Small-scale Purse Seine with FADs Fishery in the Andaman Sea of Thailand

Sakol Pheaphabrattana[1], Kanokwan Maeroh[2], and Pavarot Noranarttragoon[3*]

[1] Fisheries Resource Assessment Group, Department of Fisheries, Thailand

[2] Phuket Marine Fisheries Research and Development Center, Department of Fisheries, Thailand

[3] Marine Fisheries Research and Development Division, Department of Fisheries, Thailand

*Corresponding author: pavarotn@gmail.com

Abstract

A study of small-scale purse seine with fish aggregating devices (FADs) fishery in the Andaman Sea of Thailand were carried out by collecting data from small-scale purse seiners using FADs which were landed at fishing ports along the Andaman Sea Coast of Thailand from January to December 2023. The objectives of the study were to analyze catch per unit effort (CPUE), species composition and size of neritic tunas and seerfishes. The results showed that the CPUE of small-scale purse seine with FADs was 2,688.13 kg/day. The highest species composition was scads (*Decapterus* spp.), 24.72% of the total catch, followed by mackerels (*Rastrelliger* spp.), bigeye scads (*Selar* spp.), and sardinellas (*Sardinella* spp.), accounted for 20.85%, 10.25%, and 7.11% of the total catch respectively. The composition of four neritic tunas and two seerfishes sum up 12.04% and 0.46% of the total catch. The size measurement of neritic tunas found that the fork length of Kawakawa ranged from 10.50 – 49.50 cm and the average length was 26.95 ± 8.14 cm, the fork length of bullet tuna ranged from 12.00 – 35.00 cm and the average length was 23.61 ± 4.12 cm, the fork length of frigate tuna ranged from 13.00 – 37.00 cm and the average length was 23.06 ± 6.75 cm, and the fork length of longtail tuna ranged from 11.50 – 42.00 cm and the average length was 27.59 ± 7.01 cm. For seerfishes, the fork length of narrow-barred Spanish mackerel ranged from 40.00 – 60.50 cm and the average length was 72.29 ± 8.94 cm and the fork length of Indo-Pacific king mackerel ranged from 11.50 – 42.00 cm and the average length was 40.37 ± 1.36 cm.

Keywords: neritic tuna, seerfish, CPUE, catch composition

1. Introduction

In Thailand, purse seine is used for catching small pelagic fishes. It is classified as small-scale purse seine under IOTC definition because the vessel length is smaller than 24 and the operation occurs only in domestic waters. There are two methods for purse seine fishing: free-swimming school purse seine and purse seine with fish aggregating devices (FADs). For free-swimming school purse seine method, fishers use echo sounder or sonar to detect the fish schools. For purse seine with FADs method, the FADs are used to aggregate the fish schools. They are made of 3 – 5 bamboo poles used as a buoy, twisted wire and coconut leaves. This structure is anchored to the sea floor with a concrete block (Fig. 1). Cubic-shaped foam is also used as a buoy. The coconut leaves are tied to the wire from the top down to a depth of 20–30 m, depending on the water depth (Noranarttragoon et al., 2013). Fishing operations can be carried out during both daytime and nighttime, and fishing grounds were at a water depth of 20-100 m (Loychuen et al., 2017). The number of FADs ranges from 30 to 40 FADs per vessel. The net is made of black nylon with a 25 mm mesh size. For a fishing trip, fishers may use both fishing methods with the same net.

