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Conversion of mini trawls (Thallumadi) into light fishing craft targeting belonids and hemiramphids along palk bay, southeast coast of India

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Abstract

The needlefish both full beak and halfbeaks support a good fishery in Tamil Nadu and exploited by drift gillnet (Mural valai). In this study, we were focused to document the conversion of Mini trawls (Thallumadi) into light fishing craft targeting Belonids and Hemiramphids along Palk Bay. The detailed survey was conducted in the six landing centres along Palk Bay. The fishing was mainly targeted to catch *Tylosurus crocodilus* from 2000 to 0300 hrs at the distance of 3-4 NM in the depth of 5 m. After reaching the fishing ground, the fishes are usually aggregated using LED lights. The fishermen use the scoop net to collect the fishes. Catch per unit effort (CPUE) ranged from 36 to 40 kg/Unit and the fishery was dominated by *T. crocodilus* (85%) followed by *Hemiramphus far* (9%) and *Ablennes hians* (6%). The net operating income for this fishery is higher than the mini trawl fishery.

Keywords: needlefish, fishery, light, Tamil Nadu, catch per unit effort

1. Introduction

The Palk Bay is located between Tamil Nadu (India) and Sri Lanka along the Indian coast covering five coastal districts in Tamil Nadu viz., Ramanathapuram, Pudukottai, Thanjavur, Thiruvarur and Nagapattinam. The Palk Bay remains calm during most of the months. Turbulent conditions prevail during northeast monsoon period and fresh water streams dilute the sea near Mandapam. The coastline of Palk Bay has coral reefs, mangroves, lagoons, and sea grass ecosystems. The fishing season starts in October and lasts till February. Peak fishing season is during December to January ^[1]. The needlefish both full beak and halfbeaks support a good fishery in Tamil Nadu and on an average 42.6% of this resource in India is landed in Tamil Nadu ^[2]. These resources were exclusively exploited by a particular type of drift gill net locally known as 'Mural valai' along the Tamil Nadu coast. In this region, the commercially important species under the family Belonidae are *Tylosurus crocodilus*, *T. acus melanotus*, *Strongylura leiura*, *S. strongylura*, *Ablennes hians* and *Platybelone argalus platyura* and *Hemiramphus far* and *H. lutkei* are the two species under the family Hemiramphidae ^[3]. In general, the Needlefishes are phototactic and at night they are attracted by any lights ^[4]. The aggregation of fish in response to artificial lights was known from ancient times and this has led to the development of fishing with light in many parts of the world and exists in many forms. Light is being used in fishing by beach seine, gill net, purse seine, lift net, drift net, scoop net, hooks and line and trap. The important among them are surrounding nets (purse seine), lift nets and hand lines. Apart from lights generated from kerosene pressure, gas and electricity, underwater lamps are also commonly in use. The major groups of fishes which possess light attraction response are sardines, mackerel, anchovies, carangids and squids ^[5]. Fishermen of Devipattinam fishing village started using light for fishing during September 2020 and soon this practice spread to the nearby fishing village of Palk Bay due to their profitability. This study has documented the light fishing for Belonids and Hemiramphids along the coastal stretch of 100 km from Devipattinam to Sethubhavachatram in Palk Bay during the 2020 lockdown period by converting the existing Mini trawls (Thallumadi) into a light fishing craft.

2. Materials and Methods

The light fishing was observed in the following fishing villages viz., Devipattinam (9.481178 78.89821), Thiruppalaikudi (9.544312, 78.91885), Soliyakudi (9.712552, 78.99778), Thondi Pudukudi (9.742539 79.02171), Karankuda (10.235, 79.26994) and Sethubavachatram

(10.24741, 79.28123) from September to December 2020 (Fig.1). The detailed fishery information was collected from the fishers and discussed here. The fish was identified with FAO sheets [6]. The economic analysis was performed by following Geetha *et al.* [7].

