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समुद्री मात्स्यिकी सूचना सेवा: समुद्री मात्स्यिकी पर आधारित अनुसंधान परिणामों को आयोजकों, मत्स्य उद्योगों और मत्स्य पालकों के बीच प्रसार करना और तकनोलजी का प्रयोगशाला से श्रमशाला तक हस्तांतरित करना इस तकनीकी और विस्तार अंकावली का लक्ष्य है।

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Tunas caught by pole and line are being landed in Minicoy (Lakshadweep).

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मिनिक्वोय (लक्षद्वीप) में पॉल आन्ड लाइन के ज़रिए पकडे गये ट्यूना उतारने का दृश्य ।

Back cover photo:

'Masmin' (smoked tuna) spread on the sea shore at Minicoy (Lakshadweep) for sun drying.

पृष्ठ आवरण चित्र:

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THE PRESENT STATUS OF COASTAL TUNA FISHERY AT VIZHINJAM, TRIVANDRUM COAST

G. Gopakumar and P.S. Sadasiva Sarma

Vizhinjam Research Centre of CMFRI, Vizhinjam

Introduction

The coastal tuna fishery of Kerala, which has been yielding about 6,000 tonnes annually in recent years, constitutes 32% of the total tuna landings of the country. A district-wise analysis of the tuna production during 1979 - '81 indicated that 70% of the total tuna landings in the state was from the coastal fishery along Trivandrum district. At Vizhinjam, where fishing goes on all through the year, coastal tunas constitute a major pelagic fish resource accounting for 20% of the total marine fish landings. Since the prime requirement of tuna fishery development in the area seems to be the improvement of the existing small-scale fishery sector. knowledge on the present status of the fishery appears to be a basic necessity for the planning of further development in this sector. In addition, when the fishery harbour under construction at Vizhinjam becomes operational, mechanised fishing for tunas is bound to increase in the area and this also requires information on the catch trend and seasons of abundance of various species for the management of fishing fleet.

Fishing gear and craft

The chief gears employed for tuna are drift net and hooks and lines which are operated either from catamaran or dugout canoe. From 1983, introduction of traditional crafts fitted with outboard motors started gaining momentum in the small-scale fishery sector at Vizhinjam. Of late, the gears for tuna are mainly operated from fibre-glass coated plywood built boats of about 5.5 m OAL with outboard motors. Consequently, the effort of non-motorised traditional crafts declined considerably. The area of fishing for motorised crafts was about 20–25 km off Vizhinjam at a depth range of 60 to 80 m and that of non-motorised crafts was confined to about 10 km from the shore at a depth range of 40–50 m. In this study, a fishing trip was taken as a unit of effort and since both the gears employed were found to be almost equally effective for catching tuna, no attempt was made to standardise the trips employing different gears.

Annual production

The annual tuna catch and the total fish catch during 1983-'87 are given in Fig. 1. The catch ranged from 472 t in 1983 to 2,037 t in 1985 with the annual average at 1,401 t. The year-wise percentage of tuna catch in relation to total catch and the catch per trip of tunas is shown in Fig. 2. It is seen that the percentage contribution of tunas in the total fish catch ranged from 7.3 in 1983 to 21.6 in 1987 and averaged to 17.2. The annual catch of tunas per trip varied from 4.8 kg in 1983 to 24.8 kg in 1986. A marked increase in the catch as well as the catch rate of tunas was evident from 1984 onwards.

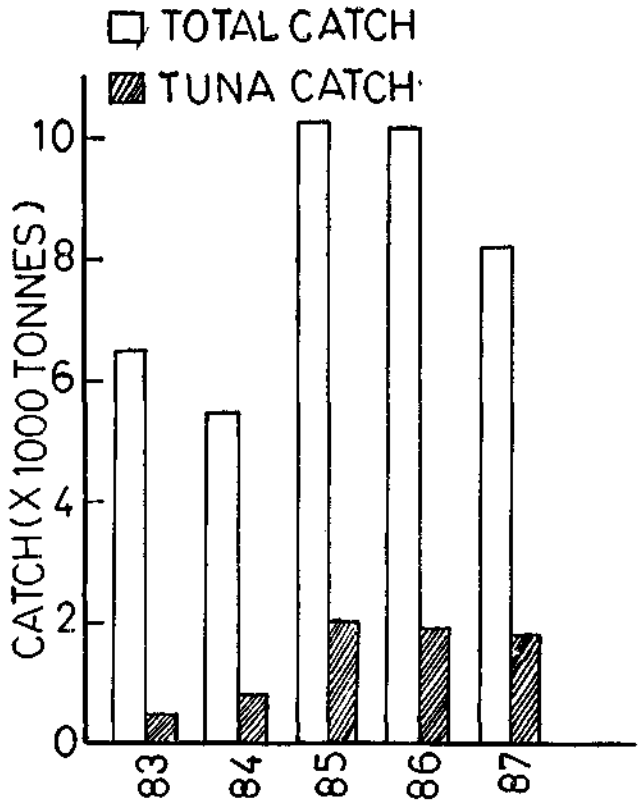


Fig. 1. Year-wise total fish catch and tuna catch at Vizhinjam during 1983-'87.

