

Sharks: bycatch in the pelagic longline fishery along Ninety East Ridge taken by research vessel in 2011-2012

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Abstract

Sharks are present as an important role in the ocean ecosystem. The fishing operation was reduced their population. This study was carried out the data by the pelagic longline. Two research vessels, M.V. SEAFDEC and F.R.V. CHULABHORN were operated along the Ninety East Ridge, Eastern Indian Ocean during 2011-2012. The composition by number of sharks was 5.60% with the CPUE 1.09 fish/1,000 hooks. The C-hook No.14 captured 53.85% of sharks, followed by the C-hook No.18 (38.46%), while the J-hook captured only 7.69% of sharks. Almost of sharks were male with the 1st and 2nd maturity stage, and their stomach were empty.

Keyword: Longline, Sharks, Ninety East Ridge

Introduction

Sharks are cartilaginous skeleton fish that play an important role as the top of food chain in the ecosystem. They control the population of several fishes in the lower trophic level which lead to the proper amount of number for sustaining the system. Recently, their population decreased quickly of which was mainly due to the high increasing rate of human consumers.

Bycatch in fishing gear is also a cause of decreasing in shark populations. The pelagic longline gear is an example. To clarify the efficiency of this fishing gear that probably is a cause of sharks declining, therefore this study was carried out along Ninety East Ridge, Eastern Indian Ocean, during the period of 2011-2012.

Material and method

Fishing operation

Two fishery research vessels were operated in this study, M.V. SEAFDEC of the Southern Asian Fisheries Development Center (SEAFDEC) and F.R.V. CHULABHORN of Department of Fisheries. They were deployed in the proposed survey areas during the period of January-February 2011 and February-March 2012, respectively. The study areas were along the Ninety East Ridge in the Eastern Indian Ocean between latitude 03°N - 05°S and longitude 087° - 093°E (Figure 1).

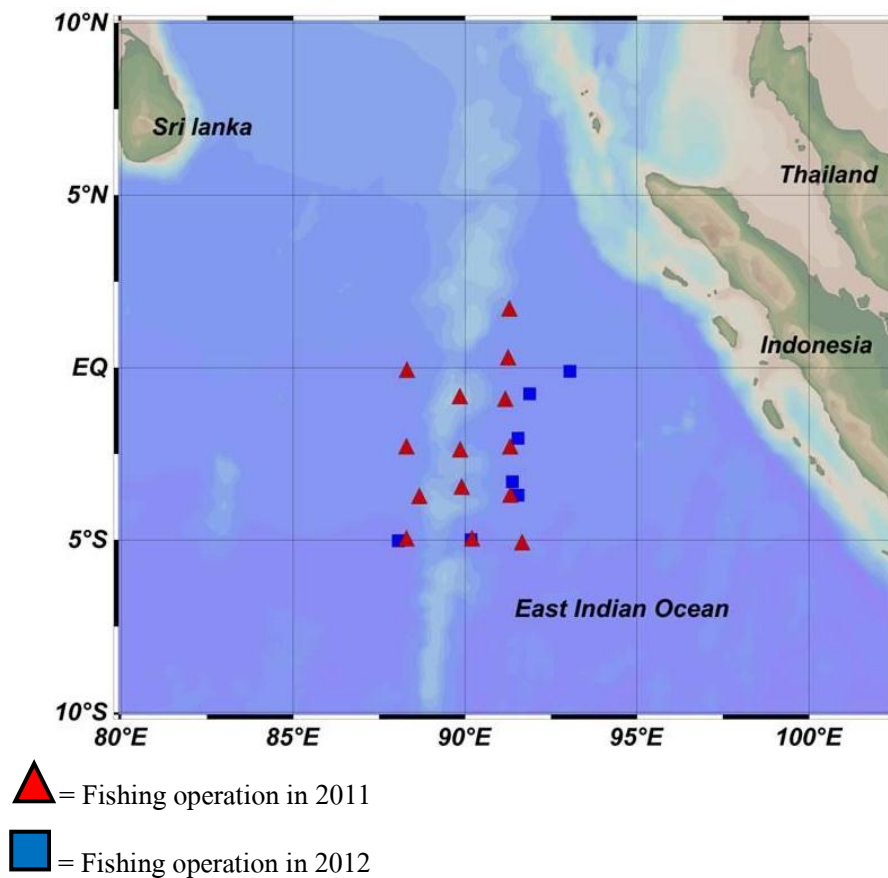


Figure 1 Study areas by pelagic longline along Ninety East Ridge in the Indian Ocean

