Purse Seine Fisheries and CPUE of Neritic Tuna Fisheries in the Andaman Sea, Coast of Thailand, 2018.

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Abstract

Purse Seine fishery in the Andaman Sea operation was 1-2 days per trip or 21 days per month. Fishing grounds located along the Andaman Sea where distances from shores are 10 to 30 nautical miles and depth of water range from 20-80 m. The operate net made from black nylon with mesh size as 2.5 cm. Average annual catch rate from January to December 2018 was 2,306.5 kg/day. The peak of CPUE occurred in March to May. Catch composed of *Decapterus macrosoma* 15.1%, followed by *Rastrelliger kanagurta* 13.2%, *Decapterus maruadsi* 10.9%, Neritic tuna 10.1%, *Selar crumenophthalmus* 8.7% , *Sardinella gibbosa* 3.9%, *Megalaspis cordyla* 3.5%, *Siganus canaliculatus* 3.1% and other species 31.5%. The average annual catch rate of Neritic tuna was 188.6 kg/day.

Neritic tuna in the Andaman Sea was caught mainly from purse seine fishery, by Thai purse seine (TPS) 825.0 kg/day (38.5%), followed by light luring purse seine (LPS) 161.0 kg/day (9.5%), and purse seine with fish aggregating devices (FADs) 148.8 kg/day (7.9%). The highest CPUE was *Euthynnus affinis, Thunnus tonggol, Auxis thazard,* and *Auxis roche*i was 66.6, 64.9, 33.0 and 24.1 kg/day, respectively.

Key words : Andaman Sea, Thai Purse seine, Light luring purse seine, Fish aggregating devices, Neritic tuna.

Introduction

The Exclusive Economic Zones (EEZ) of Thailand covers 420,280 km^2; 304,000 km^2 in the Gulf of Thailand (GoT) and 116,280 km^2 in the Andaman Sea coast of Thailand (ASCoT). There are 23 coastal Provinces surrounding such two main fishing areas, including 17 Provinces in the GoT with a coastline of approximately 2,700 km (1,143 miles) and 6 Provinces in the ASCoT covering 865 km (537 miles) of coastline. The fishing grounds are devided into 7 zones, 1-5 in the GoT and 6-7 in the ASCoT .. In the area 6 and 7 are include 6 province along the Andaman Sea, the first is Ranong province in the northern, followed by Phangnga province, Phuket province, Krabi province, Trang province and Satun province in the southern.

The total 685 fishing ports located along the coast of Thailand which included 1-2 major fishing ports for commercial fleets in each province. In the Andaman Sea, There are 143 fishing ports along the coast of Andaman Sea. These fishing port is a registered fishing port under the permission of the Department of Fisheries and has passed the fishing ports sanitation inspection.

Although commercial fishing boats mostly landing at their province fishing ports, some fleets have the wide fishing area along the coastline and landing at the closest ports to fishing grounds, especially trawlers. It also should be noted that, in the 6 Provinces along the Andaman Sea Coast, the landing port of trawlers is not provided in Krabi Province but purse

seiners are the main fleet of the Province. The sampling is taken in each month, area, and fishing practice for the hold covering of fishing gears and fishing area.

In Thailand, neritic tunas were exploited by a variety of fishing gears. The main fishing gears used for catching neritic tunas was the purse seines. In the past, Fisher used small purse seines and traditional fishing gears for the small pelagic fish species in coastal areas. At present fishing gears and techniques, are developed by using light luring techniques , FADs and fish finder equipment. Neritic tunas are gaining more important economically species. They had become the main target species for Thai fishermen since 1982 because of attractive prices offered by tuna canneries. Catch of marine fishery in the report of Department of Fisheries statistics showed the total catch of neritic tunas in Andaman sea was 9,080 tons in 2013 and increase to 12,768 tons in 2017 (DOF, 2013 and 2017), with the amount of neritic catch increasing continuously from 2013 to 2017.

Materials and Methods

Port sampling in Ranong, Phang Nga, Phuket, Krabi, Trang and Satun provinces. has been conducted to collect biological data of neritic tunas, e.g species composition, fishes were random to measured the individual body weight (kg), fork length (cm) during January to December 2018. For fishing data, e.g catch (metric ton), effort (number of trip), fishing areas, number of hauls were taken by interviewed from a fishing master.

1. Interview form : The description in the interview form mostly interviewed the data about fishing effort, total catch, day per trip, fishing methods, fishing activity, number of hauls, fishing ground, depth, species composition, vessel size (meter), engine size (Hp.), and the problem occurred between trips. Mostly the data was collected from Fishing master and the owner.

