Design and operation of Turtle Excluder Devices (TED)

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Introduction

Sea turtles are endangered species which are protected under schedule I of the Indian wildlife protection act 1972 and its amendment in 1991. Sea Turtles are listed as critically endangered or threatened on world conservation Union Red list. Sea turtles interact with trawl gears, pelagic long line gear on the high seas, and beach seine, gillnet and shrimp trawl gears in coastal waters. These interactions can lead to death, most frequently through drowning, when the turtles cannot climb to the surface of the ocean to breathe after becoming hooked or entangled in the fishing gear. New types of gear or ways of fishing can significantly reduce the rate of interactions between turtles and gear or the mortality rate after an interaction has already occurred.

The code of conduct of responsible fisheries (FAO 1995) gives guidelines for sustainable development of fisheries, prescribes the need for protecting endangered species like sea turtles. As a signatory to the code, India is bound to conduct research, develop appropriate devices and practices and implement regulatory measures for protection of endangered turtles. The fundamental objective of responsible fishing is to maximise economic returns to the fishermen without affecting the long-term sustainability of fishery resources and with minimum impact of ecosystem

Trawling and sea turtle interactions

Trawling is considered to be a very effective method of fishing for demersal population in terms of investment and yield. Trawl nets are towed gears consisting of funnel shaped body of netting closed by a bag or cod end extended sideways in front to form wings. Trawling targets at mainly shrimps gained popularity over the years and led to the development of an organised fishing industry. Trawlers form nearly 80 % of the small-scale mechanised fleet in India. Even though bottom trawl is an efficient fishing method for targeting demersal resources, it is less a selective fishing technique. Along with the targeted resources a large number of non-target resources which include protected and endangered species such a s sea turtles are also caught during trawling. Rajagopalan *et al* (1996) reported that trawls accounted for 17.8% of the incidental catch along the Indian coasts. Along the east coast this problem has been aggravated due to rapid expansion of the mechanised fishing industry. Incidental mortalities of turtles is highest in Orrisa due to presence of large congregations of marine turtles.

An US law (section 609 of public law no. 101 -162) introduced in May 1996 restricted imports of shrimp harvested with fishing equipment such as trawls nets not equipped with Turtle excluder devices (TEDs). The subsequent shrimp turtle case brought environmental requirements in the WTO into the mainstream, through its interpretation of relevant WTO articles. In view of these concerns, with respect to trade and the environment, the Department of Animal Husbandry and Dairying, Ministry of Agriculture, Govt of India constituted an expert

panel to conduct detailed investigations on marine turtle distribution in Indian waters, their incidental mortality in fishing nets and use of TED in trawl nets.

TED for Indian Fisheries

The Turtle excluder devices consist of panels of large mesh nettings (soft TED) or a frame consisting of a grid deflector bars (hard TED), installed before the cod end of the trawl net at an angle leading upward or downward into an escape opening. Small animals such as shrimp slip through the mesh lumen of the netting panel or gap between the deflector bars and are retained in the while large fishes and elasmobranchs are stopped by the netting or the grid of the deflector bars and can escape through the opening (Fig 1). Thus air – breathing marine turtles were prevented from capture and subsequent death after prolonged entrapment in the trawl.

