



Preliminary Length-Frequency Characterization of Indo-Pacific Sailfish (*Istiophorus platypterus*) from Purse Seine Fishery in the Andaman Sea of Thailand

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This paper is to request review and comments on the findings and discussion, as set out in Section 3.

Abstract

This study presents a preliminary length-frequency analysis of landed Indo-Pacific sailfish sampled from purse seine fishery in the Andaman Sea of Thailand. The length data was monthly collected in year 2025. The result showed that 85 sailfishes were sampled across eleven months of the year (no individuals recorded in July). Monthly sample sizes were highly uneven (range 0–19 individuals). The samples ranged from 45.5 to 209.5 cm LJFL (average length is 108.6 ± 37.9 cm; median = 99.5 cm). The statistical analysis showed no significant difference in length and individual encounter among monsoon seasons. The majority of sampled individuals (77.6%) were smaller than the reference length at maturity for the species reported in FishBase (150 cm). Comparison with longline-based studies from the adjacent areas, which report larger individuals suggesting that the Andaman Sea potentially are nursery or aggregation habitat of this species. Given the sparse in length data, this study provides a preliminary size structure for this data limited species in the eastern Indian Ocean supporting future researches.

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Keywords: Indo-Pacific sailfish, length frequency, Andaman Sea, purse seine, bycatch

1. Introduction

The Indo-Pacific sailfish, *Istiophorus platypterus* (Shaw, 1792), is a large, highly migratory epipelagic billfish distributed in tropical and temperate waters of the Indian and Pacific Oceans; densely distributed in waters close to coasts, islands, and reefs. (Nakamura, 1985). It is reported to reach a maximum fork length of 348 cm (Froese & Pauly, 2026). Sailfish is an important species in recreational fisheries but not generally targeted by commercial fisheries. It is often caught as bycatch in tropical purse seine fisheries in Thailand.

There are efforts to collect biological data of this fish through the routine monitoring of purse seine landings along the Andaman Sea coast of Thailand. The activity is routinely conducted by Marine Fisheries Research and Development Centers (MFRDD) under the Department of Fisheries of Thailand (DOF), using opportunistic (accidental) sampling of landed purse seine vessels at fishing ports (Thitipongtrakul & Hoimuk, 2024), together with enumerator based at the designated port which initiated in late 2024 that aims to meet the specific requirement of IOTC resolution 15/02 (Pheaphabrattana & Noranarttragoon, 2025). This study investigates length-frequency data of Indo-Pacific sailfish sampled from purse seine landings in the Andaman Sea within Thailand's EEZ, gathered by port sampling and enumerator over one annual cycle, with the aim to be as a preliminary biological baseline contributing future stock assessment works.

2. Materials and Methods

2.1 Study area and data collection

Sampling was conducted along the Andaman Sea coast of Thailand, covering purse seine landing ports along Phang Nga, Phuket, Krabi, Trang and Satun provinces. Length data of *I. platypterus* were collected in January – December 2025 from two sources; 1) monthly port sampling program by MFRDD and 2) enumerators stationed at the designated fishing port in Phang Nga province. Landed sailfish was measured for lower jaw fork length (LJFL) by measuring tape and recorded in centimeter unit.

2.2 Data analysis

Length data were reconstructed as 1 cm monthly frequency class interval. Descriptive statistics (mean, median, standard deviation, coefficient of variation, range) were calculated by sampling month. Monthly data were grouped into 3 seasonal monsoons which aim to investigate the monsoon effect. The monsoon seasons in this study are classified as northeast monsoon (NEM: November–February), inter-monsoon (March–April), and southwest monsoon (SWM: May–

October). The Kruskal-Wallis one-way analysis of variance was used to test for differences in length among the three seasonal groups. The proportion of individuals compared to the reported length at maturity (L_m) of *I. platypterus* from FishBase (at 150 cm) was also evaluated (Froese & Pauly, 2026).

3. Results and discussion

3.1 Overall size structure

A total of 85 sailfish were measured over the study period. Lower-jaw-fork length ranged from 45 to 210 cm, with a mean of 108.6 ± 37.9 cm and a median of 99.5 cm (Table 1). The overall length-frequency distribution (Figure 1) was slightly right-skewed with double mode; the primary mode between approximately 60 and 90 cm and the secondary of below 150–160 cm. There are small number of individuals exceeded 175 cm.

