Observer data analysis report for the Indian Ocean tuna and large pelagics longline FIP (Afritex)

Introduction

This report documents the results of the data analysis conducted using observer reports from the Indian Ocean tuna and large pelagics longline Fishery Improvement Project (FIP) vessels. The FIP is managed by Afritex and the fishing vessels target bigeye (*Thunnus obesus*), and yellowfin (*Thunnus albacares*) tuna, swordfish (*Xiphias gladius*), and mahi mahi (*Coryphaena hippurus*). All vessels within the FIP are pelagic longliners and are flagged to Mozambique, fishing within the Mozambique EEZ.

The aim of this report is to demonstrate the current catch biomass associated with the FIP vessels, particularly regarding incidental catch of non-target and endangered, threatened and protected (ETP) species. There is current data paucity regarding the secondary species associated with the fishing vessels, and this report aims to highlight these data. The observers have been trained to record important information including the fate (retained or discarded), condition (alive or dead), weight, length, and specific species identification. All information is critical for the FIP's progression towards certification by the Marine Stewardship Council (MSC).

The following report will outline the catch composition from the vessels within the FIP fleet, with specific reference to the requirements of the MSC, as outlined above. Finally, the report will then discuss some further improvements to the fishery sustainability that can be implemented to reduce the impact on non-target species.

Data analysis

The observer data received by the FIP were originally scanned PDF copies of a physical form that was completed by the observers on the vessels from May 2019 to March 2022. These PDFs were converted to excel sheets by hand by a member of the KT team. Once the raw data was collected in an excel sheet, it could be analysed. The first data analysis that was completed was dividing the data into fate: 'retained' and 'discarded' subsets. The condition of the animal was mostly completed for the discarded species, with only 5% of the discarded individuals not being recorded. Weight and length data were only recorded for the retained species. The lack of weight data for discarded species meant that all analysis had to be conducted on the number of individuals rather than the weight of the individuals, as required by the MSC. Nevertheless, the analysis was able to demonstrate the catch composition of the fishery and each species was able to be categorised into an MSC designation: Target, Primary, Secondary, and ETP (Table 1).

The largest contribution to the species total catch (72%) was from the target species, swordfish (46%), yellowfin tuna (18%), bigeye tuna (8%), and mahi mahi (3%). There were only two primary species recorded in this dataset, albacore (*Thunnus alalunga*) and skipjack (*Katsuwonus pelamis*) tuna (Figure 1). Both primary species contributed to <5% of the total catch, which means they are listed as 'minor' on the designation table.

There were few secondary species recorded by the observers (8.7%) (Figure *1*), and all individuals contributed to <5% of the total catch, meaning all were also listed as 'minor'. The largest contribution to secondary species was from Oilfish (*Ruvettus pretiosus*) (2.38%), and black snoek (*Thyrsitoides marleyi*) (2.06%).

Table 1: MSC designation of species based on their composition to the total catch number

Species Name	Common Name	Likely Designation	Justification	Reason
Thunnus obesus	Bigeye Tuna	P1	N/a	Target Species
Thunnus albacares	Yellowfin Tuna	P1	N/a	Target Species
Xiphias gladius	Swordfish	P1	N/a	Target Species
Coryphaena hippurus	Dolphinfish/Mahi-mahi	P1	N/a	Target Species
Thunnus alalunga	Albacore Tuna	Primary	Minor	<5% of total catch and with management tools or measures in place or stock reference points available
Katsuwonus pelamis	Skipjack tuna	Primary	Minor	<5% of total catch and with management tools or measures in place or stock reference points available
Sphyraena barracuda	Great Barracuda	Secondary	Minor	<5% of total catch and no management tools in place
Lepidocybium flavobrunneum	Escolar	Secondary	Minor	<5% of total catch and no management tools in place
Makaira indica	Black Marlin	Secondary	Minor	<5% of total catch and no management tools in place
Makaira mazara	Blue Marlin	Secondary	Minor	<5% of total catch and no management tools in place
Gemphylus serpens	Snake Mackerel	Secondary	Minor	<5% of total catch and no management tools in place
Tetradontidae	Puffer Fish Sp.	Secondary	Minor	<5% of total catch and no management tools in place
Thyrsitoides marleyi	Black Snoek	Secondary	Minor	<5% of total catch and no management tools in place
Istiophorus platypterus	Indo-Pacific Sailfish	Secondary	Minor	<5% of total catch and no management tools in place
Ruvettus pretiosus	Oilfish	Secondary	Minor	<5% of total catch and no management tools in place

