



Short Communication

†Fuel consumption by motorized fishing sector in Andhra Pradesh

*J. Charles Jeeva, Nikita Gopal, G. R. Unnithan and U. Sreedhar

Central Institute of Fisheries Technology, Matsyapuri P.O., Cochin-682 029, India.

*E-mail: jcjeeva@gmail.com

Abstract

There are 5,266 motorized crafts in operation in Andhra Pradesh contributing about 16% to the landings in the state. In this paper, an attempt is made to understand fuel utilization pattern and estimate the total quantity of fuel consumed by the motorized fishing craft operating in Andhra Pradesh. The study was carried out in Visakhapatnam district of Andhra Pradesh during the year 2004-05. The quantity of fuel utilized per trip was taken as the fuel utilized for reaching the fishing ground and returning and also the fuel spent for fishing. A total of 200 trips were covered for the study. The number of trips performed by motorized craft during the period of study was worked out at 1,28,616 for Visakhapatnam district and for the state as a whole, it was 12,40,459. The consumption by motorized craft was 1,820.54 kL and 17,558.59 kL per year for Visakhapatnam and Andhra Pradesh, respectively. The average fuel utilization by the craft was 14.15 litres per day. In addition to the estimates on fuel utilization, the general specifications of the craft and their operational aspects are also presented. The expenditure on fuel in the fishing sector is substantial and calls for optimum fuel utilization measures like the use of engine with appropriate horsepower, proper maintenance of engines, introduction of new generation fuel efficient fishing craft along with appropriate management measures like optimization of fishing fleet.

Keywords: Fuel utilization, motorized craft, Visakhapatnam, Andhra Pradesh

Introduction

Visakhapatnam is one of the major landing centres of Andhra Pradesh. The number of motorized craft in Visakhapatnam and Andhra Pradesh are 546 and 5,266 respectively. In spite of the vast expansion of trawling, the artisanal fishing sector still plays an important role in harvesting of marine fishery resources in Andhra Pradesh. As against the all India scenario, the landings from mechanized units in Andhra Pradesh constitute only 45% followed by 55% from motorized and non-mechanized units. The yellowfin tuna is a boon to the artisanal sector around Visakhapatnam. The artisanal craft with hook and lines are able to operate even at depths of 500 m, beyond the range of mechanized boats to tap this valuable resource (Commissioner of Fisheries, 2005; Rao, 2005; Sreedhar *et al.*, 2005).

The advent and spread of motorized and mechanized fishing technology has completely transformed the fishing sector in India and the consumption of fuel has increased in tune with the number and capacities of the craft over the years. An appraisal of the fleet strength shows that the number of artisanal fleet increased by about 110% from 1960s to 1990s (Rao, 2004). An earlier study conducted at Central Institute of Fisheries Technology, Cochin (Unnithan *et al.*, 2004) revealed that as high as 77% of the operating cost of mechanized fishing was towards fuel cost. Along with mechanized fishing, the traditional sector also has been converting to motorization in a large scale where outboard engines of 8 hp to 40 hp are extensively used (Unnithan *et al.*, 2005). The objective of the present study is to understand fuel

†Presented in the International Symposium "Marine Ecosystem-Challenges and Opportunities (MECOS 09)" organized by the Marine Biological Association of India during February 9-12, 2009 at Kochi.

utilization pattern and estimate the total quantity of fuel consumed by the motorized fishing craft operating in Andhra Pradesh.

Material and Methods

The study was carried out during 2004-05 in Visakhapatnam district of Andhra Pradesh. The data collected included fuel utilization, horsepower of the engine, area of operation, fishing duration and number of fishing trips in a year. The actual quantity of fuel utilized per trip was taken as the fuel utilized for reaching the fishing ground and return and also the fuel spent for fishing. However, in case of motorized craft, fuel is spent only for reaching the fishing grounds and for return trip and no fuel is spent during hauling. Data were collected by trained field staff based on structured proforma developed for the study. Data were collected randomly from motorized craft operators on every fifth day in a month to give coverage for 10 months. A total of 200 trips were covered for the study.

The formula used for the estimation was (Sukhatme *et al.*, 1984):

$$\sum \hat{Y} = \sum \left(\frac{N}{n} \times \sum_{i=1}^n y_i \right),$$

where, Y is the total estimate of the fuel consumption by the motorized sector, n is the number of trips sampled and the N is the total number of trips and y_i is the fuel consumption of the i^{th} observation.

The summation was taken for pooling the fuel consumption to obtain estimate at district and state levels. The variance of estimates were worked out by calculating,

$$V(\hat{Y}) = \frac{N(N-n)}{n} \times \frac{1}{n-1} \left[\sum_{i=1}^n y_i^2 - \frac{(\sum_{i=1}^n y_i)^2}{n} \right]$$

The percentage error of pooled estimate is:

$$SE = \frac{\sqrt{\sum V(\hat{Y})}}{\sum \hat{Y}} \times 100$$

This was also followed by the corresponding standard errors.