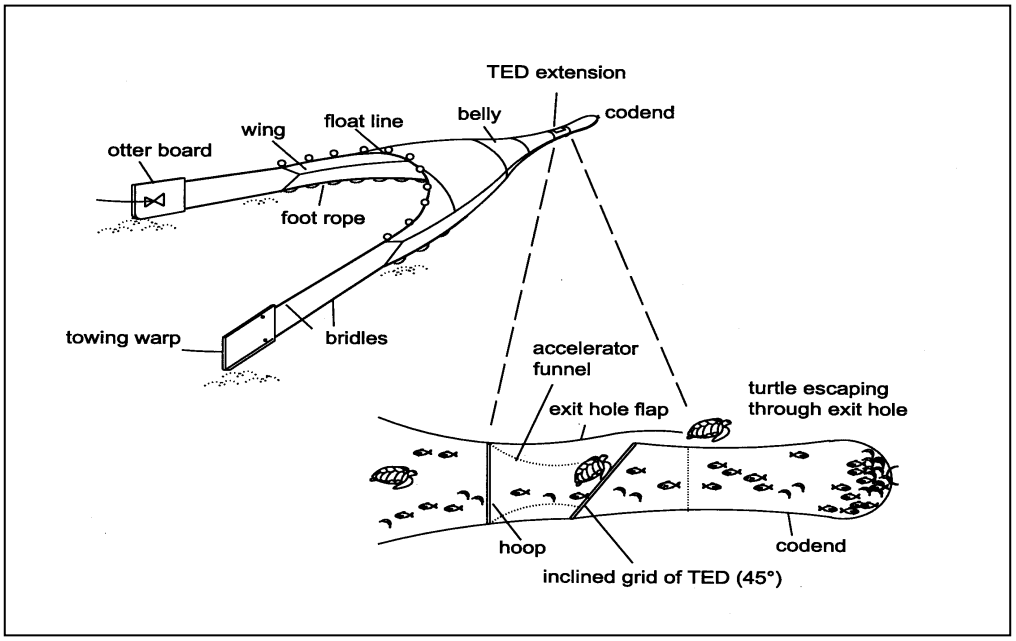

Fig. 1. Principle of TED operation

Different designs of TED are available today and they vary with regard to their construction, principle of operation and materials for construction depending on the target groups and fishing conditions (Fig. 2). Soft TED and Hard TEDs are the two types that are used worldwide (Mitchell et al 1995, Anon 2002a) The hard TED is rigid frame device installed ahead of the cod end to separately and exclude turtles from the trawl catch. Designs of hard Ted include Gorgia Jumper, NMFS hooped TED, Fixed angle TED, Antony Weedless, Flounder TED, Super Shooter (Watson and Taylor 1988), Cameron TED, Jones TED, Thai turtle free device.

Modifications of the basic TED design have been carried out by different nations. Thai Turtle free device was developed by Kasetsart University and SEAFDEC/TD, in Thailand (Chokensanguan et al 1996, Chokesanguan 2000). The AusTED (Australlian trawling efficiency device) was developed in Australia (Mounsey et al 1995, Ribon-Troeger and Dedge 1995,

Brewer et al 1998, Robins- Troeger and McGilvray 1999, McGilvray *et al* 1999) and CIFT –TED in India (Dawson 2001).

