IOTC-2018-WPTT20-19

DO DIFFERENT GEAR SETTINGS AFFECT CAPTURE OF TARGET CATACH IN TUNA GILLNET FISHEREIS – EXPERIENCES FROM NIO OFF PAKISTAN

Umair Shahid[1,], Muhammad Moazzam[1], Babar Khan[1], Rab Nawaz[1] Shoaib Abdul Razzaq[1], Syed Meesum Reza Kazmi[1], Saba Ayub[1] and Saeed ul Islam[1]

[1] WWF Pakistan, Karachi, Pakistan

Abstract

Tuna and tuna like species are important fish stocks. Among tropical tunas, yellowfin and skipjack are the two important species. Different gears are used to catch tuna and tuna like species as fishers change fishing grounds while moving from coastal to offshore, and in the high seas. A different gear setting results in different catch and therefore, has proven as a mitigation measure for reducing entanglement of incidentally caught species. However, the impact of different gear settings on target catch species has not been determined. This paper therefore aims to assess capture rates and compares target catch in two different gear settings using the data collected by four trained skippers (on 15-20 m vessels) during January 2013 – December 2017. During this period, a total of 3,430 drift gillnet sets using two different gear settings viz., surface and sub-surface multifilament gillnets, were monitored. A total of 304,952 tunas were captured (68.8% of the total catch, all species included) representing six species of tuna viz., yellowfin tuna (*Thunnus albacares*), Skipjack (*Kotsuwanis pelamis*), longtail tuna (*Thunnus tonggol*), frigate tuna (*Auxis thazard thazard*), Kawakawa (Euthynis effinis), and Bullet tuna (Auxis rochei) as target catch. We concentrated on catches of tropical tuna for this study, and a total of 86,809 yellowfin and skipjack were caught comprising of a total weight of 425,704 Kg. Captures rates (CPUE) were calculated for tropical tuna species for both gear settings. Overall, tropical tuna Capture Per Unit Effort (CPUE) in surface and subsurface gillnets did not vary significantly in numbers, but varied in weight. The results from the study suggest no negative impact on target catch, however, holds promising results as the different gear settings result in positive impact on incidentally caught species. We are encourage by the results of the study and recommend coupling of technologies such as the use of electronic monitoring systems for triangulating observer data and expanding studies elsewhere, in addition to also studying the gear behavior. Sub-surface gear settings in tuna directed gillnet fisheries provide trade-off among target and non-target catch and may be considered as a potential conservation and management measure in gillnet fisheries.

1. Introduction

Tuna and tuna like fishes are key components of pelagic resources, comprising both neritic and oceanic species. There are around 709 tuna gillnet boats which operate in the EEZ of Pakistan (Wasim, 2017). These vessels target large pelagic resources and contribute to around 26.9% of the marine capture fish production, of which the major share belongs to tunas (70%). Among tunas are, tropical species such as yellowfin (33.3%), and skipjack (1.6%), whereas the neritic species include longtail (29.7%), frigate (19.6%), tuna-nei (8.5%) and kawakawa (7.6%). There have been speculations of changing of fishing grounds and drastic increase in fishing operations in the coastal area resulting in changing in the composition of tuna landings in Pakistan. There has been attempts made for reconciliation of this information through the programme run by WWF-Pakistan on the crew-based observers or self-reporting system (Moazzam, 2017).

In addition, the trained captains or skippers involved in data collection have been most useful for providing the data on the different gear settings. This has not been previously documented, however, paper on the impacts of gear settings on incidentally caught species has been determined and shared with working party on ecosystem and bycatch in September 2018. This report presents information on target catch difference among the two gear settings in tuna drift gillnets fisheries in Pakistan, and assess the effectiveness of subsurface deployments as a possible CMM for further adoption.

2. Materials and methods

2.1 Tuna drift gillnet fishery in Pakistan

Off Pakistan, tuna are mainly caught using gillnets. It is estimated that more than 700 fishing boats are exclusively engaged in tuna fishing (Shahid et al., 2016). Most of these vessels operate from Karachi harbor; whereas some gillnet vessels operate on the west coast from Gwadar. In this study we sampled four vessels (five captains) operating from Karachi harbor. These boats are entirely made of wood. Boat length ranges from 15 to 20m. Net lengths (multifilament nylon) of the sampled vessels ranged from 4000 to 7000m in length. These nets are placed at the surface (pelagic gillnets) and have a height of 10 – 14 m from the surface with a stretched mesh size of 13 to 17 cm (Moazzam, 2016). The net is usually set in late evening /early morning and hauling starts after 12 hours, and it takes about 2-3 hours on average to haul the net. Sampled vessels mostly operate in the north-eastern Arabian Sea. Fishing operations were confined to the continental shelf waters of the Indus canyon area, continental slope and oceanic waters (Fig. 1).

