

Economic Analysis of the Hook and Line Fishery in Kombuthurai Coast, Tamil Nadu

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ABSTRACT

The present investigation is about the economic analysis of the hook and line fishery along the coast of Kombuthurai, Thoothukudi district of Tamil Nadu. Inferences from the study indicated that that hook number 5, 6 and 7 were found ideal for commercial exploitation of Carangids, Grouper, Barracuda and Needlefish in angling by wielding fresh condition live bait. Using the artificial lure number 3.5, 4.0 and 4.5 used in trolling line, the most dominant catch was seer fish (80%) and least in sailfish (8%). Significantly the study reports that the highest gross revenue ₹ 42060/trip was made in trolling line than that of the handline of ₹ 26400/trip ascribed by targeted high market value species. The trolling line crew share per person was twice over than the handline fishing (₹ 3821/trip). Instead of unorthodox eye estimation of fish weight, a novel approach of weight based fish sale (for low to high market value species) was observed in Kombuthurai fishing village and this practice also espoused by a neighbor fishing village.

Keywords: Troll line, handline, live bait, artificial lure, market, open auction.

INTRODUCTION

Marine fishers use different type of crafts (boats) and gears (nets) for harvesting fish and its efficiency is significantly important for better income. Hook and line is a traditional gear which habitually operating in the motorized and mechanized vessels due to nature of the gear such as simple for construction, easy to operate and selective in nature⁴. In the recent years, the practices of hook and line are fascinating amid fishers; it excels in capturing high market value species namely the seer fish, mackerel, tuna, elasmobranchs etc.^{4,26,27}. With worthiness, the hook and line were deemed as important, so studies on their performances were done for better understanding^{5,20,11,27}. The hook and

lines contribute about 2 % of the total marine fish landing of India and the share of mechanized hook and lines are with 0.05 lakh tonnes and outboard hook and lines tunes to 0.59 lakhs tonnes²⁵. Among hook and line, the handline, pole and line, trolling line, jigging line and longline are prominent which are in practice throughout coastal region of India. It was recognized as eco-friendly fishing gear than other kinds of fishing practices but it also catches the non-target species^{3,19,17,7}. It is also interesting to note that they perform even in the rocky area and uneven bottom places as well¹⁰.

Bait is the key factor in line fishing, which depend on the foraging behaviour of fish^{12,10}, stimulants, and sensory modalities^{14,16}. The

taste, texture, and size of the feed also important deemed which encourage the fish to approach the feed. The environmental parameters including light, temperature, current and prey density also affect the feeding behavior¹⁶. Low value fishes like sardine, and squid however are also used for human consumption and considerably the price of bait has also increased over a period of time. Hence, it is important to identify alternative bait which ought to be efficient, accessible, easy to operate with high catch efficiency, long life, and low cost. Research and Development initiatives have focused on developing artificial baits, and similar, however, a phosphorescent plastic bait was developed during 1960–1970²². A modern fish lure was developed by Heddon and Pflueger in Michigan during the early 1900s. Despite, many further development studies were also carried out throughout the world in these aspects^{13,15}. It is observed that using lure and fresh conditioned bait has become common in fishing and also gaining importance especially in the study area viz., Thoothukudi coastal region of Tamilnadu due to higher catch efficiency and lower operating cost. The idea behind this investigation is to understand the economics analysis of handline with live bait and trolling with artificial fish light lure practiced by the fishermen. The study also targeted to document the gear description and operation details.

MATERIALS AND METHODS

The present study was conducted at Kombuthurai fish landing centre (Lat. 8°34'50.49" N and Long. 78°08'12.91" E) during the period September 2014 to May 2015. For the present study an experimental fishing was conducted on handline (Fig. 1) and trolling line (Fig.2); for which their general descriptions are presented in Table 1. The mainline and branch lines were made of nylon monofilament. With three different hooke sizes of 'J' type viz. hook no. 5,6 and 7 in hand line and three different sizes of artificial lures viz. 3.5, 4.0 and 4.5 in trolling lines were found to be used by the fishermen. A light was placed to inside the lure to attract the fish and it lightene when it shakes. To elicit the economic analysis of hand and trolling lines the primary data was collected from all the handliners (20) and trolling lines (15) the Kombuthurai landing centre, Thoothukudi district, Tamil Nadu using a pre-

tested interview schedule. Data pertaining to details of fishing gears especially the design and operation catch details, price and other relevant information were also collected for the study. The secondary data on gear operations and number of fishermen using different crafts and gears were collected from the State Fisheries Department, Government of Tamil Nadu. For this study, the cost of production was grouped into two categories as fixed and operating costs and cost for deriving results on the economic analysis. Formulae used for the calculation are as indicated.

