Economic performance of motorised and non-mechanised fishing methods during and after-ban period in Ramanathapuram District of Tamil Nadu

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ABSTRACT

Ramanathapuram is an important coastal district significantly contributing to the marine fish production of Tamil Nadu State. The coastal length, number of fishing villages and fishing activities is more in Ramanathapuram District in comparison to other coastal districts in Tamil Nadu. The present study analysed the economic performance of motorised and non-mechanised craft-gear combinations during and after-ban period in Ramanathapuram District. In motorised single day craft-gear combinations, the capital productivity was higher during ban period in comparison with after-ban period, with a lower operating ratio ranging from 0.55 for gillnetter to 0.58 for bottom-set gillnetter. In motorised multi-day craft-gear combinations, the capital productivity during ban, was more in comparison with after-ban period with a lower operating ratio of 0.64 for trawler and gillnetter. In non-mechanised craft-gear combinations, during ban, the capital productivity was higher in comparison with after-ban period with a lower operating ratio ranging from 0.49 for gillnetter to 0.52 for bottom-set gillnetter. It was found that during ban period, capital productivity was high in non-mechanised gillnetter and bottom set gillnetter, while the catch, labour productivity and income were high in multi-day (2-4 days) trawler and gillnetter.

Keywords: Capital and labour productivity, Fishing ban, Gross revenue, Operating cost

Introduction

Marine capture fisheries in India has transformed from that of a subsistence fishery into multi-crore business conglomerate. India contributes to 5.68% of the world fish production. The marine fish production of the country was 3.40 million t during 2015-16 (CMFRI, 2016). Tamil Nadu with the second longest coastline in the country, covers an area of 1,076 km, comprising 13 coastal districts. It is one of the leading marine fish producing states of India, holding second position with an estimated marine fish production of 0.709 million t (CMFRI, 2016). Ramanathapuram District is an important coastal district contributing 27% to the fish production of Tamil Nadu. There are 178 fishing villages, with nearly two lakhs fisherfolk population in the district, which comprises 24% of the total fishermen population in the state (CMFRI, 2010). The district has 1,707 (29.2% of total fishing units) mechanised boats, 3,140 (53.7%) motorised and 1,002 (17.1%) non-mechanised fishing units (SFD, 2015). Most of the fishing crafts are being operated within

a limited area (Palk Bay Region) which is a threat to the fishing resources. One of the most commonly used practice to sustain the fisheries resource is the blanket ban on fishing during specific months as practised in other coastal regions of the country.

The Government imposes a fishing ban for 45 days for mechanised fishing boats and trawlers in the territorial waters of the State (*i.e.* from 15th April to 29th May in the east coast region and 15th June to 29th July in the west coast) every year since 2001, to conserve the marine fishery resources. When the ban exists for larger boats, removal of large quantities of spawners of small pelagics by motorised craft is evident (Vivekandan *et al.*, 2010). Moreover, the price of fish and other seafood goes up by 60-80% during the ban period. The cost of most sought after seer fish locally called *vanjaram* touched an all-time high of ₹800 - 1,000 during the ban period (George, 2012; Staff Reporter, 2013). The ban period contributes to an increase in income for the traditional fishermen (Shyam Salim *et al.*, 2016). In order to take

advantage of the situation, the engine power of the country boats has been improved with use of advance fishing gear like that of mechanised boats. Keeping the above scenario in mind, the present study was carried out to analyse the economic performance of motorised and non-mechanised craft-gear combinations during and after-ban period in Ramanathapuram District of Tamil Nadu.

Materials and methods

For the present study, Ramanathapuram District was selected, since the coastal length, number of fishing villages and fishing activities are more compared to other coastal districts in Tamil Nadu. Mandapam, Pamban, Rameswaram, Olaikuda, Sanghumal, Kundukal, Thondi and Keezhakarai landing centres in the district were selected for the study. From the identified landing centres, craft-gear combinations as detailed in Table 1 were selected and the sample fishing units were selected based on proportionate random sampling method.

The data on operating cost and returns was collected from the selected sample fishing units using comprehensive and pre-tested interview schedule. In order to know the economic performance of motorised and non-mechanised fishing units during ban and after-ban period, data were collected once in every three days once during ban (15th April to 29th May, 2013) and after-ban period (30th May to 30th June 2013). From the collected data, the operating cost per trip, gross revenue per trip, net operating income, capital and labour productivities were worked out.

