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Motorization of traditional craft and its effect on the exploitation of tuna and whitebait anchovy resources at Vizhinjam

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ABSTRACT

The impact of motorization of traditional craft on two fisheries resources, viz. tunas and whitebait anchovies, was studied. A conspicuous increase in the annual tuna catch was seen from 1984 due to the increased effort expended by the motorized craft by using more units of drift nets, hooks and lines than non-motorized craft. The tuna landing increased from 361 tonnes during the pre-motorization period to 1976 tonnes during the motorization period. On the contrary, the anchovy landing came down from 580 tonnes during the pre-motorization period to 386 tonnes on motorization. A decline was noticed in the effort expended for whitebait anchovies but the catch rate did not show a steep decline which indicated that the reduction of effort was not due to the decrease in the catch rate. The shifting over of motorized units to drift net and hooks and lines operation seems to be the major reason for the decline in the effort of boat seine and *netholi vala* which are the main gears for whitebait anchovies.

The motorization of traditional craft was initiated in central Kerala by 1980. It spread to northern and southern areas by 1983 (Balan *et al.* 1989). At Vizhinjam, the most important fish landing centre in Trivandrum, the motorization was initiated during the middle of 1982. A substantial increase in the effort from the motorized craft was recorded from 1984 which resulted in an immediate increase in the total fish catch at Vizhinjam. An account of the traditional fishery in the area has been given by Luther *et al.* (1982) and Nair *et al.* (1988) and the initiation of motorization of traditional craft in the area has been reported by Gopakumar *et al.* (1986). The increase in

the catch and catch rate of tunas and mackerel as a result of motorization has also been pointed out by Gopakumar and Sarma (1989) and Gopakumar *et al.* (1991). The chief gears operated by the motorized craft at Vizhinjam are hooks and lines and drift net. Motorization has extended the fishing areas of traditional craft to relatively more distant grounds and has increased the yield of certain resources like tunas which are caught chiefly by drift net and hooks and lines. This has resulted in a reduction in the operation of non-motorized units and a simultaneous decrease in the yield of certain other resources like whitebait anchovies which are caught by boat seine, shore seine and *netholi vala*. To analyse this aspect, the trends of fish landing with particular reference to two resources, viz.

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tunas and whitebait anchovies were studied in detail.

MATERIALS AND METHODS

The catch and effort statistics collected at Vizhinjam fish landing centre from 1979 to 1990 were analysed. A fishing trip of each type of gear in a day was taken as the unit of effort of that gear. Standard effort for tunas was calculated by multiplying the effort of each type of gear, in which tunas are caught, by its relative efficiency with reference to non-motorized drift net and totalling them. Similarly the standard effort for whitebait anchovies was calculated with reference to *netholi vala* (gill net for anchovies). Since motorized units regularly operated only drift net and hooks and line, the catch and effort data of these gears were separately recorded for motorized and non-motorized units. Stray numbers of *netholi vala* and boat seine were also operated from motorized units. But since their numbers were very few and were not operated regularly, they were not recorded separately. The period 1979-83 was taken as the pre-motorization period and 1984-90 as the motorization period, for comparison on the effort, distribution, yield and catch rate.

RESULTS

Total fish landing

The annual fish landing from 1979 to 1990 indicating the contribution of the motorized and non-motorized craft is given in Fig. 1. The annual catch ranged from 3 798 tonnes in 1980 to 10 299 tonnes in 1985. A conspicuous increase in the total fish landing was seen in 1985. The average annual catch during the motorization period was 7 853 tonnes as compared to 5 413 tonnes during the pre-motorization period. The percentage contribution by the motorized units to the total fish catch showed substantial increase during 1985 to 1988. But during 1989 and 1990 a

