BY CATCH, DEPREDATION & AUTHENTICITY OF TUNA VALUE CHAIN

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ABSTRACT – Tuna long liners play a very important role in the export-oriented fisheries sector in Sri Lanka while contributing a reasonable foreign income to the country. Hence, the objectives of the study were to investigate the issues of by-catch, depredation, and authenticity of the export-oriented tuna value chain while exploring the transport and logistics issues of tuna supplies and to propose strategies to overcome the issues identified. Primary data was collected from fishers in two fisheries harbors, Dikkowita and Gandara, in the Western and Southern provinces, respectively. A pre-tested, structured questionnaire was administered to the fishermen who used to fish in the high seas and the Exclusive Economic Zone. Boat owners or crew members of multiday fishing boats (IMUL) were interviewed monthly, covering 20% of the boats in each harbor. The depredation index was 15.60, with an attack interval of 3.46 and a damage rate of 0.29. Issues such as depredation of attached hooks or bait, hooking of unwanted catch, dissolving of fish schools, wastage of time, fuel, and energy, and loss of moral strength among fishers were recorded. The unwanted by-catch, such as sea turtles, sharks, seabirds, and sailfish, reduced the harvest, while these non-targeted damages adversely impacted marine life. As suggested solutions to overcome the issues, dolphin pingers could be used to repel the harmful cetacean species, the crew members could be trained for cetacean identification and record keeping, and satellite tagging could be used to closely monitor the predatory species.

Keywords: Authenticity; By catch; Depredation; Tuna

1. INTRODUCTION

Tuna long liners play a very important role in the export-oriented fisheries sector in Sri Lanka while contributing a reasonable foreign income to the country (EDB, 2022). Longline fisheries, which are used to catch massive yields of tuna, swordfish, cod, and halibut, are geographically widespread and target many species of marine life [1]. Though long line fisheries are designed to capture targeted species, untargeted marine life known as “by catch” is caught with long lines [1]. According to [2], depredation means the removal of the hooked fish or bait completely or partially by cetaceans or sharks. Bycatch in long lines accounts for more than 20% of the total catch (ISSF, 2023). By catch and depredation are found to be causing a huge loss to the global fisheries industry [2,3,4,5]. This is a growing issue for the Sri Lankan tuna longliners, especially those operating in the high seas, but not serious for the fishermen who are operating within the EEZ, except in some marine mammal hot spots.

2. MATERIALS AND METHODS

Primary data was collected from fishers in two fisheries harbors Dikkowita and Gandara in Western and Southern province respectively. A pre-tested structured questionnaire was administered to the fishers who used to fish in high seas and Exclusive Economic Zone. Boat owners or crew members of multiday fishing boats (IMUL) were interviewed monthly, covering 20% of the boats in each harbor. Information was collected

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regarding the last fishing trip they have completed and the depredation index (DPI), attack interval (AI), damage rate, depredation rate and damage intensity were calculated (Nishida, Tanio, 2001; Romanov et al., 2007). In addition, data were gathered on the species responsible for depredation, temporal and spatial changes, and severity of damage, mitigation measures and damages to marine mammals. The economic loss of depredation for two IMUL boat categories were calculated considering the direct loss of depredation.

Depredation Index $DPI = \frac{\sum_o^i FD}{\sum_o^i H} \times 10000$	Where, FD (fish damaged) is the pooled number of marketable fish individuals that were damaged; H is the total number of hooks deployed (pooled nominal fishing effort).
Attack Interval $AI = \frac{\sum O}{\sum OD}$ Damage rate (DR) $DR = \frac{\sum OD}{\sum O}$	O is number of fishing operations and OD is operation with depredation.
Damaged intensity (DI) $DI = \frac{\sum_o^i FD}{\sum_o^i Oy}$	F_D is fish damaged, O_Y – operations (either total, positive, affected, affected by specific predator)

