks (related with tuna by-catch) (Article 40) (Order-specific)	No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management	**V**	**Not consistent**	**V**
		Some relevant data are collected AND analysed to inform management		Expert advice partially implemented	
		Comprehensive data collected AND analysed to inform management		Consistent	
	Management measure(s) effective/likely to be effective? (circle as appropriate) Yes **Partially** No **Insufficient information**				
	Reasoning/comments (e.g. Is effectiveness compromised by poor design and/or implementation, or is a greater diversity or amount of management required? What data are required to better inform and evaluate management decisions? How is management inconsistent with expert advice?) There is information gaps on this issues. No data for pregnant shark catch. Juvenile information sources from observer and landing monitoring. Since early 2017, Indonesian government prohibited to catch pregnant shark. Need more law enforcement, enhance MCS instruments and devices;				

d) Magnitude of IUU fishing	Regulation of Capture Fisheries in the high seas (including commitment to combat IUU Fishing in compliance with RFMOs) Trans-shipment is prohibited	No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management		Not consistent	
		Some relevant data are collected AND analysed to inform management		Expert advice partially implemented	
		Comprehensive data collected AND analysed to inform management	**V**	**Consistent**	**V**
	Management measure(s) effective/likely to be effective? (circle as appropriate) YES Partially No Insufficient information				
	Reasoning/comments (e.g. Is effectiveness compromised by poor design and/or implementation, or is a greater diversity or amount of management required? What data are required to better inform and evaluate management decisions? How is management inconsistent with expert advice?) IUU Fishing is a complex condition which is uneasy to be addressed; MCS system and devices need improvement; data need improvement and updated. Advanced law enforcement related to IUU and shark violence.				
	Destroying IUU vessels in accordance with national commitment to combat IUU Fishing	No data OR data are of poor quality OR data are not analysed (adequately) to inform management		No expert advice on management identified	
		Limited relevant data are collected AND analysed to inform management		Not consistent	
		Some relevant data are collected AND analysed to		Expert advice partially implemented	

		inform management			
		Comprehensive data collected AND analysed to inform management	*V*	**Consistent**	*V*
	Management measure(s) effective/likely to be effective? (circle as appropriate) YES Partially No Insufficient information				
	Reasoning/comments (e.g. Is effectiveness compromised by poor design and/or implementation, or is a greater diversity or amount of management required? What data are required to better inform and evaluate management decisions? How is management inconsistent with expert advice?) The policy is effective to give deterrent effect, although some experts advised to nationalize the vessels instead of destroy them				

NEXT STEPS

- Add notes in the Worksheet for **Section 6.1** on improvements in data availability/monitoring required to evaluate the effectiveness/likely effectiveness of management under **Question 4.1(b)**.
- Add notes in the Worksheet for **Section 6.2** on improvements in management (including compliance systems) required to more fully mitigate the pressures impacting the stock/population of the shark species concerned.
- Go to **Step 5**

Worksheet for Step 5

Question 5.1

Based on the outcomes of the previous steps, is it possible to make a positive NDF (with or without associated conditions) or is a negative NDF required?

- See pages 95–97 of **Annex 1** for additional Guidance Notes on completing this Worksheet.
- Transfer all results from **Steps 2–4** to the Table below by circling the appropriate descriptors.
  - From the **Worksheets for Questions 2.1 and 2.2** above, transfer the **level of vulnerability** and **level of severity/scope of conservation concern** into the Worksheet below.
  - From the **Worksheets for Questions 3.1 and 3.2** above, transfer the **level of severity** for each trade and fishing pressure Factor into the second column in the Worksheet below and the **level of confidence** associated with each evaluation of severity into the third column in the Worksheet below.
  - Based on the information contained in the **Worksheets for Questions 4.1(a) and 4.1(b),** state in the Worksheet below whether the **existing management measures are effective/likely to be effective** at mitigating each of the pressures identified (taking into account whether they are **appropriately designed** and **being implemented**), or whether there is insufficient information to make such an assessment.
- Based on the information generated and evaluations made in the previous **Steps**, the Scientific Authority now has to decide whether to make a positive NDF for the export (with or without mandatory conditions), or a negative NDF. A decision tree to assist in this decision-making process is provided in the Guidance Notes in **Annex 1**.
- The final decision regarding the NDF should be indicated in the relevant box at the end of this Worksheet. Under "Reasoning/comments" include justification for the decision made and describe any **mandatory conditions** (for a positive NDF) and/or **recommendations as to further measures** (e.g. improvements in monitoring and/or management required – relevant for both positive and negative NDFs).