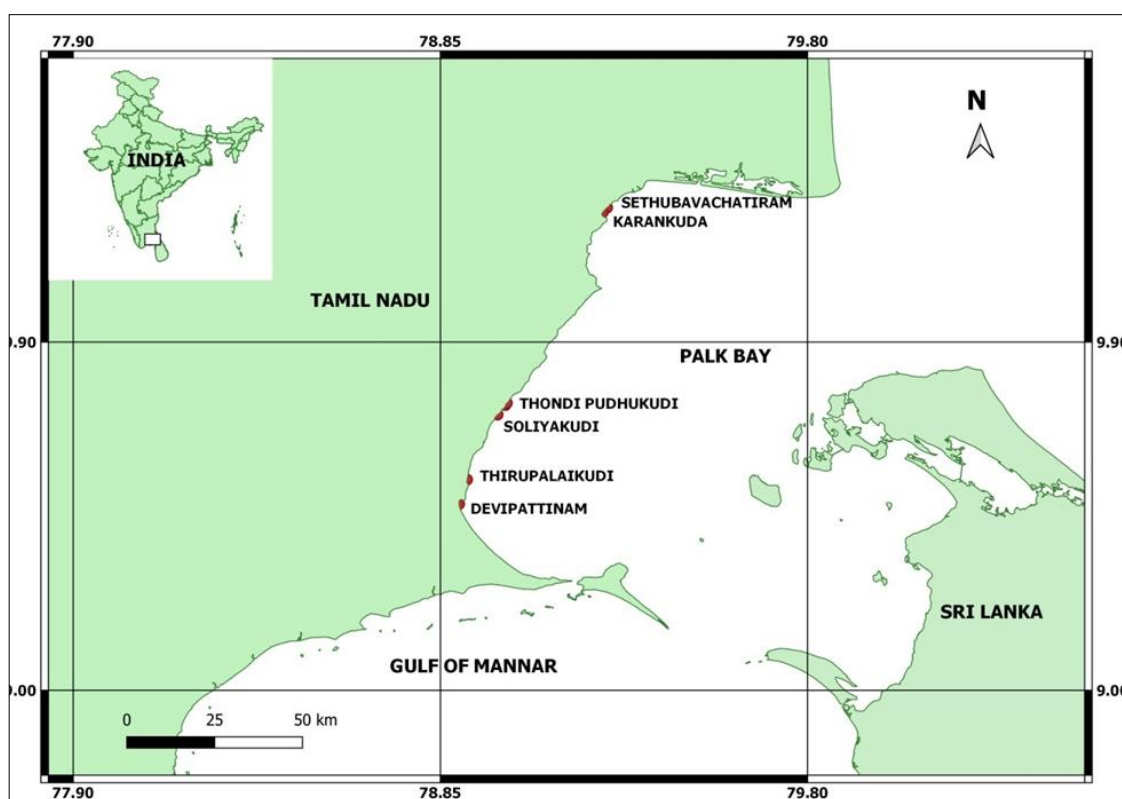


Fig 1: Prevalence of light fishing along the Palk Bay coast of Tamil Nadu

3. Results

3.1 Craft and gear

The fishing was mainly targeted to catch *T.crocodilus* (locally called *Kalinga mural*). The Minitrawl (Fibre Reinforced Plastic) is converted and fitted with lights to target the needle fishes. Totally 3-5 persons are involved per fishing boat for this practice. FRB boats with OAL of 10.5 to 11.0 m fitted with 18 hp outboard engines in Devipattinam, Thiruppalaikudi, Soliyakudi, Thondi and Pudukudi of Ramanathapuram district and 9-10 hp engines in Karankuda and Sethubavachatram of Thanjavur district were observed to practice this fishing method. Two different kinds of the light

fishing method were employed by these two district fishermen in a mixed way viz., three focus LED lamps (200 W) and three LED bulbs (60 W) with the help of a 160 AH battery used for lighting (Fig. 2) which accounts 80 percent and 20 percent of the fishermen are using 0.5 kV generator as a power source for six focus LED lamps (200 W) and six LED bulbs (60 W) (Fig.3). The lights are fitted in starboard port sides and bow of the boat. The scoop net is made locally with a mesh size of 20-30 mm and the diameter varies from 50-55 cm. The width and length of the scoop net bag is 113 cm and 90 cm respectively.



Fig 2: Lights arrangements for battery-powered FRP Craft



Fig 3: Lights arrangements for generator powered FRP Craft

3.2 Fishing operations

The fishing was carried out from 2000 to 0300 hrs at a distance of 3-4 NM in the depth of 5 m. After reaching the fishing ground, the LED lights are switched on focusing the surface of the water using the power source for the fish to

aggregate. The fishermen use the scoop net (locally called Arichavalai) to collect the fishes (Fig. 4). The fishing operation is generally continued for 5 hours without anchoring the boats with the lights switched on throughout.



