

Bycatch Presence Recorded in Purse Seine Fishing Logbooks from 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 analysis of bycatch presence recorded in purse seine fishing logbooks operated in the Andaman Sea of Thailand. The total logbook data of 20,274 trips were examined, which four trips found recorded bycatch presence entry for sharks and dolphins but no sea turtle or whale recorded. All bycatches were visually observed at sea without taken or retaining onboard. These observations appeared in the national EEZ within the fleet's normal range of distance to coast. The bycatch observed presence found to be in shallower water (13–29 m depth) and the distant to coast ranged 16.1–30.7 km. Bycatch-presented trips tended toward lower catch compares to no-bycatch trips, while fishing duration showed no associated difference. Given the limited bycatch records, this result should be interpreted as preliminary and descriptive with consideration for strengthening future logbook-based bycatch monitoring.

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Abstract

This study presents a preliminary analysis of bycatch presence recorded in purse seine fishing logbooks operated in the Andaman Sea of Thailand. The total logbook data of 20,274 trips were examined, which four trips found recorded bycatch presence entry for sharks and dolphins but no sea turtle or whale recorded. All bycatches were visually observed at sea without taken or retaining onboard. These observations appeared in the national EEZ within the fleet's normal range of distance to coast. The bycatch observed presence found to be in shallower water (13–29 m depth) and the distant to coast ranged 16.1–30.7 km. Bycatch-presented trips tended toward lower catch compares to no-bycatch trips, while fishing duration showed no associated difference. Given the limited bycatch records, this result should be interpreted as preliminary and descriptive with consideration for strengthening future logbook-based bycatch monitoring.

Keywords: bycatch, purse seine, logbook data, Andaman Sea, presence occurrence

1. Introduction

Purse seine fisheries operating over continental shelf and coastal waters of Thailand can incidentally interact with non-target megafauna considered as conservative species, including marine turtles, elasmobranchs, and cetaceans. It is mandatory to record any interaction with these bycatches in fishing logbooks even presence or caught in fishing. However, the national laws additionally states that all these bycatches (marine turtles, any cetacean species, and conservative elasmobranch species) are prohibited to taken onboard except the cases for rescuing purposes. Therefore, the bycatch records in vessel logbooks are bycatch visually presence at sea during fishing operation with no onboard retention.

This study investigates bycatch presence recorded in purse seine fishing logbooks in the Andaman Sea within Thailand's EEZ, with the aim to explore the

effectiveness of routine trip reporting bycatch in fishing logbook for the future bycatch risk assessment. A preliminary and descriptive account in consistent with data-limited available from fishery logbooks were used in the analysis.

2. Materials and Methods

2.1 Logbook data

The dataset was retrieved from Thai Flagged Catch Certification System (DOF, 2026), comprised 20,274 purse seine trip logbook records in 2025 (January-December) in the Andaman Sea coast of Thailand. The dataset contains typical information on fishing position (latitude/longitude), fishing duration (days) per trip, hauling number per trip, catch figure (kg), and bycatch presence observation during operation. A bycatch presence entry was recorded for four taxa namely turtles, sharks, dolphins, whales by fishing trip. A fishing trip which has a presence entry for any of these taxa was classified as “bycatch-observed”. All other trips which no bycatch entry and are referred to as “no-bycatch-reported.”

2.2 Data analysis

The reported location was compiled and mapping with 1:10,000,000-scale coastline vector layer derived from Natural Earth (public domain). Bathymetry data was obtained from NOAA NCEI ETOPO1 Global Relief Model (1 arc-minute resolution) via the NOAA ERDDAP data service (NOAA National Centers for Environmental Information, 2009; Amante & Eakins, 2009). The distance from each trip's reported position to the nearest coastline was calculated to explore spatial relationship. Together with depth at each trip position was sampled from the available bathymetry data and then used in analysis.

The statistical testing, with two-sided Mann–Whitney U tests (Mann & Whitney, 1947) was conducted to determine difference between bycatch presence and relevant covariates. Total catch (kg), fishing duration (days) catch rate per fishing day were compared with bycatch-observed and no-bycatch-reported trips. Regarding the noise of the dataset, the top and bottom 2.5% of catch, fishing duration, and catch per fishing day were excluded prior to comparison, in order to prevent bias results driven by a small number of extreme outliers. The results are demonstrated with descriptive of medians and interquartile ranges (IQR).

