

SHARK LONGLINE FISHERY IN TANJUNGLUAR-EAST LOMBOK

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ABSTRACT

Studies on artisanal shark fisheries in Tanjungluar - East Lombok were conducted during the year 2001-2011 (except in 2003 and 2007). A sampling method called “*rapid market survey*” method was employed to collect catch data from surface and bottom longlines fishing, rapidly. Biological data and fisheries data were collected during survey. Catch data for shark were also obtained from daily records filled by TPI officers in Tanjungluar between 2009 and 2010. The results showed that shark longline fishing was conducted every month. The trend of shark catches relates to the number of fishing vessels, fishing ground, and weather conditions at sea. The period between July and September is a transitional season from East to West seasons. During this season, the wind strength is weakened and a good fishing season for the fishers. The lowest catch occurs in January (1.06 tonnes) and the highest catch in September with the total catch of 24.6 tonnes. Sharks caught by surface longline were dominated by Silky shark, *Carcharhinus falciformis* (40-90%) with the size range of 100-125 cm. The catch of bottom longline was mostly consisting of fish in mature condition that dominated by Grey reef shark (*Carcharhinus amblyrhynchos*), Common black tip shark (*C. limbatus*), Spot tail shark (*C. sorrah*), and Scalloped hammerhead shark (*Sphyrna lewini*), with the size range of 125-200 cm, 170-250 cm, 100-150 cm, and 170-300 cm, respectively. Surface longline fishing occurs in the offshore waters in depth more than 200 m to 3000 m, whereas bottom longline fishing is operated at a depth of 50-100 m around islands.

KEYWORDS: Shark, longline fishing, Tanjungluar, East Lombok

INTRODUCTION

Globally, it was estimated that more than 50% of elasmobranchii catches were caught as bycatch, but the catches were not recorded in the world fisheries statistics (Stevens *et al.*, 2000). Based on the annual fisheries statistics, Indonesia has the highest catch of elasmobranchii in the world (Steven *et al.*, 2000; Bonfil, 2008), or the highest from 1990 – 2008 among 20 countries (including Taiwan, Spain, Mexico and India) with production of 113,626 tonnes in 2000 and 107,290 ton in 2008 or 13.25% of the global catch (Lack & Sant, 2011), and export value of \$13 billion (Blaber *et al.*, 2009). The record of catch in national level includes target and by-catch. Blaber (2006) estimated that 16% of total shark landed in Indonesia was by-catch, and it was estimated to have increased up to 32% in 2010 (Zainudin, 2010).

The main problem in the Indonesia’s shark fishery is that the catch data are not broken down into species, they are mixed together into one category. In Nusa Tenggara Timur, some fishers only take the shark fins and if their catch exceeding their target the alive shark were then released to the sea.

To date, shark exploitation is without control, the fishers aim to catch shark as much as possible, which could threaten its population. Meanwhile, biological

characteristics of shark include long duration of pregnancy, slow growing, long lived species, low fecundity and produce relatively small number of young. They are very vulnerable to extinction under high fishing pressure (Sylvana *et al.*, 1998; Castro *et al.*, 1999).

To prevent a drastic decrease in shark population, a proper management is required. Information on the fisheries and the biology of shark is needed as a basis in the development of management. Tanjungluar, in East Lombok, West Nusa Tenggara Province is a fishing base for shark fisheries. Within this area, sharks were caught as a main target species in the bottom and surface longline fisheries. This paper provides description of fishing gear, fishing ground, species composition, and monthly catch, and dominant shark catches.

MATERIALS AND METHODS

A study was conducted in Tanjungluar Fish Landing Place (called as Tempat Pendaratan Ikan/TPI), a main landing place for shark located in East Lombok, West Nusa Tenggara. Shark data were collected in the framework of “*rapid market survey*” method, i.e. recording catch data from surface and bottom longlines fishing, rapidly, during the survey.