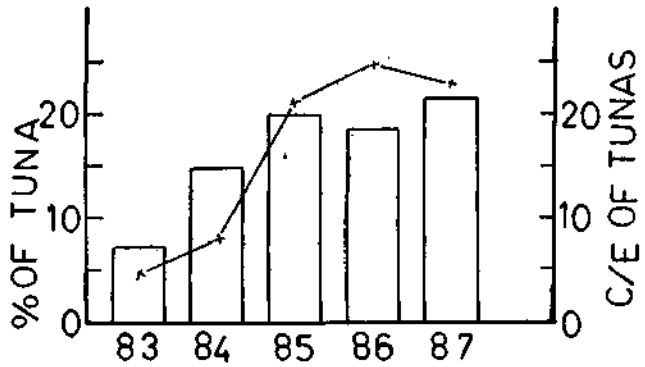


Fig. 2. Year-wise percentage of tuna in the total fish catch and catch per effort (C/E) of tuna in kg during 1983–'87.

Seasonal pattern of tuna fishery

The month-wise tuna catch, effort and catch per unit effort based on pooled data during 1983–'87 are shown in Fig. 3. The average monthly catch varied between 70.0 t in February to 230.4 t in October with the monthly average at 116.8 t. The catch per trip

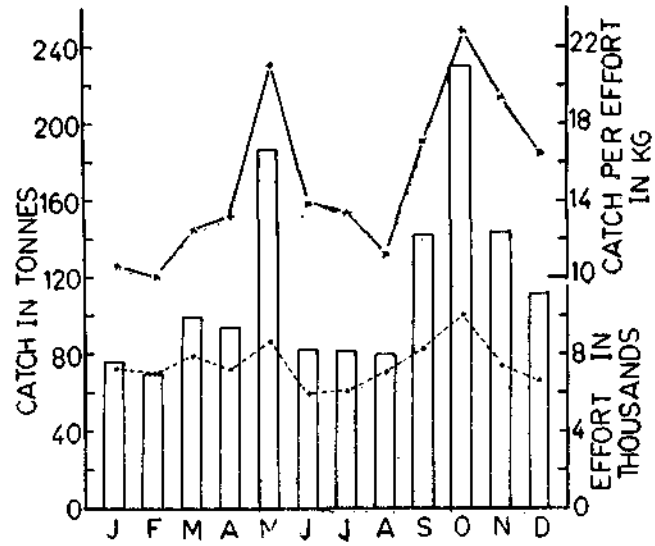


Fig. 3. Month-wise average catch (tonnes), effort and catch per effort (C/E) in kg of tunas during 1983–'87.

ranged between 9.9 kg in February to 22.8 kg in October with an overall monthly catch per trip of 15.6 kg. The peak fishing seasons were May and September-November period.

Gear-wise production

As generally understood, drift nets and hooks and lines are not operated for tunas alone. The percentage of tuna catch in the total fish catch brought by the gears operated from motorised and non-motorised crafts is

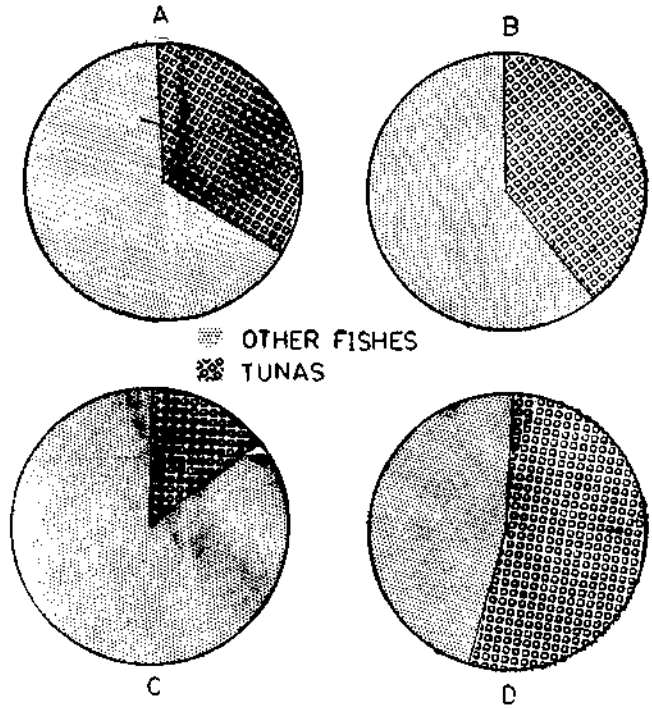


Fig. 4. Percentage of tunas and other fishes in different gears during 1983–'87. (A) Drift net (non-motorised craft), (B) Drift net (Motorised craft), (C) Hooks and line (non-motorised craft) and (D) Hooks and line (motorised craft).

given in Fig. 4. Motorised crafts brought better proportion of tuna catch. It is seen that 53.5% of the catch brought by hooks and lines operated from motorised crafts and 39.1% of the catch brought by drift net operated from motorised crafts were tunas, whereas the corresponding figures for their non-motorised counterparts were 34.2 and 14.1% respectively.

The year-wise percentage contribution of tunas in the total tuna catch by different gears is shown in Fig. 5. The change over from non-motorised to motorised traditional crafts for tuna fishing was evident from 1984 onwards. The gears operated from motorised crafts which landed only about 28% of the tuna catch in 1983, caught about 94% of the tuna catch in 1987. For the overall period 1983-'87, hooks and lines operated by motorised crafts contributed the bulk of the catch (46.8%) followed by drift net operated from motorised crafts (33.1%). The contributions of hooks and lines and drift nets operated from non-motorised crafts were 10.6 and 9.5% respectively for the period. The average monthly catch, effort and catch per unit effort of tunas in different gears for the period 1983-'87 is shown in Fig. 6.

(a) *Drift net:* The gear was operated in all the years from motorised as well as non-motorised crafts.