2. Sampling methods :

2.1 Area : There are two fishing zone in the Andaman Sea (Area 6 and Area 7) Figure 1. This fishing area is cover 6 province in the Andaman Sea from northern to southern of the Andaman Sea. There are 30.34% of the landing site are taken.

2.2 Vessel : 10 % of landing vessel are taken in each month.

2.3 Fish : The composition of fish is classified into group and species. Each group and species of fish are collected size and weight. Approximately 100 – 500 fish of each species for each area, time, and gear are measured. The number of measurement provides the required accuracy in size composition and catch of vessels. The sampling size was not less than 30 kg/vessel, to identify species and measure total length fish size by punching paper in centimeter and also measure weight in gram. Marine Fisheries Division was assigned to collect data of local purse seine for measure total length fish size (except Neritic tuna and Torpedo scad measure fork length). Have fish target 16 species are Indian mackerel (*Rastrelliger kanagurta*), Short mackerel (*Rastrelliger brachysoma*), Japanese scad (*Decapterus maruadsi*), Shortfin scad (*Decapterus macrosoma*), Bigeye scad (*Selar crumenophthalmus*), Oxeye scad (*Selar boops*), Yellowtail scad (*Atule mate*), Yellowstripe scad (*Selaroides leptolepis*), Torpedo scad (*Megalaspis cordyla*), Goldstripe sardinella (*Sardinella gibbosa*), Kawakawa (*Euthynnus affinis*), Bullet tuna (*Auxis rochei*), Frigate tuna (*Auxis thazard*), Longtail tuna (*Thunnus tonggol*), Indo-Pacific king mackerel (*Scomberomorus guttatus*) and Narrow-barred

Spanish mackerel (*Scomberomorus commersoni*). Every month, data analysis has to be reported for fishing effort, the percentage of species composition and length of fish. Mostly of purse seine has fishing ground in the Andaman Sea coast.

2.4 Fishing activity : Each fishing activity from Thai purse seine fishing vessel were taken, such as purse seine with fish aggregating devices (FADs), purse seine with light luring purse seine (LPS), and Thai purse seine (TPS).

2.5 Survey method and recording data : The systems for recording measurements are developed individually. Water-proof recording paper, measuring board and calipers are used for length measuring. The methods of recording the data are to mark the appropriate size class so that the size frequency is recorded. The size frequency is reported by 1 cm size class intervals for fish under 60 cm in fork length and 0.5 cm intervals for fish in Anchovy group.

3. Data analysis

Calculate the catch rate by calculating the catch per unit of fishing effort (CPUE). It is the basic form to defined as the total catch divided by the total fishing effort in a given period. For FADs fisheries, the catch expressed in kg of fish, the effort as sea time and the CPUE expressed in kg per unit of time spent at sea (Kg. per day).

$$\text{CPUE (Kg./day)} = \frac{\text{total catch (Kg.)}}{\text{effort as sea time (day)}}$$

CPUE = catch per unit of effort

Results and Discussion

1. **Fishing vessel**

Purse seiners are the main fleets for fishing coastal pelagic fish. This purse seine included Thai purse seine (TPS), Thai purse seine with fish aggregating device(FADs), and purse seine with light luring (LPS), but Anchovy purse seine. T he total number of purse seiners is 869 which include 10 m to larger than 25 m boat length. The 631 boats are operated in the Gulf of Thailand (GOT) and the 238 boats are operated in the Andaman sea coast of Thailand (ASCOT) (T a b l e 1). In the Andaman Sea, the highest purse seine number was 96 vessels in Phangnga province, followed by Satun province, Ranong province, Phuket province, Krabi province, and Trang province, was 46, 35, 34, 18,10 respectively.

Table 1 Number of purse seiners in Thailand, 2018

Area	Number of boat by boat size (gross tons)			
	Total	<30	30-150	>150
ASCOT+GOT	869	151	762	51

1. Source: *http://www1.fisheries.go.th/it-stat/images/stories/bookboat/ThaiVessel2561.pdf*

2. **Fishing gears and fishing ground**

All types of purse seine use black nylon net with mesh size 2.5 cm, length of net 1,000-2,000 m, depth of net 100-150 m (Figure 2). The difference of TPS, LPS, and FADs was classified that TPS caught fish by purse seine and using a fish finder, such as eco-sounder and sonar to detect fish school. While LPS and FADs caught fish school by purse seine and using one to four light-luring boats to aggregated fish. LOA of this boat ranged 14-26 m, using 100-150 hp of power engine and 40 kw of the electric generator with 50-56 lamps of 400-500 w (Figure 3). The FADs caught fish by using fish aggregating devices and light luring boat. Fish aggregating

devices constructed of bamboo poles, rope and coconut leaves fastened to a concrete block (Figure 4).

