Eastern Pacific large pelagics - longline (Martec)

Electronic Monitoring Data Review

June 2022

Introduction

The Eastern Pacific Longline Large Pelagics FIP (Martec) fishery targets yellowfin tuna (Thunnus albacares) and mahi mahi (Coryphaena hippurus) both in Costa Rica, Ecuador and Panama as well as swordfish (Xiphias gladius) exclusively in Costa Rica. The 250 longline vessels are flagged to Costa Rica and Panama and fish on the high seas and within both countries' EEZs. The fishery is locally managed by the Costa Rican Institute of Fisheries and Aquaculture (INCOPESCA) and the Panama Aquatic Resources Authority (ARAP) and regionally by the Inter-American Tropical Tuna Commission (IATTC).

To address data gaps in fisheries observer data provided by the FIP, the Martec has installed Electronic Monitoring Systems on vessels to improve both the quality and quantity of data. These systems were obtained from Shellcatch and they analysed the footage.

Method

Electronic monitoring systems were installed on the Martec longline fishing vessels to supplement catch data that were collected by in-person, fishery observers. The EM systems were provided by Shellcatch and the data recorded was processed by the same company (Figure 1). The analysis covered a total of 64 fishing days with a total of 38 sets, averaging at 7.6 sets per day. Total individuals discarded and retained were recorded as 1388, 36.5 individuals per set.

Day of Departure Date	Trip Length (days)	Sets per trip	Avg. Landings per set	Avg. Landings per day	Total Landings
16 January 2022	15	6	25.5	10.2	152.0
23 February 2022	6	3	27.3	13.7	82.0
6 December 2021	13	12	17.4	16.1	207.0
4 January 2022	22	14	29.4	20.0	441.0
19 February 2022	8	3	21.7	8.1	506.0

Figure 1: Raw data received via Shellcatch that breaks down the main report about the vessels and tracking information.

The data spreadsheet produced was comprehensive and included information about the individual vessels, their date of operation, and coordinates for tracing the vessels' movements (Figure 2). There was some missing information that is critical to improve the depth of understanding about the implications that the fishery has on vulnerable ETP species like sharks, turtles, and seabirds. This includes the condition (health review) and fate (retained or discarded) of the animals when they are caught as bycatch.

Figure 2: Vessel monitoring data from the two vessels observed in this report. The image on the right shows the operational area on a larger scale around the Pacific Coast of Costa Rica. The image on the left shows a focussed version of the same image with a more in-depth look at the tracks that the vessels travelled. The red, blue, and orange lines show the fishing trips taken by vessel A beginning on December 6th, 2021; January 4th, 2022; and January 19th, 2022, respectively. The yellow and green lines represent the trips taken by vessel B, starting on January 16th, 2022; and February 23rd, 2022.

Data results

Of the five vessel trips portrayed in Figure 2, only the data from a subset of two trips, beginning December 6th, 2021 (red track), and the vessel trip beginning January 4th, 2022 (blue track) were used in this analysis.

Table 1: MSC designation table for each of the species caught by the Martec vessels in this fishing period

Scientific Name	Common Name	Target/No target	Category
Thunnus albacares	Yellowfin Tuna	Target Species	Target
Xiphias gladius	Swordfish	Target Species	Target
Coryphaena hippurus	Mahi Mahi	Target Species	Target
Thunnus obesus	Bigeye Tuna	Target Species	Primary (minor)
Thunnus alalunga	Albacore Tuna	Target Species	Primary (minor)
Istiophorus platypterus	Sailfish	Not target species	Secondary
Mobula spp.	Stingray	Not target species	Secondary
Kajikia audax	Striped Marlin	Not target species	Secondary
Istiompax indica	Black Marlin	Not target species	Secondary
Makaira nigricans	Blue Marlin	Not target species	Secondary
Acanthocybium solandri	Wahoo	Target Species	Secondary
Carcharhinus spp.	Shark	Not target species	ETP
Carcharhinus limbatus	Black Tip Shark	Not target species	ETP
Alopias vulpinus	Common Thresher Shark	Not target species	ETP
Fregata magnificens	Seabird	Not target species	ETP
Carcharhinus falciformis	Silky Sharks	Not target species	ETP
Prionace glauca	Blue Shark	Not target species	ETP
Rhizoprionodon longurio	Sharpnose Shark	Not target species	ETP
Alopias superciliosus	Bigeye Thresher Shark	Not target species	ETP

Chelonia mydas	Green Turtle	Not target species	ETP
Nasolamia velox	Whitenose Shark	Not target species	ETP
Alopias spp.	Thresher Shark	Not target species	ETP
Indeterminated	Indeterminated	Not target species	Unknown

ETP species

There was reference to the condition and disposition of the five turtles that was caught on vessel, which were (all but one) entangled alive when brought on board, and then all remained alive when the turtles were released. The singular bird that was captured, demonstrated that the animal was released alive with minor injuries. No other animals were released, including ETP species and those that are listed as vulnerable on the IUCN Red List, including silky sharks (*Carcharhinus falciformis*), thresher sharks (*Alopias* spp.), stingray (*Mobula* spp.), blacktip shark (*Carcharhinus limbatus*), sharpnose sharks (*Rhizoprionodon longurio*), and whitenose sharks (*Nasolamia velox*).

