Landing Bycatch of Tuna Longline Fishery Landed at Phuket Province, Thailand

Sampan Panjarat* Sichon Hoimuk Thumawadee Jaiyen Supachai Rodpradit and Wanlee Singtongyam

Andaman Sea Fisheries Research and Development Center (Phuket)

Abstract

Study on landing catch of tuna longline fishery in the Indian Ocean by collecting data from foreign vessels landing at fishing ports in Phuket Province, Thailand during January to December, 2011. The length of the vessels were 19-40 m and the fish storage capacity were 15-20 tons. There were two types of vessel structure, wood and wood-fiberglass. The number of employed hooks per vessel were 1,300-1,500. The radio bouys were used to identify the position of longline, and the hydraulic winchs were used for hauling the longline. The tuna baits were round scads and/or the lived milkfish. Fishing grounds were in the latitudes of 2° S to 12° N and longtitude of 77° to 95° 40′ E. The high fishing effort were found in the beginning and ending of the year or during off Southwest monsoon. The total catch were 5,543,244 kg with the value of 766.79 million baht. They included 4,318,743 kg of tuna with the value of 690.99 million baht, 92,351 kg of billfishes with the value of 5.73 million baht and 1,132,150 kg of bycatch with the value of 70.07 baht. The tunas comprised yellowfin tuna (*Thunnus albacares*) and bigeye tuna (*T. obesus*) for 68.77 and 9.14 percent of the total catch, and the albacore tuna accounted for less than 0.01 percent. Billfishes comprised 0.57, 0.45, 0.44 and 0.21 percent of blue marlin (*Makaira mazara*), black marlin (*M. indica*), swordfish (*Xiphias gladius*) and striped malin (*Tetrapturus audax*), respectively. The bycatch was 20.42 percent of the total catch which comprised sharks, king mackerel, oilfish (*Ruvettus pretiosus*) and sailfish (*Istiophorus platypterus*). The average number of fishing days per trip was 12.6. The catch per unit of an effort (cpue) of all fish was 14,781.98 kg/trip. The cpue of bycatch was 3,019.07 kg/trip.

Key words: tuna longliner**,** fishing effort, cpue, billfishes, marlins, sharks, sailfish, fishing ground

* Corresponding author: 77 Moo 7 Vichit Sub-district, Muang District, Phuket Province 83000
Tel. +66 7639 1138 **e-mail:** spanjarat@yahoo.com

1. Introduction

Phuket is a Province in the Andaman Sea coast where is merely the only place for landing of tuna longliner since 1992-1993. The available infrastructure and directed flight to Narita airport of Japan are the factor of preference of the vessel owers to landing in Phuket. Although the catch information was gernerally derived from customs, it was on the purpose for tax collection rather than on fisheries biology purpose. The information is usually in form of total weight of groups of fish. Particularly, the miscellaneous bycatch were usally ignored to be recorded or in a rough total round weight on board of miscellaneous category. So, this study survey was expected to integrate information from both sources. Therefore, this study will update the picture and understand nature of tuna long liners fishing in the Indian Ocean and landed in Phuket. The behavior of tuna long line fishers on treating bycatch may lead to develop or seeking the way to further study on bycath in this fishery.

2. Objectives

2.1 To study on tuna longline fishery in the key terms of fishing ground, fishing season, catch and value, species composition, fishing effort and catch rate

2.2. To discuss the bycatch issue

3. Methodology

1. **Study Period:** January-December, 2011

2. Data Collection

The data were gathered from 2 ways, the first was from the record of the customs on the import tuna from longliners and another way was the port sampling.

2.1 Customs: from the record of custom, the information on vessels and round catch of each group of fish carried by the vessel were acquired. All trips were aquire from customs.

2.2 Port sampling: Port sampling was carried out at Muang Distict of Phuket Province of Thailand. The samplings were five days per month. The ports include the small private ports and the Port of Fisherie Market Organization, semi-government organisation. The steps of sampling are as following:

2.2.1 **Prior to landing:** Contact the companies to request the schedule of the landing. It usually could be known 1-2 days prior to landing. The information acquired from this step including name of vessels and its nationality and total catch. The plan of sampling and preparing resources based on this information.