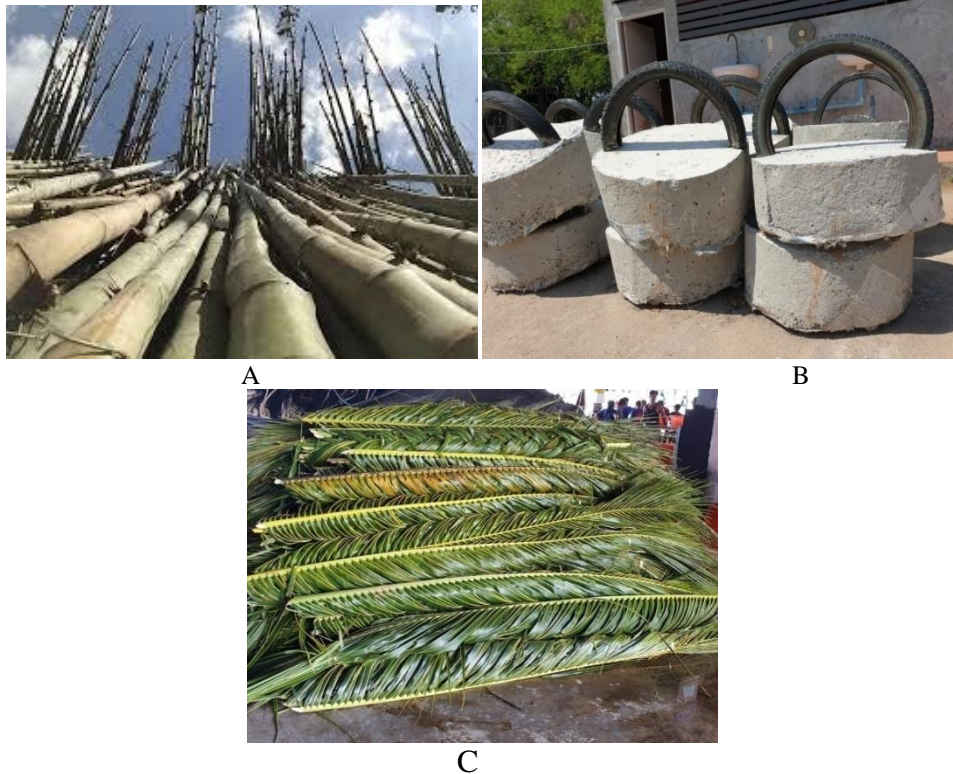Figure 1 Purse seines in Andaman sea coast of Thailand.

Figure 2 Fishing net of purse seines in Andaman sea coast of Thailand

Figure 3 Light luring vessel for aggregated fish school of purse seines.

Figure 4 Construction of FADs; bamboo poles (A), concrete block (B) and coconut leaves (C)

A

B

C

The fishing grounds were distributed along the Andaman Sea Coast. Whereas, the main fishing ground of LPS and TPS were found along the coast of Ranong, Phang-nga, Phuket and Krabi provinces, while FADs was operated in Phang-nga province and Trang and Satun provinces at 30-60 m depth (Figure 6). Boonragsa (1990) reported, the fishing ground of neritic tunas was distributed over the offshore and along the coast, depth of water more than 40 m. The fishing season was all year round where the highest season was during November to May.

The catch from fishing grounds within Thailand's EEZ contributed from the Andaman Sea coast of Thailand (ASCoT). It show the decreasing trend from these fishing ground. In 2018, Average annual catch rate from January to December 2018 was 2 ,306.5 kg/day. The peak of CPUE occurred in March to May. Catch composed of *Decapterus macrosoma* 15.1%, followed by *Rastrelliger kanagurta* 13.2%, *Decapterus maruadsi* 10.9%, Neritic tuna 10.1%, *Selar crumenophthalmus* 8.7% , *Sardinella gibbosa* 3.9%, *Megalaspis cordyla* 3.5%, *Siganus canaliculatus* 3.1%, and other species 31.5%. See as figure 5