The estimates were made for Visakhapatnam district and for Andhra Pradesh state as a whole. The total number of craft in Visakhapatnam and Andhra Pradesh were collected from secondary sources (Commissioner of Fisheries, 2005). By multiplying the actual number of trips undertaken by each craft in a year which was ascertained from the respondents of the study and the total number of crafts, the total number of trips (N) performed by motorized craft was estimated at 1,28,616 for Visakhapatnam district and for the whole state at 12,40,459.

Results and Discussion

Four types of fishing craft are popularly used by the traditional fishermen, viz., (i) *teppa* (ii) *kottu padava* (iii) *fibre teppa* and (iv) *fibre boat*. *Teppa* is a catamaran type craft which is very popular along Andhra Pradesh coast. It is made of three to four light-weight wooden logs tied together firmly using hemp rope. The size of *teppa* varies from 4 to 6 m. These are non-mechanized and are powered mostly by sails and sometimes manually. *Kottu padava* is a boat built with six to seven wooden planks tied together with rope. It is 5 to 8 m in overall length and operated in the inshore waters and powered either by sails or manually. *Fibre teppa* is a motorized catamaran in which wooden logs are replaced with fibreglass, retaining the basic configuration of the traditional catamaran. The length of the boat ranges from 6.5 to 7.5 m. This boat is powered with a 6.5 hp outboard engine and in favourable conditions, sails are used. *Fibre boat* is a motorized boat made of fibreglass in the shape of traditional *nava* and powered with 10 hp diesel engine. A fish-hold is provided in the middle. The length of this craft ranges between 7.5 and 8.5 m. It is also provided with a mast and sail for emergency. Gillnets, shoreseines, hooks and lines, boatseines and castnets are the commonly used traditional fishing gears along the coast of Visakhapatnam (Sreedhar *et al.*, 2005).

The general specifications of the motorized craft covered under this study and their operational aspects are presented in Table 1.

Table 1. Specifications of motorized craft along Visakhapatnam coast

Specifications	Motorized craft
Overall length (m)	6-10
Breadth (m)	1.5-3
Type of hull	FRP / Wooden logs
Type of engine	OBM
Horse power (hp)	6-12
Crew strength	Gillnetters: 5-6; Liners: 3
Fish hold capacity (t)	0.5-1.0
Fuel capacity (litre)	50
Fuel	Diesel/ diesel with kerosene
Endurance in days	2-3
Number of fishing trips/ year	200-250 (Mean : 236)
Duration of each trip (days)	1
Fishing grounds	North Andhra Coast (Gangavaram, Bhimili)
Depth of fishing	Gillnets: up to 70 m; Trammel nets: up to 100 m; Hook and lines: up to 500 m
Time of landing	Gillnetters: Morning; Liners: Afternoon
Type of gears	Species specific gillnets, trammel nets (<i>disco</i> nets) and hook and lines.
Species caught	Sardines, seerfishes, pomfrets, small sharks, little tuna, shrimp, sailfish

As per the Andhra Pradesh Marine Fishing Regulation Act, 1994, the motorized craft are earmarked for operation in the territorial waters up to 10 km. Motorized craft are fibre reinforced plastic (FRP) craft or *catamaran* craft of wooden logs fitted with outboard motors which undertake single day fishing. The length of the craft range between 6 and 10 m. The craft is fitted with a 6-12 hp outboard engine and occasionally in favorable conditions powered by sails. They make 200-250 fishing trips in a year with an average of 236. The fuel used is diesel and in few cases, it is diesel diluted with kerosene. About 20 litres of diesel is carried per trip. The crew size varies depending on the type of fishing. For a gillnetter, the crew size is 5-6 and for liners, it is 3. Gillnetters operate at depth up to 70 m and trammel nets are operated at depth of 100 m. The crafts are able to operate hook and lines even at depth of 500 m and beyond. The major portion of the operational expenditure goes for fuel, in addition to the expenditure of Rs. 200/- for baits in the case of liners. Most of the fishing crafts do not carry ice.

They set sail in the night and the time of landing differs based on the type of fishing. Gillnetters land the catch next day morning and liners in the afternoon. The catch is equally shared among the crew after allotting two shares for the craft owner who has to take care of the maintenance of the craft.

The estimate of fuel used by motorized craft in Visakhapatnam and Andhra Pradesh is presented below. The consumption by motorized craft was 1,820.54 kL and 17,558.59 kL for Visakhapatnam and Andhra Pradesh, respectively. The standard errors were 1.47 and 1.48 and were within the reasonable limits indicating the reliability of the estimates. The average fuel utilization by the craft was 14.15 litres per day. An earlier estimate among the mechanized sector indicated consumption of 7,941 kL of diesel for small mechanized fleet, 3,818 kL for *sona* boats, 3,684 kL for mini-trawlers and 11,256 kL for trawlers with the pooled estimate for Visakhapatnam as a whole being 26,699 kL for the year 2004. The consumption in Andhra Pradesh state was 19,698 kL for small mechanized, 21,744 kL for *sona* boats, 3,684 kL for mini-trawlers and 11,256 kL for trawlers, the pooled estimate being 56,382 kL (Nikita Gopal et al., 2008). From this, it could be observed that out of the total fuel utilization in Andhra Pradesh, the motorized sector utilized 24% and contributed 16% to fish landings in the state. In contrast, the mechanized sector utilized 76% of the total fuel consumed by the entire fishing fleet in Andhra Pradesh and contributed 46% to the state's fish landings. Further, as mentioned earlier, the motorized sector is able to operate at depth of 500 m and beyond to tap the tuna resources also. The above findings on fuel utilization, contribution to total landings and their ability to tap the untapped resources, indicate the significance of the motorized sector. A scheme for providing fuel at subsidized rates is prevalent in Andhra Pradesh at the rate of 200 litres per month for motorized fishing craft and 3,000 litres per month for mechanized craft.