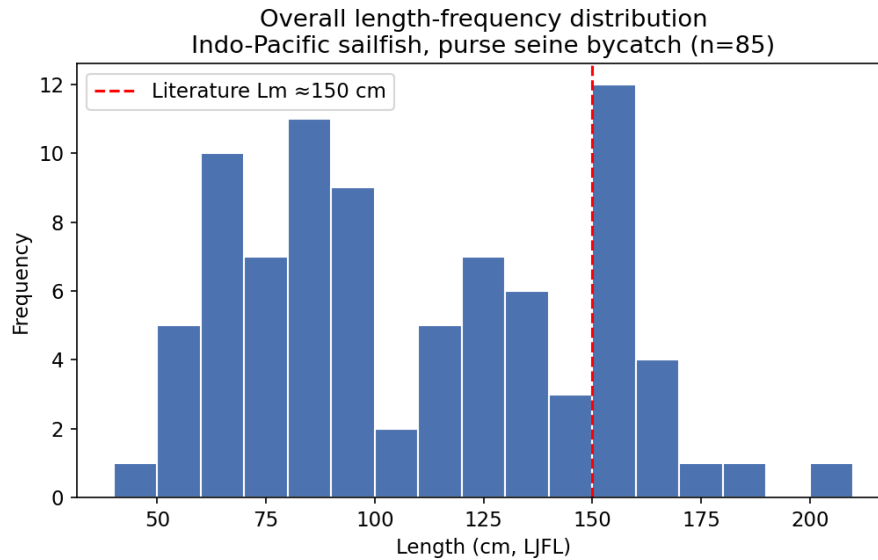


Figure 1. Overall length-frequency distribution of Indo-Pacific sailfish (*Istiophorus platypterus*) sampled from purse seine landings in the Andaman Sea, Thailand EEZ. Dashed line indicates the reported length at maturity (150 cm).

Table 1. Summary of descriptive statistics sailfish sampled from purse seine landings, Andaman Sea, Thailand

Statistic	Value	Unit
n	85	individuals
Mean length	108.6	cm LJFL
Median length	99.5	cm LJFL

Statistic	Value	Unit
Standard deviation	37.9	cm
Coefficient of variation	34.9	%
Minimum length	45.5	cm LJFL
Maximum length	209.5	cm LJFL
Skewness	0.35	—
Proportion < literature L_m (150 cm)	77.6	%

3.2 Monthly and seasonal patterns in length

Monthly sample sizes were unevenly distributed, ranging from zero in July to 19 individuals in May (Table 2). It is due to the fish is not targeted by purse seine fishery. The samples in December ($n = 13$) and May ($n = 19$) together accounted for over one-third of the total sample, while August and November each contributed a single individual. No individuals were recorded in July. Mean monthly length varied from 78.1 cm (January) to 143.5 cm (March), with the largest individuals recorded during March and December (Figure 2, Figure 3).