Figure 5 Percentage of marine catch fishery by purse seiner from the Andaman Sea coast of Thailand, 2018
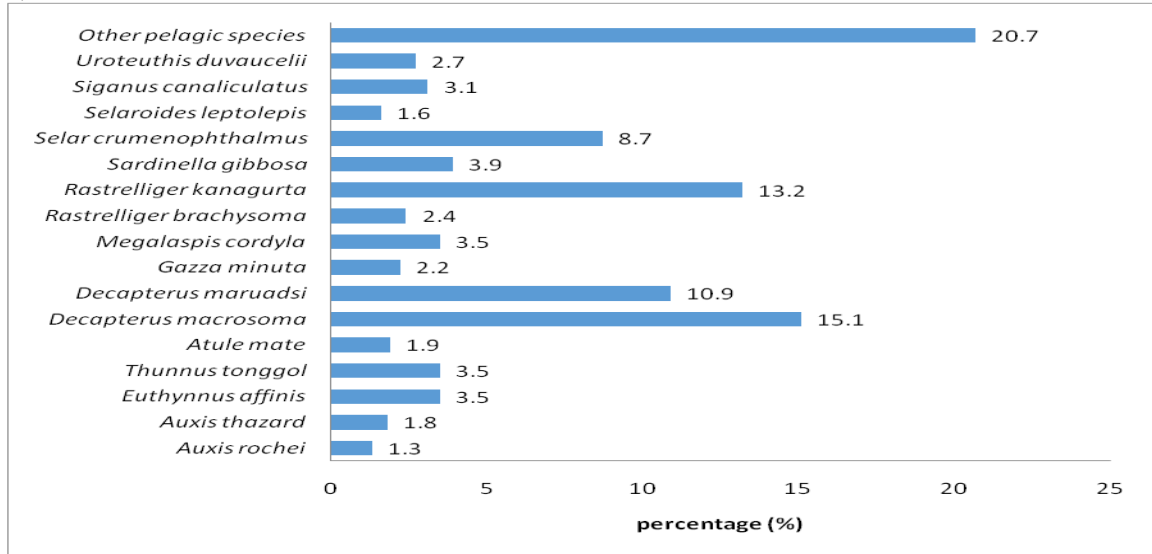
Species	Percentage (%)
Other pelagic species	20.7
Uroteuthis duvaucelii	2.7
Siganus canaliculatus	3.1
Selaroides leptolepis	1.6
Selar crumenophthalmus	8.7
Sardinella gibbosa	3.9
Rastrelliger kanagurta	13.2
Rastrelliger brachysoma	2.4
Megalaspis cordyla	3.5
Gazza minuta	2.2
Decapterus maruadsi	10.9
Decapterus macrosoma	15.1
Atule mate	1.9
Thunnus tonggol	3.5
Euthynnus affinis	3.5
Auxis thazard	1.8
Auxis rochei	1.3

Figure 6 Sampling area and fishing grounds of neritic tunas by type of gears along the Andaman Sea Coast of Thailand
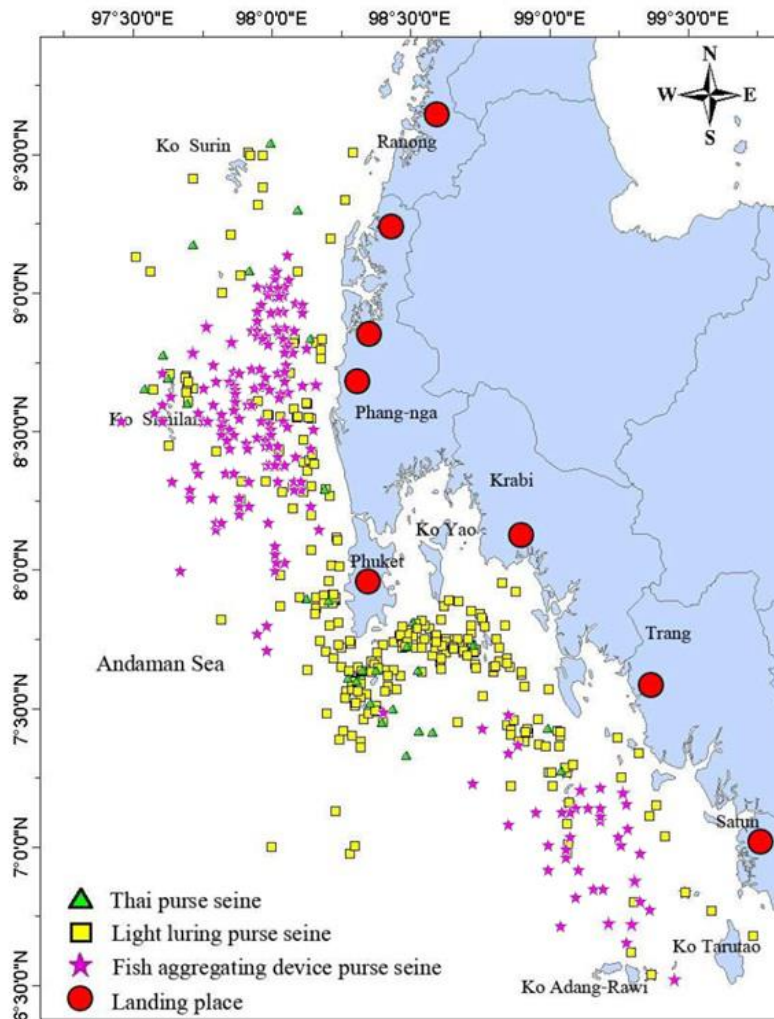
Species composition