Elagatis bipinnulata	Rainbow runner	Secondary	Minor	<5% of total catch and no management tools in place
Tetrapturus angustirostris	Shortbill spearfish	Secondary	Minor	<5% of total catch and no management tools in place
Molidae	Ocean sunfishes	Secondary	Minor	<5% of total catch and no management tools in place
Acanthocybium solandri	Wahoo	Secondary	Minor	<5% of total catch and no management tools in place
Carcharhinus longimanus	Oceanic Whitetip Shark	ETP	N/a	IUCN Red List (CR); CITES appendix I
Sphyrna zygaena	Smooth Hammerhead	ETP	N/a	IUCN Red List (VU); CITES Appendix II
Carcharhinus obscurus	Dusky Shark	ETP	N/a	IUCN Red List (EN); CMS Appendix II
Isurus paucus	Longfin Mako Shark	ETP	N/a	CITES Appendix II, CMS Appendix II
Isurus oxyrinchus	Shortfin mako	ETP	N/a	IUCN Red List (EN); CITES Appendix II; CMS Appendix II
Lepidochelys olivacea	Olive ridley turtle	ETP	N/a	IUCN Red List (VU); CMS Appendix I
Golfinho	Dolphin	ETP	N/a	CITES Appendix I; CMS Appendix II
Alopias superciliosus	Bigeye thresher	ETP	N/a	IUCN Red List (VU); CITES Appendix II; CMS Appendix II
Baleia	Whale spp.	ETP	N/a	
Manta birostris	Giant manta	ETP	N/a	IUCN Red List (EN); CITES Appendix II; CMS Appendix II
	Shark	ETP	N/a	CMS Appendix II

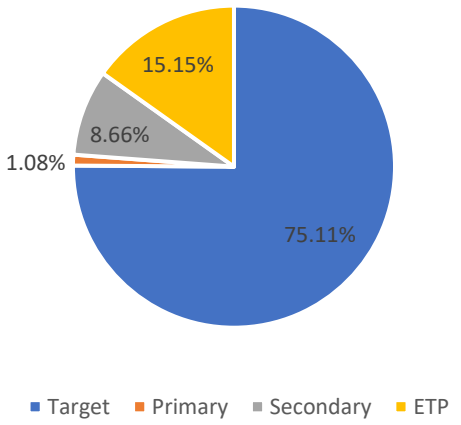

Figure 1: Percentage composition of each MSC designation to the total catch number

Species fates

Further data analysis was able to demonstrate the composition of retained and discarded species catch. As mentioned, the retained species were the only species that were recorded by weight, which means that these results were determined by using the weight data. The discarded species were only recorded by number, so the results for discarded species was conducted by total number only.

Retained species

The majority of the retained species were the target species, swordfish (40%), yellowfin tuna (35%), and bigeye tuna (19%). The remaining target species, mahi mahi, only contributed 0.51%. There were no retained ETP species, which is inline with the ETP species management and with the IOTC regulations.