Fishing gear

The pelagic longline gear was used for the exploration of large pelagic species. As for F.R.V. CHULABHORN, the gear was composed of cremona or PVA mainline (6.5 mm diameter) (Raengpan, 1990) while nylon-monofilament or PA mainline (4.0 mm diameter) was used on M.V. SEAFDEC (Promjinda *et. al*, 2008). Type of bait was round scads (*Decapterus* spp.) and bait sizes were approximately 100-125 grams. The number of hooks between floats (HBF) was 9-20 hooks.

Fishing operation was started shooting in the early morning around 0300 to 0400 am (local time) and hauling at noon time. Shooting time spent about 90 minutes for 400-600 hooks. Approximate immersion time was eight to nine hours. The depth of hook (50-300 meters) and sea temperature were recorded from the temperature-depth recorder (TDR)

Species Composition by hook types

Three types of hook (J-hook, C-hook No.14 and No.18) were used during the survey operation (Figure 2). The sequence of each basket for pelagic longline operation was J-hook, C-hook No.14 and C-hook No.18, respectively.

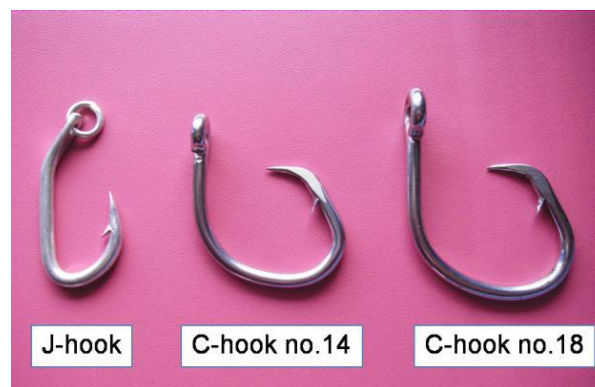


Figure 2 Three types of hook (J-hook, C-hook No.14 and No.18)

Biological data

After the hauling, each specimen was identified to specie level (Masuda *et al.*, 1984a,b; Smith and Heemstra 1986; Nelson, 2006), weighed and measured in total length. Fish were dissected for sex-maturity and removed the stomach to feeding behavior. Preys identified to the lowest as possible, and each prey item was calculated by frequency of occurrence: %OC (Hyslop, 1980).

Results

Species composition and CPUE

The total of 232 fish was collected and identified into 18 species during the operation. 13 sharks were found and identified to 5 species as bigeye thresher shark (*Alopias superciliosus*), blacktip shark (*Carcharhinus limbatus*), silky shark (*Carcharhinus falciformis*), blue shark (*Prionace glauca*) and crocodile shark (*Pseudocarcharias kamoharai*). Blacktip shark was the highest frequency of occurrence with 19.05%,

followed by blue shark (14.29%). The species composition by number in each group of fish during 2011-2012 was found the others as the highest composition (68.10%), followed by tunas and sharks with 23.71% and 5.60%, respectively. Both of 2011 and 2012, the highest composition was the others. In 2012, the composition of sharks was increased about 2 times, but tunas was decreased about 7 times (Figure 3 and Table 1).

The total efforts of 21 operations were 10,988 hooks, and the CPUE of total catch was 21.11 fish/1,000 hooks. While the CPUE of shark was 1.09 fish/1,000 hooks. The result showed that CPUE of all fishes in 2012 was lower than 2011; however, the CPUE of shark was almost the same (Table 2).