   Neritic tunas are pelagic species which are widely distributed throughout tropical waters. Four species of commonly found in the Andaman sea coast of Thailand, namely Eastern little tuna or kawakawa (*Euthynnus affinis*), longtail tuna (*Thunnus tonggol*), bullet tuna (*Auxis rochei*) and frigate tuna (*Auxis thazard*). The percentage of neritic tuna was 9.22 of total pelagic fish from purse seine. Eastern little tuna was the main composition 3.61%, followed by longtail tuna 2.92%, frigate tuna 1.64% and bullet tuna 1.05%, respectively (Figure 7).

Figure 7 Percentage of neritic tunas caught by purse seiner along the Andaman sea coast of Thailand in January to December 2018
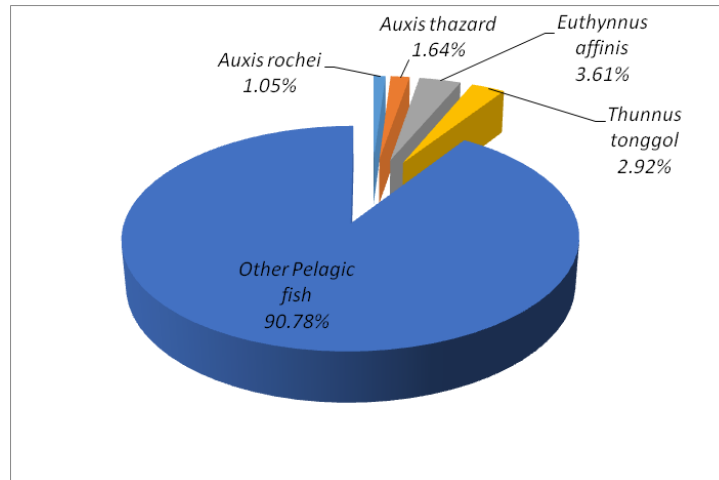
   Figures 8-10 show species composition of neritic tunas by fishing gears. TPS caught longtail tuna (27.47%), frigate tuna (2.67%) kawakawa (0.85%), and bullet tuna (0.13%). LPS caught kawakawa (4.39%), longtail tuna (1.45%), frigate tuna (1.26%), and bullet tuna (0.98%). FADs caught kawakawa (2.97%), frigate tuna (2.01%), bullet tuna (1.29 %) and longtail tuna (0.92%).