3. Results and discussion

3.1 Presence occurrence

The bycatch presence entry was recorded in 4 of 20,274 trips (0.020%): one shark and three dolphins were visually spotted and recorded; nil records for turtle or whale. Each was occurred on a separate trip at different reported positions (Table 1). Due to the very low recorded frequency, it is suggested this result should be treated as a descriptive account of ongoing vessel-self routine reporting, which is likely depends on reporting behavior instead of the actual encounter.

The overall dataset shows a right-skewed distribution particularly for catch and depth (Figure 1). This is because majority of fishing events usually happen near coastline and shallow depth area; very high catch or fishing in deep water tend to be lower in offshore area.

Table 1. Logbook trips reported a bycatch presence entry (visually spotted), with associated spatial and operational values

Trip ID (PI)	Taxon	Latitude	Longitude	Distance to coast (km)	Depth (m)	Catch (kg)	Fishing days
6815202740	Dolphin	7.431	98.293	18.7	16	500	2
6831201750	Dolphin	9.104	97.905	30.7	13	3,510	3
6819203071	Shark	7.578	98.883	16.1	13	0	3
6831208298	Dolphin	9.424	98.075	19.4	29	0	3
Overall dataset (n = 20,274) mean $\pm$ SD / [median]	—	—	—	25.7 $\pm$ 19.8 / [21.8]	53.3 $\pm$ 89.5 / [30.0]	3,588 $\pm$ 4,887 / [2,300]	2.4 $\pm$ 1.1 / [2.0]

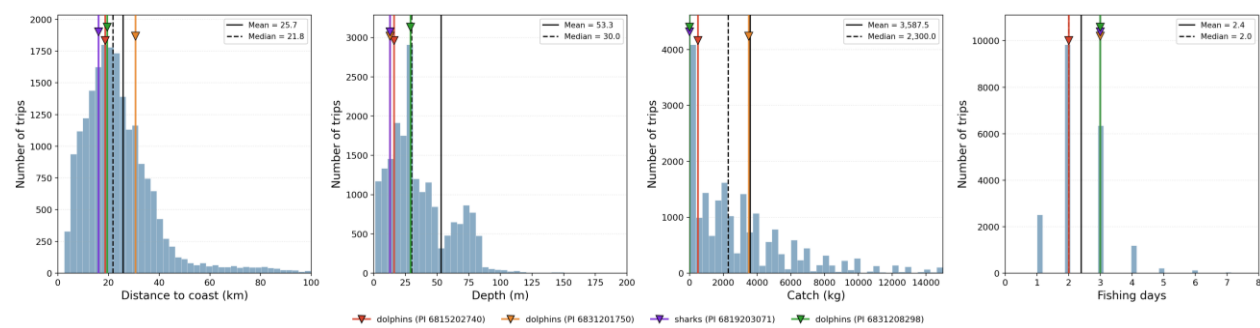


Figure 1. Distribution of all 20,274 fishing trips plotting against distance to coast, depth, catch, and fishing days. Solid and dashed black lines mark the overall mean and median, respectively; colored triangles represent the bycatch taxon of the four bycatch-observed trips.

3.2 Spatial distribution of recorded observations

The four bycatch-observed trips were distributed along the Andaman Sea coast, which occurred consistently within general purse seine fishing footprint in the study area (Figure 2).