Results and discussion

Economic performance of motorised single day bottom-set gillnetter

The average operating cost per trip of single day bottom-set gillnetter during the ban period was worked out to be ₹3,651/- per trip with gross revenue of ₹6,346/- per trip. The net operating income worked out to be ₹2,695/- per trip

with the capital productivity of 0.58 and labour productivity of 11.30 kg per crew per trip. The operating cost per trip was higher during ban period (₹3, 651/-) than that of the after-ban period (₹ 2,266/-) with fuel and crew wages accounting for about 28 and 45% of the total operating cost, respectively. The gross revenue per trip was also higher for the ban period at ₹6,346/- than that of the after-ban period at ₹2,761/-. The capital productivity was high during ban period (0.58) compared to after-ban period (0.82), whereas the labour productivity was higher during ban period at 11.30 kg per crew per trip than the after-ban period at 5.30 kg per crew per trip (Table 2). The catch per trip during ban and after-ban ranged between 24.5 to 57 kg and 10 to 22.5 kg, respectively. It is evident from Fig. 1 that the catch per trip during ban was higher, when compared to after-ban period.

The capital productivity of motorised single day gillnetter was high during ban period (0.55) compared to after-ban period (0.77), whereas, the labour productivity was higher during ban period at 16.60 kg per crew per trip than the after-ban period at 7.60 kg per crew per trip (Table 2). The catch per trip during ban ranged between

Fig. 1. Comparison of catch per trip in a motorised single day bottom-set gillnetter between ban and after-ban period

Table 1. Landing centre and craft-gear combinations-wise fishing units selected for the study

Landing centre	Motorised single day bottom-set gillnetter	Motorised single day gillnetter	Motorised multi-day (2-4 days) trawler	Motorised multi-day (2-4 days) gillnetter	Non-mechanised bottom-set gillnetter	Non-mechanised gillnetter
Mandapam	4	4	5	5	5	5
Pamban	8	8	5	5	5	5
Rameswaram	5	5	0	0	5	5
Olaikuda	5	5	0	0	6	6
Sanghumal	2	2	5	5	5	5
Kundukal	3	3	5	5	5	5
Thondi	8	8	0	0	4	4
Keezhakarai	5	5	0	0	5	5
Total	40	40	20	20	40	40

Table 2. Economic performance of motorised single day fishing units during and after-ban period

Items of average cost and returns per trip	Bottom set gillnetter				Gillnetter			
	During ban (n=40)	% to total	After-ban (n=40)	% to total	During ban (n=40)	% to total	After ban (n=40)	% to total
1. Crew wage (₹)	1,629	44.62	392	17.29	2,393	52.75	540	21.60
2. Fuel cost (₹)	1,033	28.29	945	41.71	1,061	23.39	1,006	40.24
3. Auction charges (₹)	30	0.82	30	1.32	30	0.66	30	1.20
4. Ice (value in ₹)	346	9.48	341	15.05	409	9.01	370	14.80
5. Other expenditure (₹)	613	16.79	558	24.63	644	14.19	554	22.16
6. Total operating costs (₹) (1+2+3+4+5)	3,651	100	2,266	100	4,537	100	2,500	100
7. Gross revenue (₹)	6,346		2,761		8,276		3,231	
Net operating income (7)-(6) (₹)	2,695		495		3,739		731	
Operating ratio (total operating cost/gross revenue)	0.58		0.82		0.55		0.77	
Catch (kg)	34		16		50		23	
Average crew size	3		3		3		3	
Labour productivity (kg) (catch per crew per trip)	11.3		5.3		16.6		7.6	

40 to 66.5 kg, whereas, after-ban, the catch per trip ranged between 14 to 38.5 kg. It is evident from Fig. 2 that the catch per trip during ban was higher when compared to after-ban period.

Economic performance of motorised multi-day (2-4 days) trawler

The average operating cost per trip of motorised multi-day (2-4 days) trawler during ban period worked out to be ₹34,890/- per trip with gross revenue of ₹54,208/- per trip. The net operating income worked out to be ₹19,318/- per trip with the capital productivity of 0.64 and the labour productivity of 47 kg per crew per trip. The operating cost per trip was higher during ban period (₹34,890/-) than that of after-ban period (₹24,667/-) with fuel and crew wages accounting for about 42 and 30% of the total operating cost, respectively. The gross revenue per trip was also higher in the ban period at ₹54,208/- than that of the after-ban period at ₹28,912/-. The capital productivity was high during ban period (0.64) compared to after-ban period (0.85), whereas, the labour productivity was higher during ban period at 47 kg per crew per trip than the after-ban period at 33 kg per crew per trip (Table 3). The catch per trip during and after-ban ranged between 133-599 and 119-450 kg, respectively. Fig. 3 clearly shows that the catch per trip during ban was high for majority of the days when compared to after-ban period.