Figure 8 Percentage of neritic tunas caught by TPS along the Andaman sea coast of Thailand in January to December 2018
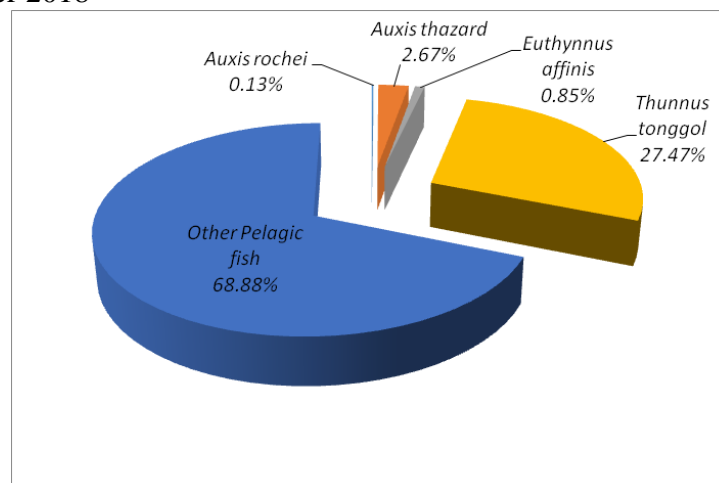
Figure 9 Percentage of neritic tunas caught by LPS along the Andaman sea coast of Thailand in January to December 2018
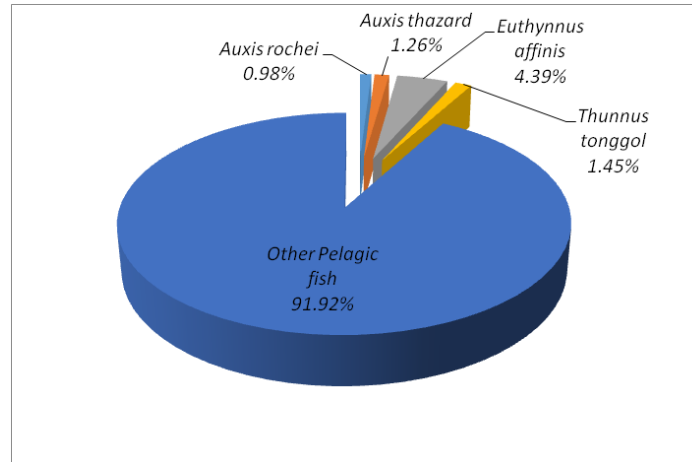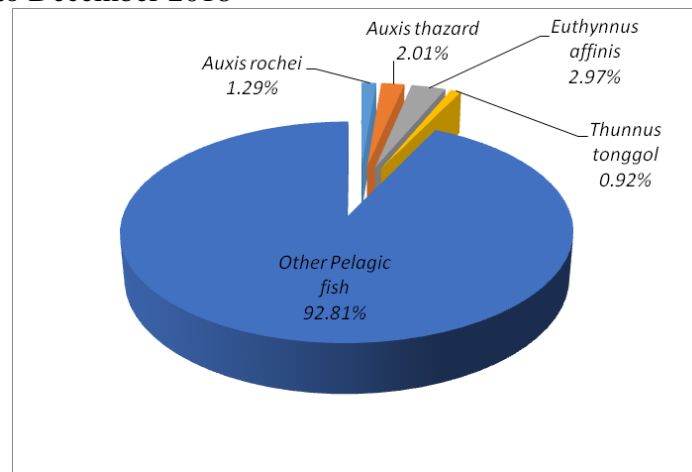

Figure 10 Percentage of neritic tunas exploited0 by FADs along the Andaman sea coast of Thailand in January to December 2018

Catch per unit effort

Catch per unit effort (kg/day) by species of nerritic tuna from TPS, LPS and FADs showed in Table1. The first trens of CPUE showed higher at the transition period from summer to Rainy (southwest monsoon season, April and May) 174.1 and 498.8 kg/day. The second, CPUE was higher again during the Winter or northeast monsoon season (October and December) 319.4 and 420.5 kg/day . During pre monsoon season (February to March) CPUE of Nerritic tuna was low (49.2 and 78.3 kg/day). Kawakawa was the highest abundance from January to December (66.6 kg/day), especially in May (239.7 kg/day). Following by Longtail tuna shows the highest CPUE in October (255.3 kg/day), frigate tuna caught the highest in May (159.0 kg/day), and bullet tuna found highest CPUE in December (96.4 kg/day). LPS was the highest fishing effort 880.51 days, followed by FADs and TPS 541 and 75.49 days, respectively (port sampling data). The average annual catch rate of Neritic tuna was 188.6 kg/day.

Table 2 Catch per unit effort of neritic tunas caught by purse seine during January to December 2018

Species	CPUE (Kg/Day)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Auxis rochei	2.2	0.9	16.3	75.5	35.6	16.5	38.4	6.6	22.3	0.0	13.3	96.4	24.1
Auxis thazard	43.9	4.5	3.8	13.1	159.0	21.5	4.6	7.8	3.9	43.6	13.8	61.0	33.0
Euthynnus affinis	99.8	43.8	52.9	83.3	239.7	55.2	29.8	57.7	19.1	20.5	21.5	84.3	66.6
Thunnus tonggol	38.7	0.0	5.4	2.3	64.4	27.9	33.5	20.0	113.9	255.3	2.7	178.7	64.9
Total	184.6	49.2	78.3	174.1	498.8	121.1	106.3	92.1	159.2	319.4	51.1	420.5	188.6

Size composition

-Longtail tuna

Size distribution ranges from 14.0-67.0 cm in the fork length from all fishing gears. The average size from TPS was 41.18 cm, while mode of length was 35.0-43.0 cm. LPS caught the average size 33.46 cm, whereas modes of length were 29.0-38.0 cm cm. FADs caught the average size 34.90 cm, while modes of length were 25.0-30.0 cm, 29.0-30.0 cm and 34.0-40.0 cm (Figure 11).