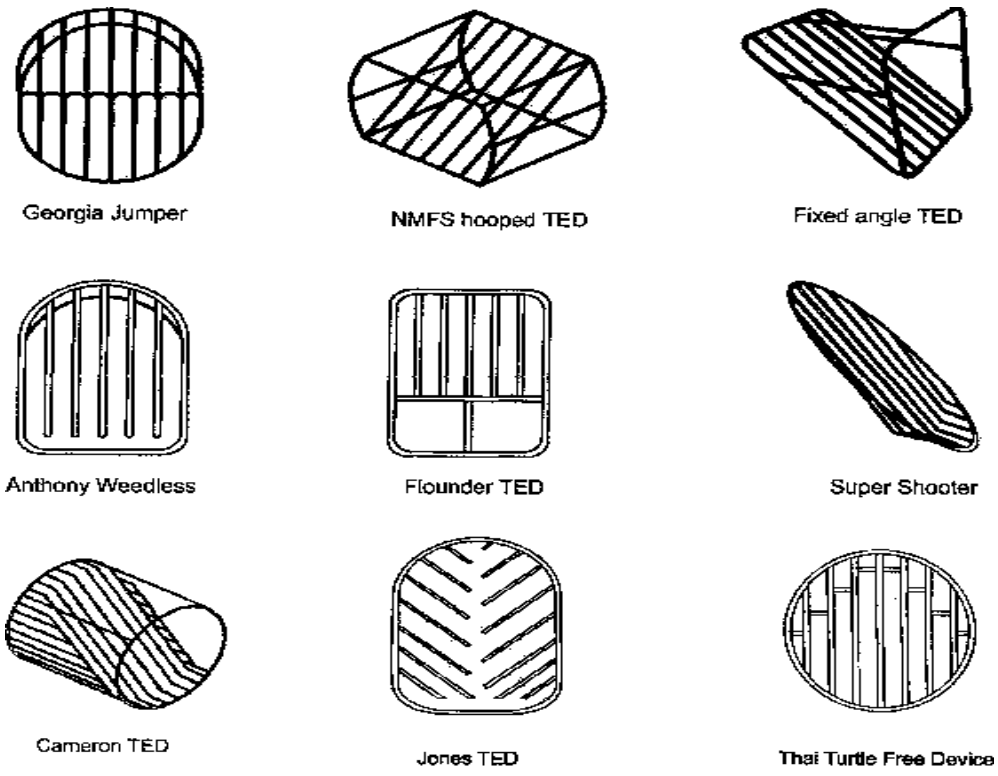

Fig. 2 Variation in single grid hard TED designs

CIFT was closely associated with evaluation of Super shooter TED designs of US origin. as envisaged under the mandate of expert scientific panel along with CIFNET with the support of MPEDA and FSI. Results of the experiments conducted by CIFT to evaluate the Super Shooter TED imported by MPEDA on Matsya Shikari has been detailed. (Boopendranath et al, 2003). The Shooter TED was of 1030 x 850 mm size with a deflector bar gap of 90 mm. 6 Fishing operations were conducted off Andhra, off Kalingapatnam at a depth of 45 – 55 m. The catch retained in the cod end comprised of catfish, perches, pomfret, seer and carangids. No turtle was retained in the experiment.

Experiments continued along the Bheemili and Chilka with an addition al exit hole cod end provided at the exit hole to retain the catch excluded due to the installation of TED in the trawl net (Fig 3). During the 5 operations which was done at a depth of 45 -140 m a total of 676 kg was landed of which 469 kgs was retained in the main cod end. The results indicated an overall escapement of 30.8 % fin fish. Turtles were not retained in the main cod end or exit hole covered cod end (Ramarao, 1995 a).

During the operations off Andhra Pradesh using Super shooter TED on board MV Skipper in the depth range of 36 -50 m (Kirubakaran et al, 2002) two turtles were excluded during the operation. The TED operations with Exit hole at the top of the net resulted in a catch loss of 13.7 %, while operations with exit hole at the bottom resulted in a catch loss of 43.3%. (Kirubakaran et al, 2002).

Unlike fishers in USA, Australia and other advanced maritime nations, fishers on the Indian coast target both shrimp and non-shrimp resources. Experiments with TED designs which have a deflector gap of less than 90 mm in Indian waters, though successful in excluding turtles showed poor performance in retention of targeted non-shrimp catch components. Hence these TEDs are not considered suitable for Indian conditions, nor were they acceptable to Indian trawler owners and operators (Mishera and Behara 2001)

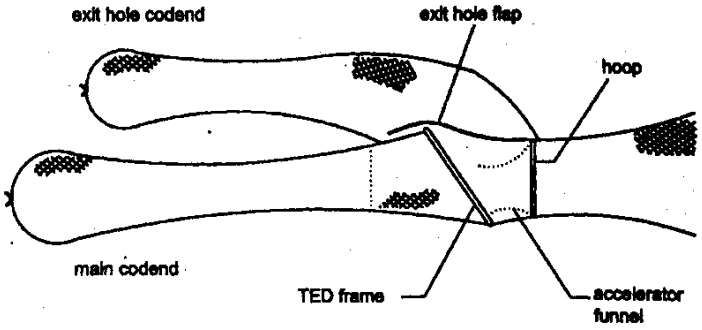

Fig. 3. Details of rigging of exit hole cod end for experimental operations

Development of CIFT-TED

An Indigenous design of TED was developed at CIFT with a focus on reducing by catch loss. THE CIFT-TED is a simple single grid hard TED with a top opening. The device can be fabricated and installed with minimum training using locally available infrastructure and net making skills at a cost of approximately Rs. 2500. The design, construction, installation and operation of CIFT-Ted have been elaborated by Dawson & Boopendranath (2002) (fig 4 -8).