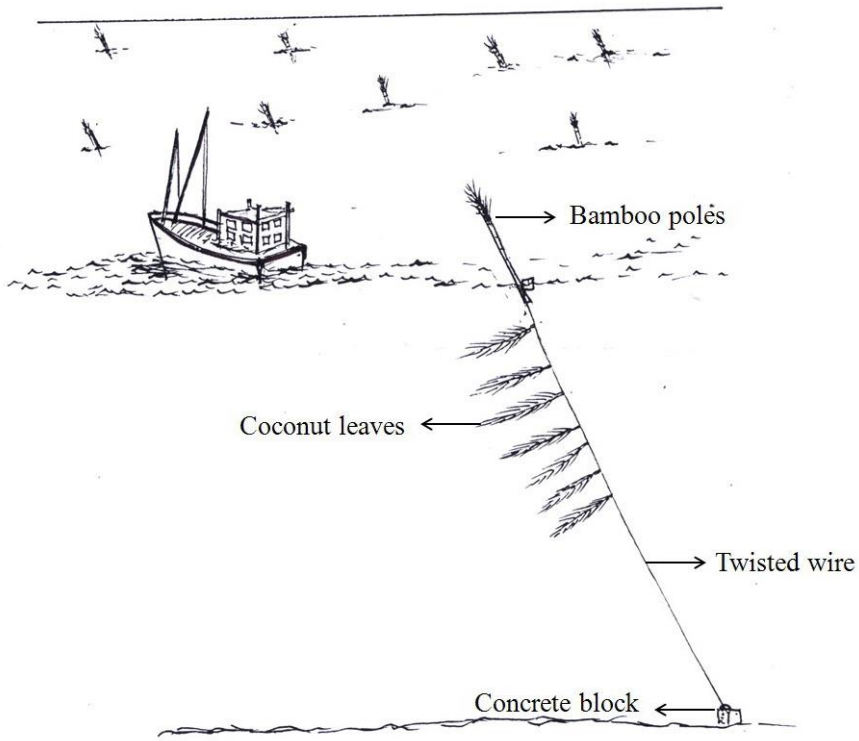

Figure 1 Construction of fish aggregating devices used in Thailand (Noranarttragoon et al, 2013).

There are four species of neritic tuna and two species of seerfish found in Thai waters (Noranarttragoon, 2023). This paper aims to study the catch per unit effort (CPUE), catch composition, and size of neritic tuna and seerfish caught by small-scale purse seine with FADs in the Andaman Sea of Thailand. It also supplements Paragraph 98 of the Report of the WPDCS19 stating that "The WPDCS NOTED that the AFADs used in Thailand are made of coconut leaves and mostly deployed in very coastal areas, where depth is less than 100 m, to aggregate small pelagic species (i.e., mackerels, scads, and sardines) while seerfish comprise a small part of the catch, i.e., generally less than 5%".

2. Method

2.1 Sampling methods

The data were collected monthly from purse seiners landing at fishing ports along the Andaman Sea Coast of Thailand from January to December 2023 (Figure 2). When the vessels landed, the captain or fish master was interviewed about fishing method, fishing effort, and total catch. Only purse seiners operating with FADs were sampled. At least 10 vessels were sampled per month. A sample of 40-50 kg of fish per vessel was taken to identify the species caught, which was done based on Carpenter and Niem (1998, 1999a, 1999b, 2001a, 2002b). Each species was weighted in grams (g).