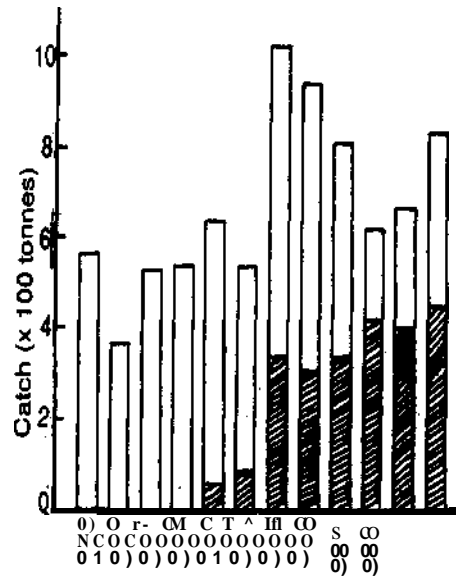


Fig. 1. Yearwise total fish catch at Vizhinjam during 1979-90 (shaded portion indicates the contribution by motorized units).

gradual decline was noted in its percentage contribution.

Tuna Resource

Annual yield: Yearwise total tuna catch, standard effort and catch per standard effort are given in Fig. 2. The annual tuna catch ranged from 229.9 tonnes in 1982 to 2 850.8 tonnes in 1990, showing a marked improvement in the yield from 1985. The catch rate (C/SE) ranged from 10.5 kg in 1982 to 24.0 kg in 1990. Here also, an increase was seen from 1985 onwards. The standard effort ranged from 18 879 units in 1979 to 154 795 units in 1988.

Gearwise yield: The gearwise effort, catch and catch rate of tunas in drift net and hooks and line operated from motorized and non-motorized craft for the different years is given in Fig. 3.

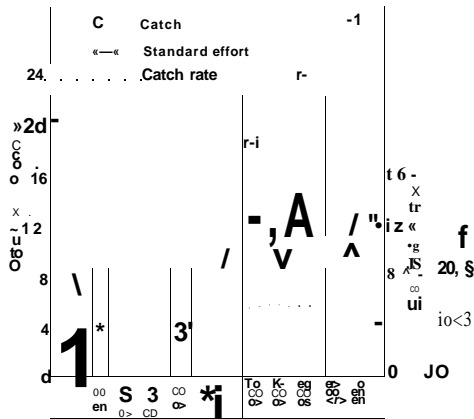


Fig. 2. Yearwise standard effort, catch and catch rate of tunas at Vizhinjam

(a) *Drift net*: The effort expended from motorized craft increased sharply from 1985

(Fig. 3a). It ranged from 2 590 units in 1983 to 41 225 units in 1990. The catch ranged from 102.8 tonnes (1983) to 1 274.5 tonnes (1990). The catch rate was maximum in 1984 (40.2 kg) and minimum (22.1 kg) in 1986. The effort expended from non-motorized craft declined markedly from 1983 to 1987 and then showed an increase from 1988 to 1990 (Fig. 3b). It ranged from 3 926 units in 1987 to 21 802 units in 1980. The catch rate ranged from 37.8 tonnes in 1987 to 280.5 tonnes in 1981. The catch ranged from 10.6 kg in 1982 to 24.0 kg in 1990.

(b) *Hooks and line*: The effort expended from motorized craft increased sharply from 1984 (Fig. 3c). A minimum of 5 195 units were operated in 1983 and the maximum of 50 894 units in 1988. An increase in the tuna