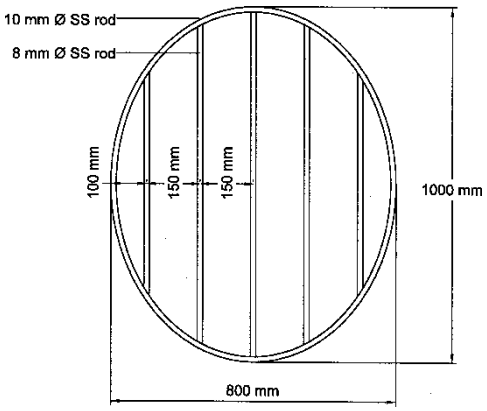

Fig 4. 1000 x 800 mm CIFT-TED

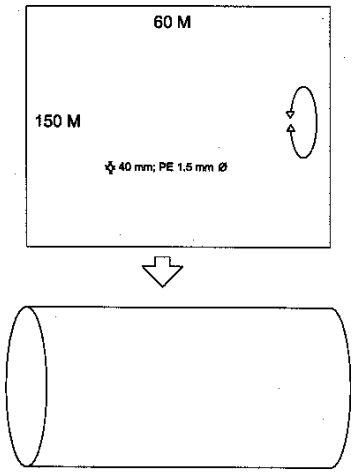

Fig 5. Construction of CIFT TED Extension

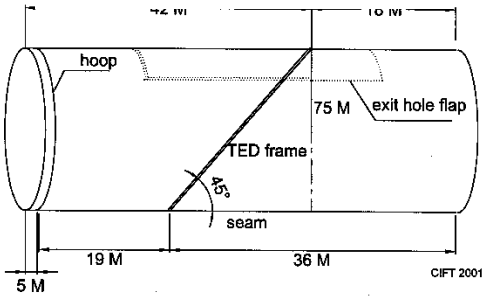

Fig 6. Fixing the grid at the correct angle

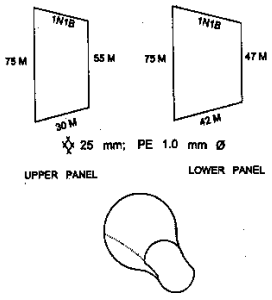

Fig 7. Construction of accelerator funnel

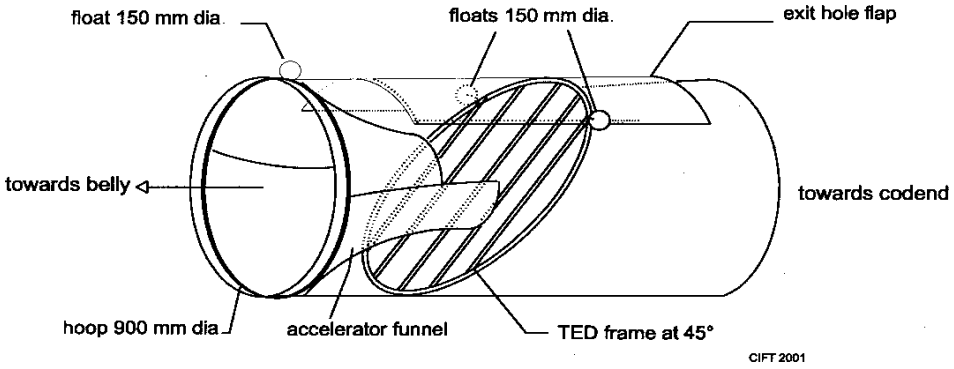

Fig 8. Perspective view of TED Extension

Area	No of hauls	No of hours	Catch retained(kg)	Catch loss(kg)	Catch loss (%)
Paradeep (Orissa)	7	7	422.6	14.3	3.3
Dhamara (Orissa)	1	1	79.23	0.07	0.08
Astrang (Orissa)	1	1	50	0.05	0.1
Bahabalpur (Orissa)	1	1	22	0.3	1.36
Balaramagad (Orissa)	1	1	44	0.8	1.81
Visakhapatnam (A.P)	5	5	69	0.13	0.18
Kakinada (A.P)	6	6	133	1.8	1.35
Nizampatnam (A.P)	2	2	35	0.25	0.71
Krishnapatnam (A.P)	1	1	25	0.7	2.8
Vadarevu (A.P)			10	0.2	2
Total	25	25	889.83	18.6	2.09