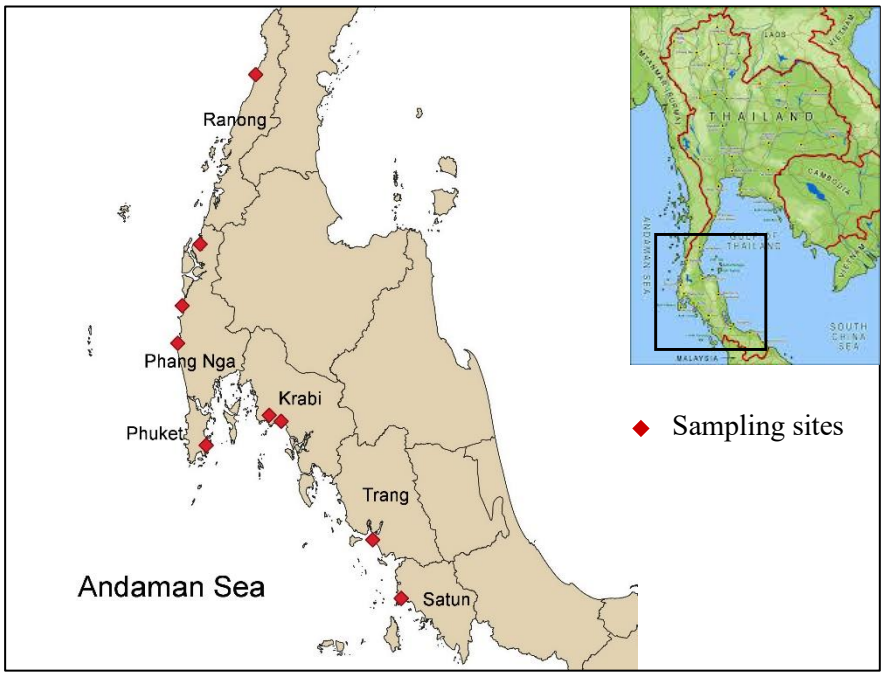

Figure 2 Sampling sites of purse seiners along the Andaman Sea Coast of Thailand in 2023

Four species of neritic tuna, i.e., longtail tuna (*Thunnus tonggol*), Kawakawa (*Euthynnus affinis*), frigate tuna (*Auxis thazard*), and bullet tuna (*A. rochei*), and two species of seerfish, i.e., Indo-Pacific king mackerel (*Scomberomorus guttatus*) and narrow-barred Spanish mackerel (*S. commerson*), were sorted out to measure the length (0.5 cm class interval) and weight (g). A hundred individuals of each species from the sampled catch were measured for length and weight. If the sample did not reach 100 fish, then the length and weight of all the sampled fish were measured.

2.2 Data analysis

The catch per unit effort (CPUE) was analyzed as follows.

$$\text{CPUE} = \frac{\sum_{i=1}^{n} \text{Catch}_i}{\sum_{i=1}^{n} \text{Effort}_i}$$

where Catch_i is the total catch of purse seiner i (kg), Effort_i is the number of fishing days of purse seiner i, and n is the number of purse seiners sampled.

The species composition (%) was analyzed as follows.

$$\text{Species composition}_i = \frac{\sum_{i=1}^{n} \text{Catch}_{ij}}{\sum_{i=1}^{n} \text{Total catch}_i} \text{ x } 100$$

where Catch_{ij} is the catch of species j from purse seiner i, Total catch_i is the total catch of purse seiners i and n is the number of purse seiners sampled.

Mean, maximum and minimum length and standard deviation (cm) were analyzed from the length composition of each species as follows.

$$\overline{X} = \frac{\sum_{i=1}^{n} x_i f_i}{\sum_{i=1}^{n} f_i}$$

$$\text{S.D.} = \sqrt{\frac{\sum_{i=1}^{n} f_i(x_i - \overline{X})^2}{\sum_{i=1}^{n} f_i - 1}}$$

where $\overline{X}$ is mean length, x_i is mid-class interval i, f_i is frequency of class interval i, S.D. is standard deviation and n is the number of class intervals.

3. Result

The total CPUE of small-scall purse seine with FADs operated in the Andaman Sea of Thailand in 2023 was 2,688.13 kilogram/day. The highest CPUE was scads (*Decapterus* spp.), 664.54 kilogram/day, accounted for 24.72% of the total catch followed by mackerels (*Rastrelliger* spp.), bigeye scads (*Selar* spp.), and sardinellas (*Sardinella* spp.), 560.49, 275.52, and 191.14 kilogram/day, accounted for 20.85%, 10.25%, and 7.11% of the total catch respectively.

The CPUE of neritic tunas was 323.55 kilogram/day, made up 12.04% of the total catch. The CPUE of Kawakawa (*Euthynnus affinis*), bullet tuna (*A. rochei*), frigate tuna (*Auxis thazard*), and longtail tuna (*Thunnus tonggol*) were 128.72, 94.60, 51.94, and 48.29 kilogram/day, accounted for 4.79%, 3.52%, 1.93% and 1.80% of the total catch respectively. The CPUE of seerfish was 12.42 kilogram/day, made up 0.46% of the total catch. The CPUE of narrow-barred Spanish mackerel (*Scomeromorus commerson*) and Indo-Pacific king mackerel (*S. guttatus*) were 11.51 and 0.91 kilogram/day, accounted for 0.43% and 0.03% of the total catch respectively (Table 1).