The field trip was undertaken for 151 days, between April 2001 and Februari 2011. Data collected include biological data (sex and total length, length of clasper (mm), maturity level of male), and fisheries data (characteristics of fish landing place, fishing techniques, fishing duration, fishing ground, catch composition). For species identification the guide book of Last & Stevens (1994) and White *et al.* (2006) was used. In addition, catch data for shark were also obtained from daily records filled by TPI officers in Tanjungluar between 2009 and 2010.

RESULTS

Characteristics of Fish Landing Place

Tanjungluar is a fishing port located in East Lombok, West Nusa Tenggara where surface and bottom longlines are the main fishing gears used by fishers. Most of fishers normally operate surface longlines almost the whole year, but the peak of fishing occurs from June to September. Bottom longlines are operated by fishers from East Lombok based at Maringkik island, a small island located nearby Tanjungluar. All shark catches landed were sold through an auction. The winner of the auction then takes the fins and sell the meat to the collectors. The sharks are normally processed and sold as fresh meat (or grilled fish) or dried product (salted fish). This fishery targets sharks primarily for their fins, but all sharks are landed whole into the market place and almost all parts are utilised. Fishers use gill nets to obtain bait, typically skipjack tuna (*Katsuwonis pelamis*), for use on the longlines. The longline fishery consists of vessels operating drift longlines (pelagic) and vessels operating bottom set longlines. Landings occur between 6 am and 8 am every day with all sharks being brought into a covered area and lined up according to the boat by which they were caught. After 8 am, each boat's catch is sold by auction and if sold, processors commence processing of the sharks immediately. Fins are removed first, then the trunk is cut in half longitudinally and cartilage, flesh and skin are separated into piles.

In certain time of the year between December – March, some tuna vessels from Sulawesi (ex Taiwan) stopover at the Tanjung luar fish landing port to sell their shark catches direct to the buyers without going into auction process.

Fishing Gear

Description, specification and operating techniques of surface and bottom longlines are as follows:

Shark Surface Longline

Shark surface longline consists of main line, branch line, hook and float. The line materials are nylon with main line and branch line of 1.000 – 1.500 m and 15 m with diameter of 6 mm and 5 mm, respectively, and hook no. 6-7. The number of branch line equals to the number of hooks, i.e. 500, with of the distance of 30 m between 2 branch lines.

Shark surface longline is operated by vessel with the dimension of length, width and depth are 15 m x 1,5 x 1 m, respectively, and weight 7 – 10 GT. This fishing vessel has two mechines (30 HP each) with capacity 10 – 20 ton. One unit of vessel has 3 crews and 1 captain. Transportation from the departure location to fishing ground spends 1 day and overnight, whereas from the fishing ground to the Tanjungluar fish landing site needs 3 days and 3 nights. This is due to the targeted fishing ground has moved farther distances. Shift of fishing ground influences fishing duration (in time) in the sea. For example, duration of fishing operation in 1995 – 2000 required 5 – 10 days, whereas in the last decade up to 2011, it became longer, i.e. 20 – 25 days including travel time to fishing ground. This was confirmed by information from fishers in Tanjungluar, who complaint that it is more difficult to catch shark nowadays (Captein Abdul Rahim, September 2011, pers. com.).

Fishers have to catch bait by themselves. Catching bait normally takes 5 – 6 days. Fishing is conducted in the morning up to late afternoon by using surface gill net. Several pelagic species were caught, however, frigate tuna and some other baby tuna are more oftenly used as bait. These species are preferred by shark compared to other pelagic fish species. Fishing activity for shark was normally done from the night time and ended in the morning. Setting of shark longline was done from 16.00 – 17.00 and hauling was done in the following day from 06.00 – 09.00.

Fishing Ground

Fishing ground of the longline fisheries is presented in Figure 1. The surface longline vessels operate in the off-shore at depths greater than 200 m to 3000 m. Their fishing grounds are located around Sawu Sea waters to the waters near the border waters of Indonesia-Australia. Whereas fishing grounds of the bottom longline were in the waters around Sumba island, Sawu sea, Ramo island (East Nusa Tenggara), Selura island (South Sumba).