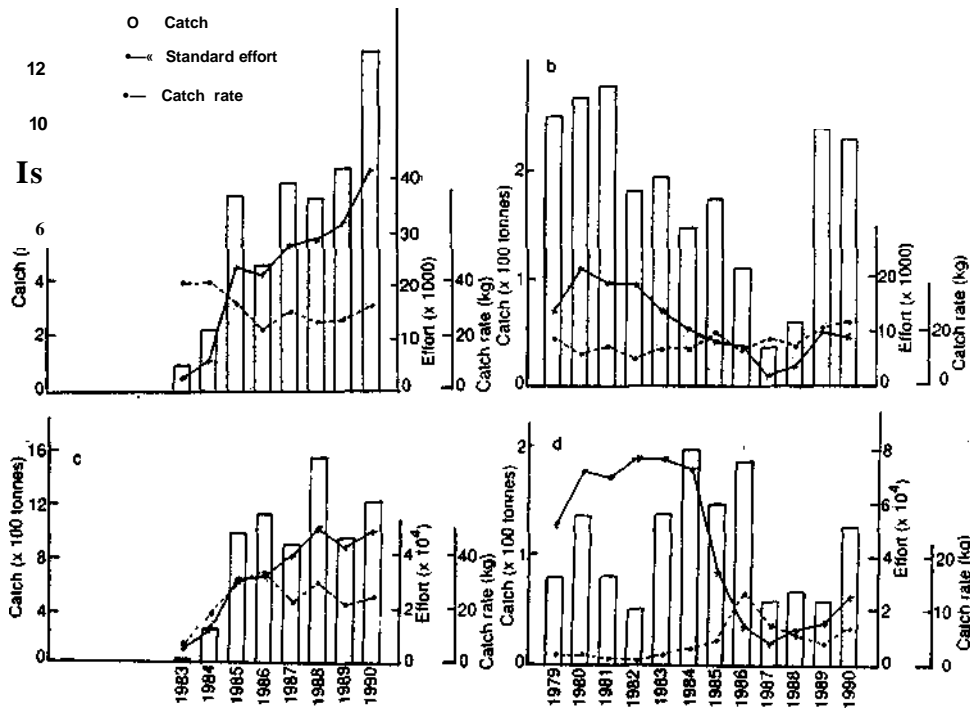


Fig. 3. Yearwise effort, catch and catch per unit effort of tunas in drift net operated from motorized (a) and non-motorized craft (b), and in hooks and line operated from motorized (c) and non-motorized craft (d).

catch by the gear was seen from 1984. The catch ranged from 31.3 tonnes in 1983 to 1 546.4 tonnes in 1988. The catch rate also increased steeply from 1984 and it ranged from 6.0 kg in 1983 to 33.8 kg in 1986. The effort from non-motorized craft declined conspicuously from 1985, which could be attributed to the shifting over to motorised units. It ranged from 8 540 units in 1987 to 76 557 units in 1982 (Fig. 3d). Even though the effort declined from 1985, the catch showed sharp decline only from 1987. The catch ranged from 52.3 tonnes in 1982 to 201.4 tonnes in 1984. Here, consequent to the decline in effort, an increase in the catch rate was seen from 1985. The catch rate was lowest in 1982 (0.7 kg) and highest in 1986 (13.4 kg).

Whitebait Resource

Annual landings. The yearwise total whitebait catch, standard effort and catch per standard effort is given in Fig. 4a. The catch ranged from 56.0 tonnes in 1979 to 1 509.7 tonnes in 1983. It could be noted that from 1980, the whitebait landing gradually increased and reached a peak in 1983. A sudden decrease was seen in 1984 and thereafter. The standard effort expended also showed an almost declining trend in recent years. It ranged from 1410 units in 1979 to 44 128 units in 1983. Even though the reduction of effort almost corresponded to the decrease in the catch, the catch rate did not show the same trend which indicated that the reduction of effort was not due to the decrease in the catch rate. The catch rate ranged from 21.8 kg in 1981 to 40.8 kg in 1990.

Gearwise yield. The gearwise effort, catch and catch rate of whitebait anchovies in different gears is given in Figs 4b to d.

(a) *Shore seine:* The effort expended showed a gradual reduction from 1980 to

1989 and a slight improvement in 1990 (Fig. 4b). It ranged from 274 units in 1989 to 2 416 units in 1979. The reduction of effort has not correspondingly reduced the anchovy catch by this gear. The catch ranged from 1.3 tonnes in 1988 to 16.0 tonnes in 1990. The catch rate also varied widely from 2.8 kg in 1979 to 37.1 kg in 1990 and these fluctuations were not directly related to the effort expended. Hence the reduction of effort of shore seine was not a major factor responsible for the decline in the anchovy catch in recent years.