Table 1 Catch per unit effort (CPUE) and species composition of small-scale purse seine with FADs in the Andaman Sea of Thailand in 2023

Group / common name	Scientific name	CPUE (kg/day)	Composition (%)
Scads	***Decapturus* spp.**	**664.54**	**24.72**
Indian scad	*D. russelli*	372.96	13.87
Shortfin scad	*D. macrosoma*	286.32	10.65
Mackerel scad	*D. macarellus*	4.72	0.18
Redtail scad	*D. kurroides*	0.54	0.02
Mackerels	***Rastrelliger* spp.**	**560.49**	**20.85**
Indian mackerel	*R. kanagurta*	340.65	12.67
Island mackerel	*R. faughni*	182.67	6.80
Short mackerel	*R. brachysoma*	37.17	1.38
Scads	***Selar* spp.**	**275.52**	**10.25**
Bigeye scad	*S. crumenophthalmus*	183.67	6.83
Oxeye scad	*S. boops*	91.84	3.42
Sardinellas	***Sardinella* spp.**	**191.14**	**7.11**
Goldstripe sardinella	*S. gibbosa*	190.99	7.10
Fringescale sardinella	*S. fimbriata*	0.15	0.01
Neritic tunas	**-**	**323.55**	**12.04**
Kawakawa	*Euthynnus affinis*	128.72	4.79
Bullet tuna	*Auxis rochei*	94.60	3.52
Frigate tuna	*Auxis thazard*	51.94	1.93
Longtail tuna	*Thunnus tonggol*	48.29	1.80
Seerfishes	***Scomberomorus* spp.**	**12.42**	**0.46**
Narrow-barred Spanish mackerel	*S. commerson*	11.51	0.43
Indo-Pacific king mackerel	*S. guttatus*	0.91	0.03
Barracudas	***Sphyraena* spp.**	**85.32**	**3.17**
Yellowtail scad	***Atule mate***	**70.86**	**2.64**
Torpedo scad	***Megalaspis cordyla***	**60.06**	**2.23**
Others	**-**	**444.23**	**16.53**
Total	**-**	**2,688.13**	**100.00**

The size measurement of neritic tunas caught by small-scale purse seine with FADs found that the fork length of Kawakawa ranged from 10.50 – 49.50 cm and the average length was 26.95 ± 8.14 cm, the fork length of bullet tuna ranged from 12.00 – 35.00 cm and the average length was 23.61 ± 4.12 cm, the fork length of frigate tuna ranged from 13.00 – 37.00 cm and the average length was 23.06 ± 6.75 cm, and the fork length of longtail tuna ranged from 11.50 – 42.00 cm and the average length was 27.59 ± 7.01 cm. For seerfishes, the fork length of narrow-barred Spanish mackerel ranged from 40.00 – 60.50 cm and the average length was 72.29 ± 8.94 cm and the fork length of Indo-Pacific king mackerel ranged from 11.50 – 42.00 cm and the average length was 40.37 ± 1.36 cm (Table 2).

Table 2 Size of neritic tunas and seerfishes caught by small-scale purse seiner with FADs in the Andaman Sea of Thailand in 2023

Species	Fork length (cm)		
	Minimum	Maximum	Average
Kawakawa (*Euthynnus affinis*)	10.50	49.50	26.95 ± 8.14
Bullet tuna (*Auxis rochei*)	12.00	35.00	23.61 ± 4.12
Frigate tuna (*Auxis thazard*)	13.00	37.00	23.06 ± 6.75
Longtail tuna (*Thunnus tonggol*)	11.50	42.00	27.59 ± 7.01
Narrow-barred Spanish mackerel (*Scomberomorus commerson*)	60.00	88.00	72.29 ± 8.94
Indo-Pacific king mackerel (*S. guttatus*)	40.00	60.50	40.37 ± 1.36

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