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Depredation in gillnets operated along the south-west coast of India

S. CHINNADURAI, PARAS NATH JHA, R. K. RENJITH, M. P. REMESAN, SALY N. THOMAS AND M. V. BAIJU

ICAR-Central Institute of Fisheries Technology, Kochi - 682 029, Kerala, India
e-mail: chinnaduraitvl@gmail.com

ABSTRACT

Experimental gillnet (polyamide, 210 d×9×3 with 140 mm mesh size) fishing was conducted onboard FV Sagar Harita (L_{OA} 19.5 m) during September, 2016. Out of six sets deployed, three incidents of depredation, possibly by puffer fish were observed, when 41.5, 33.7 and 40% of the catch was lost. Depredation could be prevented effectively by frequent monitoring of the deployed gillnets at shorter intervals. Studies on depredation with special reference to soaking time, hauling speed, seasonal variation and location of fishing grounds are needed in view of the economic losses incurred.

Keywords: Catch, Depredation, Fishing, Food loss, Predator, Puffer fish

Food loss and its quantification is one of the most challenging tasks in capture fisheries. Understanding of losses is a critical step towards better fisheries management. The causes for the food loss are usually loss of gear, lack of proper storage, non-targeted catch, adverse weather, no market demand and depredation (FAO, 2017). Depredation is defined as partial or complete removal of catch from the fishing nets by predators (Romanov *et al.*, 2009). Though it has been well documented in longline fishery (Garrison, 2007), very little information is available for gillnets. Sharks and cetaceans are the major predators reported in artisanal fishing gears (Konigson *et al.*, 2007; Brotons *et al.*, 2008; Rafferty *et al.*, 2012; Cosgrove *et al.*, 2015).

Experimental fishing was conducted onboard FV Sagar Harita (L_{OA} 19.5 m) during September, 2016 using multifilament gillnets made of polyamide (PA) (210 d×9×3) with 140 mm mesh size. The nets were of 1990 m length and 104 meshes deep rigged at 0.5 hanging coefficient. The depth of operation ranged between 35 and 50 m. Six sets of nets were deployed between 17.30 and 18.00 hrs. Soaking time of the net ranged from 3 to 5 h (Table 1).

Target species of experimental gillnets were large pelagics. *Scomberomorus guttatus* dominated the catch (29.42%), followed by *Sphyraena jello* (26.47%), *Rachycentron canadum* (13.23%), *Megalaspis cordyla* (8.45%), *Rastrelliger kanagurta* (8.09%) and miscellaneous fishes (14.28%). Targeted and bycatch species contributed 74.5 and 25.5% of the total catch respectively.

The present experiment coincided with the season when puffer fish abundance was expected to be the highest in the south-west coast of India (Mohamed *et al.*, 2013). Out of six sets deployed, three (50%) incidents of depredation, possibly by puffer fish, were observed during the study. The assumed weight (W) of each fish prior to predation, was estimated from mass (W) - length (L) equations described by Rafferty *et al.* (2012). It was observed that 41.5, 33.7 and 40% of the catch was lost due to depredation in three fishing operations, respectively. Comparative analysis showed that Indian mackerel and carangids were the most affected by depredation. It was estimated that depredation led to an average economic

Table 1. The geographical position of the study area, depth of operation, soaking time and depredation loss observed in gillnets

Date	Latitude	Longitude	Depth (m)	Soaking time (h)	Depredation (%)
06.09.2016	09°47'056"N	076°02'083"E	40	5	0
09.09.2016	09°48'051"N	076°04'043"E	35	4.5	41.5
19.09.2016	09°46'076"N	076°00'067"E	45	3	33.7
21.09.2016	09°50'001"N	076°00'013"E	40	3	40.0
23.09.2016	09°48'051"N	075°56'010"E	50	3	0
26.09.2016	09°43'054"N	076°03'007"E	50	3	0

loss of ₹150 per 1,000 m of net which represents 5.19% of the catch value.

The pattern of bites mainly on antero-dorsal portion of fishes clearly indicate depredation causing the removal of flesh from the fish caught in the net (Fig. 1). The mean weight of damaged fish was highest on 09 September 2016 (41.5%). Mean size of depredated and undamaged fishes were similar in all instances. No substantial difference in size of damaged and undamaged fish caught in the gear was noted. The overall proportion of depredated Indian mackerel in the current study (18%) was considerably higher than carangids (10.9%).



Fig. 1. Depredation observed in the catches of Indian mackerel and carangids caught in gillnets off Kochi

The most common puffer species encountered during fishing activity are *Lagocephalus inermis*, *Arothron* sp., and *Diodon* sp. (Raphael *et al.*, 2017). Damage caused by puffer fish to the catch and gear potentially poses threat to the livelihood of coastal fishermen. However, very little quantitative information is available in this regard (Mohamed *et al.*, 2013). The major constraints due to depredation are the substantial loss of catch, the time required to repair damaged gear and loss of gear. Depredation by puffer fish often results in damage to a sizeable quantity of the net also. Puffer fish taken as bycatch in trawls are also responsible for damage to other catch already caught (Mohamed *et al.*, 2013). A growing body of information concerning the operational interactions between puffer fish and fishing gear has been emerging in India, post-tsunami period (Raphael *et al.*, 2017). Depredation in gillnets and significant damage to gillnet operations by harbour seal and spiny dog fish was reported in George Bank (Rafferty *et al.*, 2012). Konigson *et al.* (2007) reported that due to depredation almost half

of the catch (42%) is lost from herring gillnet fisheries in northern Baltic Sea. Depredation rate by bottlenose dolphin (*Tursiops truncatus*) was nearly 13% in artisanal fisheries around the Balearic Islands (Brotons *et al.*, 2008). For bottom-set gillnet in Irish waters, the depredation rate was upto 29% (Cosgrove *et al.*, 2015). Understanding the factors contributing to interactions between predators and gillnet is essential for reducing depredation and the damage to gear in gillnet fishing operations.

Incidents of killer whale and shark depredation in longline fishery has been reported from the Indian EEZ (Varghese *et al.*, 2008; Kumar *et al.*, 2016). The first report of depredation in gillnet fishery in India was on depredation by crabs in Lakshadweep waters (Sherief *et al.*, 2015). However, the present study is the first report on quantification of catch loss in Indian gillnet fishery due to depredation. The economic loss by depredation in both artisanal and mechanised gillnet fisheries in Indian waters needs special attention.

Soaking time in the case of gillnet fisheries is found to be a significant factor for depredation and can be controlled by simple operational interventions. Depredation could be prevented effectively by frequent monitoring of the deployed gillnets at shorter intervals. Further studies are needed on depredation in gillnets, with special reference to soaking time, hauling speed, seasonal variation and location of fishing grounds.

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