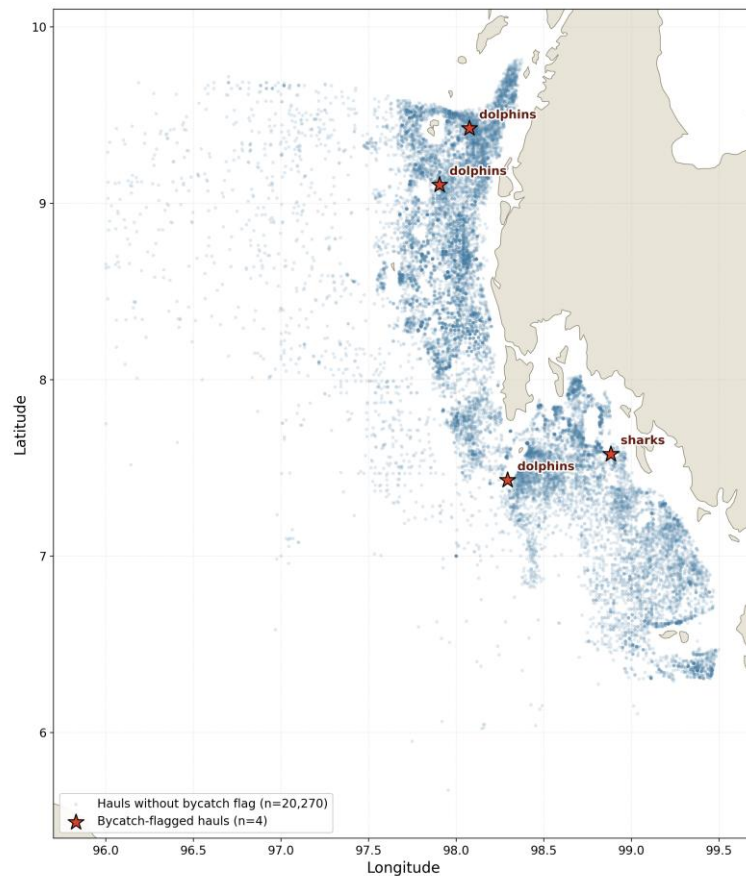


Figure 2. Reported locations of bycatch-observed trips (red stars) relative to the full extent of purse seine fishing effort (blue points)

3.3 Distance to coast and depth

Purse seine fishing distance to coast ranged from 2.5 to 205.1 km (median 21.8 km; IQR 14.7–30.8 km). The fishing appeared to happen mostly in near-shore area. The four bycatch-observed trips were recorded at 16.1, 18.7, 19.4, and 30.7 km from the coast (Figure 3). The Mann–Whitney test found no significant difference of distance to coast between bycatch-observed and no-bycatch-reported trips ($p = 0.784$), indicating that recorded bycatch is not associated with unusually near-shore or offshore fishing location.

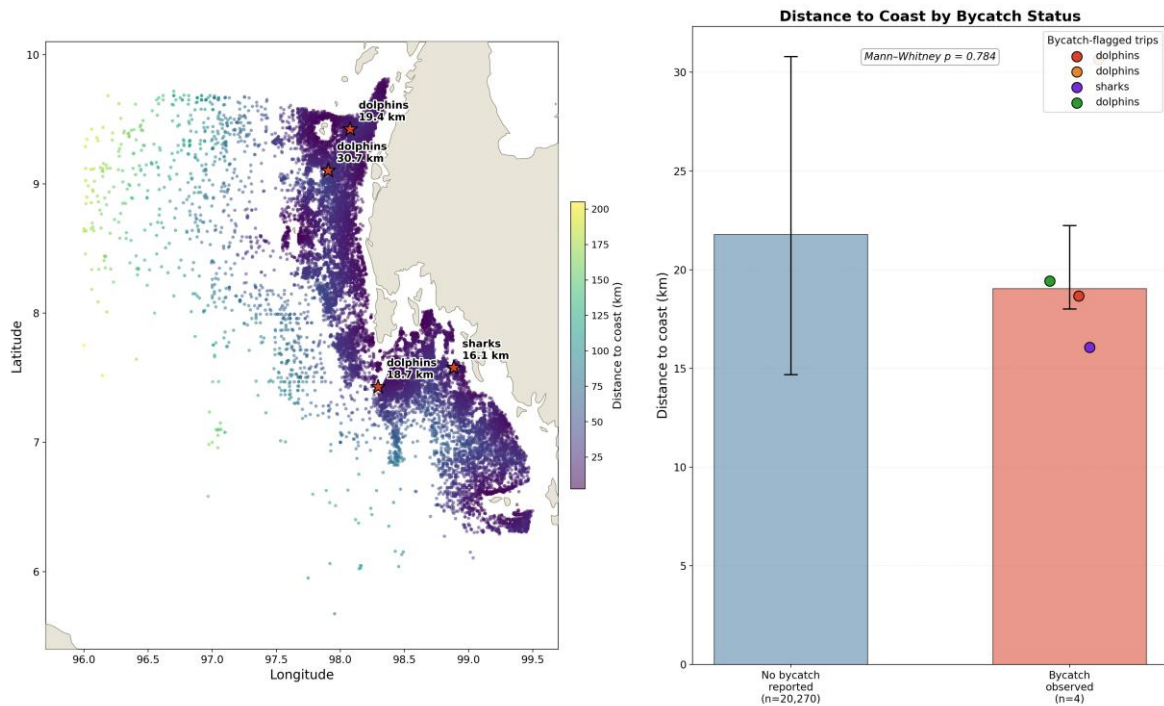


Figure 3. Distance to coast for all purse seine fishing trips, with bycatch-observed trips overlaid (Left). Median distance to coast by bycatch observation status (black lines represents IQR; color dots represent individual bycatch-observed trips) (Right).