$$\text{Net return} = \text{Gross revenue} - \text{Total cost}$$

$$\text{Gross revenue} = \text{price of fish / kg (₹)} \times \text{quantity of fish caught on that day}$$

$$\text{Total cost} = \text{Total Fixed Cost (TFC)} + \text{Total Variable Cost (TVC)}$$

TFC is the sum of fixed cost and TVC is the sum of variable cost.

The results are presented in the tabular and graphical form. The entire data analysis was thru in Microsoft Office, 2016 in windows 8.0 version.

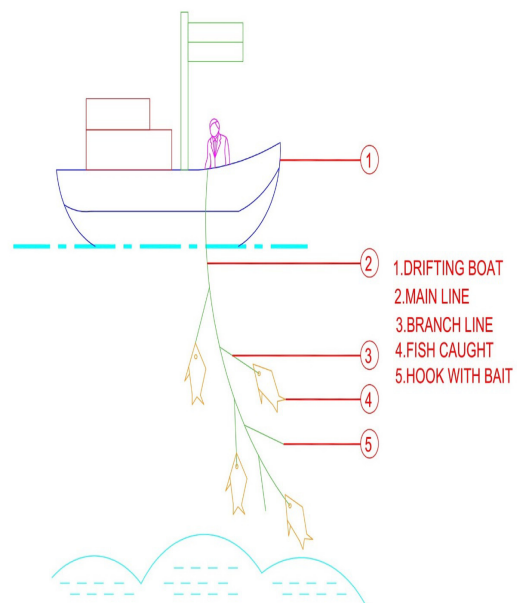


Fig.1: Traditional Handline

RESULTS AND DISCUSSION

Operational details

The experimental handline and trolling line were operated by 15 m (OAL) FRP boat each fitted with 9.9 Hp Out Board Motor (OBM) (Table 2). The towing speed about 5 to 6 knots while fishing and running speed about 10 kw/hrs. The number of the crew for trolling and handline was found to be 3 and 4 persons / boat respectively. The handline was operated (Fig 1) during October to March of every year. But, a study stated that the handline was operated around the year and peak season lie during January to March¹⁸. Handline of 3 to 20 m length

and 1 to 20 hooks were used in Nicobar¹. The float was attached for the easy identification of the line. The distance between each line was about 10 to 12 feet to cover a wide area and avoid the escape of fishes. The bait varied with fishing methods as well as target species. In addition, the prawn, sardine, anchovies and squid were the prominent baits employed in handline and trolling line². Another study in Nicobar, found that the fish (sardine, anchovies, and carangids), hermit crab and filamentous algae were used as live baits in handline, trolling line and longline^{1,21}. However, a better catch efficiency was recorded by using the fresh condition live bait rather than natural bait in dead condition at Kombuthurai.

Table 1: General description of the Trolling line and Handline in Kombuthurai coast

S. no	Name of the items	Trolling line with artificial lure	Handline with Natural bait
1.	Length of mainline (m)	25	25-30
2.	Height of branch line (m)	-	0.5
3.	Height between the branch line (m)	-	0.5
4.	Hook/Lure number	3.5,4.0 and 4.5	5,6 and 7
5.	Bait type	Artificial lure	Live and natural bait
6.	Depth of operation (m)	20	25-30
7.	Material used for mainline	Monofilament (Nylon)	Monofilament (Nylon)
8.	Diameter of mainline (mm)	1.5	1.3
9.	Material used for branch line	Monofilament (Nylon)	Monofilament (Nylon)
10.	Diameter of branch line (mm)	-	1.1