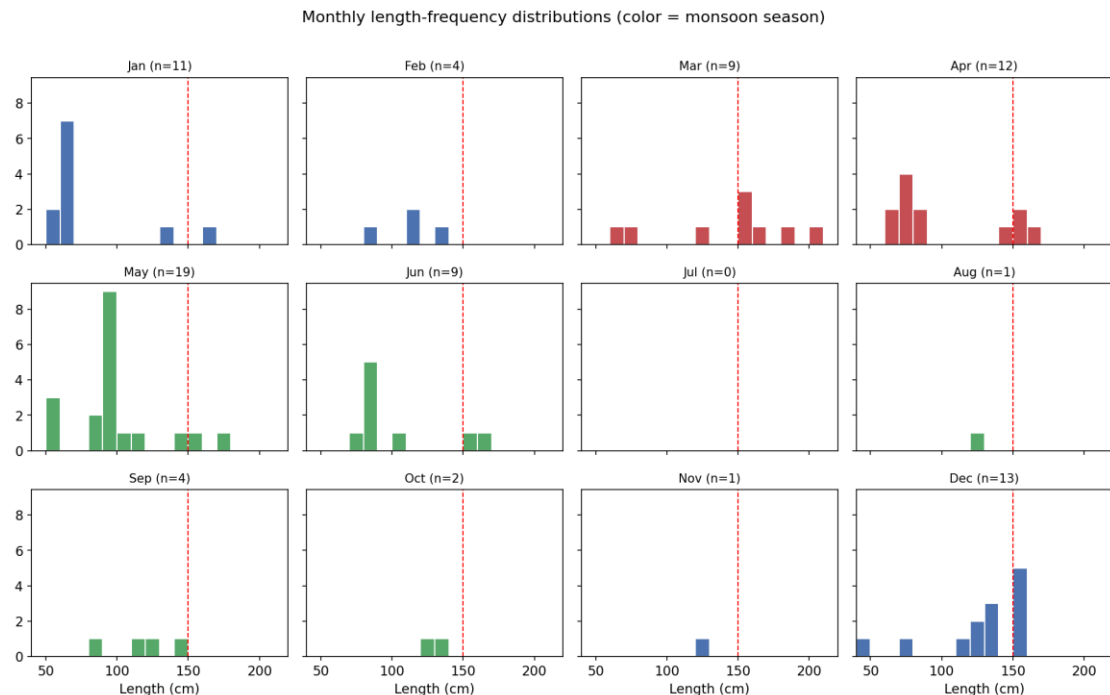


Figure 2. Monthly length-frequency distributions of sailfish sampled from purse seine landings, Andaman Sea, Thailand. Panel color indicates monsoon season (blue = northeast monsoon, Nov–Feb; red = inter-monsoon, Mar–Apr; green = southwest monsoon, May–Oct). Dashed line indicates the reported length at maturity (150 cm)

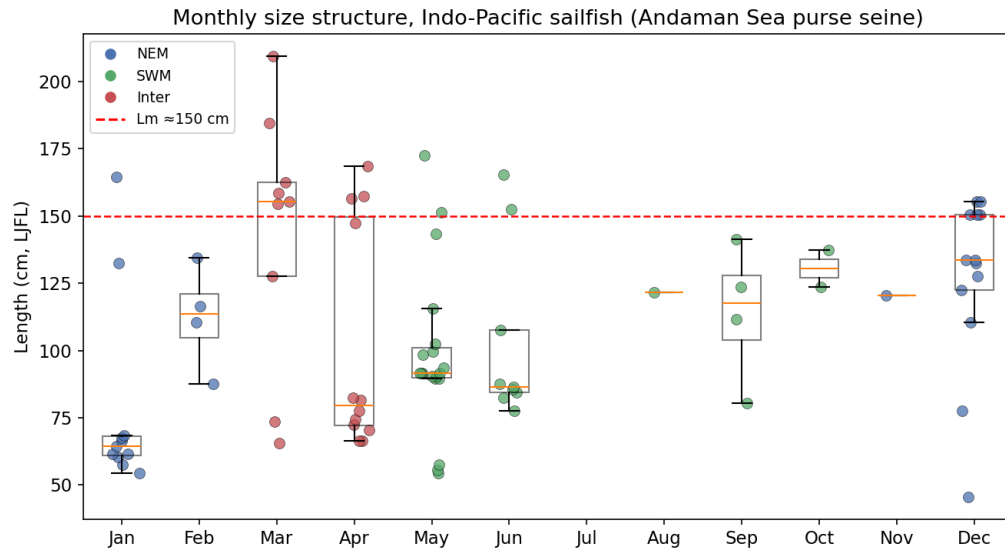


Figure 3. Monthly boxplot of size structure of sailfish sampled from purse seine landings, Andaman Sea, Thailand. each point showing individual observations. Dashed line indicates the reported length at maturity (150 cm).

Table 2. Monthly sample size and descriptive statistics for landed sailfish length (LJFL) from purse seine fishery, Andaman Sea, Thailand.

Month	Season	n	Mean (cm)	SD	Min (cm)	Max (cm)
Jan	NEM	11	78.1	35.8	54	165
Feb	NEM	4	112.2	19.4	87	135
Mar	Inter	9	143.5	47.6	65	210
Apr	Inter	12	101.8	41.7	66	169
May	SWM	19	98.4	30.4	54	173
Jun	SWM	9	103.3	32.8	77	166
Jul	SWM	0	-	-	-	-
Aug	SWM	1	121.5	-	121	122
Sep	SWM	4	114.2	25.7	80	142
Oct	SWM	2	130.5	9.9	123	138
Nov	NEM	1	120.5	-	120	121
Dec	NEM	13	126.6	32.6	45	156

The Kruskal-Wallis test found no statistically significant difference in length among these three seasonal groups ($H = 1.324$, $df = 2$, $p = 0.516$), indicating that fish size is not affected season. However, this result should be interpreted as inconclusive given the small and highly unbalanced sample sizes in several months. On the other hand, it is considered limited statistical power rather than strong evidence for the absence of a seasonal pattern.