2.2 Data collection

Training of the five captains was a critical step for the success of the study. Species identification guides of the Indian Ocean Tuna Commission were prepared in local language (Urdu) by WWF-Pakistan. The captains were trained to document any capture (targeted, non-targeted, including fish, marine reptiles, marine mammals, invertebrates, etc.). During each trip, they recorded fishing hours, position of gillnet sets, the length of net deployed and fishing method (either surface or subsurface net deployment). Gillnet sets had an average duration of 12 hours (soak time). The captains were provided with IOTC Species Identification Guides (Urdu version) and digital cameras, for species identification, global positioning system (GPS) devices and data recording templates as required by IOTC. Surface gillnets were deployed at the surface, whereas "subsurface" gillnets were deployed at 2 meters below the surface (net height varied from 10 to 14m) (Kiszka et al., 2018).

2.3 Data analysis

Captures per Unit of Effort (CPUEs) were calculated and compared between taxa and fishing methods using the following formula:

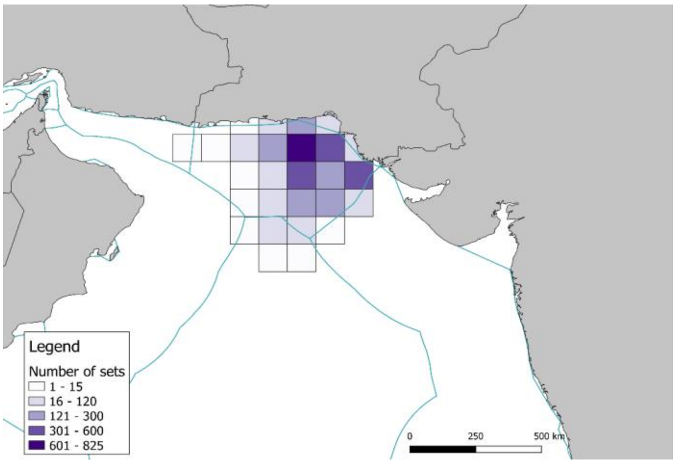
$$\text{CPUE} = \frac{\text{total captures in weight}}{\text{net length (km)* number of set (d)}}$$

A zero-inflated GLM was also used to investigate the influence of geographic position (latitude, longitude), month, year and fishing method on CPUE values. Since data were not normally distributed, a non-parametric chi-square test was used to compare CPUEs between surface and subsurface deployments for tuna catch.

3. Results

3.1 Total Fishing effort

From January 2013 to December 2017, a total of 3,430 drift gillnets were monitored. During this period, two different gear settings were used and 1,754 surface sets and 1,676 sub-surface sets were monitored. A total of 304,952 tunas were captured (68.8% of the total catch, all species included) representing six species of tuna viz., yellowfin tuna (*Thunnus albacares*), Skipjack (*Kotsuwanis pelamis*), longtail tuna (*Thunnus tonggol*), frigate tuna (*Auxis thazard thazard*), Kawakawa (Euthynis effinis), and Bullet tuna (Auxis rochei) as target catch. We concentrated on catches of tropical tuna for this study which totaled 86,809 in numbers. Out of these around 78,238 were yellowfin and 8,571 were skipjack. They both totaled to 425,704 Kg. Based on the set locations (fig 1) the highest concentration of surface and sub-surface deployments were reported on the continental slope around Indus Canyon area with concentration of around 601-825 surface and 321-400 sub-surface sets. Overall, the sets were distributed throughout the Pakistani EEZ, and rarely the sets drifted to Iranian and Indian EEZs and in international waters, however, these incidents were rare as shown in the set concentration below (Fig 1). Sets were distributed in continental shelf, slope and deep oceanic waters.



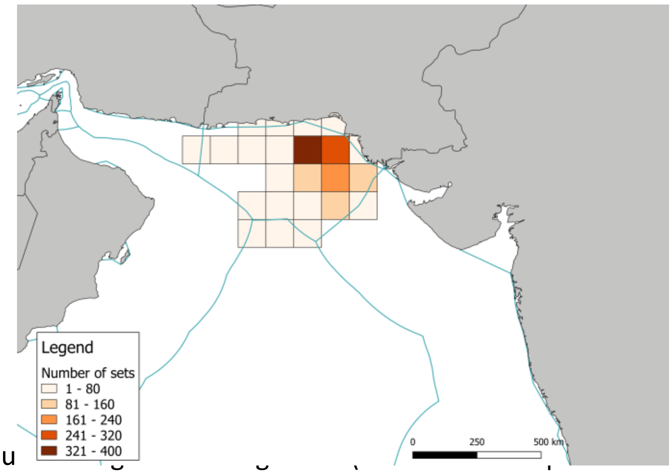


Fig. 1: Surface and sub-surface gear deployments of the tu
1° cell) off Pakistan from 2013 to 2017 (Source: Kiszka et al., 2018)

Overall, all tuna species account for 60.3% of catches. Tuna CPUEs in surface and subsurface gillnets were not significantly different (χ^2 = 3.423, df = 1, p > 0.05; Fig. 2a).