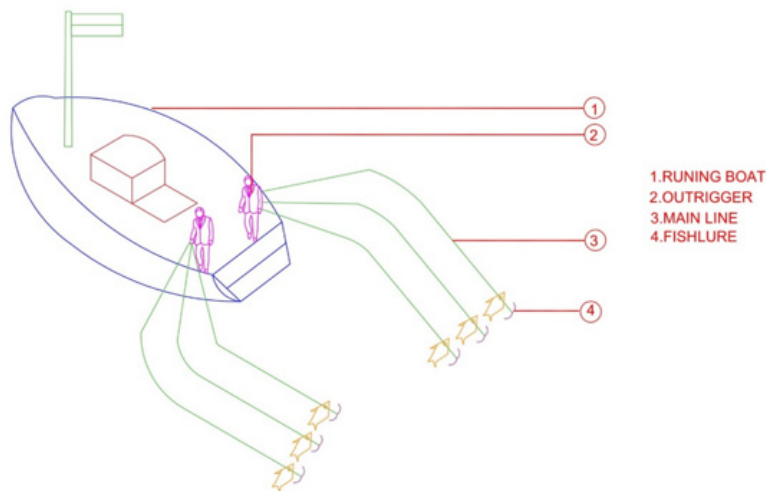


Fig. 2: Traditional Trolling Line

Similarly, the fresh condition baits were also utilized to capture the carnivore fishes in Nicobar²¹.

The trolling line with lure operated (Fig 2) during the southwest monsoon season i.e from the month of May to September and jigging in June and July is in accordance with the earlier reports¹⁸. The bright colour lure (red and black) was used during water turbid periods and the dull colour lure during clear water periods. The low cost lure (₹ 120) was utilized for about 5 to 6 fishing operation and the high-cost lure (₹ 500) 15 to 20 fishing operation. However, for a single operation, 20

to 25 lure were employed. The double hook lure performed for better catch efficiency and distance between the trolling line was about 1.0 to 2.0 m. The branch line length was uneven to avoid the fish from escapement. Locally made artificial baits were used in Nicobar using broiler chicken feather, plastic waste, rubber waste, nylon rope, nylon twine and fish lure²¹.

Species Composition

The computed catch rate of the handline and trolling line is presented in figure 3 and 4 respectively. The larger size Grouper landing

Table 2: Operational and techno-economic characteristics of the Trolling line and Handline in Kombuthurai coast

S. no	Name of the items	Trolling line with artificial lure	Handline with Natural bait
1.	Type of fishing boat	FRP	FRP
2.	Length of the fishing boat (M)	15	15
3.	KW/ hr.	10	10
4.	On board facilities	No	No
5.	Fuel (litre/trip)	75-85	120-130
6.	Number of crew	3	4
7.	Number of shares	5	6
8.	Gear expenses (₹)	650/piece	3000/roll
9.	Other running cost (₹)	150	150
10.	Ownership	Single	Single
11.	Fishing days (days per annum)	52 – 60	113 – 120
12.	Horse Power of the engine (hp)	9.9	9.9

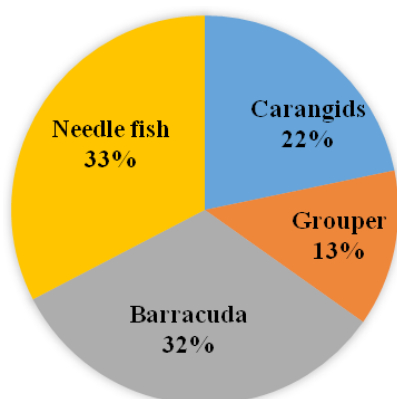


Fig. 3: Species composition of major food fishes by handline fishing with live bait

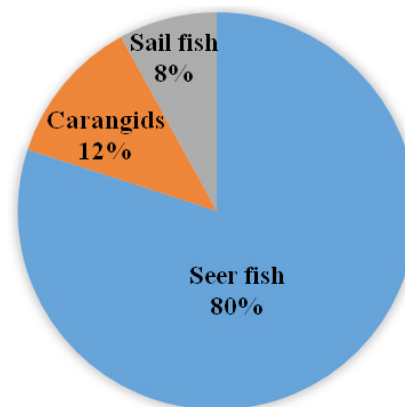


Fig. 4: Species composition of major food fishes by trolling line fishing with artificial lure

was accounted in hook no. 5 and minimum in 7 of handline. Similarly larger size of Seer fish, was recorded in lure size no. 4.5 and least in 3.5 in trolling line. Needlefish was the most dominant group of finfish (33%) and least dominant catch was Groupers (8%) in the handline fishery (Fig 3). But, in a trolling line the dominant group of finfish was Seer fish (80%) followed by Carangids (12%) and Sailfish (8%) (Fig 4). At Thoothukudi Threadfin

