Energy efficiency in the ring seine fishery of south Kerala coast

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ABSTRACT

The artisanal fisheries of Kerala, India, is characterised by the coexistence of the motorised and the non-motorised sectors. The ring seine is the most important gear of the artisanal sector contributing nearly 40 % of the total landings of the State. It has been observed of late, that there is indiscriminate use of outboard motors in the ring seine sector. An attempt is made in this study to compare the technical efficiency of the different types of ring seine units classified on the basis of the horsepower of the outboard motors used. The parameter used for comparison is the catch per adjusted horsepower. Statistical analysis of the results shows that the units using lesser horsepower engines performed well with respect to the catch per adjusted horsepower.

Kerala, has always given greater importance to the development of fisheries. The mechanisation brought in this sector during the fifties caused the average catch in the traditional sector to fall by over 50 % between 1965 and 1980. This resulted in conflicts between the two sectors. The artisanal fishermen at first reacted by violent means, but later turned to the upgradation of the technology by adopting outboard motors for propulsion. By 1994 the contribution of the artisanal sector to the total landings reached 43 % of which 39 % was contributed by the motorised sector. 70 % of the landings of the motorised units were by the ring seines.

The ring seine is a mini purse-seine which came into operation in 1986. They are operated from one or more large plank built canoes (OAL 12 -24 m). The ring seines of south Kerala can broadly be classified into two, the large meshed (20 mm) thanguvala units (450-750 x 50-90 m) and the small meshed (10 mm) choodavala units (150-400 x 30-60m). They started operation with outboard motors of 15 hp but as the size of the gear increased the size of the craft and horsepower of engines also increased. Canoes in some areas like Cochin use 3-4 engines with a cumulative horsepower of 80-90 hp. The indiscriminate utilization of energy has been noted by many authors but few studies have been conducted on the energy utilization in the Kerala context.

In Kerala, studies have been conducted on the economic and technical efficiency of craft-gear combinations by

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Kurien and Willmann (1982) and the South Indian Federation of Fishermen's Societies (Anon, 1991). Hameed and Hridayanathan (1989) have analysed energy consumption pattern of small classes of mechanised vessel of the southwest coast of India. References have been made on the growing energy inefficiency in Kerala fisheries in general by Achari (1987). As regards the ring seine fisheries of Kerala, studies on the catch per unit effort have been conducted by Sathiadas et al. (1993), and Balan and Andrews (1995). Economic aspects of efficiency of fuel utilization in traditional fisheries was studied by Annamalai (1995) with respect to the ring seines. Another attempt was made by Edwin and Hridayanathan (1995) to compare the technical efficiency of ring seine. Other than these no attempt has so far been made to assess the efficiency of different types of ring seines based on their horsepower or fuel consumption. Hence this study is attempted with an objective to compare the efficiency of two types of ring seines namely thanguvala and chooodavala units which were further classified according to the horsepower.

The efficiency with which energy is utilised in the ring seine units was studied by using an important parameter viz. the catch per adjusted horsepower as adopted by Trinida et al. (1993). The adjusted horsepower (c/ahp) is the sum of the engine horsepower and the horsepower equivalent of manpower per trip. This equivalent was taken into consideration as the crew size may vary for the different classes of vessels using engines of identical horsepower. The two centres selected for study were Cochin and Ambalapuzha - two nodal centres of ring seine activity along the southern coast of Kerala. The fishermen of Cochin adopt two-boat operation whereas in the Ambalapuzha single boat operation is prevalent. Fishing takes place all the year round in Ambalapuzha while in Cochin it dwindles down after the peak season.

Observations were taken for the following classes of vessels.

1. Thanguvala units using engines of (a) 50-60 hp, (b) 60-70 hp, (c) above 70 hp. 2. Chooodavala units using engines of (a) 35-45 hp, (b) 45-55 hp, operated from Cochin. 3. Thanguvala units using engines of (a) 50 hp, (b) 55 hp. and 4. Chooodavala units using engines of (a) 50hp, (b) 25hp, operated from Ambalapuzha.

The two types of nets from the two centres were also compared.

A characteristic feature of the ring seine units of Cochin area, is that both types of units use an additional outboard motor (usually of 9.9 hp) during the monsoon months (June-September) for efficient operation. That was taken into consideration while calculating the catch/adjusted horsepower. The data regarding the catch was taken for a period of 24 months (January 1995 to December 1996) from 40 vessels, 20 each from the two centres on a weekly basis. The catch per adjusted horsepower was then estimated for horsepower per trip pooled to get the average catch per horsepower per trip for the different months and for different vessels. The size of craft and gear in each class were almost the same. The variations in the catch with respect to the different horsepower were analysed using the Analysis of Variance Method.