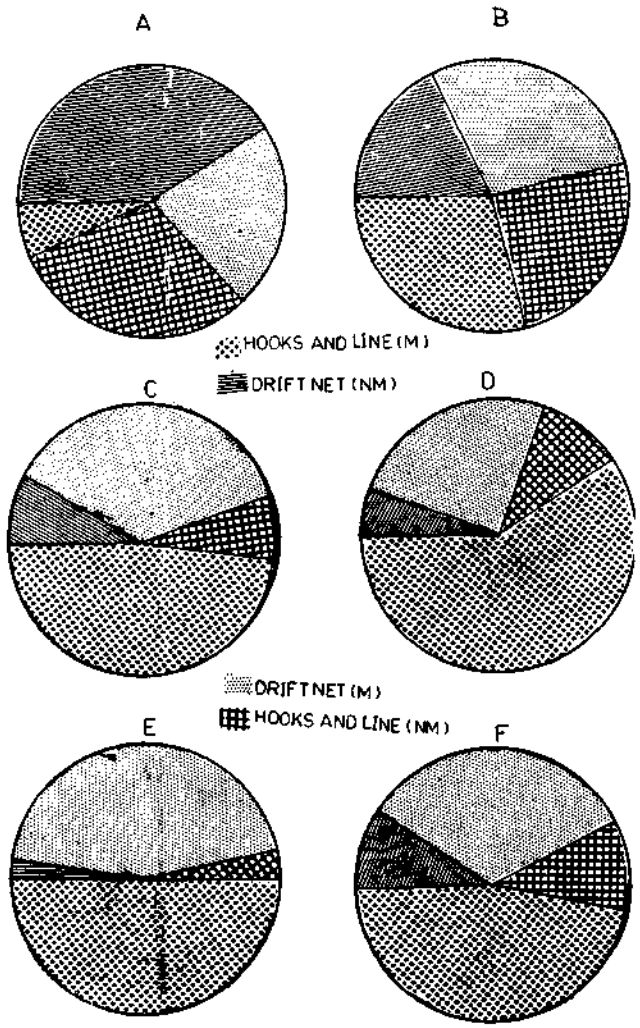


Fig. 5. Percentage contribution of tunas by different gears in the total tuna catch. '(M)' indicates gear operated from motorised craft and '(NM)' indicates gear operated from non-motorised craft. (A) 1983, (B) 1984, (C) 1985. (D) 1986, (E) 1987 and (F) Average for the period 1983–'87.

The annual effort from non-motorised crafts ranged from 2,097 in 1987 to 14,036 in 1983, with the average at 8,602 units. A reduction in the effort was seen from 1984 onwards. Maximum catch (196.2 t) was noted in 1983 and the minimum (37.8 t) in 1987, with the annual average at 133.3 t. Eventhough the effort expended and the tuna catch brought by drift net operated from non-motorised crafts showed steep decline through 1983–'87, the catch per unit effort did not show the corresponding decline. It ranged from 14.0 kg (1983 and '84) to 20.3 kg (1985) with the average at 15.5 kg. The gear was operated in all the months except July–August and it was intense during April–May and October - November. April – June and September-November yielded comparatively good catch rate of tunas. May was the best month of tuna catch by drift net operated from non-motorised crafts.

Eventhough drift net operation from motorised crafts was observed in all the years, it intensified conspicuously from 1985 onwards. The annual effort ranged from 2,590 units in 1983 to 27,058 units in 1987 with the average annual at 15,970 units. The decline in the effort of drift net from non-motorised crafts coincided with the increase in the effort of the same gear from motorised crafts. The annual tuna catch ranged from 102.8 t in 1983 to 779.3 t in 1987, with the annual average at 463.5 t. The catch per unit effort ranged from 22.1 kg in 1986 to 40.2 kg in 1984, with the annual average at 29.0 kg. It could be seen that the catch per trip of tunas from drift nets operated from motorised crafts was almost double of that operated from non-motorised crafts. Motorised crafts operated drift nets during all the months and the peak efforts were expended during May and September–October. The maximum tuna catch was obtained during May–June and September–October. Prior to 1987, drift nets were not operated during the peak southwest monsoon months *viz.* July–August. It is interesting to note that the operation of drift nets during these months in 1987, yielded comparatively good catch and catch rates of tunas.

(b) *Hooks and line:* The annual effort of hooks and line operated from non-motorised crafts declined from 1,37,439 units in 1984 to 8,540 units in 1987 with the average annual at 54,012 units. Tuna catch also declined from 201.4 t in 1984 to 59.8 t in 1987 with an annual average catch of 149.1 t. The catch per trip ranged from 1.5 kg in 1984 to 13.4 kg in 1986 and averaged to 2.8 kg for the overall period. A significant aspect noted here was the increase in catch rate with the decrease in fishing effort from 1984 onwards.