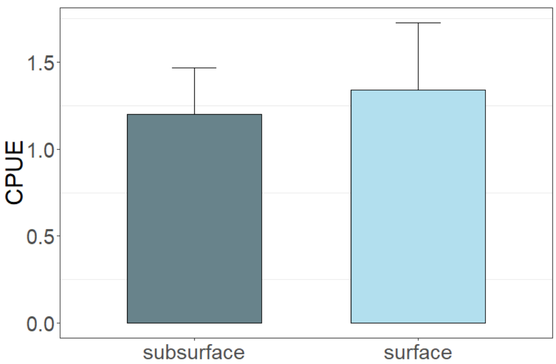


Fig. 2a: Tuna CPUEs in subsurface and surface drift gillnets (Source: Kiskza et al., 2018)

However, the yield or the weight per unit of effort calculated was higher for both yellowfin and skipjack tuna caught in the sub-surface gear setting as compared to surface gear setting. This indicates that although in terms of numbers the catch is lower in sub-surface the yield remains higher in terms of weight (fig 2b and 2c).

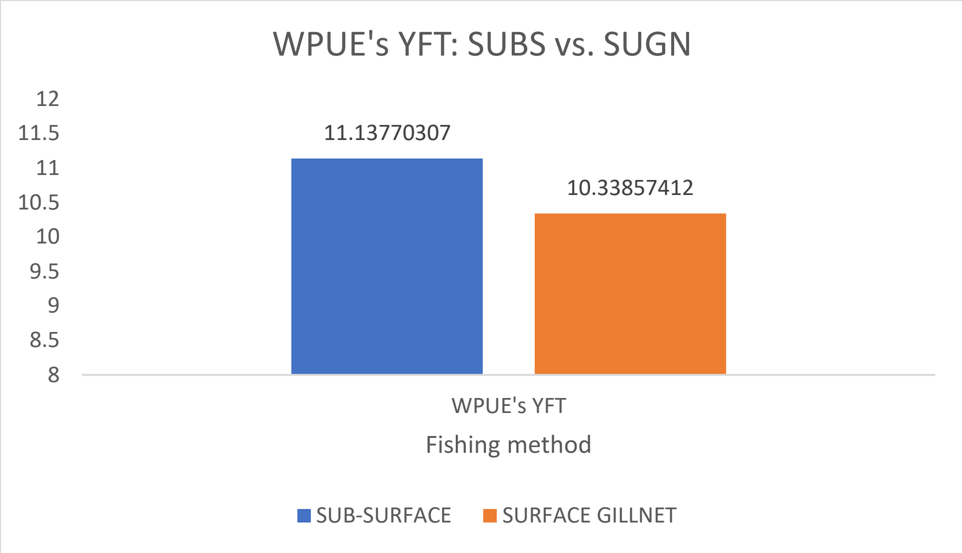


Fig 2b: Weight in Kg (yield) per unit of effort for Yellowfin tuna in surface and sub-surface gear setting

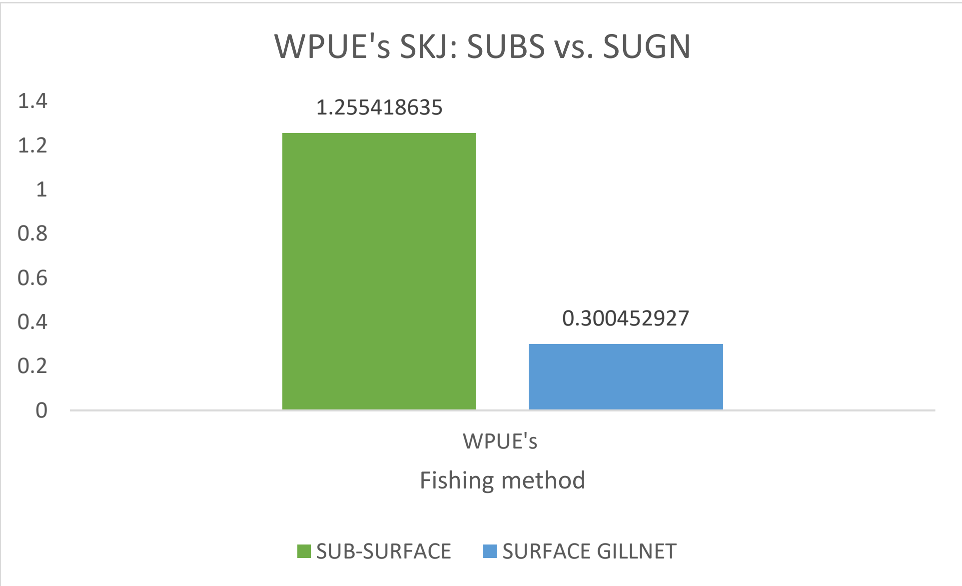


Fig 2c: Weight in Kg (yield) per unit of effort for Yellowfin tuna in surface and sub-surface gear setting