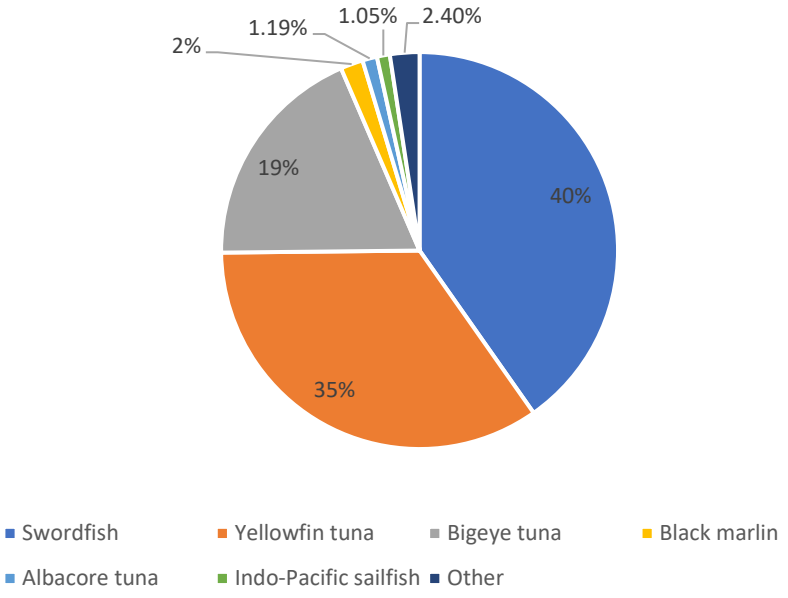

Figure 2: Percentage composition of the individual species that were retained on board the vessels

Discarded species

The majority of discarded species were from the target species (46%), followed by ETP species (38%) (Figure 3). Only 16% of the total number of discarded species were designated as secondary species.

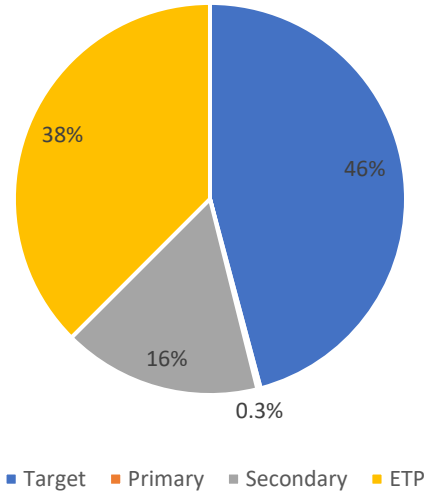

Figure 3: Percentage composition of the different MSC designation groups to the discarded species catch composition (number)

All the discarded species were recorded as either dead or alive, in order to demonstrate the effectiveness of the bycatch handling procedure and policies that are active on the vessels. Of the species that were recorded as being dead upon discard, none of them were ETP species (Figure 4). This is evidence that the FIP is adhering to the bycatch handling techniques for ETP species because although there were 135 ETP individuals caught, all of them were discarded alive.

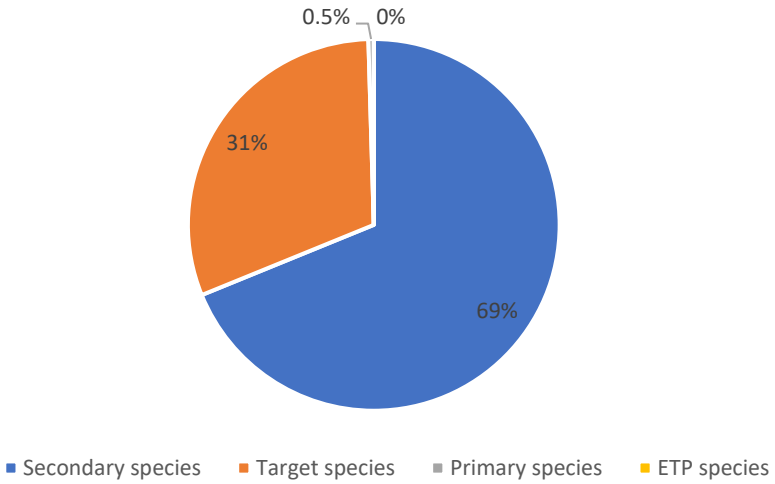

Figure 4: Percentage composition of the species that were discarded dead, grouped by their MSC designation

The highest proportion of dead discards was derived from the secondary species group (69%). The majority of discarded incidents occurred because an individual had been predated on by either a marine mammal or a shark (n=130).

