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Biting through Nets - Puffer Fish Attacks in Gillnets - Field Observations from Fort Kochi, Kerala

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ABSTRACT

Puffer fish-induced damage to fishing nets is a recurring and widespread issue, often reported from different parts of the world, resulting in substantial economic losses and threatening the livelihoods of fishing communities. Along the south west coast of India, increasing interactions between puffer fishes and fishing gears have been reported in recent years, resulting in catch losses and gear damage. The present study assessed the extent of puffer fish-induced damage in gillnet fisheries at Fort Kochi, Kerala, through a field survey conducted during April-May 2026. The dominant species of puffer fish encountered was *Lagocephalus inermis* (smooth blaasop), which caused both catch depredation and severe damage to polyamide monofilament gillnets. Fishers reported that up to 50 % of catch was damaged during peak seasons of puffer fish attacks. Gillnets exhibited severe structural damage, including torn meshes, broken twines, and holes ranging from 3.5 to 11cm and a breaking strength reduction of 35-40% in damaged meshes. About 59% of the surveyed fishers reported replacing their nets every two to three months, with monthly repair expenses ranging from Rs. 1200-1600. The findings highlight

the growing impacts of puffer fish interactions with gillnets and emphasize the need for developing measures to mitigate economic losses and improve the sustainability of coastal fisheries.

INTRODUCTION

Interactions/attacks of aquatic organisms such as cetaceans, puffer fish, crabs can cause significant damages to fishing gears. Pufferfish-induced damage to fishing nets is a recurring and widespread issue, often reported from different parts of the world, resulting in substantial economic losses and threatening the livelihoods of fishing communities (Nader et al., 2012; Christidis et al., 2024). The increasing abundance of puffer fishes in the Arabian sea, particularly during post monsoon months, has been reported since 2006 (Mohamed et al., 2013) and the major puffer species reported were *Lagocephalus inermis* (smooth blaasop), followed by *Arothron* spp. and *Diodon* spp.

Puffer fishes are well known for their powerful teeth, formed by fused dental plates which can easily bite through net meshes while feeding on fishes caught in the nets. As a result, fishers often retrieve their nets with torn meshes, large holes, and partially consumed catch. The issue has emerged as both an economic and operational challenge for coastal communities. Continuous net repairs increase labour requirements and operational expenses, reduces fishing days, placing an additional burden on small scale fishers who already face uncertain fishing conditions. Besides damages to the nets, partial or complete removal of the entangled fishes from the nets (referred to as depredation) causes substantial loss in catch and reduces the market value of the catch.

Studies on depredation and catch loss in ringseines in Kerala have estimated that 20-30 kg of net has to be replaced after every puffer fish attack and the repair cost ranges from 1-3 lakhs (Raphel et al, 2017). Nakhawa et al., 2025 reported that many ring seine operators along Ratnagiri coast, Maharashtra suspended their fishing operations in certain months due to the damages in nets by puffer fishes and repair costs associated with such incidents. Gillnet fishers suffer from these types of damage and losses due to puffer fishes, even though to a lesser extent compared to ringseines. However reports on such damages in gillnets due to puffer fish are scanty except a few (Raphel et al ., 2017; Chinnadurai et al., 2018).

FIELD STUDY

To understand the extend of damage in gillnets due to the puffer fish interactions, a field survey was conducted at Fort Kochi, Kerala. The survey was conducted with a pre-structured questionnaire among 25 small scale gillnet fishers during April to May 2026. Most fishers used polyamide (nylon) monofilament gillnets (mesh size 44 - 50 mm, diameter - 0.16mm) and mainly targeted for mackerel or sardines. Gillnets were typically 500-600 m long with a mesh depth of 100-150 meshes. Gillnets were operated as drift gillnets from motorized FRP boats of 6-9 m in length, having engine power of 4-9 hp and the operations were carried out during early morning hours and soaking time varied from 1- 2 hrs. Most fishers reported that interactions with various organisms such as dolphins, jellyfish, pufferfish damaged their nets. Nearly two-third of the respondents identified dolphins and puffer fishes as the principal cause of gear damage, jelly fish was also reported as an occasional source of damage for the gillnets.