2.2.2 **On the landing day**: interviewed captain and request them to locate fishing ground on map as well as other information of fishing activity, baits, number of fishing days, and the day of travelling, catch, fish composition, quantity of fish which carried by other vessels for landing and quantity of fish from other vessel which carried by the sampled vessel. The markings were alsways with the fish that not belong to landing vessel as to be easy to identify and sort out. The landing catch were identify based on Collette and Nauen (1983) and Nakamura (1985). Fifty fish per vessel were sampled to record individual weights (kg) which were dressed weights.

4. Data analysis

4.1 The study mostly used descriptive statistic to **describe** the result of the survey study vessel and fisheries characteristics e.g. nationality of vessel, fishig ground, bait, number of hooks, number of trip, value of fish (Thai Baht), catch (kg), species composition (%), individual weight (kg), catch per unit of effort: CPUE (kg/trip).

4.2 The geographic information was use to explain the spatial context including fishing position and their distribution, species composition in the area of fishing.

5. Result

5.1 Tuna longline fishery

5.1.1 Vessel characteristics

The bodies of landed vessel were two types including wood-fiberglass and wood. The wood-fiberglass was more common vessels. The lengths were 19-23 m and there were 6-7 fish holes. The one on the front was usually used for storing bycatch in form of frozen. The nationalities of these vessels were Taiwan, Belize, Malaysia and India (Table 1 and Figure 1). The material of Indonesian vessels was wood with the length of 30-40 m. They host 7-8 fish holes that can store 20-50 tons (Table 1 and Figure 2).

Table 1 Characteristic of tuna longliners landing at Phuket Province of Thailand, 2011

nationality (accronym)	boat material	capacity of fish storage rooms (ton)	length over all (m)
Taiwan (TW)	wood-fiberglass	20-60	19-23
Belize (BZ)	wood-fiberglass	50	23
Malaysia (MY)	wood-fiberglass	50	23
India (IN)	wood-fiberglass	50	23
Indonesia (ID)	wood	20-50	30-40

Figure 1 Wood-fiberglass tuna longliners (A) an overview, (B) registration number and (C) fish storage rooms

Figure 2 Wood tuna longliners (A) an overview and (B) fish storage rooms

5.1.2 Fishing gear and bait

The employed hooks were in the range of 1,300-1,500 per vessel, hydraulic winch, bouy and bouy line and radio bouy were the regular equipment. One vessel possessed 10-12 radio bouys (Figure 3). In the past, Indian mackerel and imported Argentina squid (*Illex argentinus*) were the common bait for tuna longliners that landed in Phuket (Chantawong, 1995; Panjarat et al, 2003; Chow and Weicheng, 2002). However, there prices have been more expensive. So, round scads and lived milkfish were used (Figure 4).