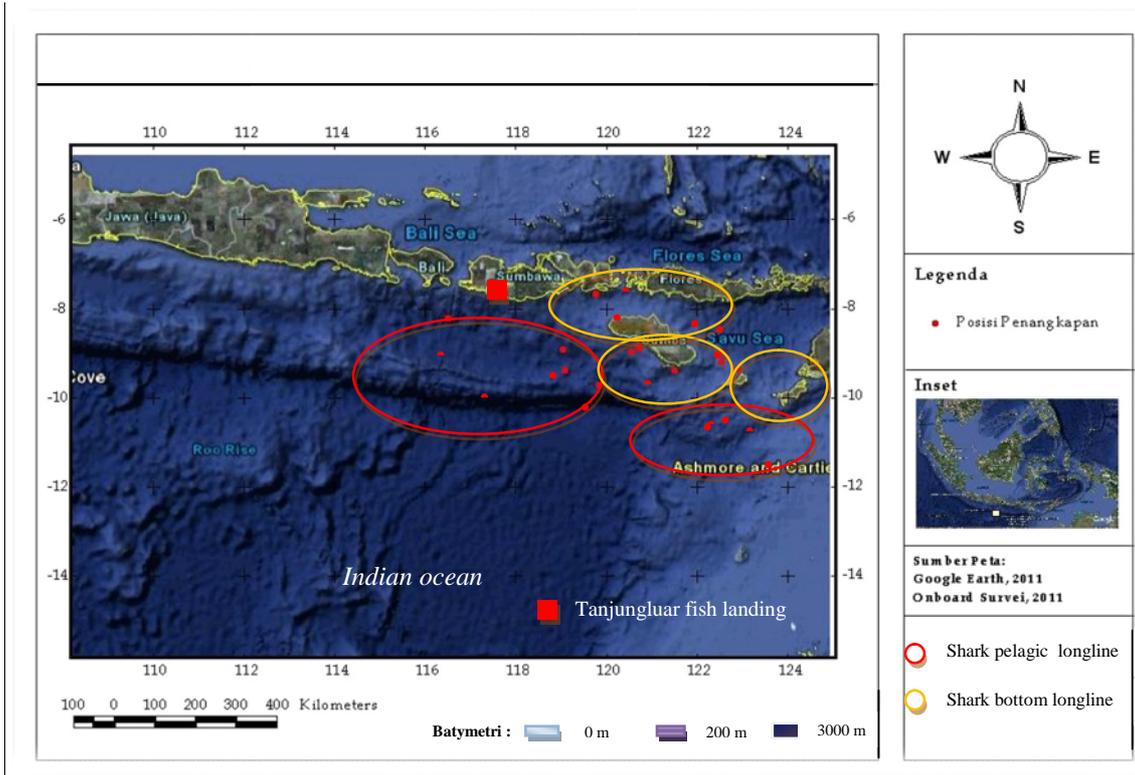


Figure 1. Fishing area of shark longline fisheries

Bottom Shark Longline

Specification of bottom shark longline consisted of main line made of nylon with diameter of 6mm and length of 300 m, and 25 branch lines with diameter of 5 mm and length of 50 m (each branch line). The number of hooks is adjusted with the number of branch line. The hook is made of stainless steel, i.e. hook no. 1. Each bottom shark longline vessel has 5 baskets which each basket contains 25 hooks. The bottom shark longline is operated by using wooden boat, with the length of 14 m, width of 1 m and depth of 1 m, and supported by two engines (25 HP each). One unit of vessel is operated by 4 crews and 1 captain. The bait used are frigate tuna, spanish mackerel and anchovy. The bait fish is were caught by net fishing. Fishing for bait is conducted during the day. The longline gear is then set in the late afternoon between 5 – 6 pm and set in the water with the depth of 40-50 m in surrounding Sumbawa island, eastward of Sumba island. Hauling is carried out in the following day at 7 am. From 2000-2005, shark fishing was done for 7-12 days with a normal catch of 10-20 fish. But since 2006, fishing operation had increased to 10-14 days with less fish caught (4-5 fish). The fishers spent 2 days to reach the fishing ground from Maringkik island which serves as the basis of the shark longline fisher group.