On the other hand, depth showed the more distinct pattern than distance to coast. fishing depth ranged from 10 to 1,431 m (median 30 m; IQR 18–57 m). The four bycatch-observed trips occurred at depth of 13, 13, 16, and 29 m (Figure 4). The statistical testing showed bycatch presence has no significant different to depth, but close to the conventional statistical significance ($p = 0.070$). The statistical test results presented in Table 2.

It would be pre-assumed that these bycatches tend to preferentially associate in the nearshore water with this fishery. However, it could not be strongly conclude based on this available sample size. It might be clearer in this pattern if the sample size increased in the future.

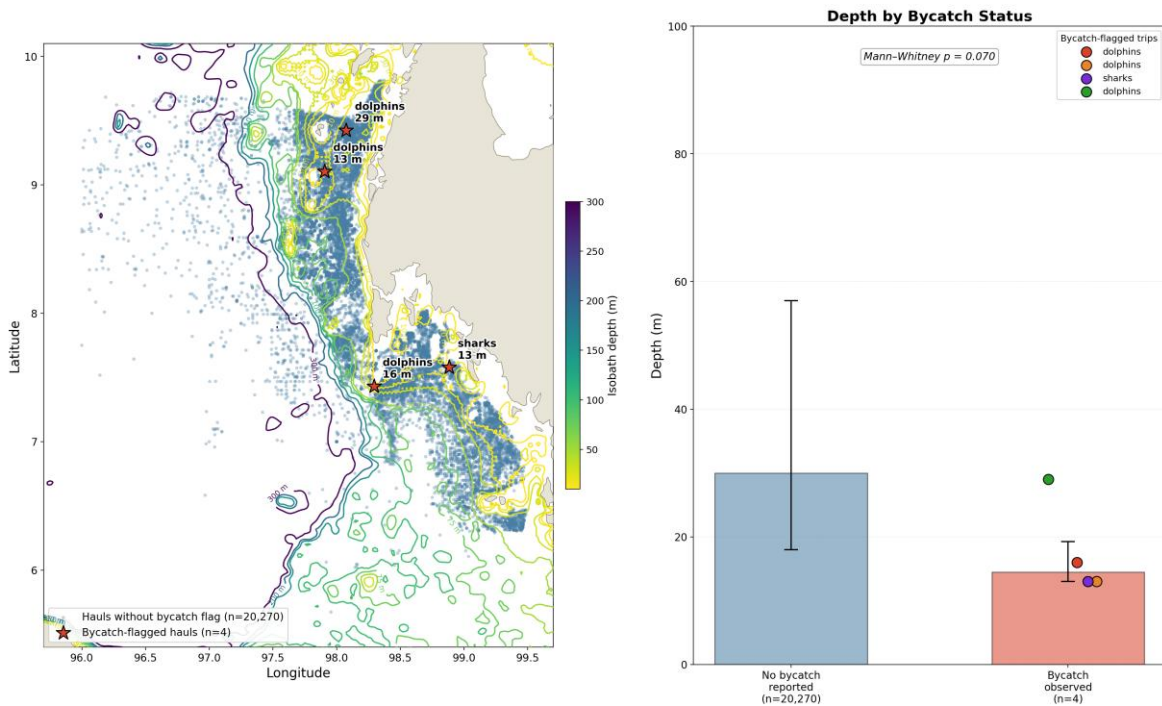


Figure 4. Location of all fishing trips with bathymetric colored contour lines (Left). Mean depth by bycatch observation status (black lines represents IQR; color dots represent individual bycatch-observed trips) (Right).

Table 2. Statistical comparison of spatial covariates between bycatch-observed and no-bycatch-reported trips.

Variable	Bycatch-observed (n = 4) median [IQR]	No bycatch reported (n = 20,270) median [IQR]	Test	Statistic	p-value
Distance to coast (km)	19.0 [18.0–22.2]	21.8 [14.7–30.8]	Mann–Whitney U	37,330	0.784
Depth (m)	14.5 [13.0–19.3]	30.0 [18.0–57.0]	Mann–Whitney U	19,365	0.070

3.4 Catch and fishing duration

Figure 5 shows the median of catch, fishing duration, and catch rate associate with bycatch presence. Median catch was lower at bycatch-observed trips (250 kg; IQR 0–1,253 kg) compared to no-bycatch-reported (2,100 kg; IQR 700–4,400 kg). Fishing duration exhibits contrast figure with higher median of bycatch-observed compared to no-bycatch-reported. However, the median found similar between the two group (median 3 days vs. 2 days). The median catch rate follows the median catch pattern which lower at bycatch-observed trips (125 kg/day vs. 1,000 kg/day).