Figure 11 Length frequency (%) of longtail tuna caught by purse seiner during January to December 2018
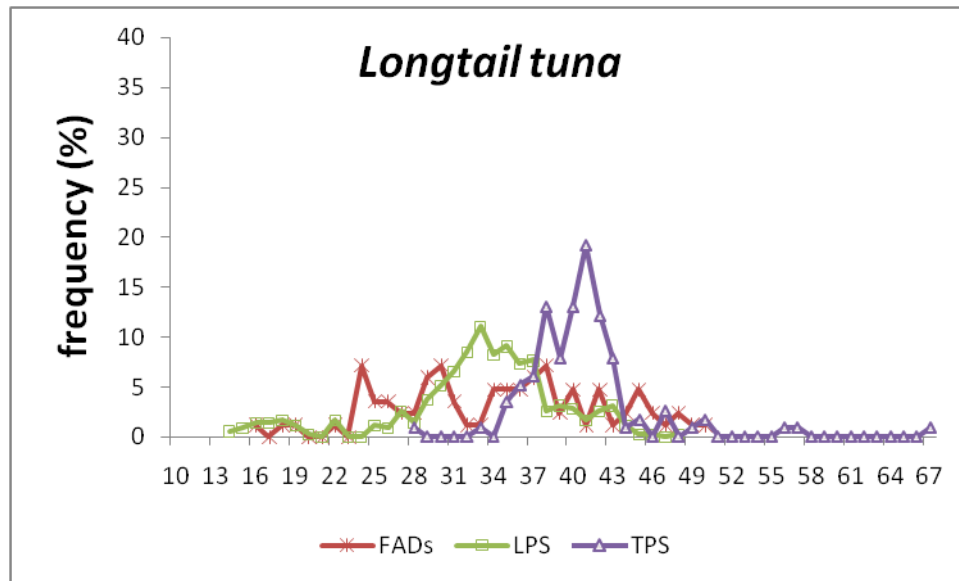
-Kawakawa

Figure 12 show the size distribution, which fork length varied from 13.0-61.0 cm of all fishing gears. The average size from TPS was 38.08 cm, while modes of length were 29.0-34.0 cm, and 39.0-48.0 cm. LPS caught the average size was 25.35 cm, whereas modes of length were 17.0-29.0 cm. FADs caught the average size 27.02 cm, while modes of length were 25.0-30.0 cm. (Figure 12).

Figure 12 Length frequency (%) of kawakawa caught by purse seiner during January to December 2018
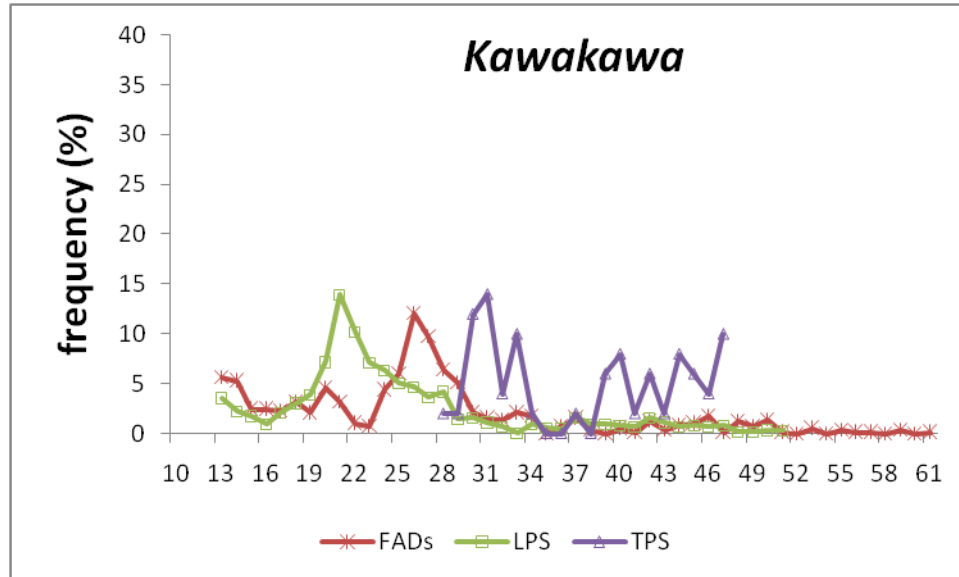
-Frigate tuna

Size distribution varied from 11.0-58.0 cm caught by all fishing gears, average size and major modes that caught by TPS, LPS and FADs was 35.83 cm (33.0-43.0 cm), 26.46 cm (22.0-31.0 cm), and 27.62 cm (24.0-28.0, and 34.0-39.0 cm), respectively (Figure 13).