4. Discussion

The major result of this study is that slight changes of fishing methods can potentially have no significant impact on the target capture rates, but can result in higher yields as revealed by the data analysis above. In addition, the trade-off is largely between having significant positive impact on the incidental captures (Fig 3a, 3b, 3c) (Kiszka et al., 2018). As a precautionary approach, encouraging fishermen to deploy deeper (at least 2 meters) gillnets should significantly bring more gains, with increase in target catch yield. The monitoring of tuna drift gillnet fisheries has been further expanded in 2018 with now 75 boats being monitored (at least 15% of the fleet). Improving data quality using electronic monitoring will also enable to improve species identification and composition. Moreover, a further next step would be to explore the disaggregation of data from the highest concentrated area of sets as observed in figure 1 and to compare surface/sub-surface deployments and gear behavior.

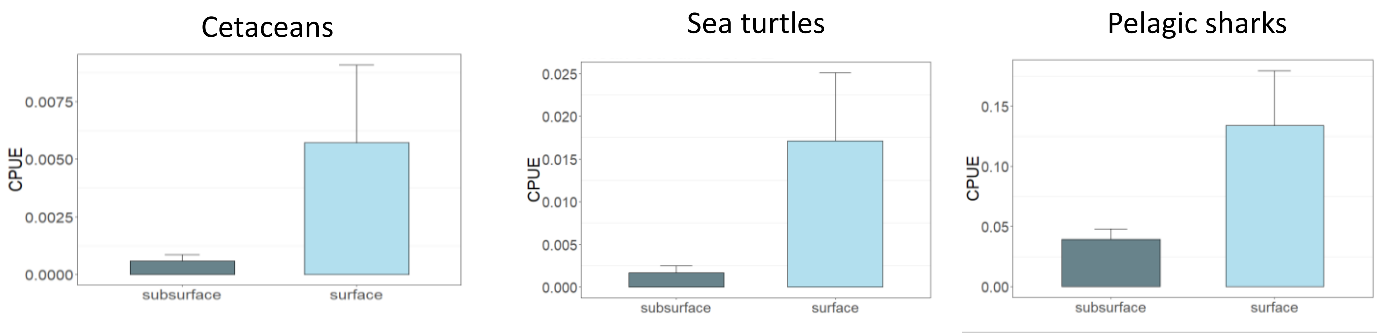


Fig 3a, 3b, 3c: Captures in surface/sub-surface sets

5. Conclusion

Different gear settings (surface and sub surface) do not significantly affect target catch of tropical tuna in numbers, however, have an increase in yield and captures in increased weight of tropical tuna caught in subsurface as compared to surface sets. Moreover, the decrease in incidental captures of Cetaceans, sea turtles and pelagic sharks is significant and a potential trade-off. Moreover, it is highly likely that the capture rates of these species and their composition varies by area of operation and may need further investigation on different gear settings on how they behave in similar area, time-period and seasons.

In conclusion, the results are encouraging and may be scaled up in other areas to collate information that may potentially be a viable conservation, management measure for gillnet fisheries operating in the IOTC area of competence.

Acknowledgements

WWF thanks the GEF/Common Oceans and FAO funded ABNJ Tuna project for providing financial support for this work. The authors thank the boat captains to be involved in this project for data collection and their continued support and collaboration. The authors also thank Dr. Jeremy Kiszka from Florida International University on providing support for data analysis and options.

References

Khan, M.W. (2017). Status of tuna fisheries in Pakistan. IOTC Scientific Committee Report.

Kiszka, J.J., M. Moazzam, M. Nivière, U. Shahid, B. Khan and R. Nawaz (2018). Cetacean bycatch in tuna drift gillnet fisheries off Pakistan (Arabian Sea). Intended for IOTC-WPEB.

Moazzam, M. (2018). Status of fisheries of yellowfin and skipjack tuna in Pakistan. IOTC-WPTT20-13.

Shahid, U., M. M. Khan., R. Nawaz., S. A. Razzaq and S. Ayub (2016). Bycatch analysis of tuna gillnet fisheries of Pakistan: An analysis of bycatch data from 2013-2015. IOTC-WPEB.