Table 1. Details of TED installed trawl operations along east coast coast

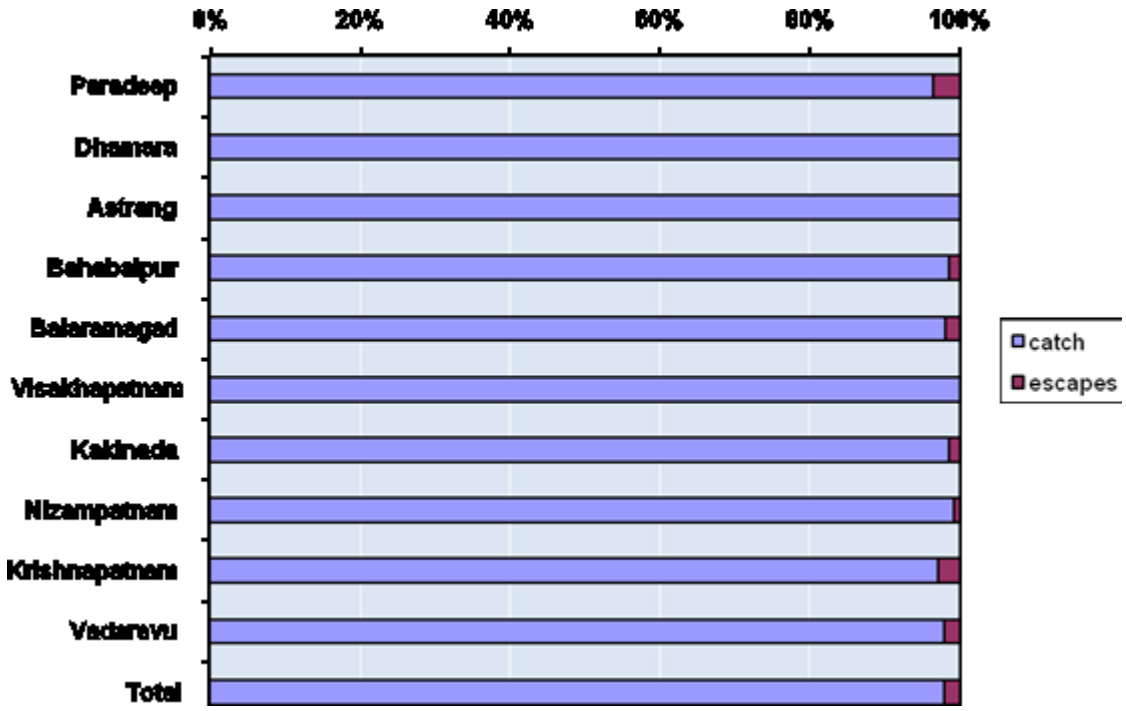

Fig 9. Relative exclusion and retention rates during CIFT-TED installed operations along the east coast of India