Figure 13 Length frequency (%) of frigate tuna caught by purse seiner along the Andaman sea coast of Thailand in January to December 2018
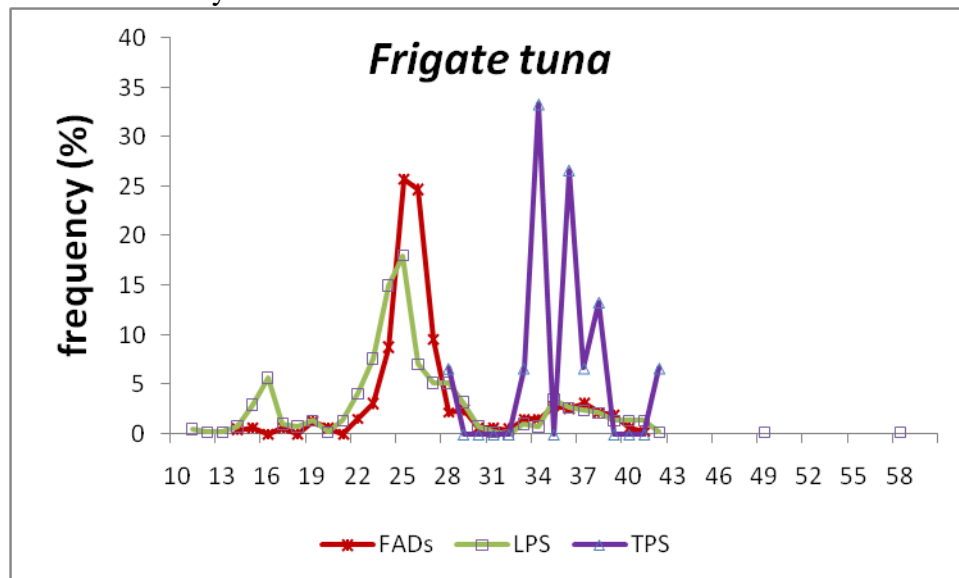
- Bullet tuna

Size distribution varied from 17.0-36.0 cm, average size that caught by TPS, LPS and FADs was 22.56 cm, 23.14 cm and 22.60 cm, major modes of total length was 30.0-34.0 and 39.0-47.0 cm, 19.0-29.0 cm and 25.0-31.0 cm, respectively (Figure 14).

Figure 14 Length frequency (%) of bullet tuna caught by purse seiner along the Andaman sea coast of Thailand in January to December 2018
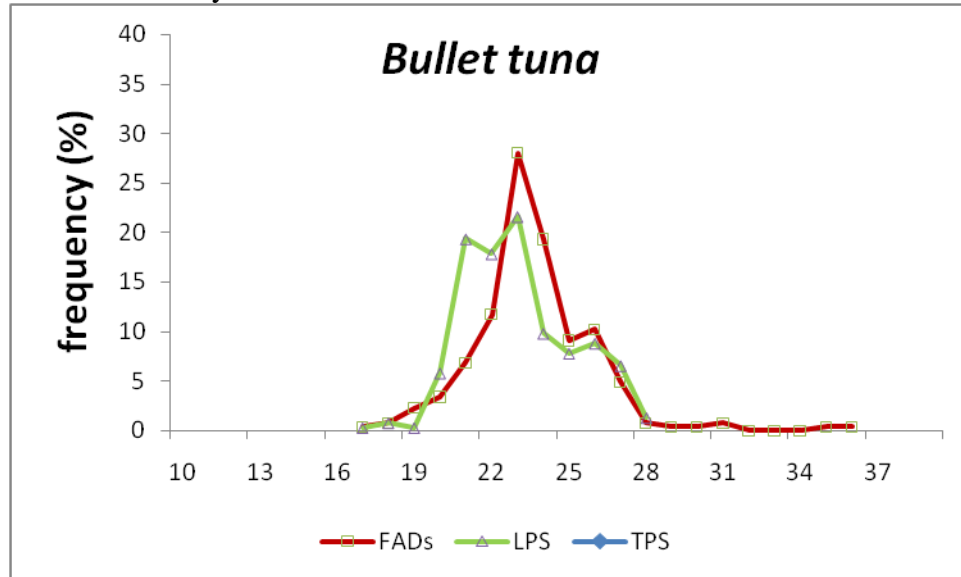
The result from size composition of neritic tunas showed that big size of longtail tuna, kawakawa, frigate tuna, and bullet tuna are caught from TPS. While FADs and LPS caught the size was wide distribute . Same as the previous study from Boonragsa (1990) reported neritic tunas caught by LPS appeared to be smaller than those caught by TPS.

Recommendation

This report was written from data collection of Upper Andaman sea Fisheries Research and Development Center and Southern Andaman sea Fisheries Research and Development Center, Marine Fisheries Research and Development Division, from January to December 2018. This data is the base for the statistic of Thailand, 2018 and also the statistic of marine capture production of commercial fishery, 2018.

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