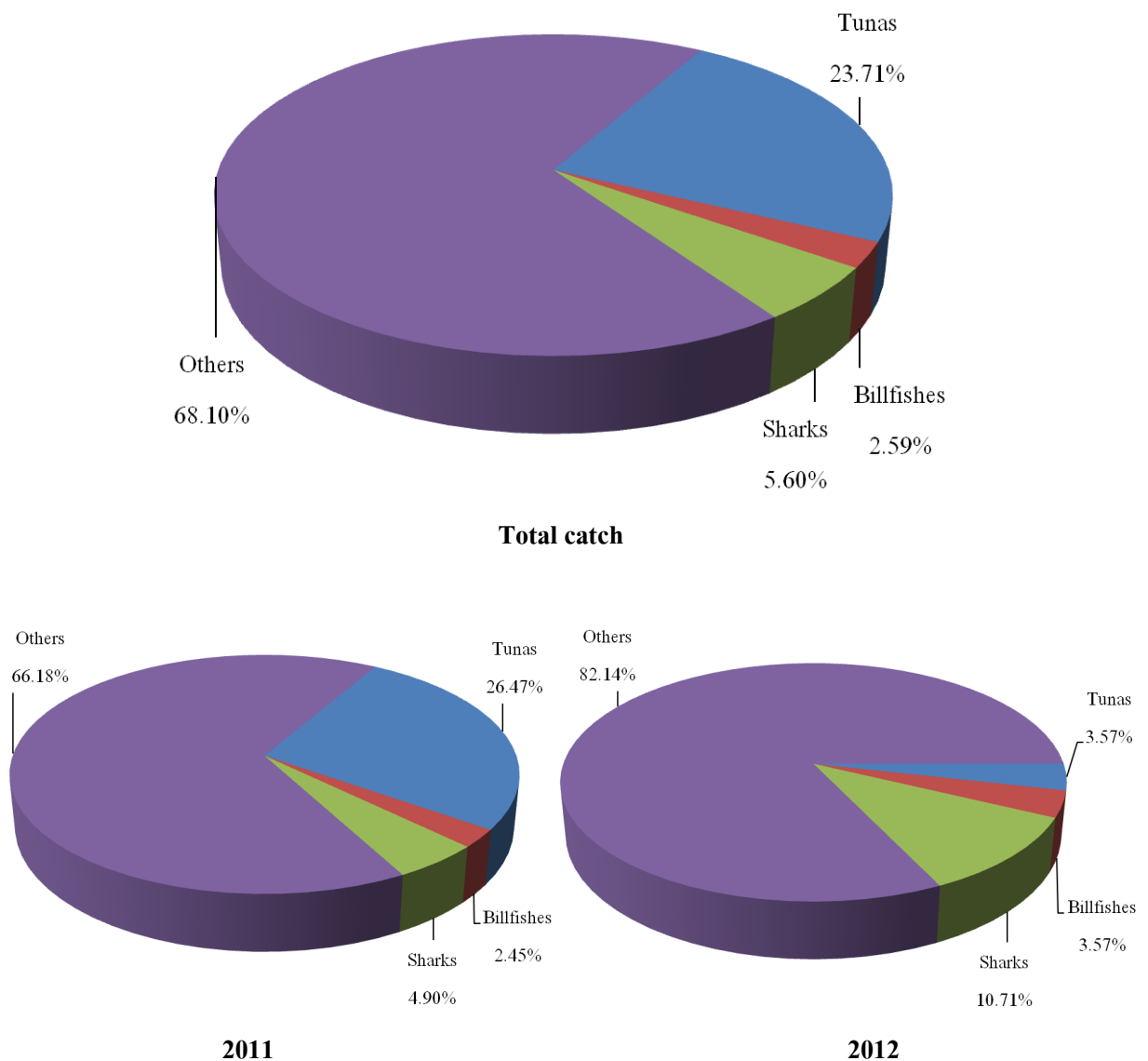


Figure 3 Catch composition by number in 2011 and 2012

Species Composition by hook types

The species composition of all catches showed that 41.38% of total were hooked by C-hook No.14. The target groups, tunas and billfishes had the highest proportion in C-hook No.14 while the least proportion was in J-hook. 53.85% of sharks was hooked by C-hook No.14 and followed by C-hook No.18 with 18.38%, while the least 7.69% of sharks was hooked by J-hook (Table 3).

Biological data

Biological data of sharks contains: length, weight, sex maturity and stomach contents (Table 4). Only one bigeye thresher shark was caught with total length of 330 cm and weight of 98.0 kg. It is a male with the 1st maturity stage (juveniles stage), and its stomach was empty.

Four of blacktip shark were hooked, but a shark fell to the sea. Three specimens were ranged from 85-188 cm of total length and weight ranged from 3.4-52.0 kg. 67% of specimen is male with the 2nd and 4th maturity stage (sub adult stage and sexual active stage, respectively), and 33% is female with the 1st maturity stage (juveniles stage). Their stomachs were none of prey.