3. RESULTS AND DISCUSSION

3.1. Issue of by catch, Depredation, and Authenticity of Export-Oriented Tuna Value Chain

According to the results the depredation index was 15.60 which means that high number of fish are damaged by the predatory fish such as *Pseudorca crassidens, Feresa attenuate, Peponocephala electra, and Globicephala macrorynches.* According to the damage intensity, it was identified that for every single operation, nearly 2 fish were found damaged. According to the calculated economic loss, for every trip in IMUL high sea vessels 3.83±3.53 out of 11.86±3.53 total fishing days caught damaged fish and it accounted for 1,149,671.00 LKR of average loss per trip. In IMUL EEZ vessels, 2.08±2.77 out of 9.62±5.64 total fishing days caught damaged fish and it accounted an estimated loss of 348,786 LKR (table 01). By catch included sharks, dolphins, sail fish and sea turtles.

Table 1. Calculated economic loss.

Boat category	Number of hooks/boats	Number of days spent at sea pre trip	Number of fishing days per trip	No of days damaged	Loss per trip Rs
IMUL High seas	1532±415	36.3±11.0	11.86±3.53	3.83±3.25	1,149,671.00
IMUL EEZ	1132±504	19.23±13.61	9.62±5.64	2.08±2.77	348,786.00

3.2. Transport and Logistics Issues of Tuna Supplies

Types of damages recorded by the fishermen included depredation of hooked fish and baits, dissolving of fish schools, and extra running cost and time to find new fishing areas reducing the fishing time, damages to the fishing gears (extra repairing time delaying the next fishing trip) and the extra repairing cost and loss of moral strength of the fishers when the harvest is continuously reduced.

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3.3. Strategies to Overcome the Issues Identified

As mitigatory strategies to the identified issues of bycatch and depredation, following remedial measures could be applied. To repel the marine mammals from depredating, lights could be switched off in vessels when they get signal of predators. Moreover, artificial baits could be used so that they will not attract predators. If the fishing area has recorded above threshold level of predator records, the fishing area could be banned for fishing during the season concerned. Moreover, satellite tags could be used to track and locate predatory marine mammals. Then the vessels can avoid the groups and lay the long lines.

4. CONCLUSION

The multiple measures taken by the fishermen are not successful. The level of depredation, spatial distribution of the marine mammals, species responsible and mitigatory measures already used by the fishers and insights into the economic damages are important for designing a new mechanism. As a recommendation to mitigate the issue, use of Dolphin pingers, training crew members for cetacean identification and record keeping, and introducing satellite tag systems to locate predatory species could be utilized. Further, a continuous assessment on the population level of black fish species and other cetaceans could be recommended so that if the recorded depredation and by catch goes above the threshold level, fishing in the located areas for that season could be completely shifted to other regions.

REFERENCES

1. Werner, T. B., Northridge, S., Press, K. M., & Young, N. (2015). Mitigating bycatch and depredation of marine mammals in longline fisheries. ICES Journal of Marine Science, 72(5), 1576-1586.
2. Hernandez-Milian, G., Goetz, S., Varela-Dopico, C., Rodriguez-Gutierrez, J., Romón-Olea, J., Fuertes-Gamundi, J. R., ... & Pierce, G. J. (2008). Results of a short study of interactions of cetaceans and longline fisheries in Atlantic waters: environmental correlates of catches and depredation events. Essential Fish Habitat Mapping in the Mediterranean, 251-268.
3. Donogue, M. (2003). Report on the workshop on interactions between cetaceans and longline fisheries. In New England Aquarium Aquatic Forum Series Report (Vol. 1, pp. 1-44).
4. Dalla Rosa, L., & Secchi, E. R. (2007). Killer whale (Orcinus orca) interactions with the tuna and swordfish longline fishery off southern and south-eastern Brazil: a comparison with shark interactions. Journal of the Marine Biological Association of the United Kingdom, 87(1), 135-140.
5. Kumar, K. A., Pravin, P., & Meenakumari, B. (2016). Bait, bait loss, and depredation in pelagic longline fisheries–A Review. Reviews in Fisheries Science & Aquaculture, 24(4), 295-304.