The statistical test found no significant difference for any of the three variables (Table 3). It is due to few observed presences (four presence trips) and 50% of them were reported as nil (zero) catch.

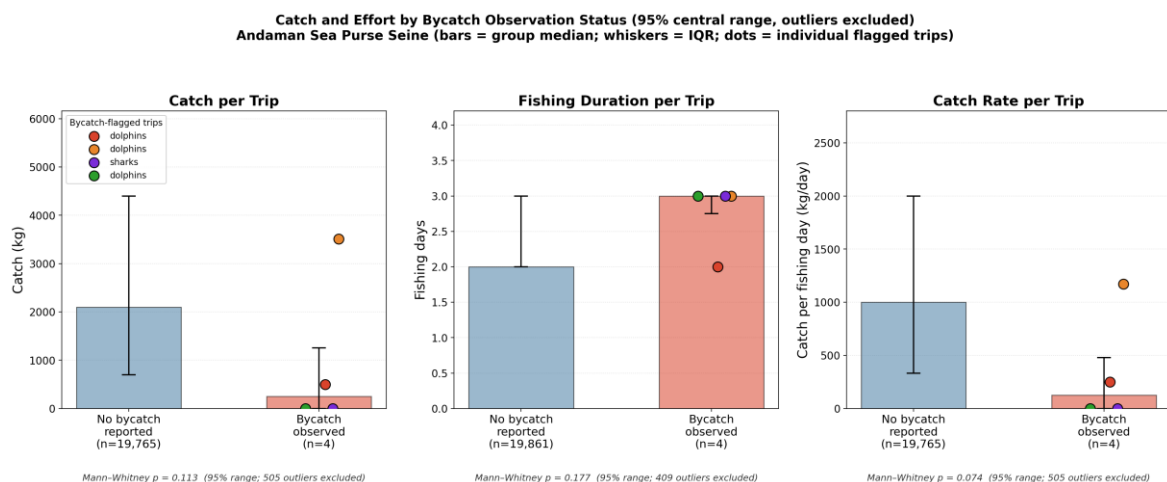


Figure 5. Median catch, fishing duration, and catch per fishing day at trips by categorizes, restricted to the central 95% range of each variable (outlier excluded) (black lines represents IQR; color dots represent individual bycatch-observed trips)

Table 3. Statistical comparison of catch and effort variables between bycatch-observed and no-bycatch-reported trips

Variable	Bycatch-observed (n = 4) median [IQR]	No bycatch reported (n = 20,270) median [IQR]	Test	Statistic	p-value
Catch (kg)	250 [0–1,253]	2,100 [700–4,400]	Mann–Whitney U	21,486	0.113
Fishing days	3.0 [2.75–3.0]	2.0 [2.0–3.0]	Mann–Whitney U	53,945	0.177
Catch per fishing day (kg/day)	125 [0–480]	1,000 [333–2,000]	Mann–Whitney U	19,183	0.074

3.5 Data representation and considerations for future monitoring

Taken together, the results showed that the bycatch-observed trips fished in the shallower water, close to shore and relatively tended toward the lower or nil catch. However, due to the sparse bycatch presence events, this finding should be treated as a preliminary document for improving bycatch reporting scheme.

From the available data used in this analysis, several constrains were spotted. The recorded bycatch was presence-only by visual observation at sea in a single trip level, resulting to aggregated trip-level condition rather than a set operation (haul by haul) that bycatch was encountered. Also, fishing trips without a bycatch entry are not confirmed to be bycatch-free. Vessels might spot these bycatches but did not record in logbooks. This cause uncertainty in analysis.

By noting these constrains, there are suggestions that would improve logbook reporting to support more than descriptive analysis. 1) bycatch recording should be as quantitative records by with location by haul basis where feasible, not presence/absence records at the level of by trip basis. The number of animal

encounter would be essential for future risk analysis. 2) the recorded bycatch should be confirmed as bycatch-free or not. It is to avoid confusion of omit data and nil report bycatch records. 3) an independent onboard verification, even onboard observers or electronic monitoring should be considered where possible for supporting the future assessment.

4. Conclusion

This preliminary analysis of purse seine logbook entries in the Andaman Sea, Thailand. The bycatch was visually observed to be interact with fishery at sea only; no onboard retention. It was found that the bycatch presence on 4 of 20,274 logged trips, occurring within the fleet's normal distance-to-coast range, usually in shallower water than the fleet median. The presence bycatch was associated toward the lower or nil catch of the trip. Regarding limited in sample size, the result should be considered as a descriptive baseline for future improvement of bycatch reporting in monitoring scheme in this fishery.

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