Step 2: Intrinsic biological vulnerability and conservation concern

Intrinsic biological vulnerability (Question 2.1)	**High**	Medium	Low	Unknown
Conservation concern (Question 2.2)	**High**	Medium	Low	Unknown

Step 3: Pressures on species			**Step 4: Existing management measures**
Pressure	**Level of severity (Questions 3.1**	**Level of confidence (Questions 3.1**	**Are the management measures effective* at addressing the concerns/pressures/impacts identified? (Question 4.1b)**

	and 3.2)	and 3.2)	*Taking into account the evaluation of management appropriateness and implementation under Question 4.1a*
Trade pressures			
a) Magnitude of legal trade	High Medium Low Unknown	High Medium Low	Yes Partially No Insufficient Information **Not applicable
a) Magnitude of illegal trade	High Low Medium Unknown	High Medium Low	Yes Partially No Insufficient Information **Not applicable
** Only to be used where the trade pressure severity was assessed as "Low" for any of the Factors in **Step 3** and a judgement is made that the impacts on the shark stock/population concerned are so low that mitigation is not required.			
Fishing pressures			
a) Fishing mortality (retained catch)	High Medium Low Unknown	High Medium Low	Yes Partially No Insufficient Information **Not applicable
b) Discard mortality	High Medium Low Unknown	High Medium Low	Yes Partially No Insufficient Information

			**Not applicable
c) Size/age/sex selectivity of fishing	High Medium Low Unknown	High Medium Low	Yes Partially No Insufficient Information **Not applicable
d) Magnitude of IUU fishing	High Medium Low Unknown	High Medium Low	Yes Partially No Insufficient information **Not applicable

** Only to be used where the fishing pressure severity was assessed as "Low" for any of the Factors in **Step 3** and a judgement is made that the impacts on the shark stock/population concerned are so low that mitigation is not required.

A) Can a positive NDF be made?	YES – *go to B*	**NO** – *go to **Step 6** and list recommendations for measures to improve monitoring/management under Reasoning/comments below*
B) Are there any mandatory conditions to the positive NDF?	YES	**NO** – *go to C*
C) Are there any other further recommendations? *(e.g. for improvements to monitoring/management)*	**YES** - *go to **Step 6** and list recommendations for measures to improve monitoring/management under Reasoning/comments below*	**NO**

Reasoning/comments (include justification for decision made and information on mandatory conditions and/or further recommendations)

-Indication of stable stocks in Indonesia water according to national production data.
-Strong national commitment on conservation and fishing regulation (including commitment to comply with global regional arrangement on species conservation.
-Instrument/policies for management measure has been established and implemented effectively

especially on combating IUU Fishing.
-The compliance of implementation agencies and/or fishery activities is improving steadily.

Mandatory

-Improvement and increasing fisheries management to reduce pressure in shark and rays target fisheries. Reduce by catch in commercial fisheries and reduce shark pregnant and juvenile catch.
-Improvement in fisheries data (number of fleet, production data and biological data.
- Improving trade monitoring through strengthening trade regulation, technology and human recources.
-Develop and strengthening traceability system

NEXT STEPS

- OPTION 1: If improvements in monitoring or management are required (whether in the case of a **positive or negative NDF**) go to **Step 6**
- OPTION 2: If no improvements in monitoring or management are required, make a **positive NDF** and stipulate any **mandatory conditions**, if appropriate, to the Management Authority and any other relevant bodies.

Section 6.2 Improvement in management is required
See Chapter 6

Worksheet for Step 6 Further measures
Section 6.1 Improvement in monitoring or information required
See Chapter 6