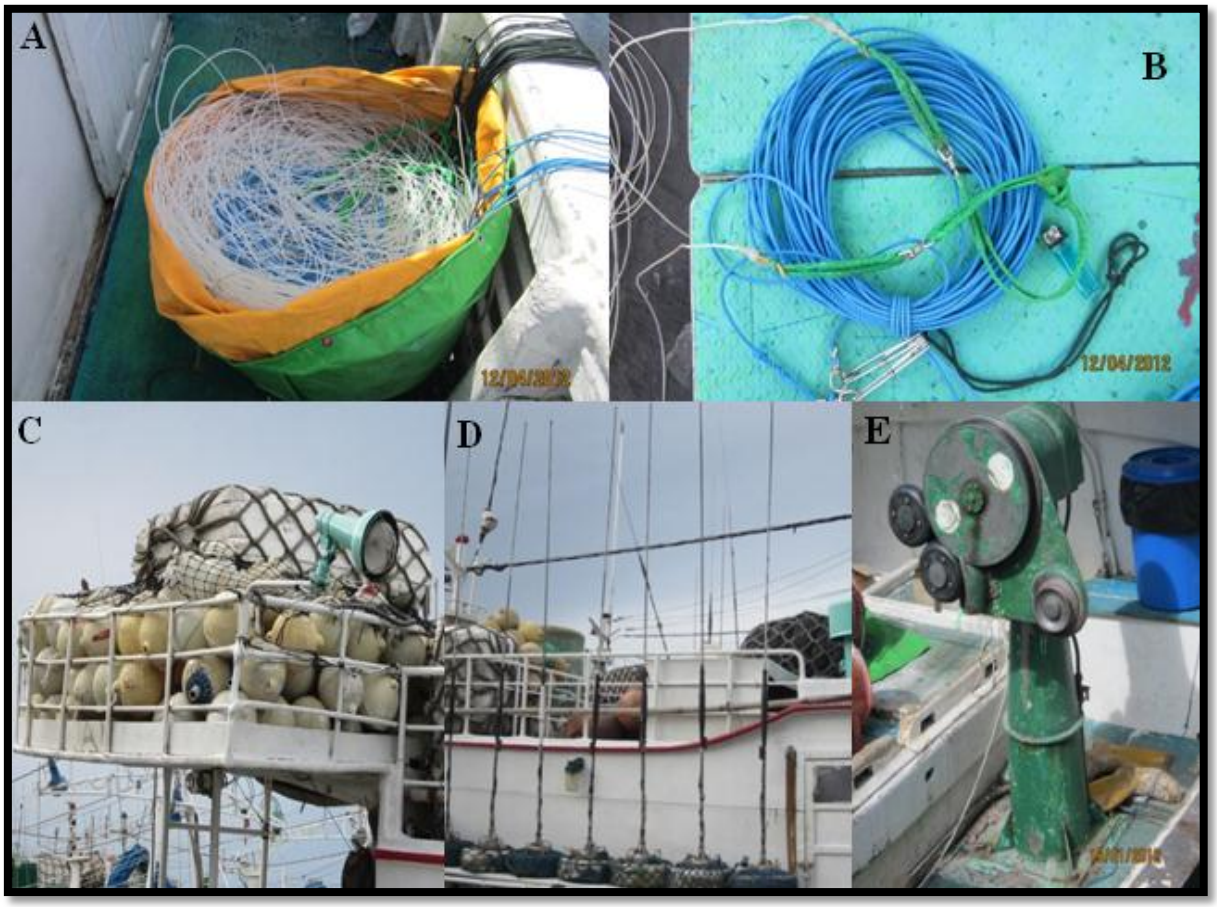

Figure 3 Longline gear equipments (A) mainline, (B) branchline, (C) bouy, (D) radio bouy and (E) hydraulic winch

Figure 4 Baits for tuna longline fishery (A & B) round scads and (C & D) lived milkfish

5.1.3 Fishing ground and Fishing season

The fishing ground were in latitudes of 2°S to 12° N and longitude of 77° to 95° 40′ E where took 1-2 days to sail to or sail from and took 12 days of fishing. The high season of tuna fishing in this area was during November to March. The low fishing season was during May to October which was during Southwest monsoon season (Figure 5-6).