Monthly Catch

The average of shark catch landed monthly by various gears (bottom longline, surface longline, tuna net, and tuna longline) is presented by Figure 2. While, average daily landings for each month using the market survey data for 10 years combined (2001-2011) showed in Table 1.

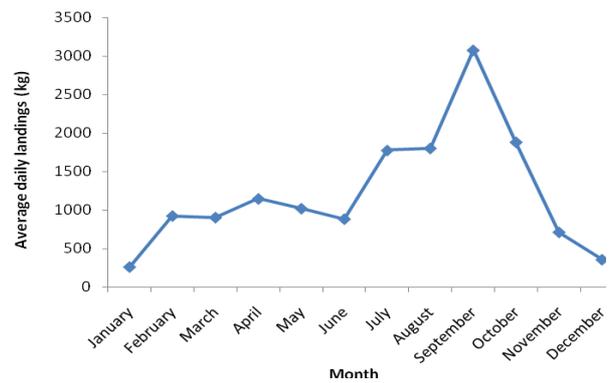


Figure 2. Catch fluctuation of shark based on daily average landing from combined data during 10 years (2001-2010)

Table 1. Average daily landings for each month using the market survey data for 10 years combined (2001-2011).

Month	Number of survey days	Total observed landings (kgs)	Average landings per day (kgs)
January	4	1055.1	263.8
February	2	1852.6	926.3
March	12	10872.1	906.0
April	5	5742.6	1148.5
May	4	4087.0	1021.8
June	3	2658.0	886.0
July	9	15994.1	1777.1
August	11	19841.1	1803.7
September	8	24618.5	3077.3
October	13	24485.0	1883.5
November	4	2857.2	714.3
December	4	1435.8	358.9

Number of species by family

Sharks caught by surface longline were generally pelagic shark group from the following families: Carcharhinidae, Lamnidae and Alopiidae. These families live in mesopelagic zone with the depth between 200 to 1.000 m (Camhi *et al.*, 2007).

On the other hand, bottom longline catches sharks that live in the bottom waters and some species of ray from families Rhynchobatidae, Rhinidae, and Dasyatidae. The number of shark and ray species by individual family caught by surface and bottom longline is presented in Figure 3.

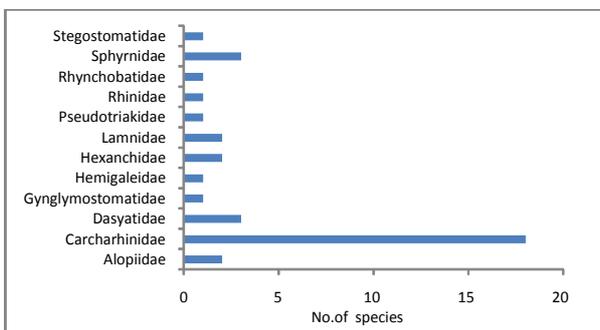


Figure 3. Number of species by family from the shark longline fishery at Tanjungluar.