Economic performance of motorised multi-day (2-4 days) gillnetter

Between the ban and after-ban period, the operating cost per trip of motorised multi-day (2-4 days) gillnetter

Fig. 2. Comparison of catch in a motorised single day gillnetter between ban and after ban period

was higher during ban period (₹33,492/-) in comparison with after-ban period (₹26,831/-) with fuel and crew wages accounting for about 39 and 30% of the total operating cost, respectively. The gross revenue per trip was also higher during the ban period at ₹51,892/- than that of the after-ban period at ₹32,998/-. The capital productivity was higher during ban period (0.64) compared to after-ban period (0.81). Similarly, the labour productivity was higher during ban period at 50 kg per crew per trip than the after-ban period at 34 kg per crew per trip (Table 3). The catch per trip during ban ranged between 95 to 684 kg, whereas after-ban the catch per trip ranged between 65 to 410 kg. The catch per trip during ban was higher during majority of the days as compared to after-ban period Fig. 4.

Table 3. Economic performance of motorised multi-day (2-4 days) units during and after-ban period

Items of average cost and returns per trip	Trawler				Gillnetter			
	During ban (n=20)	% to total	After ban (n=20)	% to total	During ban (n=20)	% to total	After ban (n=20)	% to total
1. Crew wage (₹)	10,330	29.60	2,835	11.49	10,010	29.89	4,035	15.04
2. Fuel cost (₹)	14,640	41.96	12,272	49.75	13,192	39.39	13,156	49.03
3. Auction charges (₹)	30	0.08	30	0.12	30	0.09	30	0.11
4. Ice (Value in ₹)	2,680	7.68	2,570	10.42	2,650	7.91	2,490	9.28
5. Food	2,600	7.45	2,170	8.80	2,570	7.67	2,500	9.32
6. Other expenditure (₹)	4,610	13.21	4,790	19.42	5,040	15.05	4,620	17.22
7. Total operating costs (₹) (1+2+3+4+5+6)	34,890	100	24,667	100	33,492	100	26,831	100
Gross revenue (₹)	54,208		28,912		51,892		32,998	
Net operating income (8)-(7)	19,318		4,245		18,400		6,167	
Operating ratio (total operating cost/gross revenue)	0.64		0.85		0.64		0.81	
Catch (kg)	329		233		352		236	
Average crew size	7		7		7		7	
Labour productivity (in kg) (catch per crew per trip)	47		33		50		34

Fig. 3. Comparison of catch in a motorised multi-day (2-4 days) trawler between ban and after ban period

Economic performance of non-mechanised bottom-set gillnetter

The net operating income of non-mechanised bottom-set gillnetter worked out to be ₹1,138/- per trip with capital productivity of 0.52 and labour productivity of 4.5 kg per crew per trip. Between the ban and after-ban period, the operating cost per trip was higher during ban period (₹1,251/-) than that of after-ban period (₹704/-) with crew wages accounting for about 51% of the total operating cost. The gross revenue per trip was also higher during the ban period at ₹2,389/- than that of the after-ban period at ₹704/-. The capital productivity was higher during ban period (0.52) compared to after-ban period (0.67), whereas, the labour

Fig. 4. Comparison of catch in a motorised multi-day (2-4 days) gillnetter between ban and after ban period

productivity was higher during ban period at 4.5 kg per crew per trip than the after-ban period at 2.8 kg per crew per trip (Table 4). Fig. 5 shows that the catch per trip during ban period was higher when compared to after-ban period.

Economic performance of non-mechanised gillnetters

The net operating income of non-mechanised gillnetter was estimated to be ₹1,670/- per trip and the capital productivity was 0.49. The labour productivity was found to be 13 kg per crew per trip. The operating cost per trip was higher during ban period (₹1,612/-) than that of the after-ban period (₹940/-), with crew wages accounting for about 33% of the total operating cost. The gross revenue per trip was also higher during the ban period (₹3,282/-) than

Table 4. Economic performance of non-mechanised bottom-set gillnetter during and after-ban period

