Bycatch of Thai handline fishery in Western Indian Ocean

Weerapol Thitipongtrakul

Jidapa Setthatham

Marine Fisheries Research and Development Division, Department of Fisheries

Abstract

This study investigates bycatch in Thai handline fishery operations in the Western Indian Ocean. Data were collected by scientific onboard observers during a 44-day fishing trip in April-May 2024, operating in the area of 9°-11°S, 60°-62°E. The handline fishery reported a total catch of 170.42 tons, with 4.47 tons of bycatch (2.62% of total catch). Bycatch occurred in 31 out of 55 hauls (56% encounter frequency). All bycatch comprised elasmobranch species, including five shark species and one ray species. Requiem sharks (*Carcharhinus* spp.) were most frequently caught, followed by Tawny nurse shark (*Nebrius ferrugineus*) and Brown stingray (*Bathytoshia lata*). Nearly all catch (99.9%) was retained onboard for landing. Length analysis of 40 measured specimens revealed that some shark species were caught below their length at first maturity while others were above, indicating the area serves as habitat for various life stages. The findings demonstrate that Thai handline fishery has relatively low bycatch rates, though the exclusive capture of elasmobranch species raises conservation considerations for these vulnerable taxa in the Western Indian Ocean.

Keywords: Bycatch, handline fishery, Western Indian Ocean

Introduction

Thailand has not any fishing vessels operating in the IOTC area outside Thai EEZ after 2016. Only small-scale purse seine vessels targeting small pelagic fish and neritic tunas have fished inside Thai waters. However, since 2017, two Thai-flagged oversea fishing vessels authorized to fish in the Indian Ocean. The vessels were registered and authorized to fish in Southern Indian Ocean Fisheries Agreement (SIOFA) and Indian Ocean Tuna Commission (IOTC) area in 2017 and 2024 respectively. Thai fishing vessels have overlapping fishing ground in IOTC and SIOFA area due to the fishing gear used. The vessels use bottom otterboard trawl as the primary gear and handline as a secondary gear. The target species are different depending on fishing gear used. Bottom trawl targets demersal fish and faunas such as lizardfish and threadfin breams while handline fishery targets pelagic fish and demersal rockfishes. The IOTC-managed species can be caught sometimes by handline.

All Thai oversea fishing vessels have a scientific onboard observer accompany every fishing trip as complying the mandate in SIOFA CMM 01(2024), the Conservation and

Management Measure for the Interim Management of Bottom Fishing in the Agreement Area (Interim Management of Bottom Fishing), that each contracting party, cooperating non-contracting party, participating fishing entity or cooperating non-participating fishing entity (collectively CCPs) operating trawl gear must deploy 100 percent scientific observer coverage for the duration of each fishing trip (SIOFA, 2024). The observers are tasked to collect fishing related data, biological data of interested species. Also observe bycatch and vulnerable species encountered in fisheries. This scheme is also applied to IOTC fisheries by Thai vessels as well due to Thai vessels authorized to fish in IOTC and SIOFA.

However, the Thai fishing vessels were later ceased fishing for IOTC-managed species in late 2024 due to some constraints, and the fishing license on high seas in IOTC competence area was cancelled. Therefore, this study aims to investigate bycatch encountered in handline fishery of Thai flagged vessels authorized to fish in the IOTC area, which will provide some available information on bycatch resources in IOTC competence area.

Methodology

The data was collected by scientific onboard observers during the fishing trips in 2024 on haul-by-haul basis. The observers were tasked to observe fishing operation, species caught and bycatch, and do length measurement of target and bycatch species. In this study, bycatch was categorized into retained bycatch which retained onboard for landing and discarded bycatch which was discarded at sea. All bycatch were identified to the finest taxonomic level as possible. For elasmobranch species, the classification was followed Ahmad et al. (2017, 2020) and Krajangdara et al. (2022). The observers sampled individual bycatch for weighting in kilogram and measuring for total length (TL) in centimeter, except rays which were measured for disc width (DW) in centimeter. The data was analyzed for species composition, bycatch frequency encounter and spatial distribution in the fishing area

Results

Handline fishery and catch

The handline gear configuration is simple. A set of handline consist of a main line, branch lines attached with a hooks, a sinker, and a hand reel. The number of hooks used per line depends on fisher preferences but usually 2-3 hooks per line. Baits are used in fishing. Handline generally targets pelagic fishes like trevallies, carangid fishes, and demersal rockfishes like snappers, groupers, or emperor fish. The fishing depth was at 10-20 meters for pelagic fishes and at nearly seafloor when targeting demersal rockfishes, generally 20-35 meters.