Fig 4: Scoop net used for light fishing

3.3 Catch per unit effort (CPUE)

During the initial days, the catch was good and the CPUE ranged from 36 to 40 kg/Unit and as time goes by there is a decreasing trend in the CPUE was observed ranged from 10

to 12 kg/unit. The catch rate depends on the aggregation of fish in response to light. The number of units operated in the fishing villages shown in figure 5.

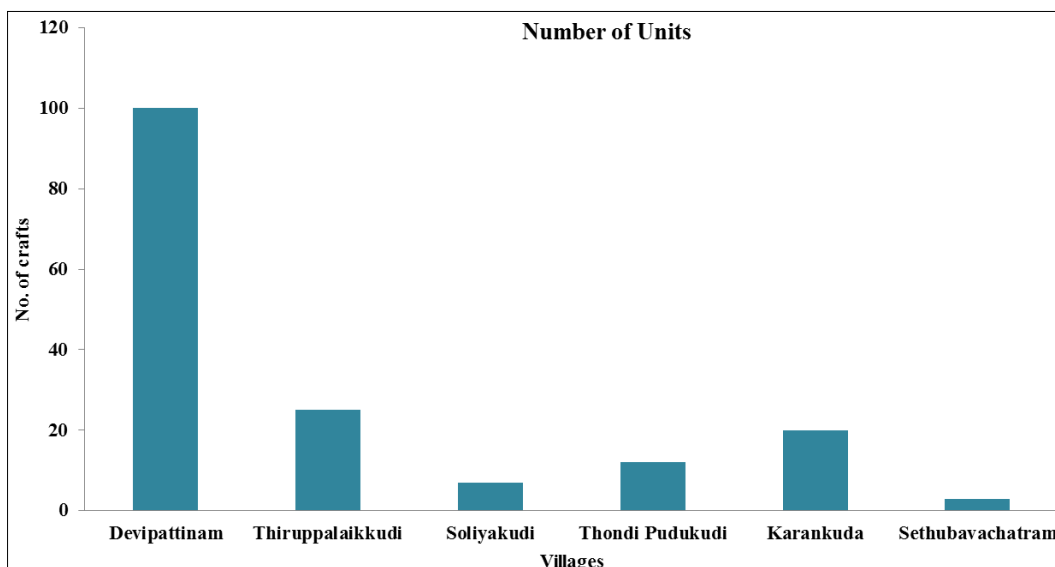


Fig 5: Number of units involved in light fishing along the Palk Bay coast

3.4 Catch composition

The fishery was dominated by *T. crocodilus* (85%), *H. far* (9%) and *A. hians* (6%) (Fig. 6). The size range of

T. crocodilus (Fig.7), *H. Far* (Fig.8) and *A. hians* is 80-100 cm, 24-30 cm and 60-90 cm respectively. The fish are sold at an average rate of ₹250-300per kg.