Of the 805 individuals caught during the fishing trips, 76% were target species, including yellowfin tuna, mahi mahi, and swordfish. The second-largest contributor (14%) to the total catch was from secondary species, and include a range of different pelagic fish species, including marlin, sailfish, and wahoo. The ETP species bycatch contributed to 8% of the total catch, and primary species, albacore and bigeye tuna, contributed only 2% to the total catch number (Figure 3).

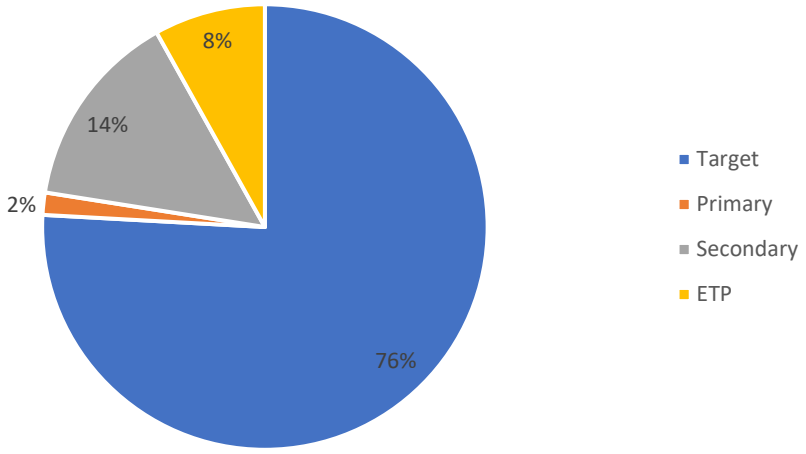

Figure 3: The percentage composition of species, designated by the MSC standards, to total catch number for the Costa Rica large pelagics longline FIP (Marpesca)

There were 31 “indetermined” species recorded as part of this dataset once analysed by the EM systems. Nine of the points were alleged to be because of either the positioning of the camera and/or due to obstructions of the view from elements of the vessel and crew members (Figure 4). In the future, increased awareness when installing the cameras, as well as sufficient training of the crew to ensure that the camera has a full, clear view of the deck is essential to ensure all catch can be accurately recorded.

Figure 4: Photo still of a video depicting the release of the singular seabird caught during the vessel operations. The distance between the camera position makes it difficult to accurately assess the species identification of the seabird. However, the distinctive red belly is a clear identifying factor to the magnificent frigatebird.

Discussion

The results of the report demonstrate that there are some issues with the catch and bycatch onboard each of the vessels within the Martec longline FIP, especially with regard to the vulnerable ETP species. The highest contributor to total catch is the target species, by a majority percentage, which is a positive for the fishery. However, there is also a large proportion attributed to non-target species, including secondary and ETP species.

Sharks and rays

All but one of the 76 individual elasmobranchs caught by the vessels were reportedly sent for commercial sale. The remaining elasmobranch (*Mobulid* spp.) was finned, and the carcass was disposed of, as recorded by experts using the footage from the EM videos.

There were nine silky sharks caught by the vessels and taken to commercial sale, which, under the IATTC Resolution C-21-06, requires longline vessels to limit the bycatch of silky sharks to only 20% of the total catch weight. However, because there were no recorded weights for the EM data, this is not possible to determine. There was one report that described a silky shark being “juvenile/immature”. Under C-21-06, the number of silky sharks measuring under 100 cm should be limited to 20% of the total silky shark catch for longliners. The EM data report failed to record specific lengths of the individuals caught, which means that there is not evidence that the juvenile/immature individual was under 100 cm. However, because there was only one, it would not exceed the 20% limit as described by IATTC.

Turtles

The five green turtles (*Chelonia mydas*) that were caught by the Martec longline vessels were reported to be released alive by the EM system videos were analysed, which is in line with the IATTC Resolution C-19-04. Four of the turtles were said to have been entangled by the line alive when brought on board and subsequently released alive. However, the condition of one turtle was not recorded by the EM

experts, despite associated photographs showing a turtle with a line tangled around the head. All turtles brought on board were caught on lines that used circle-shaped hooks and none of them were reported to have been hooked on the line.

The J-shaped hooks contributed to 52 of the bycatch incidents (68%), which means the fleet is still using these hooks as their main hook preference, which have been shown to contribute to large incidents of turtle bycatch and post-capture mortality (Pacheco, et al., 2011; Gilman & Huang, 2016). Swapping the J-hooks for circles has already demonstrated an improvement in the number of turtle bycatch, as well as the survival rate for the species that are able to be released back into the ocean. The circle hooks are so designed to reduce the depth of the hooks inside the animal and therefore improve the chance of them being removed easily (Sales, et al., 2010; Gilman & Huang, 2016). Furthermore, the circle hooks have also shown to be beneficial with the catch of target species, across different tunas, which means that the benefits of circle hooks far outweigh those of J-hooks (Sales, et al., 2010).

