### Key issues and challenges in gear marking in India

The challenges with regard to gear marking, as mentioned above, is because of the vast diversity in the gears used. Also there has been no clear cut policy on gear marking. Some of the reasons for this issue being given less priority so far, may be due to India being a characteristic multi species, multi gear tropical fisheries—long coastline with multiplicity of harbours/ landing centers (>1500). A rough estimate shows that 0.5 - 0.6 million fishing gears are operated in the marine sector. Fabrication of gears are done by artisans locally and there is no system of registration of gears. The fisheries departments of the various states in the country have multiple functions from registering vessels to implementing social schemes and the manpower is fairly stretched with work to be given additional responsibilities.

### Suggestions for introduction of gear marking in India

A Unique Identification Code that can be machine read for each gear being operated from registered fishing vessels can be used for gear marking which provides the encrypted information on the gear used. The implementation of same in India would require the creation of awareness among fishermen on the international requirements and the use of gear marking system, providing gear manufacturers with clear guidelines on marking of gear, making mandatory that all registered fishing vessels should operate only marked gear, documenting the specification details of each gear available onboard a vessel and details of operation. At the same time, considering the large section of artisanal fishers of India factoring the costs of marking into the cost of gear will be difficult for the fishers to bear and it would be difficult to prevent defaulters without stringent monitoring.

# Encouraging Results of Bycatch Reduction Devices (BRDs) in shrimp trawls – A Preliminary analysis

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The flower shrimp (*Penaeus semisulcatus*), fishery is restricted to the Gulf of Mannar and Palk Bay region of south eastern Tamil Nadu. Gillnets contribute about 12% of the landings along northern Palk-bay (Josileen et al. 2019) and the rest by indigenous sail assisted fishing (*Thallu valai*) (Sampson et al., 1987). The rest of the landings is contributed by mechanized trawl sector. The landings of this species are reported to reach about 80% in trawl fishery during peak seasons (Kumar et al., 2017) but considering the average yearly landing, *P. semisulcatus* may contribute 3-5% of total shrimp landing (Siva et al., 2012). The fishery is seasonal and starts from the month of July and extending till February each year. The most common mesh size used in the codend is 20-25 mm and a chaffing gear made of HDPE twine of 2.5 mm dia. is used by all the vessels, to prevent damage to the codend. The depth of operation varies from 15-25m and beyond 3 nautical miles from the shore. There are a total of 2262 mechanized trawlers of sizes varying from 12-14 meter in length fitted with inboard engine with horsepower varying from 68-193 (Kasim, 2015).

Recent stock assessment based on catch and effort data shows that the flower shrimp stocks fluctuate around the MSY level, however stock

assessment based on length frequency data has indicated overfishing during the early 90's (CMFRI, 2003).

Bottom trawl is a non-selective gear and there are reports of high incidence of non-targeted catches from trawlers in this area (Lobo, 2007). There are no technical measures used in the fishery, except for the seasonal monsoon ban implemented uniformly along the east coast. Being an especially important and ecologically sensitive area along the Indian coast, works related to the use responsible trawl systems are scarce from the region.

This study reports the results of an experimental study carried out onboard commercial trawlers with three different BRDs developed by ICAR-CIFT to gauge their efficacy. Square mesh codend, Juvenile Fish Excluder cum Shrimp Sorting Device (JFE-SSD) and CIFT-Turtle Excluder Device (CIFT-TED were rigged in traditional trawl nets for experimental trials. The size of the vessels and the installed engine power used, were similar to the ones used by the commercial trawlers. Three major harbours along the Palk Bay *viz.*, Kottaipattanam, Mandapam and Rameshwaram fishing harbours were selected for the experimental trials (Figure :1).


*Fig. 1 Location of Experimental trawling operations*

The experimental trawling operations were conducted in the three fishing harbours during the month of February 2020. Two on-board observers were employed for supervising the fishing operations and to collect representative samples from the fishing vessels after each haul. Each haul was of 45 minutes duration and standard procedures were followed for setting and retrieval procedure in all fishing locations. A representative sample of the catches before sorting and the samples from discards were also collected, preserved and brought to the laboratory for identification, quantification and measurements.

**Catch and discards:** The catch from the different gears during the entire fishing operations, were 1001.2 kg and the total discards were 316.6 kg, which worked out to be about 31.6%, for all the fishing gears combined. Catch and discard from each BRD type varied significantly revealing highest percentage of discard from control net followed by TED, JFE-SSD and square mesh codend (Fig. 2). CPUE in kilogram was found highest for TED followed by square mesh codend, control and JFE-SSD (Fig.3).