(30%) was the prominent landing species in handline followed by 20% of lethrins, 19% of *Belone* spp., 10% of serranids, and 6% of carangids²³. An attempt was also taken to study the species composition in trolling line operation of which Mackerel, queenfish, *Caranx* sp. (carangids), herring, cobia, and tuna were the major fish catches⁶. Mackerel landing was highest than followed by queen fishes and caranx. The average catch per day ranged from 21.2 to 116.5

Table 3: Gross Income of the handline

S. No	Name of fish	Total fish landing (kg)	Price / kg (₹)	Gross Income (₹)
1.	Carangids	150	130	19500
2.	Grouper	12	150	1800
3.	Barracuda	30	70	2100
4.	Needlefish	30	100	3000
	Total			26400

Table 4: Gross Income of trolling line

S No	Name of fish	Total fish landing (kg)	Price / kg (₹)	Gross Income (₹)
1.	Seer fish	80	500	40000
2.	Carangids	15	130	1950
3.	Sailfish	1	110	110
4.	Total Income		42060	

Table 5: Cost and returns of handline and trolling line fishing (₹ /trip)

S. No	Name of particulars	Hand line fishing	Trolling line fishing
1.	Total variable cost		
	Fuel	3125	2000
	Ice	50	50
	Food	150	0
	Other operating cost	150	150
	Total	3475	2200
2.	Gross revenue	26400	42060
3.	Net return (without fixed cost)	22925	39860
4.	Number of shares	6	5
5.	Share per crew	3821	7972
6.	Owners share	7642	15944

kg. Seerfish, tuna, barracuda, caranx and mackerel landings were observed in trolling line using the artificial and natural bait¹.

Economics

It is a fact that the technical features of the fishing vessels influence the fish catch^{8,9}. This study also attempted in these lines to obtain data on better utilization and optimum substitution of the input variables.

The gross income for handline (Table 3) and trolling line (Table 4) was calculated and a sum of ₹ 26400 and ₹ 42060 was earned respectively which also depends on the quantity of landings and price of the fish. It was observed that 222 kg of fish was landed through handline and 96 kg in trolling line. The species selectivity also affects the fishing strategies and distribution (horizontal and vertical) of fish. The area and depth of operation is normally based on the experiences of the skipper and fish detecting devices also the catch rate improve with increased depth of operation. However, the price per kg realized was found to be higher for seer fish than those of other species; a similar kind of report was inferred in another study²⁴. The price variation depends upon the supply and price of the related species landing. The price of fish is highly elastic compared to the agriculture commodities due to the nature of perishability and uncertainty in landings. The market timing yet another factor affects the price²⁴.

The calculated cost and returns details was depicted Table 5. The economic returns were found to be higher in trolling with a return of ₹ 39860 than that of the handline fishing ₹ 22925 excluding the fixed cost and the crew share was about ₹ 7972 and ₹ 3821 respectively. In addition, the owners have two shares for the craft and engine. The owner share (earning) was twofold higher in trolling line than the handline fishery which means the trolling line vessel owner earned an income of ₹ 15944 and the handline vessel owner with ₹ 7642.

Market structure

In India, the domestic fish marketing system is carried out by the private dealers between

producer and consumer⁸. An auctioneer is a middle man in marine fish marketing who auctions the fishes provides by fisherman to various stakeholders. The auctioneer offers advance money to fishermen to take the rights of the auction of his catches, and also charged 5 % of the total sales as auction fee. The fishes sale is being practiced by open auction for a heap of fish in all marine fish landing centre of India^{24,26} and there is no exception for Tamil Nadu. But controversial to this existing practice, fish sales is done through open auction based on price per kg weight. In the study area and the same is also accepted by a nearby village Amalinagar as they believe that by adopting this method underestimation of fish price could be curtailed. The result would definitely paves an easy way to estimate production at the individual level to draw policy conclusions and to initiate development interventions.

CONCLUSION

In the present study, an attempt has been made to evaluate the income of the handline and trolling line fishery at Kombuthurai, Tamil Nadu. The trolling line fishermen had higher gross income (₹ 42060/trip) as compared to handline fishers (₹ 26400/trip). The greater income was achieved by target fishing and high market value species through adoption of novel marketing practiced by them, which is open auction based on price per kg weight method. In upcoming smarketing studies, this efficent method should be focused on the practice of line fishery, help us to compute the stock status, potential catch and bycatch reduction. So, upcoming policies should give importance to the hook and line fishery to secure the juveniles and sustainable fisheries.

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