Contrastingly, there were 144 individuals that were discarded alive (Figure 5) and the majority (93%) of these were the ETP species. There were 10 secondary species individuals that were discarded alive and the reason for their discard was explained to be due to being too small or having low/no market value, including the sunfish and black snoek species.

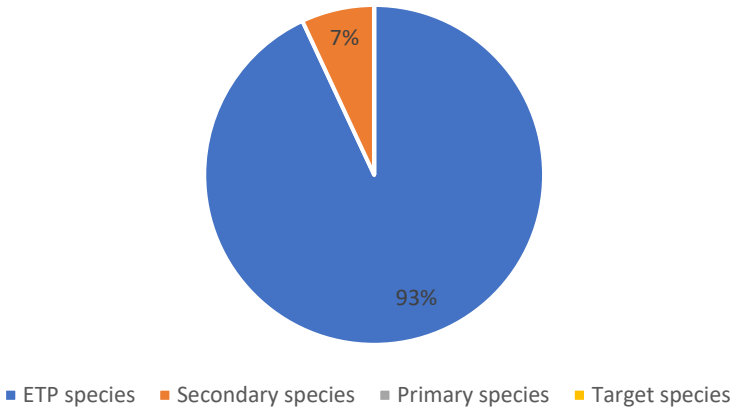

Figure 5: Percentage composition of individuals that were alive when discarded, grouped by their MSC designation

Next steps for the fishery

The results of the observer data analysis showed that there are still some areas that could be improved upon within the fishery's bycatch mitigation and management strategies.

1. Weight reporting

One of the major improvements that could be made is to the types of information recorded, including weight data for discarded species. The MSC requires weight data from observer reports to define the contribution of species to MSC designations (Target, Primary, Secondary, and ETP species), because they need to know about the catch composition. Unfortunately, we were unable to complete the MSC designation table based on the weights of the species caught and instead had to use the total number of individuals, which is not in line with the MSC requirements.

2. Increase ETP mitigation techniques

The observer data demonstrated that 15% of the total catch composition resulted from ETP species. Despite 100% of the ETP species individuals being recorded as alive upon discard, the number of ETP individuals caught could still be reduced by way of improvements in mitigation techniques. Fortunately, there were no seabird bycatches recorded in the observer reports. However, there was a large number (n=128) recorded as bycatch in the observer reports, most of those (94%) were dusky sharks.

The FIP does have two bycatch handling and release policies enshrined in it's management for both cetaceans and sharks. The policies include the methods that are most effective at returning animals back to the water upon catching them, without causing injury to the animal or the crew member dealing with it. However, in order to prevent incidents like these from re-occurring or reducing the number of incidents could be managed by implementing mitigation techniques on the vessels, including swapping the bait from squid to fish, which has shown to deter blue sharks from the line and hooks (Gilman, et al., 2020). Furthermore, there are repellent devices that can be attached to the lines and hooks to prevent sharks approaching the bait, known commercially as SharkGuards (Doherty, et

al., 2022). SharkGuards emit powerful, short-range electrical pulses, which are designed to overstimulate the electroreceptors of sharks and deter incidents of bait predation and hooking. The trials of the SharkGuard showed that when the device was inactive, predation on the bait by blue sharks was 20% and pelagic stingrays was 68% of the total catch. When the SharkGuards were activated, there was a decrease in hooking incidents by 91 and 73%, respectively. This is a promising result and could be applicable to other species of shark, including ETP species in the future.

References

Doherty, P. D. et al., 2022. Efficacy of a novel shark bycatch mitigation device in a tuna longline fishery. *Current Biology,* 32(22), pp. R1260-R1261.

Gilman, E. et al., 2020. Effect of pelagic longline bait type on species selectivity: a global synthesis of evidence. *Reviews in Fish Biology and Fisheries,* Volume 30, pp. 535-551.