Based on the discussions with the fishermen, the ideal number of trips that can be undertaken by the craft was arrived at as 1,63,800 for Visakhapatnam and 15,79,800 for the state as a whole. This was

estimated by multiplying the number of trips each craft can ideally perform in a year with the total number of craft in the district and the state as a whole. As mentioned earlier, the actual number of trips performed by motorized craft was worked out at 1,28,616 for Visakhapatnam district and for the state as a whole, it was 12,40,459. Thus the motorized craft operated only 78.52% of the trips that can be ideally performed by them. The demand for fuel at varying fishing capacity utilization levels has been extrapolated as given in Table 2.

Table 2. Demand for fuel at different capacity utilization

Fishing capacity utilization, %	Fuel demand (in kL) in Andhra Pradesh
78.52	17,558.59
90.00	20,125.74
100.00	22,361.93

At price levels of 2004-05 (Rs. 25.95 per litre of diesel), each motorized craft had expended Rs. 367/- per trip on fuel. Annual fuel cost was worked out at Rs. 87,000/- per craft. The total expenditure on fuel by the motorized fishing sector is estimated as Rs. 45.56 crores in Andhra Pradesh. Assuming 100% capacity utilization at 2004-05 fuel prices, the expenditure on fuel would be Rs. 58.03 crores. Nikita Gopal *et al.* (2008) estimated the total expenditure on fuel by the mechanized fishing industry in Andhra Pradesh as Rs. 146.29 crores at 79.70 % fishing capacity utilization.

Making fisheries sector energy efficient will decrease operational costs. The expenditure on fuel in the fishing sector is substantial and calls for fuel conservation measures like the use of engine with appropriate horse power, proper maintenance of engines, introduction of new generation fuel efficient fishing craft and better fishing methods along with appropriate management measures like optimization of fishing fleet, which will go a long way in achieving this objective.

Acknowledgments

The authors express their sincere thanks to Dr. B. Meenakumari, Director, CIFT, Cochin, for granting permission to publish this paper. They are also thankful to the craft operators for providing necessary information for this study.

References

- Commissioner of Fisheries, Govt. of Andhra Pradesh. 2005. Status and highlights of fisheries developments in Andhra Pradesh. *Fishing Chimes*, 24 (10): 143 - 146.
- Nikita Gopal, J. C. Jeeva and G. R. Unnithan. 2008. Fuel consumption pattern by the mechanized fishing sector in Andhra Pradesh. *Fishery Technology*, 45 (1): 113-120.
- Rao, G. S. 2005. Marine fisheries of Andhra Pradesh - An overview. In: M. R. Boopendranath, P. T. Mathew, S. S. Gupta, P. Pravin, and J. C. Jeeva (Eds.) *Sustainable Fisheries Development: Focus on Andhra Pradesh*. Society of Fisheries Technologists (India), Cochin, p. 17 - 21.
- Rao, N. S. 2004. Economic dimensions of Indian fisheries sector. *Current scenario and future needs of Indian fisheries - Decennial Publication of Forum of Fisheries Professionals*, Visakhapatnam, p. 72 - 78.
- Sreedhar, U., G. Rajeswari and R. R. Prakash. 2005. Artisanal fishing gears of Visakhapatnam. In: M. R. Boopendranath, P. T. Mathew, S. S. Gupta, P. Pravin, and J. C. Jeeva (Eds.) *Sustainable Fisheries Development: Focus on Andhra Pradesh*. Society of Fisheries Technologists (India), Cochin, p. 101 - 111.
- Sukhatme, P.V., B.V. Sukhatme, S. Sukhatme and C. Asok. 1984. *Sampling Theory of Survey with Applications*. Third Revised Edition. Iowa State University Press, Iowa (U.S.A.) and Indian Society of Agricultural Statistics, New Delhi (India), p. 105-180.
- Unnithan, G. R., N. Gopal and V. R. Nair. 2004. Economics of operation of 18 m fuel efficient steel trawlers of CIFT design. *Fishery Technology*, 41 (1): 71 - 76.
- Unnithan, G. R., N. Gopal, V. R. Nair and M. Nasser. 2005. Fuel consumption pattern by the mechanized fishing sector in Kerala. *Fishery Technology*, 42 (1): 77 - 82.

Received : 12/02/09

Accepted : 09/10/09