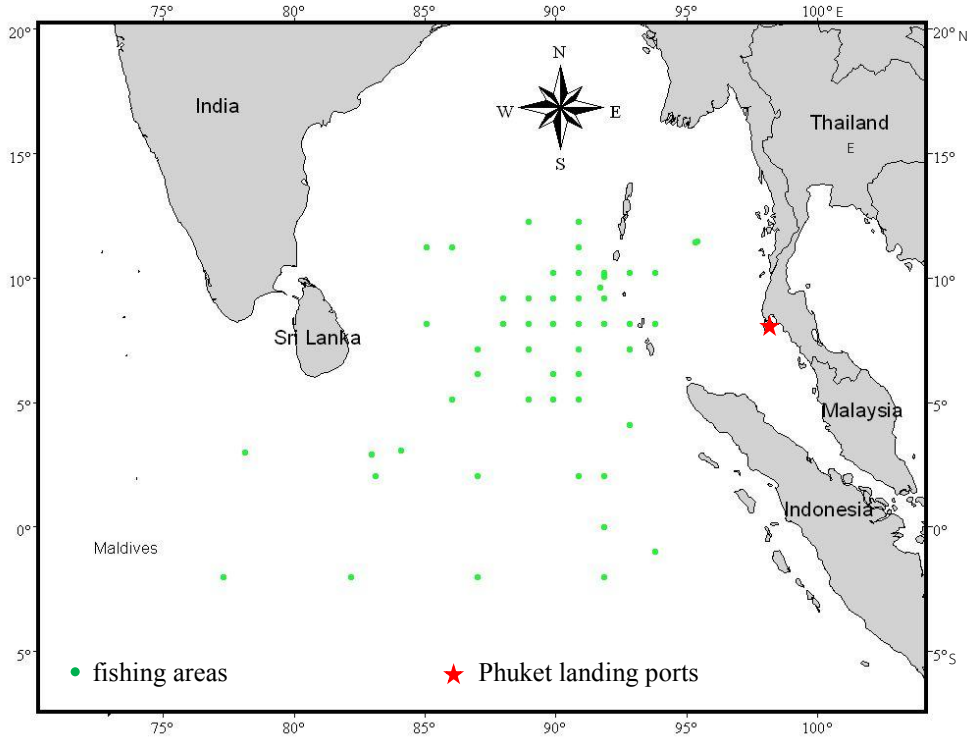

Figure 5 Fishing ground of tuna longliners unloading at Phuket Province, 2011

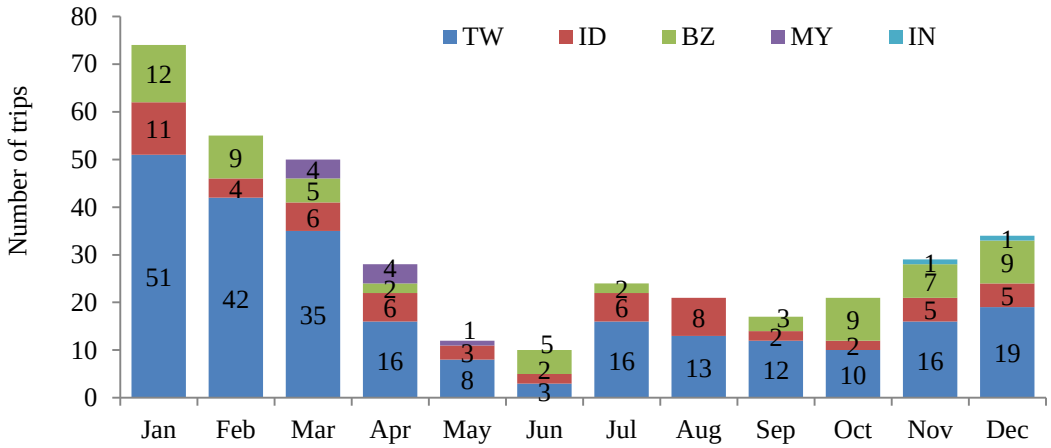

Figure 6 Number of trips of tuna longliners landing at Phuket Province, 2011

5.1.4. Catch and species composition

The total landing catch in 2011 was 5,543,244 kg including 4,318,743 kg of Tuna (77.92%), 92,351 kg of billfishes (1.67) and 1,132,150 kg of miscellaneous byctach (20.42%) . The tunas included Yellowfin (*Thunnus albacares*) and bigeye tunas (*T. obesus*) for 68.77% and 9.14% while albacore (*T. alalunga*) accounted less than 0.01%. Billfishes included blue marlin (*Makaira mazara*), black marlin (*M.*

indica), swordfish (*Xiphias gladius*) and striped marlin (*Tetrapturus audax*) for 0.57%, 0.45%, 0.44% and 0.21%, respectively. Micellanaous fish accounted for 20.42% that include sharks, Spanish mackerel (*Scomberomerus commersoni*), oil fish (*Ruvettus pretiosus*) and sailfish (*Istiophorus platypterus*) (Table 2). However, the proportion of these fish could not be determined. In addition, it was remarked that the percentage of miscellaneous fish was higer during the low tuna fishing season. It was remaked in July and Sepetember when their percentages were upto 57.40 and 54.86 (Figure 7).