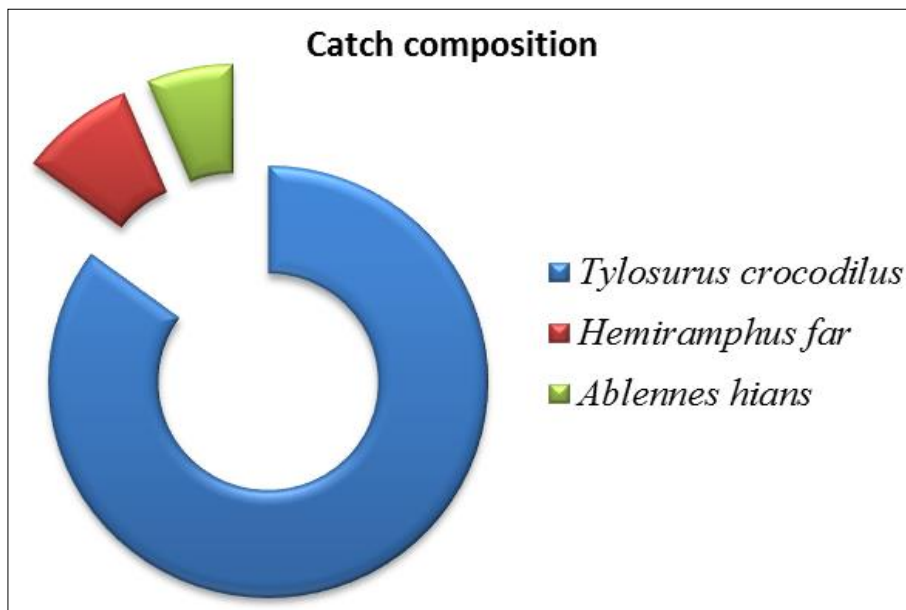


Fig 6: Species composition of fish in light fishing



Fig 7: Kalinga mural or Pachai mural (*Tylosurus crocodilus*)



Fig 8: Selva mural (*Hemiramphus far*)

3.5 Limitations

1. Heavy wind and wave action reduce the fish catch in light fishing
2. Phototaxis behaviour of the fish

Economics analysis of FRP Craft fishing with lights per trip (values in ₹)

Particulars	Battery	Generator
1. Initial investment		
i. Craft and Engine	200000.00	200000.00
ii. Battery/Generator 0.5 kVA	20000.00	35000.00
iii. Gear and accessories	500.00	500.00
iv. Lights	3000.00	10000.00
Total	223500.00	245500.00
2. Fixed cost		
a. Depreciation		
• Craft and engine (20%)	250.00	250.00
• Battery/ Generator (10%)	16.60	29.16
b. Interest on investment	130.37	143.20
c. Repair and maintenance	41.60	66.60
Total	438.57	488.96
3. Operating cost		
i. Fuel	300.00	1000.00
ii. Crew wages	3000.00	4500.00
iii. Food	200.00	300.00
Total	3500.00	5800.00
4. Total cost (2+3)	3938.57	6288.96
5. Gross Revenue	9000.00	13500.00
6. net operating income (5-3)	5500.00	7700.00
7. Net profit (5-4)	5061.43	7211.04
8. profit margin (7/5)*100	56.23	53.41
9. Annual days of operation	120	120
10. Productivity measures		
• Labour productivity (kg)	15.0	15.5
• Remuneration (Rs.)	1687.14	1802.76
• Fuel efficiency (kg/L)	8.0	3.6

4. Discussion

Fishing using lights has been practised by a man from historic times, and continues throughout the history of fishing. A classic example from India is more than 200-years old. Chinese dip nets (stationary lift nets) in Kerala, use lights (earlier kerosene lights and now CFL lamps) to attract fish over the dipnet^[8]. Japan is one of the main nations in the world which practices light fishing^[9]. Technological intervention in the Indian fishing industry is intended to increase marine fish production of the country. Beloniform fishes are dominant and they are caught selectively in different type of gill nets along Thoothukudi coast. They were reported five species of Halfbeaks belongs to the family Hemiramphidae and six species of full beaks belongs to family Belonidae^[2]. In palk bay also the needle fishes were targeted and exploited with selective gears called Mural valai. The use of lights designed for fishing was limited earlier, and mostly confined to squid fishing boats (squid jigger) along the coast. Reduction in the quantity of catch per unit effort on one hand and increasing cost of fishing inputs on the other hand, the investment in capital intensive fishing units have become risky^[10]. It is mainly due to continuous increase in the price of fishes that the fishing units are able to earn moderate profits. Light fishing is one of the innovative cost effective and efficient techniques used by fishermen of Palk Bay yielded more catch of needle fishes than that of gill netting. Analysis of economics of both battery and generated operated light fishing units indicated that almost on an average, run on profit. However, due to the nature of competition of open access marine fisheries, sometimes the less efficient units

belonging to each category are being phased out of operation due to losses^[7].

Earlier studies indicate that most of the large pelagic predatory fishes (carangids, tunas and barracuda) that are caught in purse-seines with lights are above their sizes-at-first-maturity,^[8] and the present study also has found similar results. In India, in many places light fishing has led to conflicts among traditional fishers who exploit different resources in territorial waters using traditional gears. Targeted fishing, no damage to juveniles, less labour dexterity, high fuel efficiency and marginal engine depreciation lead to sustainable fishing when compared to Mini trawls. However, on a precautionary measure, this new fishing practice needs to be studied in detail to understand its long term effects on the sustainability and suitability along this coast.

5. Acknowledgements

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