The size composition of sailfish caught by the purse seine fishery in the Andaman Sea clearly differs from reported sailfish studies in the Indian Ocean region which mostly from longline. Ramalingam & Kar (2011) reported sailfish length caught by longline in the Andaman & Nicobar Islands range of 113-230 cm FL, mean length of 177.8 cm for male and 133-250 cm FL, mean length of 192.1 cm for female, which overlapping with length observed in this study. The differences of the reported size in this study and others could be explained by two related reasons i.e., gear selectivity and life history of the fish. Gear selectivity basically differs between the purse seine and longline, especially gear setting: purse seine gear operates in surface and near-surface waters over continental shelf and nearshore habitats, whereas longline gear fishes at deeper depths in further offshore. Additionally, juvenile pelagic predators including billfishes are known living near shore and coastal habitats in their young life stages and tend to move to oceanic waters when adult.

By noting that the usual fishing ground of Thai flagged purse seine located near shore in contiguous zone and territorial zone (Hoimuk & Pheaphabrattana, 2023), this emphasis that nearshore waters of the Andaman Sea may function as a nursery or juvenile aggregation area for this species.

3.3 Effect of monsoon season on individual encounter

Addition testing for number of individuals encountered per monsoon using Chi-square test was carried out parallelly with seasonal differences in length. Number of individuals were aggregated in seasonal observation, which were 29 individuals across NEM months, 21 across the two inter-monsoon months, and 35 across the six SWM months (Table 3; Figure 4). The average fish observes in inter-monsoon period was nearly double the encounter rate in the compared with SWM. A chi-square goodness-of-fit test result found no statistically significance ($\chi^2 = 4.635$, $df = 2$, $p = 0.099$).

Although the test result showed no different encounter between season, it should be noted that there are multiple effort-driven and ecological-driven affected to individual encounter. For example, sea condition in different monsoon affects to frequency of vessel operation. The oceanographic condition and seasonal movement and aggregation event of the fish in the monsoon are also affected to individual encounter as well.

Table 3. The number of observed versus expected monthly encounter of sailfish by monsoon season, Andaman Sea, Thailand

Season	Months (n)	Observed n	Expected n	Mean n / month
NEM (Nov–Feb)	4	29	28.3	7.25
Inter-monsoon (Mar–Apr)	2	21	14.2	10.50
SWM (May–Oct)	6	35	42.5	5.83

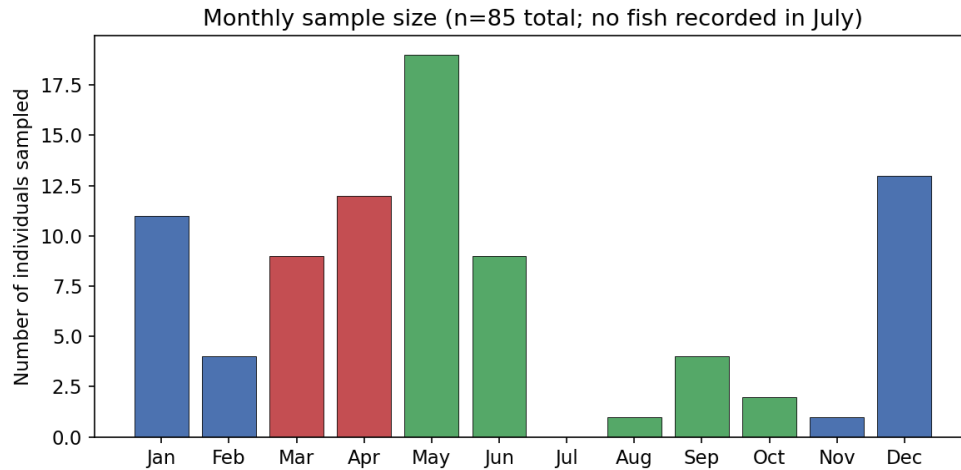


Figure 4. Monthly number of sailfish measured from purse seine landings, Andaman Sea, Thailand. Bar color indicates monsoon season as in Figure 2.

3.4 Proportion of immature individuals

Referred to the 150 cm reference length threshold (length at maturity), the majority of sampled individuals (66 of 85; 77.6%) fell below this value. This interprets that sailfish caught by purse seine fishery in the Andaman Sea, Thailand are mostly juveniles.

4. Conclusion

This preliminary analysis of 85 Indo-Pacific sailfish sampled from purse seine landings in the Andaman Sea, Thailand. It was found a size distribution (range 45–210 cm LJFL) which majority comprised individuals below a length at maturity

(77.6% < 150 cm). The length data is constrained by small and unbalanced monthly sample sizes which results to not significant seasonal difference in length (fish size) and individual encounter between season. However, it is a notably higher average monthly encounter rate in the inter-monsoon transition than other seasons. Even though the result is too limited in size and monthly balance but it gives a preliminary size-structure baseline of Indo-Pacific sailfish in the eastern Indian Ocean area.

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