Species compositions were not different among fishing positions. However, it was noticed that the billfished were mainly caught in the latitude of 7°-10° N and longitude of 88°- 93° E (Figure 8).

Table 2 Catch of fish from tuna longliners unloading in Phuket Province, 2011

fish		catch		Value (Thai baht)
		kg	%	
tuna	yellowfin tuna (YFT)	3,812,225	68.77	609,949,516
	big eye tuna (BET)	506,465	9.14	81,032,407
	abacore tuna (ALB)	53	0.00*	8,476
	sub total	4,318,743	77.92	690,990,400
billfishes	swordfish (SWO)	24,410	0.44	1,513,420
	black marlin (BLM)	24,824	0.45	1,539,086
	blue marlin (BUM)	31,541	0.57	1,955,505
	stripe marlin (MLS)	11,576	0.21	717,720
	sub total	92,351	1.67	5,725,731
miscellaneous	sharks	18	0.00*	nd
	oilfish	4,006	0.07	nd
	others	1128,126	20.32	nd
	sub total	1,132,150	20.42	70,072,555
total billfishes & miscellaneous		1,224,501	22.08	
Grand total		5,543,244	100.00	609,949,516

Remarks: * = less than 0.01 of value ; others = king fish, sun fish and sailfish

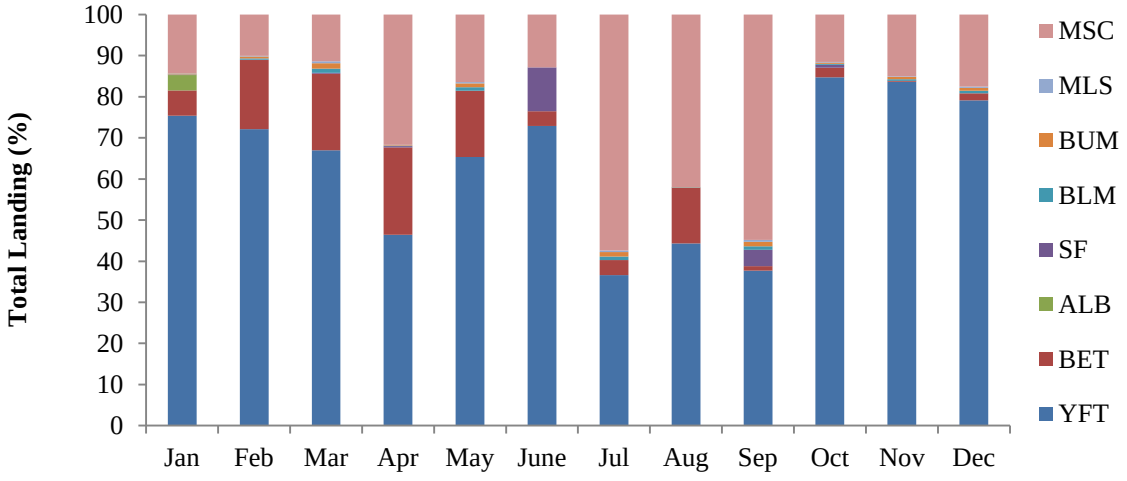

Figure 7 Monthly catch species from tuna longliners unloading in Phuket Province, 2011