Seabirds

There was only one seabird caught across each vessel within the sample, magnificent frigatebird (*Fregata magnificans*) and was released alive with minor injuries. The bird was described as being entangled in the line, rather than hooked. However, the line used during this bycatch incident used J-shaped hooks as opposed to circle hooks.

Conclusion

The results from the EM systems on board the Martec longline fishing vessels demonstrated some positive and negative aspects of the current operational methodology taking place within the fleet. While some of the trips used only circle-hooks, these gears were not used exclusively across all vessels, despite clear research that has highlighted the benefits of using these hooks as opposed to J-hooks for both target and bycatch species. Likewise, there are still incidents of shark finning occurring on the vessel, which will need to be completely prohibited if the FIP is aiming to become MSC certified. There are a number of actions to be taken within the FIP to improve the measures in place for ETP species to ensure the sustainability of the fishery and the species it interacts with.

Next Steps

Based on the above results from the EM catch data, it is clear that there are some improvements to be made to the Martec fishing vessels, in order for them to improve on the catch and bycatch species biomass.

1. Prohibit J-shaped hooks and replace with circle hooks

The use of J-hooks is an archaic method used on longline fishing gears and has been proven to be detrimental for bycatch species due to their invasive nature when an animal becomes caught on the line (Sales, et al., 2010; Swimmer, et al., 2011; Gilman & Huang, 2016). Prohibited across most line fisheries around the world, the Martec FIP would benefit enormously from the substitution to circle hooks.

There has been a plethora of research conducted on the benefits of circle hooks in marine fisheries (Swimmer, et al., 2011) due to the sustainability benefits that they provide for the fishery and how they can reduce the environmental impact of the fishery on population biomass for non-target (bycatch) species. For ETP species like turtles in particular, it is imperative that even if the animals are alive when the line is retrieved, they must remain alive when being released. Traditional J hooks are invasive and can be detrimental to the animal's long-term health and survival after release.

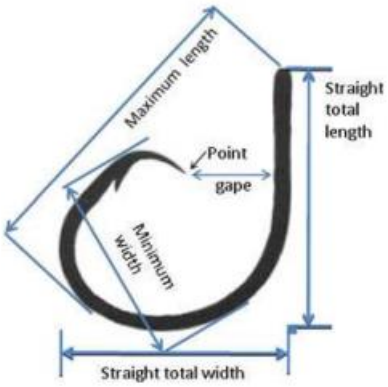

Fig. 1 Dimensional terms of a circle hook (adapted by Yokota and Boggs, pers. comm.)

Of the five turtles that were caught as bycatch in this EM dataset, one of their conditions was not recorded, which alludes to this individual being deceased when it was returned to the water. Furthermore, there was no reference to how two of the individuals were released (i.e., if they were released quickly or not), which, again alludes to the turtles having not been released in a timely manner as outlined in the IATTC Resolution C-19-04 (IATTC, 2019).

2. Ensure adhering to shark policy

There is evidence that certain shark species are being caught and retained on board the vessels, despite the fact that there are rules and restrictions on the capture and retention of those species, for example, silky shark. Resolution C-21-06 specifically highlights the regulations for silky shark bycatch in IATTC managed fisheries, including the prohibition of retention on board the vessel (IATTC, 2021). However, the information provided through the EM catch data reports recorded that all nine individual sharks were retained for direct commercial sale.

3. No wire leaders or shark lines

Wire leaders have been used by longline fishing vessels for decades in an attempt to reduce the amount of gear loss, because hooked animals can often sever the monofilament line and cause breakages. However, this also means that more bycatch animals, particularly sharks end up becoming caught and face mortality (Ward, et al., 2007). Furthermore, not only are shark bycatch rates decreased when wire leaders are not used, but the catch rate of target species, including tunas are increased.

4. Remove uncertainties in the data

There were some incidents of bycatch that could not be identified to species level, which is a significant limitation with EM systems because oftentimes the reason provided describes that there is something blocking the view of the camera. Efforts to reduce the obstruction of the view on the camera should be implemented and ensured when installing the EM systems. The photograph of the seabird that was caught (Figure *4*) portray the distance between the EM camera and where the animals are released. This distance made it difficult to identify the bird, the only identifier was the stark red belly of the magnificent frigatebird. Other species, especially sharks are more difficult to identify at long distances due to their similar body forms and colourations.

5. Weight data

In line with the MSC certification standards, catch data weights are essential to understand the implications of bycatch in comparison with the target catch. Although EM systems are excellent at constantly monitoring the catch brought on board vessels, and supplementing observer data, they cannot accurately weigh individual bycatch species. Although there is no way to precisely provide the weights for the bycatch, an alternative could be to use average weights for a species and estimate the weight from the length of the animal.