(b) *Boat seine:* The effort expended showed a declining trend from 1982 onwards with slight improvement in 1985 (Fig. 4c). The effort ranged from 14 481 units in 1989 to 47 794 units in 1979. The catch varied from 34.1 tonnes in 1979 to 1 348.5 tonnes in 1983. The catch rate showed wide fluctuation from 0.7 kg in 1979 to 45.2 kg in 1983. The effort-catch rate relationship showed that the reduction of effort in recent years was not due to poor catch rate.

(c) *Netholi vala:* The *Netholi vala* operation showed a decline from 1984 to 1988 even though it improved in 1987, 1989 and 1990 (Fig. 4d). The effort ranged from 378 units in 1979 to 4 454 units in 1983. The anchovy catch showed a decreasing trend with fluctuations and almost corresponded to the reduction of effort. The catch ranged from 14.9 tonnes in 1979 to 152.6 tonnes in 1983. The catch rate did not show the corresponding decline of the catch and effort. The catch rate ranged from 21.9 kg in 1981 to 40.7 kg in 1990.

Comparative Analysis

Annual trend. The standard effort, catch and catch rate of tunas increased conspicuously during the motorization period (Table I). On the other hand, the standard effort as well as

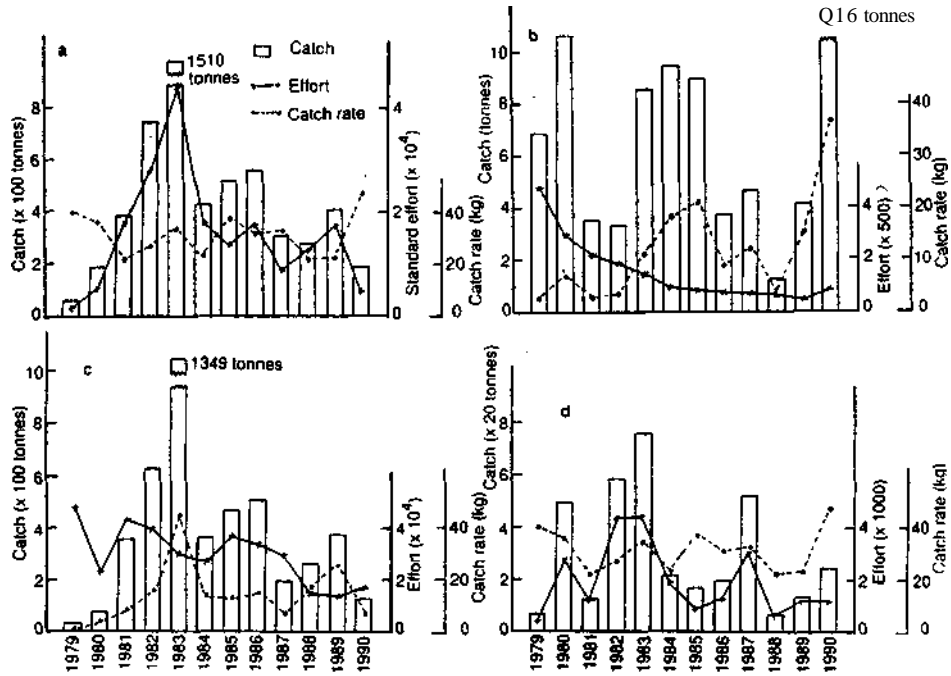


Fig 4. Yearwise standard effort, catch and catch rate of anchovies, a. Total, b. in shore seine, c. in boat seine, d. in *netholi vala*

the yield declined during the motorization period for whitebait anchovies. However, the decline in the catch rate of whitebaits during the period was only marginal.

Gearwise trend. On account of motorization the effort, catch and catch rate of tunas in drift net increased (Table 2). In the case of hooks and lines, even though the effort ex-

pended showed a marginal decrease, the catch and catch rate registered more than a ten-fold increase.