Hooks and line fishing from motorised crafts intensified from 1985. The annual effort ranged from 5,124 units in 1983 to 39,873 units in 1987 with an annual average effort of 24,437 units. Here also, the increase in the effort of motorised units from 1985 onwards coincided with the decrease in the effort of non-motorised units. The annual tuna catch varied between 31.3 t in 1983 to 1,130.1t in 1986 and averaged to 655.2 t. The catch per trip ranged from 6.1 kg in 1983 to 33.8 kg in 1986 with the annual average at 26.8 kg. It is seen that the catch per trip of tunas increased with the increase in effort till 1986, but showed a slight decline in 1987. A conspicuous increase in the catch per trip of tunas was seen in the motorised units when compared to that from non-motorised units. Maximum effort of this

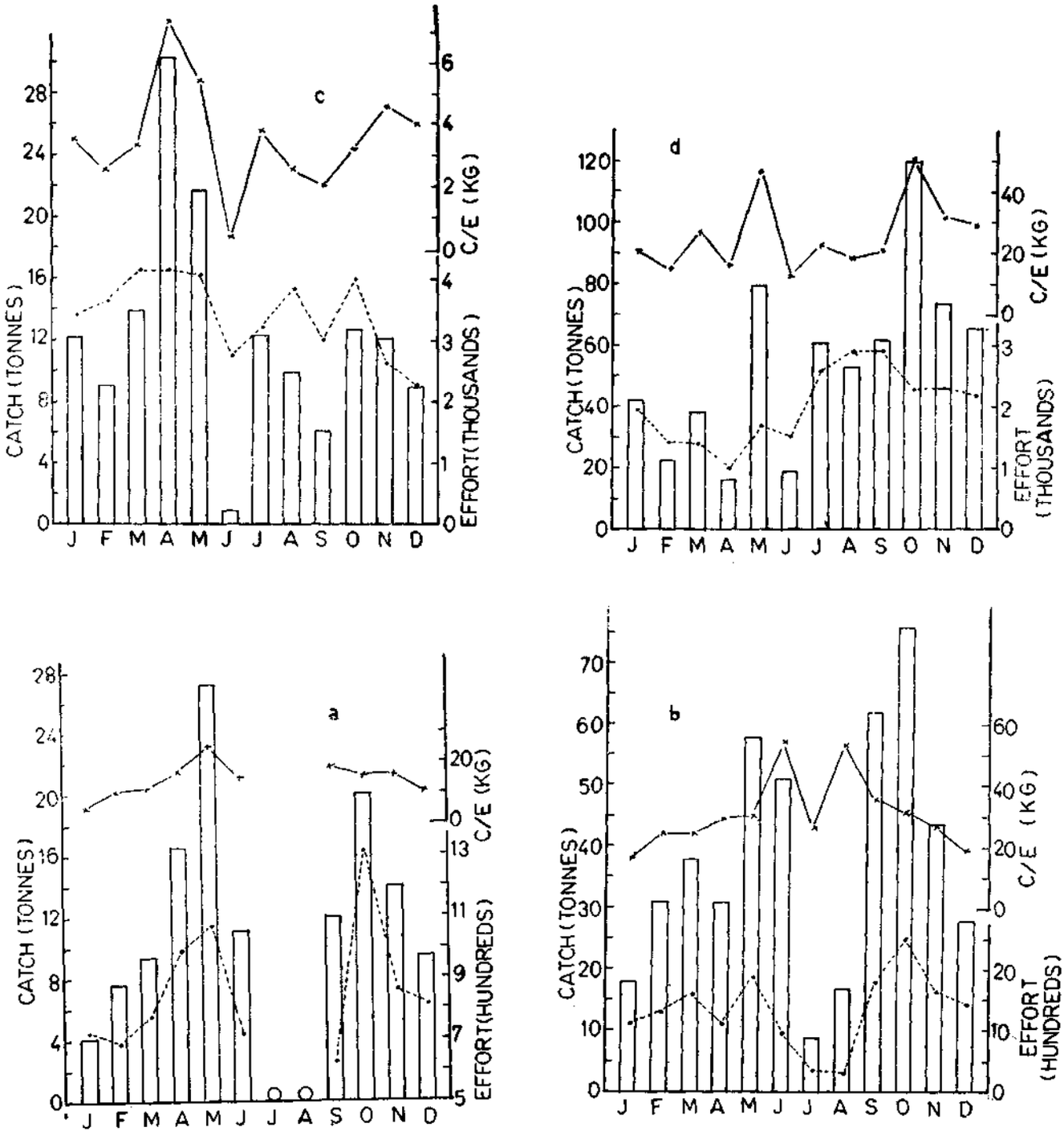


Fig. 6. Gear-wise average catch (tonnes), effort and catch per effort (C/E) in kg of tunas during 1983–'87 ('0') at the baseline indicates non-operation of the gear). (a) Drift net (non-motorised craft), (b) Drift net (motorised craft), (c) Hooks and line (non-motorised craft), (d) Hooks and line (motorised craft).

unit was expended during July–December. Maximum tuna catch and catch rates were noted during May and October–November.

Species composition

Seven species of tunas occurred in the fishery. The overall relative abundance by weight of the species is

given in Fig. 7. The bullet tuna *Auxis rochei* contributed the bulk of the catch (45.3%) followed by the little tunny *Euthynnus affinis* (34.5%). The other

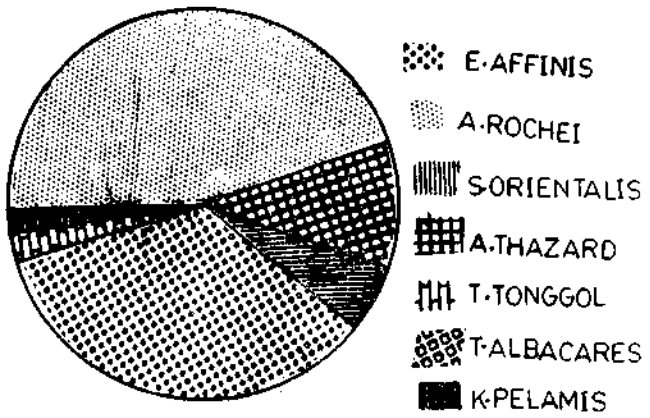


Fig. 7. Species composition of tunas (all gears together) during 1983–'87.

species in the order of abundance were *Auxis thazard* (10.2%), *Sarda orientalis* (5.5%), *Thunnus tonggol* (2.5%), *T. albacares* (1.5%) and *Katsuwonus pelamis* (0.5%).