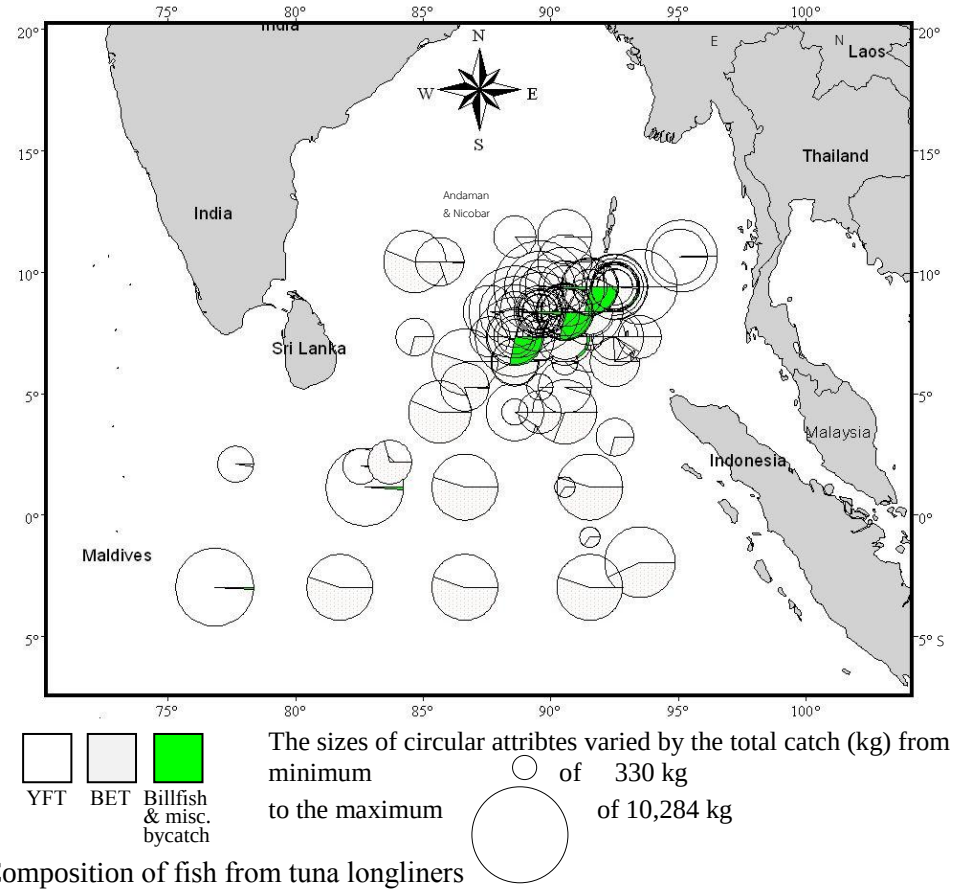

Figure 8 Composition of fish from tuna longliners

5.1.5 Fishing effort and catch rates

In 2011, there were totally 375 trips (Figure 9) and the everage days/trip was 12.6. The average total catch was 14,781.98 kg/trip. The average catch rate of tunas and billfish were 11,762.91 kg/trip while the average catch rate of miscellaneous bycatch was 3,019.07 kg/trip. The lowest average total catch was found in June (9,357 kg/trip) and the highest average total catch was found in December (24,688.04 kg/trip) (Figure 10). The toal catch rates were in the range of 30-760 kg/ 1,000 hooks and the distribution of catch rates was shown in Figure 11. The catch rate of billfishes and bycatch were in the range of 10-60 kg/ 1,000 hooks and the distribution of catch rates was shown in Figure 12.

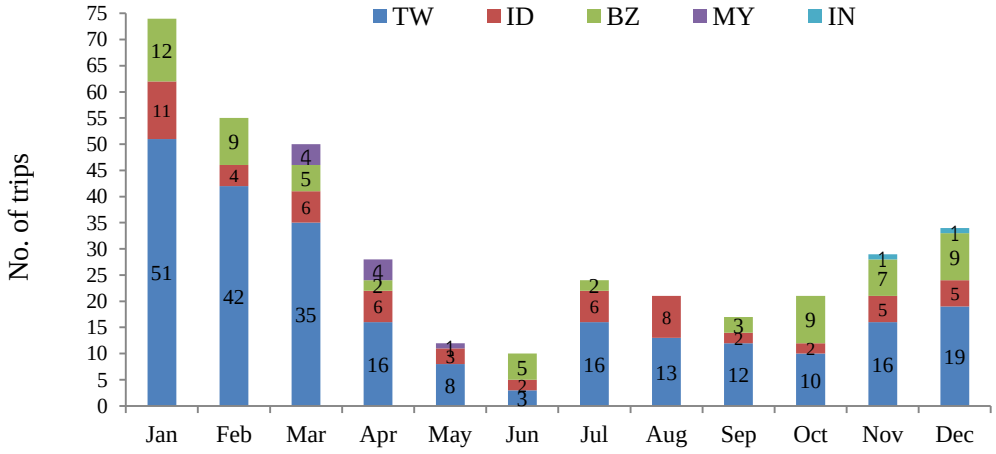

Figure 9 Fishing effort of foreign tuna longliners unloading in Phuket Province of Thailand, 2011