The effort expended as well as the anchovy catch decreased in all the gears during the motorization period (Table 3). However, the catch rates in boat seine and *netholi vala* did not show any significant

Table I. The average annual standard effort expended, catch and catch rate of tunas and whitebaits during the pre-motorization and motorization period

Resource	Pre-motorization period			Motorization period		
	Standard effort	Catch (kg)	Catch rate (kg)	Standard effort	Catch (kg)	Catch rate (kg)
Tunas	26413	361 110	13.7	108124	19 76 041	18.3
Whitebait anchovies	19351	580 158	30.0	13 419	385 696	28.7

Table 2. Gearwise average annual effort, catch and catch rate of tunas

Period	Drift Net			Hooks and Line		
	Effort	Catch (kg)	Catch rate (kg)	Effort	Catch (kg)	Catch rate (kg)
Pre-motorization	17 699	255 363	14.4	69 721	105 747	1.5
Motorization	33 058	863 448	26.1	60 442	117 014	18.5

Table 3. Gearwise average annual effort, catch and catch rate of whitebait anchovies during the pre-motorization and motorization periods

Period	Effort	Boat seine		<i>Netholi vala</i>			Shore seine		
		Catch (kg)	Catch rate (kg)	Effort	Catch (kg)	Catch rate (kg)	Effort	Catch (kg)	Catch rate (kg)
Pre-motorization	36 615	491 164	13.4	2 645	82 318	31.1	1346	6 675	4.9
Motorization	24 859	333 479	13.4	1473	45 301	30.8	398	6 915	17.4

decrease. In shore seine, even though the effort declined, the catch and catch rate increased during the motorization period.

Monthly trend. The average monthly catch of tunas and anchovies during pre-motorization and motorization periods are given in Fig. 5a. The annual catch trend of tunas showed a bimodal pattern with the modes during May and October. Tuna catch was significantly high in all the months during the motorization period. The catch ranged from 93.3 tonnes in January to 281.5 tonnes in October. In the pre-motorization period the catch was 6.5 tonnes in July and 77.4 tonnes in May.

In case of anchovies, during the pre-motorization period, the monthly average catch ranged from 0.3 tonne in January to 241.5 tonnes in July and in the motorization period it ranged from 0.1 tonnes in January to 115.1 tonnes in August. It is seen that during the motorization period the catch increased in March, June, September and December but declined during the other months, especially

in July, the peak month of boat seine fishing activity as compared to pre-motorization period. Similarly during the peak fishing months of *netholi vala*, viz. April-May and October, the anchovy catch was reduced during the motorization period. Thus during the peak months of operation of boat seine and *netholi vala*, the catch of anchovies was reduced during the motorization period due to the reduction of effort of these gears.

DISCUSSION

In this study, an improvement in the total fish catch during the motorization period was seen which was brought about by the increased catch of certain groups of fishes. This was clearly seen in tunas in which a conspicuous increase in the yield was seen from 1984 due to the increased catch and catch rates by drift nets and hooks and lines operated from motorized craft. On the other hand, this trend reduced the effort expended for certain nearshore resources like anchovies, where it was seen that the reduction of effort of boat