The puffer fish specimens collected from fishers were identified as *Lagocephalus inermis* smooth blaasop puffer fish (Figure 1), locally known as *kadalmakri or thavala* belonging to the family Tetraodontidae and characterized by silvery body, smooth skin, and less spine. Since these fishes possess strong fused dental plates, they bite chunks out of entangled fish. Observations from the study showed that, mackerels were predominantly depredated by puffers, followed by sardines. Fishes damaged by pufferfish bites typically showed a crescent-shaped circular wound, missing fins, exposed flesh, and partially eaten bodies (Figure 2). When a pufferfish starts biting on an entangled fish, the prey struggles violently causing scale loss, bruising, torn skin leading to reduce market quality even if the bite is small. They preferentially attack the belly, gill region and eyes of entangled fish as these are soft areas. Fishermen opined that 50% of the catch are attacked by puffer during the peak months. Even when fish remained in the nets, bite wounds and physical damage reduced their market value, forcing many fishers to discard them or use them as animal feed.

Figure 1. *Lagocephalus inermis*, smooth blaasop puffer fish

Figure 2. Pufferfish-induced bite damage on gillnet-caught mackerels

The damages extended beyond the catch itself. Due to puffer fish bites, gillnets exhibited severe structural failure, marked by irregular ruptures, broken twines causing damage to the nettings (Figure 3). When pufferfish use their sharp dental plates to bite through the netting, mesh integrity was lost, creating numerous holes that render the gillnet ineffective for catching the target species. Mechanical strength measurements indicated that the strength (breaking strength) of the damaged meshes was reduced by approximately 35-40% when compared with the undamaged net. In the bite areas of the gillnet, hole sizes ranged from 3.5- 11cm depending on the severity of the attack. After each fishing operation, if the holes are small, fishers repair the nets by tying the broken meshes, while severely damaged sections often required complete

replacement. About 59% of the surveyed fishers reported replacing their nets in every 2-3 months due to these damages. Monthly repair expenses ranged from Rs 1200-1600/. For traditional fishing communities depending on daily income, such losses can directly affect household livelihoods. Fishers stated that gillnets damaged by pufferfish were either reused as fencing material around poultry sheds or else discarded as trash.

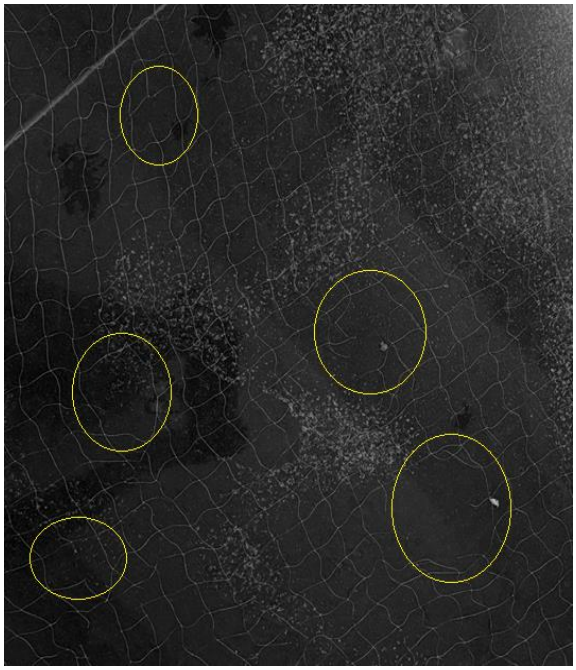

Figure 3. Damages to gillnet meshes due to puffer fish bites

CONCLUSION

The increasing occurrence of puffer fish bites in the Arabian sea, especially along the South West Coast of India has been linked to the increase in tetaraodontids biomass associated with ecological changes, potentially driven by trophic cascades triggered by the depletion of top predators (Mohamed et al., 2013). Although puffer fish are naturally occurring marine species, their increasing interaction with fishing gears is a growing challenge for the fishing community. Addressing the issue requires both scientific investigation and management measures. Detailed studies are needed to understand the seasonal abundance, feeding behaviour, and spatial distribution of puffer fish in Kerala coastal waters. Improved fishing gear materials that are more resistant to biting damage may reduce the likelihood of damages and improve gear durability. Equally important is documenting the experience of fishers, whose observations will provide valuable information for developing mitigation measures. The experiences of small-scale gillnet fishers from Fort Kochi highlight the growing need to address emerging fishery-related challenges associated with changing marine ecosystems. Recognizing and addressing the puffer fish-induced damages in fishing gears is essential not only for reducing economic losses but also for supporting the long- term sustainability of traditional coastal fisheries.

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