Gear-wise abundance of species

The gear-wise species composition of tunas during the period is shown in Fig. 8. In drift net operated from motorised and non-motorised crafts, *E. affinis* dominated the catch, followed by *A. thazard,* whereas in hooks and line operated from motorised and non-motorised crafts, *A. rochei* was the dominant species followed by *E. affinis*. A significant aspect noted here

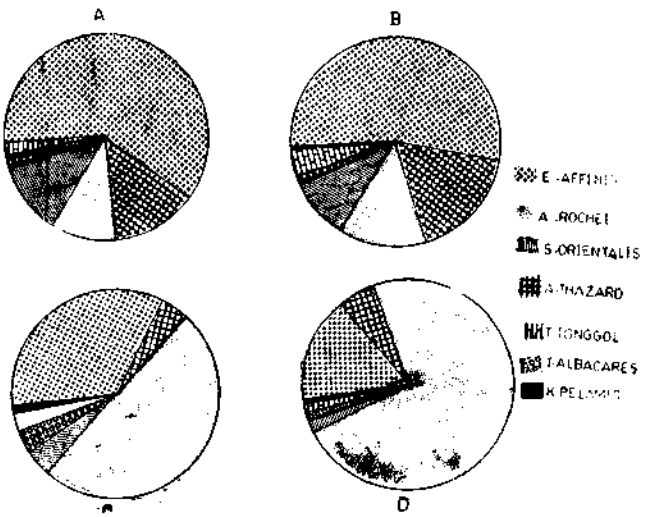


Fig. 8. Gear-wise species composition of tunas during 1983–'87. (A) Drift net (non-motorised craft), (B) Drift net (motorised craft), (C) Hooks and line (non-motorised craft) and (D) Hooks and line (motorised craft).

was the abundance of *A. rochei* in hooks and lines operated from motorised crafts, where it formed about 74% of its total catch.

In drift net (non-motorised craft) *E. affinis* was abundant during May and October, *A. thazard* and *A. rochei* during April and *S. orientalis* during September–October. In the same gear operated from motorised crafts also *E. affinis* was abundant during May and October, *A. thazard* in February-April, *A. rochei* in September and November and *S. orientalis* in September. In hooks and lines operated from non-motorised crafts, *E. affinis* was caught abundantly in April and *A. rochei* during April-May. In the same gear operated from motorised crafts, *E. affinis* was caught in good quantities during March, May and November, *A. thazard* during March and *A. rochei* during May and July to December.

Seasonal abundance of species

The seasonal trend of different species is shown in Fig. 9. Two fishing seasons were noted for *E. affinis viz.* April–June and September–November with peak landings during May and October. The fishing season for *A. thazard* was February–April with peak catch in May. May and July to December were the best months for *A. rochei* with peak catch in October. *S. orientalis* was caught in good quantities during May to October with peak catch in September. The months of maximum availability of *T. albacares* were January and October, those for *T. tonggol* June, October and November and those for *K. pelamis* January and October.

Impact of motorisation of traditional crafts

The motorisation programme which started gaining momentum from 1983, has clearly resulted in an increase in the catch and catch rate of tunas at Vizhinjam. The percentage contribution of tunas by different gears from 1983–'87 (Fig. 4) indicates that motorised crafts have largely replaced the non-motorised ones for hooks and line and drift net fishing. The increase in tuna catch from 1984 onwards (Fig. 2) was chiefly due to the better catch and catch rate of the motorised units. The catch rate of tunas by drift nets operated from motorised crafts was 29.0 kg as against the same of 15.5 kg from non-motorised units. Similarly hooks and lines operated from motorised crafts recorded a high catch rate of 26.8 kg in contrast to 2.8 kg of non-motorised crafts. The accessibility to new fishing grounds beyond the traditional areas seems to be the main reason for the higher catch rates of motorised crafts. Another significant aspect of motorisation was