There was a single trip of handline fishery authorized to operate in the IOTC area in 2024. The fishing trip was 44 days at sea in April to May 2024. The fishing ground was found in Saya de Malha Bank, the Western Indian Ocean area at latitude of 9° - 11° S and longitude of 60°-62° E (Figure 1), at the depth ranged 22 – 52 meters.

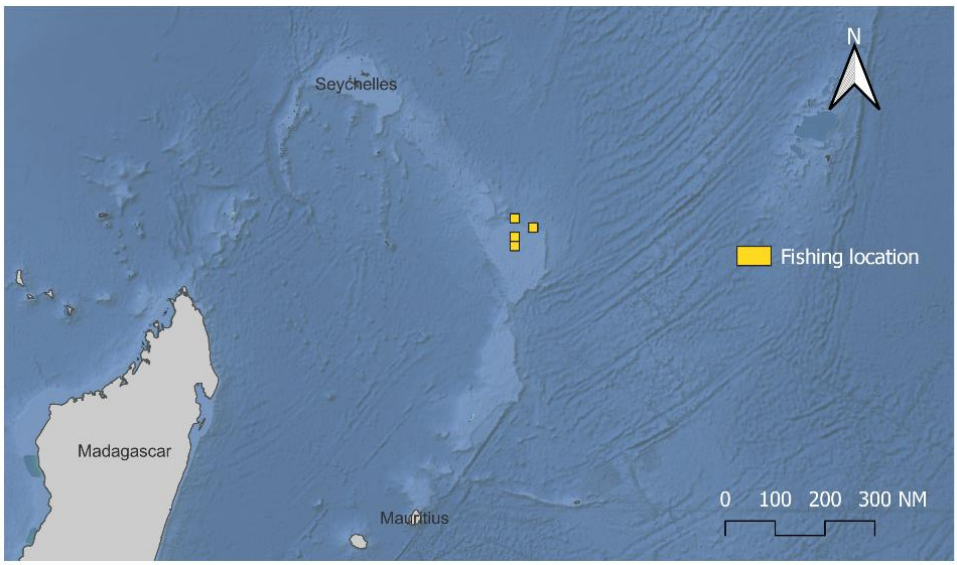

Figure 1 Fishing location of Thai handline fishery in 2024

The total of 170.42 tons was reported from handline fishery in the period. The target catch consisted of trevallies, snappers, job fish, emperor fish, groupers, and neritic tunas. Meanwhile bycatch of 4.47 tons was reported, accounted for 2.62% of the total catch. All bycatch were elasmobranchs. Almost of the caught fish (99.9%) were retained onboard for landing. Only 18.2 kg of fish were discarded at sea (Table 1 and Figure 2).

Table 1 Handline catch (tons) of Thai flagged vessels in 2024

Group	Species group	Retained weight (t)	Discarded weight
Target	Trevallies	152.76	0
	Snappers	8.13	0
	Jobfishes	2.88	0
	Emperor	1.40	0
	Groupers	0.34	0
	Dogtooth tuna	0.30	0
	Kawakawa	0.13	0
Bycatch	Elasmobranchs	4.47	0
discard	Other pelagics	0	0.0182
Total		**170.40**	**0.0182**

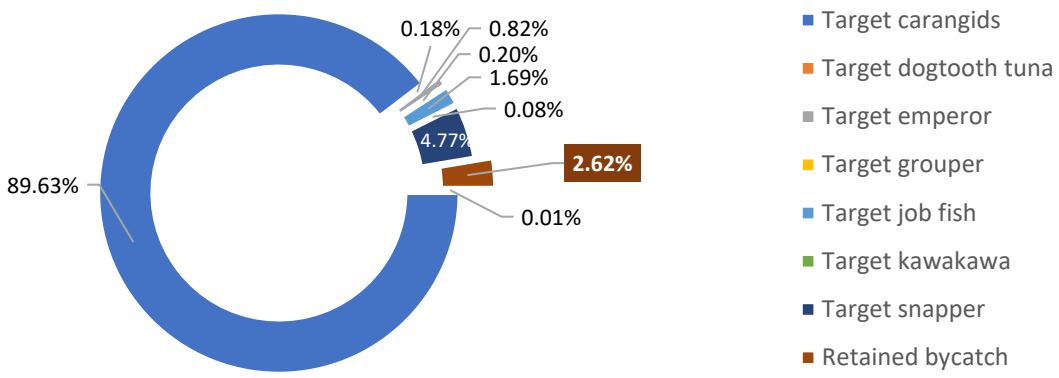

Figure 2 Catch composition of Thai handline fishery by species group in 2024

Bycatch encounter frequency

The definition of bycatch depends on vessels, whichever suit their economic aspect of landing. Based on the vessel's criteria all large economic finfish species were classified as target catch. The others were classified as bycatch but still retained onboard. The unwanted small size fishes or damaged were discarded at sea. However, the discards are occasional in handline fishery by Thai flagged vessel.