There was significant variation in the c/ahp with respect to months and
horsepower in the case of thanguvala operated from Cochin, the values of F=5.096 (p 0.05) and F=22.783 (p 0.01) for 2 and 16 degrees of freedom. The Least Significant Difference was then found out (LSD=4.284) and there was significant difference between the mean values of c/ahp of 50 hp and 70 hp classes of vessels, the mean catch of the 50 hp vessels being higher than that of the 70 hp class.

The comparison of the two classes of choodavala units of Cochin showed no significant difference with horsepower. But there was significant difference with respect to the months. Comparison of the c/ahp of the thanguvala units of Ambalapuzha revealed significant difference at 5 % level (F = 43.52, df = 1, 11) while the choodavala units using 50 hp and 25 hp engines at 1 % level (F=64.78, df=1, 11) regarding horsepower and months. When the thanguvala of Ambalapuzha and Cochin were compared it was found that the units at Ambalapuzha performed better than those at Cochin whereas in the case of the choodavala units of the two centres there was significant difference in the c/ahp at 1 % level (F=19.16, df=122).

Kurien and Willmann (1982) compared the catch per trip of twenty two different combinations of craft and gear operated from the Kerala coast. This study revealed that even before the use of the outboard motors the thanguvala, the predecessor of the ring seine was more efficient than the boat seine. Later, studies conducted by the South Indian Federation of Fishermen’s Societies also showed that the catch per units of effort was higher when compared to the encircling net and the boat seine (Anon., 1991). Another study on the ring seines of the Malabar coast indicated higher technological efficiency than the boat seines operated from the same area (Rajan, 1993). Trinida et al. (1993) in an inter-gear, inter-sector and inter-regional comparison of the productivity and technical efficiency of ten types of pelagic gear in Philippines have shown that ring nets were the most efficiently used gear. This study considered c/ahp as one of the criteria for the assessment of efficiency. The present observations reveal the technological supremacy enjoyed by ring nets over the other artisanal gears of Kerala and elsewhere. The comparison among the different units of ring seines showed that the units using engines of lesser horse power performed better at both centres as depicted in Figs. 1-4. Earlier studies conducted by Edwin and Hridayanathan (1995) in the ring seine sector showed that among the thanguvala and choodavala units operated from Ambalapuzha, the units using 25 hp engines performed better than those using 50 hp engines with respect to the c/ahp. It was observed that in the case of both types of gears the units at Ambalapuzha performed better than those at Cochin. The use of an additional vessel for carrying the catch necessitates the use of an additional

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Fig. 1. Catch per adjusted Horsepower of 3 types of thanguvala units of Cochin (1995 & 1996).
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Fig. 2. Catch per adjusted horsepower of 2 types of choodavala units of Cochin (1995 & 1996).

Fig. 3. Catch per adjusted horsepower of two classes of thangualava units of Ambalapuzha (1995 & 1996).

Fig. 4. Catch per adjusted horsepower of two classes of choodavala units of Ambalapuzha (1995 & 1996).

While assessing the energy consumption pattern of fishing boats operating in the inshore waters of the southwest coast of India, Hameed and Hridayanathan (1989) cited improper maintenance, high horsepower of engines, inefficient propellers and thick gear materials as sources of energy loss. Hameed and Kumar (1993) suggested fishing gear optimization by using large meshes, acoustic systems and proper propulsion systems as energy saving measures. The present study brings to light the fact that excessive horsepower is being used unnecessarily in the ring seine units. With the increase in the size of craft and gear the number of outboard motors used for propulsion increased in the ring seine sector. But this was markedly felt in the Cochin area where units began to use as many as four motors with a cumulative horsepower of about 80-90 hp. The engines of high horse power were used in anticipation of high catches (Annamalai, 1995). The subsidies extended by the government and the lack of restrictions regarding the number and power of engines have resulted in this indiscriminate use. The same was the case when mechani-
sation was first started in the state. (Achari, 1987). As per the estimates of the Department of Fisheries in 1996 there are 17,350 outboard motors and with the recent hike in fuel prices the annual expenditure has increased further. The stiff competition among the artisanal units operating in the inshore waters is yet another reason. Endal (1989) was of the opinion that fuel prices must be kept at a reasonably high level in fisheries, no subsidies allowed and investment on fuel saving measures be encouraged. The increase in the prices of fish has also contributed to the use of excess energy. There was a 766 % increase in the price of mackerel, 1034 % in oil sardine, 933 % in anchovies and 291 % in prawns between 1985-'86 and 1994-'95, and the above groups formed the major constituents of the ring seine catches.

The present study confirms that the energy is being used excessively by the units operating from Cochin and that the use of lesser engine power, smaller crew size and single boat operation can make ring seine operation more energy efficient.

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