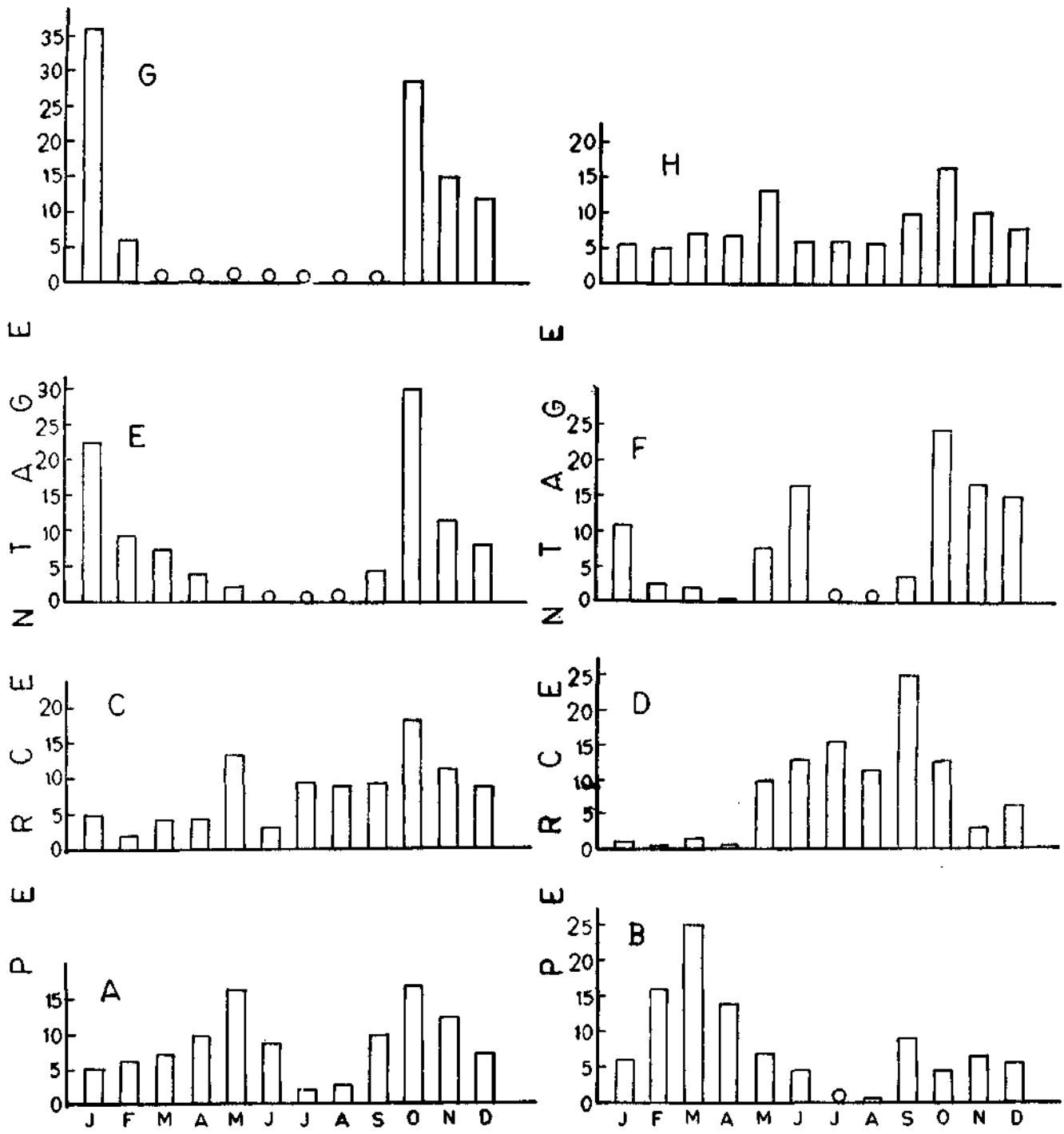


Fig. 9. Seasonal trend of tunas during 1983–'87 ('0') at the baseline indicates nil catch. (A) *E. affinis*, (B) *A. thazard*, (C) *A. rochei*, (D) *S. orientalis*, (E) *T. albacares*, (F) *T. tonggol*, (G) *K. pelamis* and (H) Total tuna catch.

the change in the pattern of species abundance of the tuna catch in the area. New fishing ground for *A. rochei* was exploited mainly after the introduction of motorisation. Consequently, *A. rochei* became the most abundantly exploited species instead of *E. affinis* which dominated the fishery prior to motorisation of crafts.

Conclusions and recommendations

(1) A conspicuous increase in the catch and catch rate of tunas was noted from 1984 onwards. The average annual catch of tunas during the period of study was 1,401 t which accounted for 17.2% of the total fish catch in the area.

(2) The peak fishing months for tuna were May and September–November.

(3) The motorisation of traditional crafts has resulted in an increase in the catch and catch rate of tunas in the area. Motorised units brought higher proportion of tuna in their catch. In the total tuna catch, hooks and line from motorised units brought 46.8% and drift nets from motorised units 33.1%. The catch rates in hooks and line and drift net were 26.8 kg and 29.0 kg as compared to 2.8 kg and 15.5 kg respectively of the non-motorised crafts.

(4) The operation of drift net during the peak southwest monsoon months *viz.* July–August which was done only during 1987, yielded comparatively good catch and catch rate of tuna.

(5) *Auxis rochei* was the most abundant species (45.3%) followed by *E. affinis* (34.5%), *A. thazard* (10.2%) and *S. orientalis* (5.5%). In drift net *E. affinis* dominated the catch, whereas in hooks and line *A. rochei* was the major species.

(6) The peak months of availability of *E. affinis* were May and October. The best available month of *A. thazard* was May, that of *A. rochei* was October and that of *S. orientalis* was September.

(7) New fishing ground for *A. rochei* was located after the introduction of motorisation.

(8) Judging by the catch and catch rate of tunas throughout the year as well as the increased yield of tunas by the exploitation of slightly distant fishing grounds by motorised traditional crafts, it is felt that tuna fishing offers further scope for development in the area.

(9) The chief requirement of tuna fishery development in India should be the development of small-scale fishery sector. In this context, the motorisation of small-scale sector at Vizhinjam, which conspicuously augmented the production of tunas is a trend worth encouraging by fisheries development agencies.

(10) Diversification of drift gill net fishery by the introduction of pablo type boats deserve urgent attention. A study of drift gill net fishing with pablo boats at Cochin revealed that in addition to tunas, quality by-catch of other pelagics such as seer fishes, sharks, carangids, pomfrets and cat fishes which fetch good price were caught by this fishing. The annual profit of drift gill net fishing was estimated to be Rs. 28,430.

(11) Introduction of boats for surface trolling and hooks and line fishing beyond 70m depth is another option for enhancing tuna production, especially of *E. affinis, A. thazard, A. rochei* and *T. tonggol* in the area.