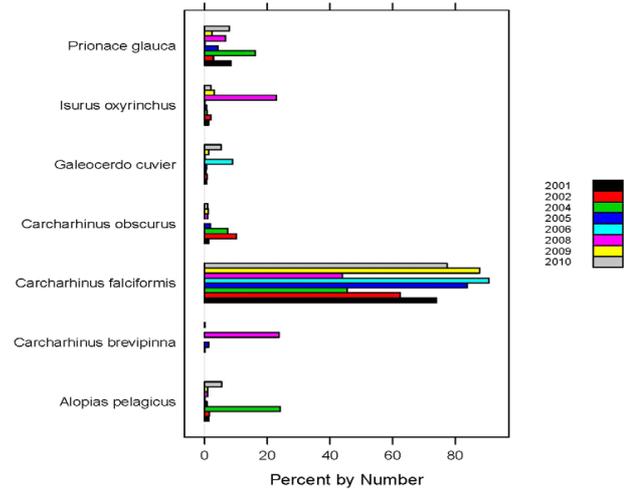


Figure 4. Annual trends of catch by number of species (%) of the surface longline.

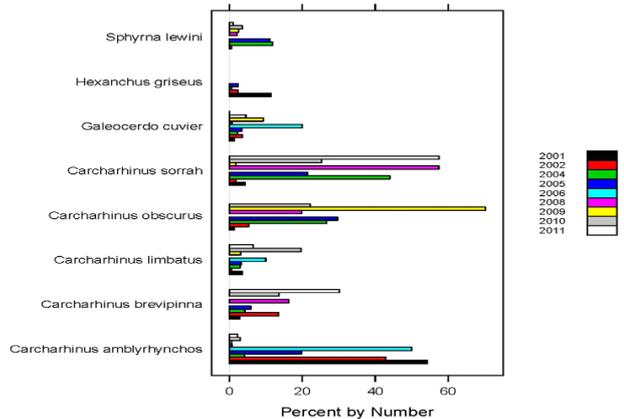


Figure 5. Annual trends of catch by number of species (%) of the bottom longline.

Dominant Shark Catches

The dominant shark species caught by surface and bottom longlines, size of the shark caught and conservation status are presented in Table 2 and 3. Species of dominant sharks caught by those longlines showed in Figure 6 and 7.

Table 2. Size of dominant shark caught by surface longline and its conservation status

Species	Shark caught by size (cm)		Conservation status (IUCN, 2006; 2009)
	Immature (%)	Mature (%)	
<i>Alopias pelagicus</i>	150-270 (46)	250-350 (54,0)	Vulnerable to extinction
<i>Carcharhinus brevipinna</i>	50-190 (60,4)	200-300 (39,6)	Near threatened
<i>Carcharhinus falciformis</i>	100-215 (75,9)	220-250 (24,1)	Least concerned
<i>Carcharhinus obscurus</i>	200-270 (92,9)	290-300 (7,1)	Near threatened
<i>Galeocerdo cuvier</i>	130-310 (95,8)	350-380 (4,2)	Near threatened
<i>Isurus oxyrinchus</i>	100-250 (58,6)	200-260 (41,4)	Near threatened
<i>Prionace glauca</i>	200-210 (6,1)	210-300 (93,9)	Near threatened

Table 3. Size of dominant shark caught by bottom longline and its conservation status

Species	Size of shark caught (cm)		Conservation status (IUCN, 2006; 2009)
	Immature (%)	Mature (%)	
<i>Carcharhinus amblyrhynchos</i>	75-125 (17)	125-200 (83)	Near threatened
<i>Carcharhinus limbatus</i>	60-180 (34)	170-250 (66)	Near threatened
<i>Carcharhinus sorrah</i>	80-110 (36)	100-150 (64)	Not evaluated
<i>Hexanchus griceus</i>	200-375 (85)	310-480 (15)	Near threatened
<i>Sphyrna lewini</i>	100-225 (42)	170-300 (58)	Near threatened