The total of 55 hauls of handline activities were observed during the trip. There were 31 out of 55 hauls encountered bycatch species (the blue bar in the Figure 3), accounted for 56% of the total hauling number. The average weight of bycatch caught was 144.2 kg/haul. It was very few comparing to the weight of target fish in each haul.

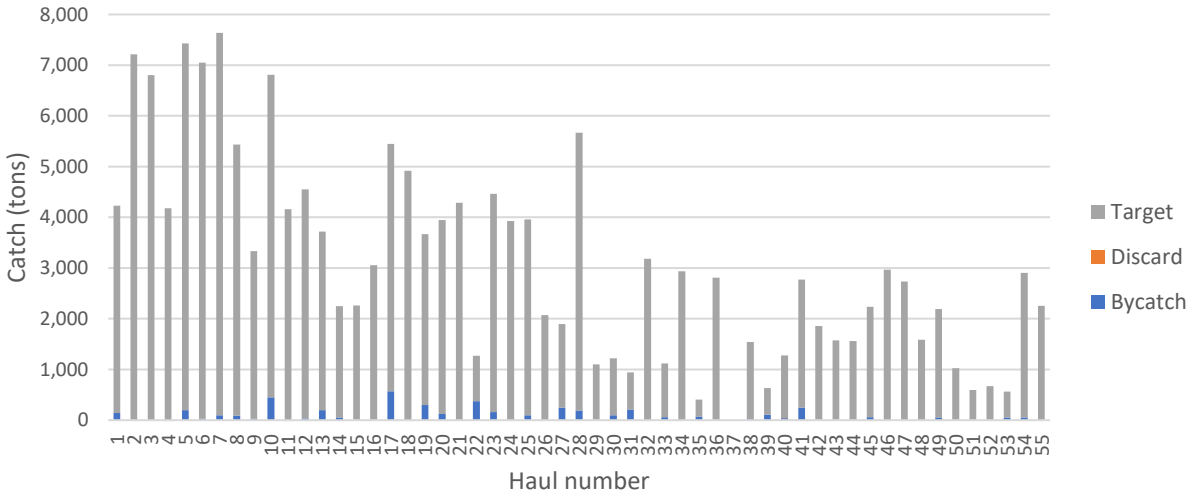

Figure 3 Catch by type of Thai handline fishery in 2024

Bycatch species

It is appeared that several species were caught by Thai handline, however, the bycatch of this fishery comprised only elasmobranchs. There were 5 sharks and 1 ray species observed in the bycatch, and all of them are species inhabit in shallow area. Requiem sharks (*Carcharhinus* spp.) were the most frequently caught, followed by Tawny nurse shark (*Nebrius ferrugineus*), meanwhile Brown stingray (*Bathytoshia lata*) was only ray species that found in bycatch. All of elasmobranchs were kept as unprocessed frozen fish for landing. The observed species are presented in Table 2.

Table 2 Weight (tons) and bycatch composition of Thai handline fishery in 2024

Species group	**Scientific name**	**Retained weight (t)**	**Percentage**
Shark	*Carcharhinus leucas*	2.000	44.75%
	Nebrius ferrugineus	1.880	42.07%
	Carcharhinus amblyrhynchos	0.307	6.87%
	Carcharhinus amboinensis	0.200	4.48%
	Carcharhinus brevipinna	0.013	0.29%
Ray	*Bathytoshia lata*	0.069	1.54%
Total		**4.469**	**100.00%**

Length of bycatch was measured and recorded by the onboard observers. The total of 40 samples of bycatch were measured and weighted individually, except Spinner shark (*Carcharhinus brevipinna*) which unable to collect length data. Based on average length, it appeared that some of elasmobranch bycatch which are Pigeye shark (*Carcharhinus amboinensis*) and Bull shark (*Carcharhinus leucas*) seem to be larger than its length at first maturity. All of Blacktail reef shark (*Carcharhinus amblyrhynchos*) found smaller than its length at first maturity. Meanwhile the Tawny shark and Brown stingray have no length at first maturity for references (Table 3 and Figure 4).