(12) Small purse seiners (OAL 11.5–13.5 m) land good quantity of tunas from shelf waters. A regulated purse seine fishery for tuna along the southwest coast of India should yield good results. It is felt that when the harbour facilities at Vizhinjam are completed, introduction of small purse seiners may also prove economical.

COMPARATIVE ECONOMIC EFFICIENCY OF SAIL BOATS OPERATING DIFFERENT GEARS IN TAMIL NADU

R. Sathiadhas

Central Marine Fisheries Research Institute, Cochin - 682 031

Introduction

The present study was carried out in Tuticorin region of Tamil Nadu. The main objectives of the study were (i) to identify the present status of the utilization of wind energy for fishing operations (ii) to compare the costs and returns of traditional fishing practices and (iii) to determine how far the utilization of wind energy in nearshore trawling is economically viable as compared to other existing practices.

Data and methodology

A pilot survey was carried out in fishing villages extending from Veerapandiyanpattinam in the south to Vembar in north of Tuticorin region to find out the present status of utilization of wind energy by sail boats for fishing operations and to identify the centres for indepth study. Based on this information, two centres namely Therespuram and Tuticorin South were selected and three types of craft-gear combinations were identified for continuous observation. They were (i) plank-built sail boats operating mini trawl nets *(thallumadi)* by wind energy, (ii) plank-built boats operating gill nets *(kolavalai)* by wind energy and (iii) plank-built boats with inboard (I.B.) engines operating gill nets *(kolavalai)*. Three seasons identified for the purpose of data collection and referred in text are September-December, 1986 as season I, January–April, 1987 as season II and May–August, 1987 as season III.

Craft and gear combinations along Tuticorin coast

Catamarans and plank-built boats are operating different types of nets throughout the year depending on seasonality of fish along Tuticorin coast. Gill nets, drift and bottom-set gill nets are the prominent gears used by the non-mechanised crafts. Specifically *chalavalai* or *kolavalai, valavalai* or *podivalai, paruvalai* (gill net) *sinkiralvalai, thirukkaivalai* (bottom-set gill net) and *thallumadi* (disco net) are widely used by sail boats in this region.

Among the bottom-set gill nets *sinkiralvalai* and *thirukkaivalai* are widely used for fishing operations by sail boats in Tuticorin region.

The *karavalai* (shore-seines), *ralvalai* (Prawn net) and *madivalai* (Bag net) are the nets almost gone out from the field. Pallavali, Harbour point, Alangarathattu and Vembar are the prominent centres operating *karavalai*. Most of the people operating this type of net belong to Vembar.

In recent years *thallumadi* and disco net are the two fishing gears introduced by fishermen with the intention of catching more prawns in this region. *Thallumadi* is operated by the sail boats in the near shore areas within 5 m depth and disco net by boats fitted with inboard engines in deeper waters of 6 to 15 m depth range. *Thallumadi* is a modified shrimp trawl operated by mechanised boats also without otter board. It is operated throughout the year in Tuticorin area either towards north or south depending on the direction and intensity of wind. The initial cost of a *thallumadi* is about Rs. 1,500.

Disco nets are operated in Tuticorin region during the prawn season of June to September.

Operational costs and returns

Operational costs of fishing units composed of repairing and maintenance, fuel, wages, auction and other day-to-day expenses for carrying out fishing operations. The gross income of a unit is the total value received for different species of fish caught in the unit. Net operating income is obtained by substracting operating costs from gross income.

Sail boat operating trawl net (thallumadi): The season-wise break up of operational costs and returns of a sail boat, operating trawl net *(thallumadi)* at Threspuram centre during September, 1986 to August, 1987 is given in Table 1.

The actual number of fishing days for *thallumadi* units are 93 for season I, 85 for season II and 102 for season III. The operational costs in each season range from Rs. 4,097 to 12,246. Labour cost is the major operational expenditure accounting 81% for season I, 77% for season II and 82% for season III. Sharing

Table 1. *Operational costs and returns of a sail boat operating trawl net* (thallumadi) *at Tuticorin*, 1986–'87

Items	Sep.–Dec.		Jan.–Apr.		May–Aug.		Annual	
	Total	Average per day	Total	Average per day	Total	Average per day	Total	Average per day
I. Operational costs (Rs.)								
i) Repairing & maintenance								
a) craft	560	6	340	4	510	5	1,410	5
b) gears	284	3	170	2	316	3	770	3
c) sails	185	2	90	1	200	2	475	2
ii) Wages	7,998	86	3,145	37	9,996	98	21,139	75
iii) Auction charges	651	7	260	3	918	9	1,829	7
iv) Other expenses	200	2	92	1	306	3	598	2
Total	9,878	106	4,097	48	12,246	120	26,221	94
II. Returns (Quantity caught (Q) in kg and Value realised (V) in Rs.)								
i) Penaeid prawns Q:	595	6.4	248	2.9	581	5.7	1,424	5
V:	11,904	128	4,633	55	16,320	160	32,857	117
ii) Crabs Q:	150	1.6	80	1	50	0.5	280	1
V:	670	7	330	4	230	2	1,230	4
iii) Silverbellies Q:	190	2	187	2	40	0.4	417	2
V:	558	6	468	6	80	1	1,106	4
iv) Others Q:	140	1.5	147	2	60	0.6	347	1
V:	326	4	442	5	180	2	948	4
III. Total catch (kg)	1,075	11.5	662	7.9	731	7.2	2,468	9
IV. Gross revenue (Rs.)	13,458	145	5,873	69	16,810	165	36,141	129
V. Net operating income (Rs.)	3,580	39	1,776	21	4,564	45	9,920	35

system is followed for payment to the crew. They are paid 60% of the gross revenue to be equally divided among themselves. However, the study reveals that it is not strictly followed for all seasons. Labourers are getting lesser share during the lean season (January–April). The auction charges also depend on the gross returns. The auctioneers collect 4 to 6% of the gross returns as their commission. The auction charges range from 6 to 7% of operating costs for different seasons. Repairing and maintenance charges of craft, gears and sails of *thallumadi* units range from 8 to 15% of the operational expenditure. As a whole the average daily operational cost of a *thallumadi* unit ranges from Rs. 48 for season II to Rs. 120 for season III.

