Implementation of TED (Turtle Excluder Device) for Turtle Protection

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ABSTRACT

Marine turtles, despite their global distribution and ecological significance, face severe threats to their populations, primarily due to human activities such as illegal trade, habitat destruction, and incidental capture in fishing gear. Over the past three decades, the protection and conservation of sea turtles, particularly in India, have garnered increasing attention from government bodies, NGOs, and the public. However, incidental capture in fishing gear, particularly in trawl nets, poses a significant threat to turtle populations. Trawling, which indiscriminately captures non-target species, often leads to high mortality rates in sea turtles, with drownings and traumatic injuries occurring during capture. To mitigate this issue, the Turtle Excluder Device (TED) was developed, which allows large marine animals, including sea turtles, to escape from trawl nets unharmed. This review highlights the importance of TEDs in sea turtle conservation and the need for continued efforts to integrate selective fishing practices to protect endangered marine species.

INTRODUCTION

Marine turtles are globally distributed in every ocean on earth, occupying distinct ecological niches, and vary within species in terms of reproduction, morphology, and population levels and trends. Globally, marine turtle species are currently

classified under Endangered (i.e., green turtle *Chelonia mydas*), Critically Endangered (i.e., Kemp's ridley *Lepidochelys kempii* and Hawksbill *Eretmochelys imbricata*), Vulnerable (Olive ridley *Lepidochelys olivacea*, Loggerhead *Caretta caretta* and Leatherback *Dermochelys coriacea*) and Data Deficient (Flatback *Natator depressus*). It is known that the Indian coastal seas are home to five different species of marine turtles: green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), leather back turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*) and olive ridley turtle (*Lepidochelys olivacea*). Olive ridleys are said to be the most prevalent marine turtles worldwide and are the most prevalent species in Indian seas. It is well-known for its large reproductive aggregations, which are referred to as *arribada* (Spanish for "arrival by sea"). The north-east Indian coast's Gahirmatha, Orissa, is home to the world's biggest known nesting aggregations of olive ridleys. To the south of Gahirmatha, the rookeries at Devi and Rushikulya are smaller. Many government agencies, non-governmental organizations (NGOs), and the general public have become more interested in the condition of sea turtles and the necessity for their conservation and population recovery throughout the last 30 years (Campbell *et al*., 2007).

Threats to Marine turtle in Trawling

A major anthropogenic danger to marine species globally is bycatch, also known as the incidental or unintentional capture of non-target species in fishing gear. According to Arlidge *et al.* (2020), fishing operations are the cause of both high sea turtle mortality and declining sea turtle numbers globally. For many endangered populations, accidental catch of air-breathing animals with fishing gear is a leading cause of death. Even when people throw them alive, they might not live because of direct harm or more obscure internal physiological harm like decompression sickness. Around the world, sea turtle populations are thought to be seriously threatened by fishing-induced mortality, and trawling is one of the practices that have the most adverse effects as trawling is considered responsible for more sea turtle fatalities than all other human activities combined. Bycatch in marine fisheries, especially fishing trawls, has hindered the recovery of sea turtle populations globally. Turtles caught in trawl nets may drown, going into a vegetative state before passing away. Sea turtles caught in trawls may suffer from traumatic injuries and physiological effects as a result of being forced to immerse themselves (Wilson *et al*., 2014). Turtles' regular dive duration is actually shorter than their typical tow times, and their tolerance is further diminished under forced apnea (Lutcavage and Lutz, 1997), particularly if they are caught in a trawl net, when other variables most likely take place (Stabenau *et al*., 1991). In order to catch target species, trawls drag a big funnel-shaped net across the ocean floor or through the water column. However, trawls can indiscriminately catch other species, such as sea turtles that coexist with target species like fish and shrimp.

Turtle Excluder Device (TED)

Fishing practices like trawling and gill netting cause a significant amount of unintentional turtle death. The main countries where turtles die as a result of fishing, especially prawn fishing, are India, Australia, and the United States. To lessen the unintentional capture of endangered sea turtles by shrimp trawls, the National Marine Fisheries Service (NMFS) of the United States created the Turtle Excluder Device (TED), a novel separator trawl design, in 1980. To enhance its operations, the NMFS created many TED designs. The USA has updated federal TED restrictions that are more successful in lowering turtle death starting with the 1993 shrimp season.