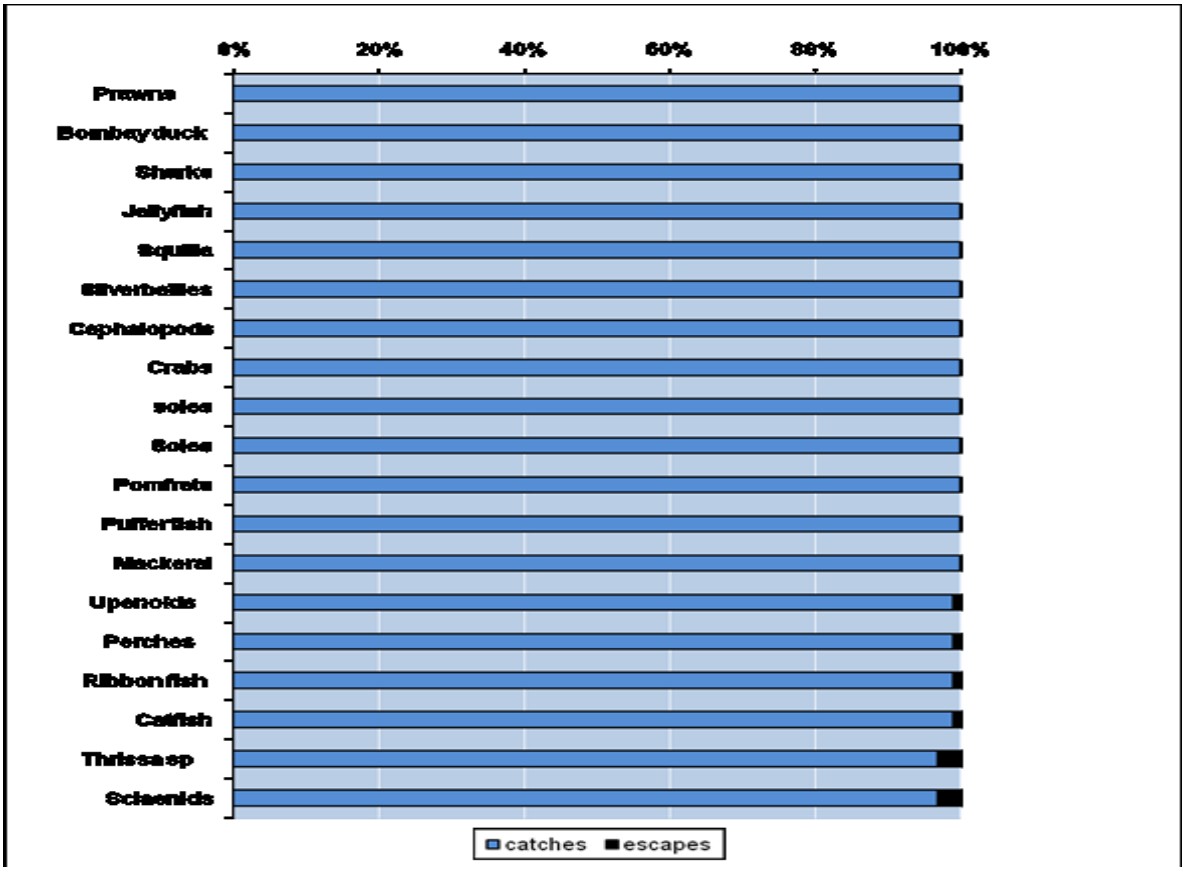

Fig 10. Relative exclusion rates of different species groups after installation of CIFT-TED during experimental trawling along east coast of India

Field trials and demonstration with CIFT-TED along the east coast of India

Field trials with CIFT-TED along the east coast of India so far have shown a mean catch loss in the range of 0.52-0.97% for shrimp and 2.44-3.27% for non-shrimp resources, which is considerably less than the loss incurred during the operations with imported TED designs. The loss of finfish catch is expected to vary from zone to zone and from season to season, depending on the percentage representation of large finfishes and elasmobranchs in the trawl catch. As turtle exclusion in TED is dependent on a physical separation process based primarily on size differences, there is no way available to retain finfishes larger than that could be et in through deflector bar spacing. It is to be noted, however, that large species that are excluded due to installation of TED are not lost to the fishery as a whole, as they can be caught by other fishing techniques in vogue in the fishing area. Studies conducted under a WII project during November 2001 – March 2002, off Gahirmatha, Paradip and Debi (Orissa) between 11 to 24 m depth have further substantiated the efficacy of the CIFT-TED in saving sea turtles with minimal catch loss (Gopi et al., 2002). Results of 51 hauls showed 100% escapement of 21 sea turtles that entered the trawl, and catch loss ranging from 2.3 to 10.3%. Demonstrations conducted by SIFT, Kakinada, from commercial trawlers in 25–40 m depth have shown that the reduction in catch due to installation of TED is minimal. The percentage loss of catch of finfish and shellfish during the 15 demonstrations off Andhra Pradesh ranged from 0.5 to 3.6% (Sankar and Raju, 2003).

Challenges and prospects

Use of the TED among trawler fishermen has been constrained by a lack of incentive-disincentive scheme to facilitate its adoption. Though several maritime states such as West Bengal, Orissa, Andhra Pradesh and Kerala have TED regulations under the Marine Fisheries Regulation Acts, its implementation has not been sufficiently effective so far. This points to the need for a sufficiently attractive incentive scheme for encouraging the use of TEDs. This may take the form of better price realisation for the produce derived from TED-installed operations or TED-use linked subsidy scheme for fuel, as well as effective changes in the enforcement, preferably under a co-management regime, involving all concerned stakeholders.

Suggested reading

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