Three of silky shark were caught with total length ranged from 84-113 cm and weight ranged from 3.4-7.0 kg. All of specimens are males with the 1st and 2nd maturity stage (juveniles stage and sub adult stage, respectively), and their stomachs were empty.

Three of blue shark were hooked, but 2 sharks fell to the sea. Only specimen was 249 cm of total length and weight of 85.0 kg. The specimen is a female with the 4th maturity stage (uterine stage), and its stomach was found only squids.

Two of crocodile shark were caught with total length ranged from 100-102 cm and weight ranged from 4.9-5.7 kg. One of specimen is a male with the 4th maturity stage (sexual active stage), and another is a female with the 2nd maturity stage (ripening stage). The stomach contents of specimens were none of prey.

Conclusion

The pelagic longline investigation during 2011-2012 was found the composition by number of sharks as 5.60%. The average CPUE of sharks was 1.09 fish/1,000 hooks, while the CPUE of sharks in 2011 and 2012 were similarity values. 53.85% of shark's composition by number was hooked by C-hook No.14, followed by C-hook No.18 with 38.46%. Indeed, the J-hook was captured 7.69% of sharks. The biological

information of five sharks were too not enough for this study, especially the data of stomach contents or shark's preys.

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Table 1 Amount and frequency of occurrence of fishes caught by pelagic long line

Species	Individual	%OC
Sharks		
Bigeye thresher shark (<i>Alopias superciliosus</i>)	1	4.76
Blacktip shark (<i>Carcharhinus limbatus</i>)	4	19.05
Silky shark (<i>C. falciformis</i>)	3	9.52
Blue shark (<i>Prionace glauca</i>)	3	14.29
Crocodile shark (<i>Pseudocarcharias kamoharai</i>)	2	9.52
Tunas		
Yellowfin tuna (<i>Thunnus albacares</i>)	31	33.33
Bigeye tuna (<i>T. obesus</i>)	22	47.62
Skipjack tuna (<i>Katsuwonus pelamis</i>)	2	9.52
Billfishes		
Swordfish (<i>Xiphias gladius</i>)	4	14.29
Blue marlin (<i>Makaira mazara</i>)	2	9.52
Others		
Pelagic stringray (<i>Pteroplatytrygon violacea</i>)	9	28.57
Great barracuda (<i>Sphyreana barracuda</i>)	1	4.76
Wahoo (<i>Acanthocybium solandri</i>)	7	19.05
Dolphinfish (<i>Coryphaena hippurus</i>)	2	9.52
Escolar (<i>Lepidocybium flavobrunneum</i>)	25	57.14
Lancet fish (<i>Alepisaurus ferox</i>)	105	95.24
Sickel promfet (<i>Taractichthys steindachneri</i>)	8	28.57
Snake makeral (<i>Gempylus serpens</i>)	1	4.76
Total	232	-

Table 2 Fishing effort, catch and CPUE by number

Year	#no. of stations	#no. of hooks	Total catch	Total CPUE	Sharks CPUE
			(fish)	(fish/1,000 hooks)	(fish/1,000 hooks)
2011	14	8,375	204	24.39	1.19
2012	7	2,613	28	10.72	1.15
Total	21	10,988	232	21.11	1.09

Table 3 Catch composition of each group by hook types

Group	#no.	%	Catch (%)		
			J-hook	C-hook no.14	C-hook no.18
Tunas	55	23.71	18.18	54.55	27.27
Billfishes	6	2.59	16.67	50.00	33.33
Sharks	13	5.60	7.69	53.85	38.46
Others	158	68.10	34.81	35.44	29.75
Total	232	100.00	28.88	41.38	29.74

Table 4 Biological data of sharks

Common name	#no.	Sex (maturity stage)		Total length (cm)	Body weight (kg)	Stomach content (%OC)
		Male	Female			
Bigeye thresher shark	1	100% (1)	-	330	98.0	Empty
Blacktip shark*	4	67% (2,4)	33% (1)	85 - 188	3.4 - 52.0	Empty
Silky shark	3	100% (1,2)	-	84 - 113	3.4 - 7.0	Empty
Blue shark**	3	-	100% (5)	249	85.0	Squids (100)
Crocodile shark	2	50% (4)	50% (2)	100 - 102	4.9 - 5.7	Empty

Remark: missing biological data because fish fell to the sea (*1 fish / **2 fish)