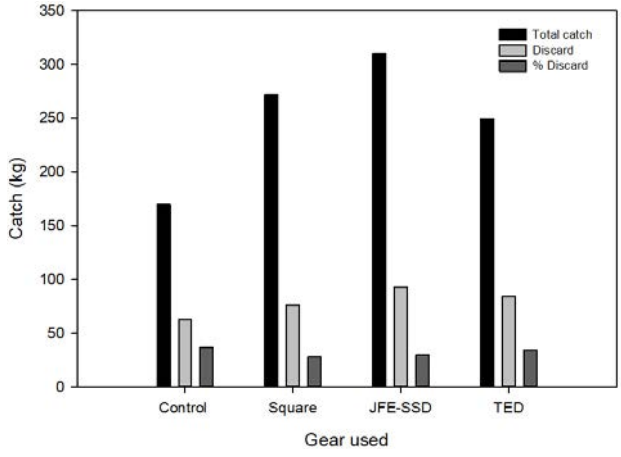


*Fig. 2 Total catch (kg) from the different gears used during the experiments*

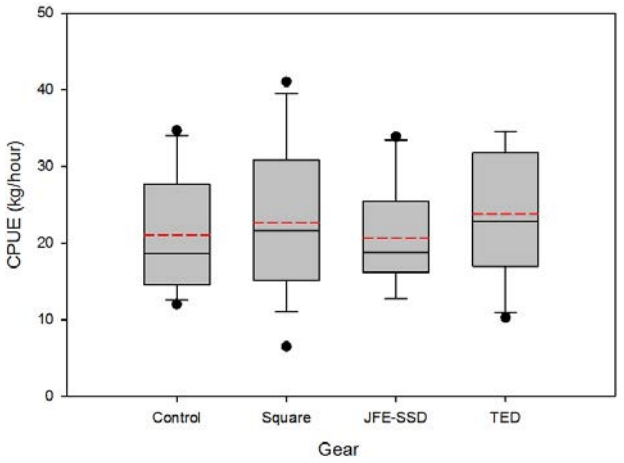


*Fig.3. The catch in the different gears expressed as CPUE (kg/hour). The continuous black line is the median and the dashed red line indicates mean.*

The total discards from different fishing systems were analyzed and it was observed that highest discards in terms of CPUE (kg/h) was observed in the control vessels (6.9kg/h) and the lowest discards were in the trawlnets fitted with the square mesh and JFE-SSD, with mean CPUE of 4.8 kg/h and 4.7 kg/h respectively. The discards generated were at the rate of 6.1 kg/h in case of nets fitted with the TED.

**Length frequency:** The length frequencies in the different fishing systems studied, showed that there is an improvement in the selection properties, in case of square mesh and the JFE-SSD rigged trawls. An improvement of about 10-20% in the length frequencies are observed when diamond meshes are replaced by square meshes in the codend. No significant reduction in the catches and discards and difference in length frequency indicated very less escapement through the opening of the TEDs, which is often a problem which fishers raise during the trials.

**Economic loss incurred by BRDs:** The average reduction in the CPUE noticed were 2.17 kg, 2.31 kg, and 0.92 kg per hour of trawling for the nets installed with square mesh, JFE-SSD and TED, respectively. The cost of bycatch discards varies considerably and an average price of Rs. 20 per kilogram was used for the quantification of loss. Based on the above assumptions, the average loss to the fishermen in monetary terms using different BRDs will account to Rs. 44, Rs. 46 and Rs. 18, per hour of operation when square mesh, JFE-SSD and TED are used, respectively.

It is assumed that the discards/bycatch are sold after they are landed and the loss is due to the reduction in the quantity thus sold, due to juveniles escaping from the BRDs. The loss in terms of per hour of trawling, is shown in figure 4.

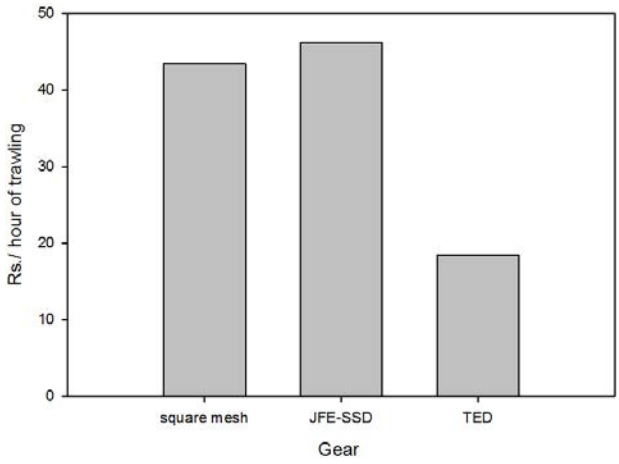


*Fig. 4. Loss in terms of rupees per hour of trawling, when different BRD were used in the traditional trawl nets*

It was noticed that the escapement in terms of value was higher in the TED installed nets followed by JFE-SSD and square mesh codends. The length frequency analysis of the catches was also carried out, which showed improvement of about 10-12% depending on the species, for the square mesh codends.

The values wise analysis carried out showed an average escapement of about Rs. 30-45 per hour of operation, due to the loss of juvenile fishes from the codend. However, this value is very meager considering the value, if allowed to grow. It has been observed that the fuel consumption of square mesh codend are less compared to traditional diamond mesh codend, due to the lower drag offered by these codends. However, the savings in fuel due to the use of square mesh

codends would negate the short-term loss caused due to the release of juveniles. The experiments were the first of its kind that have reported BRDs rigged trawls in the region and would be a baseline for future studies related to implementation of gear based technical measures in trawling sector.

The study was experimental in and for a short duration. Any gear modification would require several trials, for the gear to get stabilized and for the fishers to get used to the new technology. Hence the results may not be the same as in commercial operations, however the overall profile of the species catches observed in this study shows the positive benefits of using these BRDs in Palk Bay. Technical modifications to the gear are a complex process, since it involves many operational parameters that work in tandem and includes the non-technical factor of operational profit. Therefore, more trials would be required in different seasons and at different harbours to further substantiate the results of this preliminary fishing experiments along Palk Bay.

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# Jellyfish menace in estuarine Stake nets operated off Kochi, Kerala

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Jellyfish are distributed around the world oceans and estuaries, living from surface to greatest depths. These gelatinous zooplankton, belonging to Phylum Cnidaria, an ancient phylum of organisms having about 10,000 species include jellyfish, corals and sea anemones. Jellyfish swarms are widespread and frequent in coastal areas worldwide and considered as menace due to their ecological and socio economic consequences (Stabili *et al.*, 2020). Several studies have reported increased influx in recent years with massive blooms appearing in estuaries