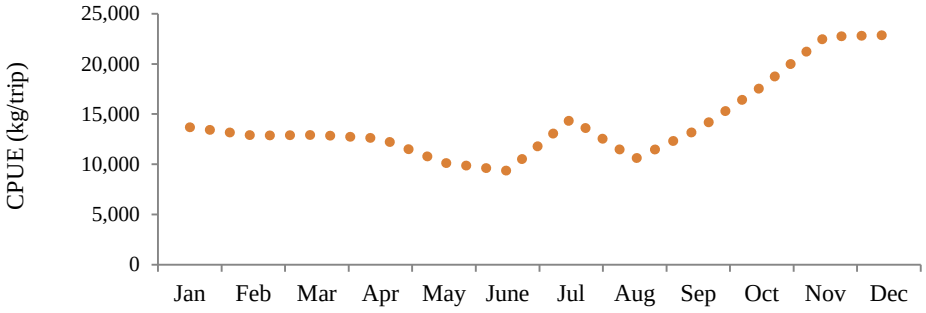

Figure 10 CPUEs of tuna longliners unloading in Phuket province of Thailand, 2011.

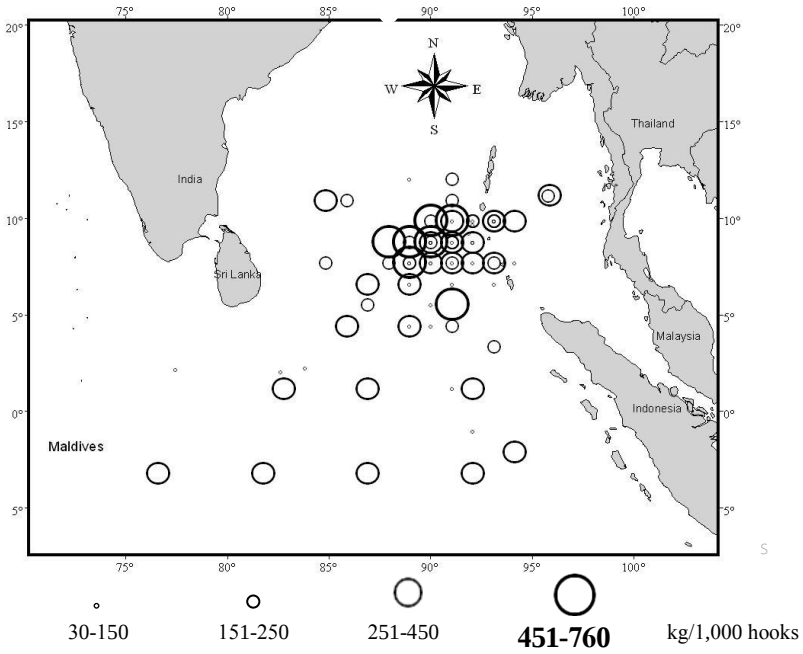

Figure 11 Total catch rate of foreign tuna longliners in the Indian Ocean, 2011.