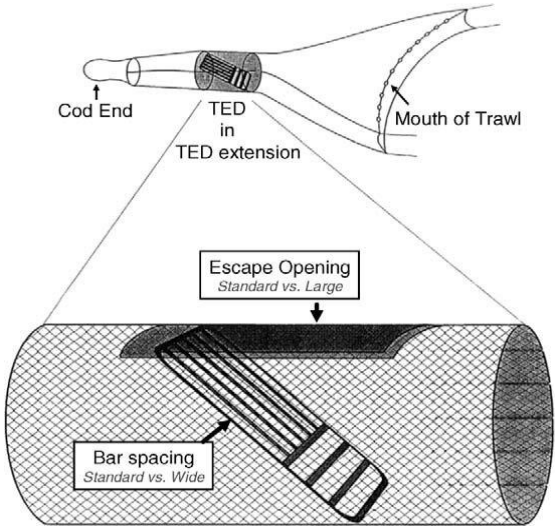

Figure 1 Schematic of a turtle excluder device (TED) extension in a summer flounder bottom otter trawl (Haas, 2010). The term "bar spacing" refers to the space between the deflector bars as well as that between the bars and the TED frame.

An angled metal grid called the Turtle Excluder Device (TED) is positioned in the trawl to keep big creatures out of the cod-end. Specimens halted by the TED can escape, largely undamaged, through a tiny hole in the trawl that is either above or below the grid. Shrimp, for example, are targeted species that migrate to the rear of the cod-end. TEDs often include a panel of big mesh webbing (soft TEDs) or a metal grid (hard TEDs) that is positioned at an angle of 40° to 60°. This establishes a physical barrier that permits prawns and other creatures smaller than the mesh webbing of a soft TED or the bar spacing of a hard TED to enter the cod end of the TED. Large creatures, such as sea turtles, glide along the TED to an exit hole that is cut at either the top (top opening TED) or bottom (bottom opening TED). To lessen the chance of losing prawns, a flap of webbing may be placed over portion of the exit hole.

In light of the US restriction on imports from nations that do not use TEDs, India also began testing various imported TEDs. Indian institutes such as Central Institute of Fisheries Technology (CIFT), Central Institute of Fisheries Navigation and Engineering Training (CIFNET) and Fishery Survey of India (FSI) carried out experiments using imported TEDs. TEDs may be divided into two categories based on how by-catch is eliminated; active and passive. Fish behavior is used by active TEDs to distinguish between target and non-target species. To distinguish between target and non-target animals, passive TEDs employ a physical sorting technique. Two ICAR-funded projects, Performance evaluation of suitable selective devices for elimination of by-catch (BRD) and Turtles (TED) in shrimp trawling and development studies on responsible trawl systems with focus on the design, fabrication, field-testing of TEDs and training of trawler fishermen and other stakeholders in their fabrication and use, established the Central Institute of Fisheries Technology as the nodal organization to develop TED designs appropriate for Indian conditions.

CONCLUSION

The conservation of marine turtles, particularly in India, is critical due to the numerous threats they face, primarily from illegal trade, habitat destruction, and incidental capture in fishing gear, especially trawling operations. As sea turtle populations continue to decline, the need for effective mitigation measures becomes increasingly urgent. The Turtle Excluder Device (TED) has proven to be a significant tool in reducing the incidental capture of sea turtles in shrimp trawling operations. By allowing sea turtles to escape from trawl nets unharmed, TEDs have the potential to significantly reduce turtle mortality and facilitate the recovery of endangered populations. Despite the progress made in the development and implementation of TEDs in countries like the USA, India, and Australia, challenges remain in ensuring their widespread adoption and effectiveness in diverse marine environments. Continued research, testing, and refinement of TED designs, as well as training

and collaboration with local fishing communities, are essential for enhancing their impact. Protecting sea turtles through such measures is not only crucial for the species' survival but also for the broader marine ecosystem, as these reptiles play an important role in maintaining ecological balance. Therefore, it is vital that concerted efforts from governments, NGOs, scientists, and fishing industries continue to focus on reducing bycatch and ensuring the long-term conservation of sea turtles globally.

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