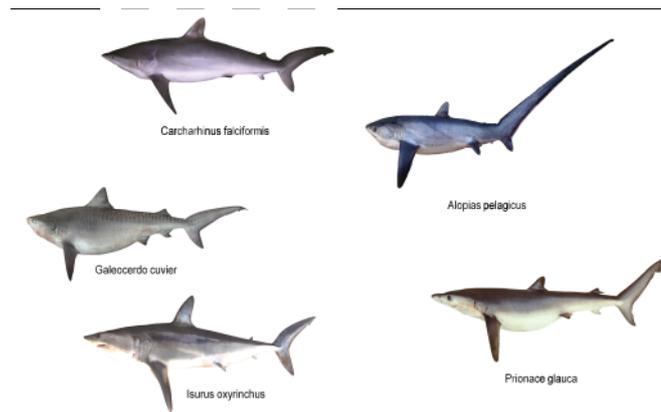


Figure 6. Species of dominant sharks caught by surface longline

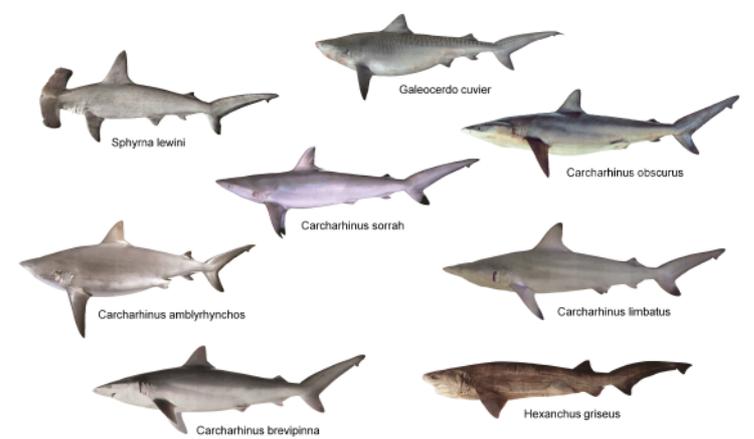


Figure 7. Species of dominant sharks caught by bottom longline

DISCUSSION

Interviews with fishers operating bottom shark longline, indicated that between 1994-1998, their fishing grounds include waters of Teluk Campi, Datuk island up to boundary waters of Australia, they caught 100 – 200 sharks that was dominated by *Prionace glauca* (*hiu karet* or *hiu slendang*). However, between 1999 and 2008, the fishing grounds moved to other waters such as Sumba, Sabu and Rote islands with the catch between 20-50 fish consisted of several shark species. Recently, shark catches by fishers based at Tanjungluar decreased relative to the previous years. Fishing activities normally increase between June and September. During the peak season, fishers only need 12-14 days at sea. Whereas during west season (January-March) fishing activities decreased, only 2-3 vessels were in operation, normally only fishers from Bugis-North Celebes. This was due to bad weather condition (caused by rough wind and big wave).

Fishing activity of bottom shark longline takes the whole year except during the bad weather. Catches of bottom shark longline were relatively stable from year to year between 5-10 fish per trip. Several shark and ray species that were rarely caught from 2000-2011, i.e. *Rhynchobatus* sp (*hiu panrung*), *Squalus* spp., *Centrophorus* spp. (*hiu botol*) (Captein Asrul, September 2011, pers. com.). These species were listed as vulnerable to extinction under IUCN (2006). There are some vulnerable shark species caught in the Indian Ocean from 2001-2005, i.e. *Isurus paucus*, *Isurus oxyrinchus* (*hiu mako*, *hiu tenggiri*), *Carcharhinus longimanus* (*hiu koboi*), and *Centrophorus squamosus* (*hiu botol*). Those species were mostly found in the condition of adult mature size (Dharmadi *et al.*, 2012).

Shark fishing activities in Tanjungluar occur every month. The monthly catches of shark fluctuated, but from July to October the catches were within the range of 15,9-24,5 tonnes (Table 1). These catch levels were higher than the catches before July and after October, with the peak occurred in September (24,6 tonnes). The trend of shark catches relates to the number of fishing vessels, fishing ground, and weather conditions at sea. The period between July and September is a transitional season from East to West seasons. During this season, the wind strength is weakened and serves as a good fishing season for the fishers.