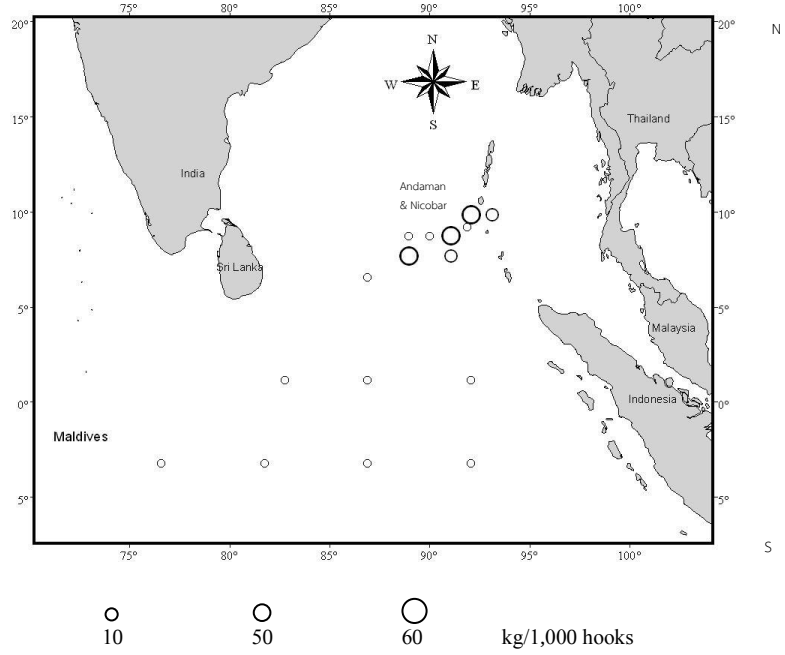

Figure 12 Billfishes and miscellaneous bycatch rate of tuna longliners landing in Phuket, 2011.

6. Discussion

This study report the landing catch, not the actual catch. It tried to extract the bycatch information by using the port sampling. However, the proportion of species could not be determined. It still was the rough information of composition derived by interview. The information derived from invoice and bill of lading was the same as well that declared the imported bycatch as the total micellanous fish. The obstacle of the port sampling was that these fish were kept separately from tuna, and they were not unloded on the same day with tunas because the agencies did not want to waste the time to unload these lower prices fish while tuna needed to be on the airplane ontime for export to Japan. Moreover, there were no time schedual of unloading of these by catch. It was depending on their convernient e.g. labors available and dealing time with the processing plants. The fish were unloaded directly to truck to carry to local processing plants. Although, in a very few time, sampling team could be at the unloading period, the fish wrapped by plastic bags in form of frozen and were more difficult to be identified.

According to the FAO report (FAO, 1998), the fish composition from longliners in this area included tunas, billfishes, sharks and other fish for 37.5% 28.2% 32.9 and 1.4%, respectively which quite different from this study which were 77.92%, 1.67% and 20.42% of tunas, billfishes and other. However, there was no experiment or enough information to determine the factors of the difference. One assumption was different used bait. The FAO reported the use of Pacific saury (*Cololabis saira* (Brevoort, 1856)) while this study reports scads and live milkfish. Another assumption was the behavior of fishers that possibly discards the low value catch. However, if it was the case, the total catch rate would be very higher.

This study derived fishing information based on interview and sampling instead of requesting logbook and then the obstacles were as above addressed. The improvement of the port inspection based on the Port State Measure might facilitate and enhance the port sampling and lead the accuracy of information.

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Appendix figure 1 Sampling form

CT Number_____Processing Plant_____
Boat's name_____Date_____

No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1
1			21			41			61			1			21			41			61		
2			22			42			62			2			22			42			62		
3			23			43			63			3			23			43			63		
4			24			44			64			4			24			44			64		
5			25			45			65			5			25			45			65		
6			26			46			66			6			26			46			66		
7			27			47			67			7			27			47			67		
8			28			48			68			8			28			48			68		
9			29			49			69			9			29			49			69		
10			30			50			70			10			30			50			70		
11			31			51			71			11			31			51			71		
12			32			52			72			12			32			52			72		
13			33			53			73			13			33			53			73		
14			34			54			74			14			34			54			74		
15			35			55			75			15			35			55			75		
16			36			56			76			16			36			56			76		
17			37			57			77			17			37			57			77		
18			38			58			78			18			38			58			78		
19			39			59			79			19			39			59			79		
20			40			60			80			20			40			60			80		
total												**total**											

No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1	No.	kg	LD_1
1			6			11			16			1			6			11			16		
2			7			12			17			2			7			12			17		
3			8			13			18			3			8			13			18		
4			9			14			19			4			9			14			19		
5			10			15			20			5			10			15			20		
total												**total**											

1			6			11			16			1			6			11			16		
2			7			12			17			2			7			12			17		
3			8			13			18			3			8			13			18		
4			9			14			19			4			9			14			19		
5			10			15			20			5			10			15			20		
total												**total**											