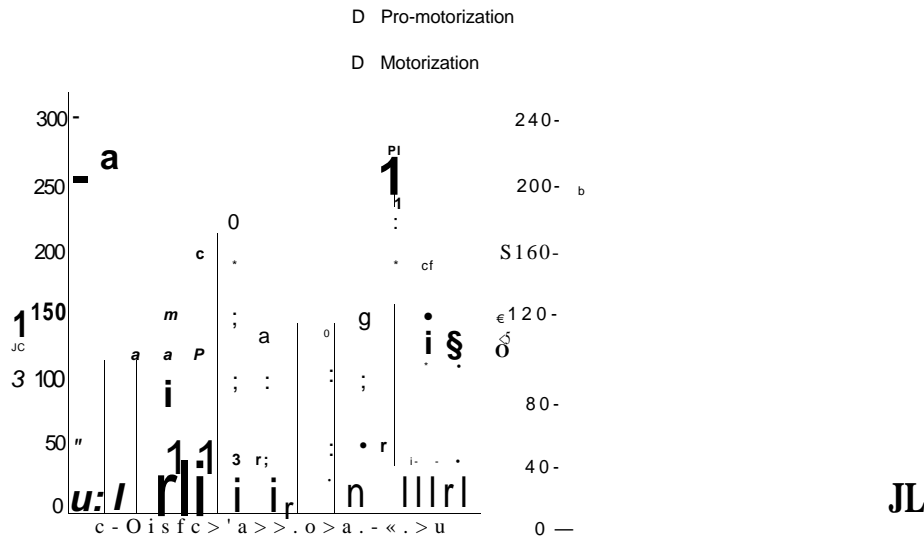


Fig 5. Average monthwise catch of tunas (a) and anchovies (b) during the pre-motorization and motorization periods.

seine and *netholi vala* during the motorization period decreased the yield. Since the effort was diverted to comparatively high unit value fishes, considerable quantities of annually renewable resources like anchovies were lost to the fishery.

Jacob *et al.* (1987) opined that the use of outboard motors for propulsion of country craft has picked up very fast and its indiscriminate expansion programme may not be desirable as the catch rates are dwindling. Balan *et al.* (1989) stated that in Kerala, even though the effort and catch of motorized country craft increased steadily from 1980 to 1987, the overall catch per boat trip decreased from about 420 kg in 1980 to 200 kg in 1986. A sectorwise analysis showed that even though an increasing trend in the landings was observed in the southern and northern Kerala during 1983-1987, in central Kerala, where motorization started as early as 1980, a parabolic growth reaching a plateau indicating a growth stagnancy in that region was noted during the same period.

The motorization process no doubt, has extended the area offishing to slightly distant grounds, consequently locating new fishing grounds for certain hitherto underexploited species. However, the proliferation of motorized craft operating only drift net and hooks and line may create exploitation pressure on certain resources caught by these gears. This could be overcome by the diversification of fishing with motorized units. Gears like boat seine, *netholi vala*, *chala vala* etc., which land comparatively low unit-value fishes also should be regularly operated by these units. The introduction of ring seine which is being operated by motorized craft at Alleppey area is worth experimenting at Vizhinjam by these craft.

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REFERENCES

- Balan K, Panikkar K K P, Jacob T, Andrews Joseph and Rajendran V. 1989. Motorization of country crafts in Kerala —an impact study. *CMFRI Special Publication No. 45*, 74 pp.
- Gopakumar G and Sarma P S Sadasiva. 1989. The present status of coastal tuna fishery at Vizhinjam, Trivandrum coast. *Marine Fisheries Information Service, T & E Series 97* : 1-7.
- Gopakumar G, Pillai N Gopalakrishna and Nair P N Radhakrishnan. 1986. Mechanisation of traditional crafts with outboard motors at Vizhinjam. *Marine Fisheries Information Service, T and E Series 69* : 23-28.
- Gopakumar G, Pillai N Gopalakrishna and Omana T A. 1991. The fishery characteristics and biology of mackerel at Vizhinjam. Paper presented at the Symposium on Tropical Marine Living Resources. *Journal of Marine Biological Association of India* 33(142): 107-14.
- Jacob T, Rajendran V, Pillai P K Mahadevan, Andrews Joseph and Satyavan UK. 1987. An appraisal of the marine fisheries in Kerala. *CMFRI Special Publication No. 35*, 42 pp.
- Luther G, Nair P N Radhakrishnan, Gopakumar G and Nair K Prabhakaran. 1982. The present status of small-scale traditional fishery at Vizhinjam. *Marine Fisheries Information Service, T & E Series 38* : 1-17.
- Nair P N Radhakrishnan, Pillai N Gopalakrishna, Sarma P S Sadasiva, Velayudhan A K, Joseph Mathew, Thomas K T and Omana T A. 1988. Marine Fish Calender — IX Vizhinjam. *Marine Fisheries Information Service, T & E Series 87* : 15.