There are 12 families of shark and ray caught by both surface and bottom longlines, with the most dominant group were from family Carcharhinidae, i.e. 18 species. Other studies indicated that within the artisanal shark fishery in the Eastern Indonesian

waters, the domination of family Carcharhinidae reached to 60% (White *et al.*, 2006b; White, 2007). On the other hand, survey conducted in 2001-2010 indicated that catches of surface longlines were dominated by Silky shark (*Carcharhinus falciformis*) with the percentage of 40-90% (Figure 4). Amade *et al.* (2008) stated that in the Western Indian Ocean Silky shark were frequently caught as by-catch by purse seine between July and September. In addition, 85% of the catches were in immature condition or small size and were discarded to the sea, only 15% of the catches were retained by the fishers as their additional income or for consumption. Some experts reported that shark species predominantly caught in the Western Pacific Ocean was Silky shark, 70-80% of the total catch (Anderson & hafiz *et al.*, 1997), while purse seine contributed 25% of the catches in the Pacific Ocean (Oshitani *et al.* (2003). In the waters of Southern part of Java, 66,4% of Silky shark catches were still young, with the size of 50 – 170 cm (Dharmadi & Fahmi, 2007). Whereas in the Western part of Indonesian waters, almost 50% of Silky shark catches were in immature condition (< 1400 mm TL) and < 5% were juvenile (Fahmi & Sumadhiharga, 2007).

The catch of bottom longline consists of 8 species of 3 families, i.e. Sphyrnidae, Hexanchidae, dan Carcharhinidae (Figure 5). Only 3 species of sharks dominated the catches of bottom longline from 2001-2010, i.e. Spot-tail shark (*Carcharhinus sorrah*), Dusky whaler (*C. obscurus*) and Grey reef shark (*C. amblyrhynchos*).

Several shark species of Carcharhinidae (*Carcharhinus brevipinna*, *C. falciformis*, *C. obscurus*, *Galeocerdo cuvier*, dan *Isurus oxyrinchus*) caught were (58-96%) in immature condition (Table 2). Meanwhile, *Prionace glauca* (Blue shark) were caught more on the adult size up to mature condition (93,9%). In terms of conservation status, those species population are threatened to extinction (IUCN, 2006; 2009). More than 50% of the *Alopias pelagicus* (Pelagic thresher shark) catches were adult-sized up to mature (250-350 cm) with the conservation status of being vulnerable to extinction (IUCN, 2006; 2009). On the other hand, the dominant sharks caught by bottom longline were mostly in mature condition except *Hexanchus griceus* (Table 3). These species belong to vulnerable to extinction status are *Carcharhinus amblyrhynchos*, *Carcharhinus limbatus* (Silky shark), *Hexanchus griceus* (Bluntnose sixgill shark), and *Sphyrna lewini* (Scalloped hammerhead) (IUCN, 2006; 2009). One of those species (*S. lewini*) was listed in appendix II of the IUCN, in the 16th Conference of the Parties (CoP-16) in 2013.

CONCLUSION

1. Fishing activity for shark in Tanjungluar occurs across the whole year. The lowest catch of shark landed occurs in January (1.055,1 kg) and the highest was in September (2.4618,5 kg)
2. Fishing grounds for bottom longline are in the waters around Sumba island, Sawu sea, Ramo island (East Nusa Tenggara), Selura island (South of Sumba) in the depth between 50-100 m. Surface longline vessels operated in the offshore waters near the Eastern part of the Indian Ocean down to the waters near the boarder between Indonesia and Australia.
3. Catch of shark surface longline was dominated by Silky shark (*Carcharhinus falciformis*) whereby most of them were in immature condition. Whereas bottom longline catch was dominated by families of Carcharhinidae (*Carcharhinus amblyhynchos*, *C. limbatus*, *C. sorrah*), Hexanchidae (*Hexanchus griceus*), and Sphyrnidae (*Sphyrna lewini*). These shark species were caught in mature condition.

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