Items of average cost and returns per trip	Bottom set gillnetter				Gillnetter			
	During ban (n=40)	% to total	After ban (n=40)	% to total	During ban (n=40)	% to total	After ban (n=40)	% to total
1. Crew wage (₹)	642	51.32	191	27.13	896	55.58	313	33.30
2. Fuel cost (₹)	0	0.0	0	0.0	0	0.0	0	0.0
3. Auction charges (₹)	30	2.40	30	4.26	30	1.86	30	3.19
4. Other expenditure (₹)	579	46.28	483	68.61	686	42.56	597	63.51
5. Total operating costs (1+2+3+4) (₹)	1251	100.0	704	100.0	1612	100	940	100
6. Gross revenue (in ₹)	2389		1043		3282		1584	
Net operating income (6)-(5) (₹)	1138		339		1670		644	
Operating ratio (total operating cost/ gross revenue)	0.52		0.67		0.49		0.59	
Catch (kg)	9		5.6		26		19	
Average crew size	2		2		2		2	
Labour productivity (catch per crew per trip) (kg)	4.5		2.8		13		9.5

Fig. 5. Comparison of catch in a non-mechanised bottom-set gillnetter between ban and after-ban period

that of the after-ban period (₹1,584/-). Capital productivity was higher during ban period (0.49) compared to after-ban period (0.59), whereas, the labour productivity was higher during ban period at 13 kg per crew per trip than the after-ban period at 9.5 kg per crew per trip (Table 4). Catch per trip during and after ban ranged between 17 to 33 kg and 10 to 31 kg, respectively. Catch per trip during ban period was higher when compared to after-ban period Fig. 6.

Seasonal fishing ban is one of the measures adopted in marine fisheries management and it is being diligently followed in our country. Aswathy and Sathiadhas (2006) concluded that the ban on trawling had a favourable effect on resource conservation. Similarly, Shyam Salim (2007) observed that a notable increase in marine fish production of the country occurred in the post-ban period. On the other hand, Vivekandan *et al.* (2010) opined that there is no indication to suggest that fishing ban has helped long-term sustainability of stocks. However, fishing

Fig. 6. Comparison of catch in a non-mechanised gillnetter between ban and after ban period

ban is applicable to the mechanised sector, whereas, the motorised and non-mechanised sector are exempted from the ban. The present study revealed that during ban period, the motorised and non-mechanised craft-gear combinations got good catch and earned higher returns in comparison to after-ban period.

In motorised single day craft-gear combinations, during ban period, the capital productivity was higher in comparison with after-ban period with a lower operating ratio ranging from 0.55 for gillnetter to 0.58 for bottom-set gillnetter. In motorised multi-day craft-gear combinations, the capital productivity was more during ban period, in comparison with after-ban period with a lower operating ratio of 0.64 for trawler and gillnetter. In non-mechanised craft-gear combinations, the capital productivity was higher during ban period in comparison with after-ban period with a lower operating ratio ranging from 0.49 for gillnetter to 0.52 for bottom-set gillnetter. The results are in conformity with findings of Narayanakumar *et al.* (2009) who reported

that the capital productivity was higher in non-mechanised fishing methods with a lower operating ratio for the gill net operation in the east coast.

By comparing all craft-gear combinations operating during ban period, it was observed that the labour productivity of the motorised multi-day (2-4 days) gillnetter recorded the highest productivity of 50 kg per trip. The capital productivity was higher in non-mechanised gillnetter and bottom-set gillnetter. Similar to our findings, Shabir *et al.* (2015) reported that economic viability of gillnet fishing operations are profitable. The catch, labour productivity and income were higher in multi-day (2-4 days) trawler and gillnetter.

Based on the present study, it is concluded that the economic performance of all craft-gear combinations operated during ban period was better in comparison with after-ban period. The reason for fishing ban is to reduce the fishing effort during the spawning period of most of the fishery resources, aimed at conserving the resources and to ensure sustainable harvest. But, the present study revealed that the motorised and non-mechanised fishing sector get a good catch during the ban period. Hence, there is a concern that if the fishing ban really reduces the fishing effort and provides sustainable harvest. Based on the findings of the present study, the following recommendations are suggested: In addition to fishing ban, other regulatory measures such as mesh size regulation, size limits, licensing, restricting the number of boats and seasonal closure for renewal of fish stocks can be adopted to achieve desirable results. There is an immediate need for re-formulating proper regulation on allowing motorised boats during ban period.

The fishing ban is essential and it should be continued. Along with fishing ban other regulatory measures which are mentioned above should be followed strictly in order to ensure livelihood security, resource sustainability, economic efficiency and ecosystem integrity.

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