Table 3 Length of observed bycatch species caught of Thai handline fishery in 2024

Species	Length type	Observed number	Min	Max	Average	Lm[1]
Carcharhinus amblyrhynchos	TL	17	69	127	99.4 ± 14.2	128.0
Carcharhinus amboinensis	TL	1	240	240	240	212.0
Carcharhinus leucas	TL	7	235	292	266.1 ± 21.5	201.0
Nebrius ferrugineus	TL	12	71	252	208.3 ± 73.0	n/a
Bathytoshia lata	DW	3	74	116	90.7 ± 22.3	n/a

Remark: [1]length at first maturity derived from Fishbase

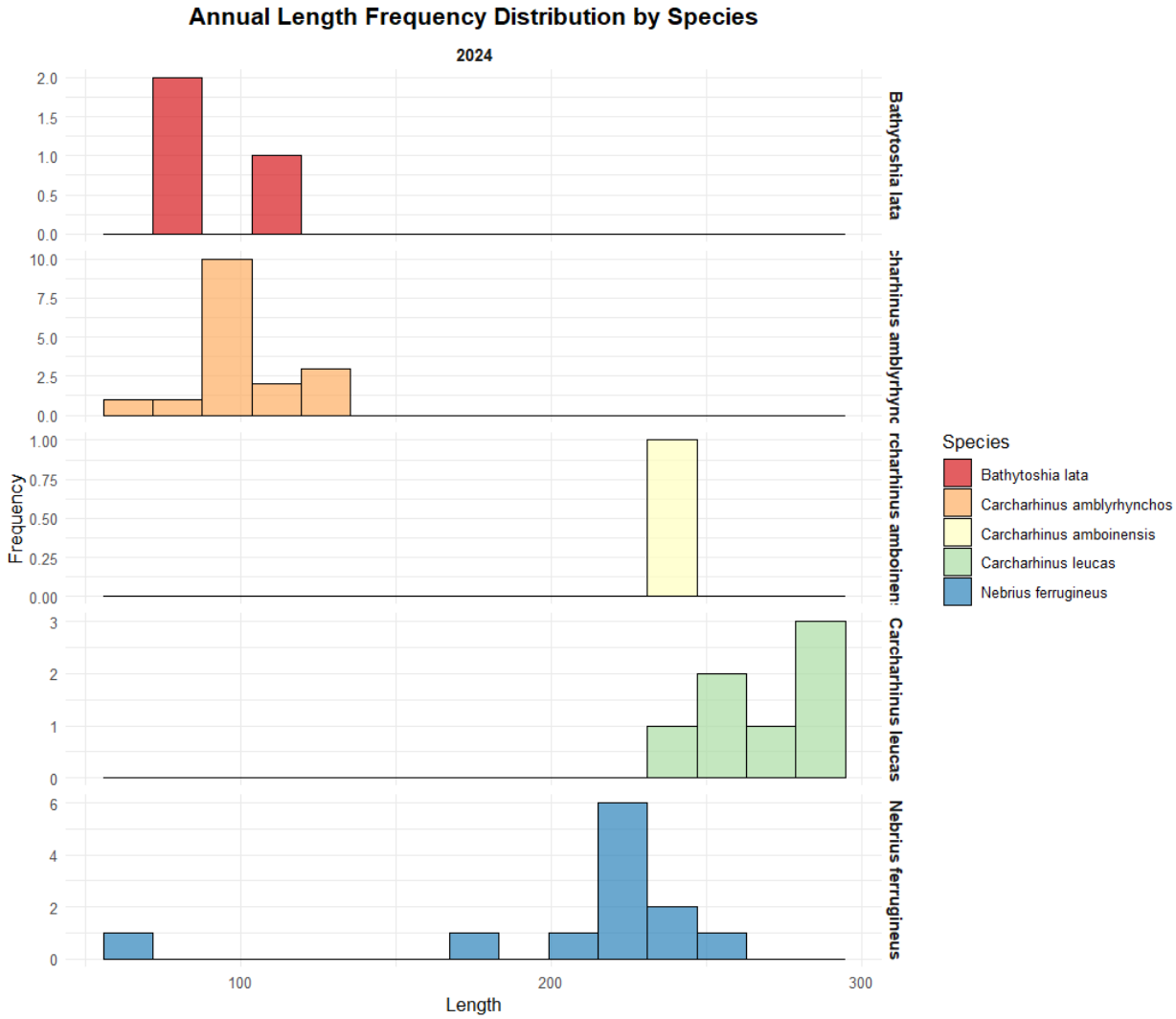

Figure 4 Length frequency distribution by bycatch species of Thai handline fishery in 2024

Conclusion

The findings shows that Thai handline fishery occasionally have bycatch, but with low quantity. The fishing ground is located in shallow area in Western Indian Ocean with fishing depth ranged 20-50 meters. There was 56% encounter of bycatch with handline operation. The bycatch was accounted for 2.62% of the total catch. All observed bycatch were shallow elasmobranch species which retained onboard for landing. The length analysis of the bycatch shows that some shark species were found smaller than its length at first maturity while some species were larger, which indicating that the area is a competent habitat of sharks and rays.

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