Penaeid prawns, crabs, silverbellies, carangids, sciaenids and *Epinephelus* spp. are caught by *thallumadi* units. The catches of penaeid prawns constitute *Penaeus semisulcatus, P. indicus* and *Metapenaeus dobsoni*. Comparatively lesser quantity of penaeid prawns was caught during the season II. The catch per season varies from 0.66 to 1.07 tonnes by a *thallumadi* unit. Penaeid prawns accounted for 55% of total catch during season I, 37% in season II and 79% in season III. It may be noted that 60% of the prawn catches was comprised of *M. dobsoni* and small sizes of *P. indicus* and *P. semisulcatus*. Silverbellies contributed 6–28%, crabs 7–14% and other varieties like carangids, sciaenids, *Epinephelus* spp. and *Hilsa toli* 8–22% of catches for different seasons. As a whole the daily catch of a *thallumadi* unit ranges from 7.2 to 11.5 kg for the three seasons.

The gross revenue realised for the *thallumadi* unit during September-December, 1986 was Rs. 13,458 with an average of Rs. 145 per fishing day. The value realised from the sales of penaeid prawns alone ranged from 79 to 97% of the gross revenue for the three seasons. The non-availability of prawns during January–April period in the nearshore areas led to the decline of gross revenue to the lowest level of Rs. 5,873 with an average of Rs. 69 per day of operation. Maximum gross revenue per unit was obtained during May–August, 1987 with Rs. 16,320

Table 2. *Operational costs and returns of a sail boat operating gill nets at Tuticorin,* 1986-'87

Items		Sep.–Dec. Total	Sep.–Dec. Average per day	Jan.–Apr. Total	Jan.–Apr. Average per day	May–Aug. Total	May–Aug. Average per day	Annual Total	Annual Average per day
I. Operational costs (Rs.)									
i) Repairing and maintenance									
a) craft		480	5	720	8	430	5	1,630	6
b) gears		670	7	685	7	600	7	1,955	7
c) sails		85	1	98	1	80	1	263	1
ii) Food		776	8	1,740	19	1,170	13	3,686	13
iii) Wages		5,722	59	10,262	112	7,644	87	23,678	86
iv) Auction charges		970	10	1,380	15	1,056	12	3,406	12
v) Other expenses		290	3	185	2	350	4	825	3
Total		9,043	93	15,070	164	11,320	129	35,443	128
II. *Returns* (Q - quantity caught in kg and V-Value realised in Rs.)									
i) *Sardinella gibbosa*	Q:	4,559	47	4,048	44	3,960	45	12,567	45
	V:	10 088	104	15,364	167	15,400	175	40,852	148
ii) *Sardinella albella*	Q:	194	2	—	—	176	2	370	1
	V:	291	3	—	—	352	4	643	2
iii) *Sardinella sirm*	Q:	—	—	828	9	—	—	828	3
	V:	—	—	4,784	52	—	—	4,784	17
iv) *Thryssa* spp.	Q:	1,067	11	2,024	22	880	10	3,971	15
	V:	1,164	12	3,036	33	1,144	13	5,344	19
v) *Ilisha* sp.	Q:	970	10	—	—	176	2	1,146	4
	V:	970	10	—	—	264	3	1,234	5
vi) Others	Q:	485	5	276	3	352	4	1,113	4
	V:	1,067	11	644	7	704	8	2,415	9
III. Total catch (kg)		7,275	75	7,176	78	5,544	63	19,995	72
IV. Gross revenue (Rs.)		13,580	140	23,828	259	17,864	203	55,272	200
V. Net operating income (Rs.)		4,537	47	8,758	95	6,544	74	19,829	72

for season as a whole and Rs. 165 per operating day. Although the catches of prawns were comparatively less than those of season I, composition of bigger sized prawns coupled with higher price led to maximum revenue during this season.

The net operating income (income after deducting operating cost from gross revenue) ranged from Rs. 21 per day during January–April to Rs. 45 per day during May–August, 1987. The number of average annual fishing days for a *thallumadi* unit was found to be 280 with daily gross earning of Rs. 129 and net operating income of Rs. 35.

Sail boat operating gill nets: The operational costs and species-wise revenue realised for a sail boat operating gill net in different seasons during 1986–'87 is given in Table 2. Number of actual fishing days for these boats are 97 for season I, 92 for season II and 88 for season III. The average operational expenditure per season ranged from Rs. 9,043 to 15,070. About 64 to 68% of the operating expenditure is incurred towards payment of wages to crew for different seasons. Normally six persons go for fishing in sail boats operating *kolavalai.* Sharing system is followed for the payment of crew wages. Expenses on food, auction charges and other day-to-day expenses are deducted

Table 3. *Operational costs and returns of a sail boat with inboard engine operating gill net at Tuticorin,* 1986-'87

Items		Sep.–Dec.		Jan.–Apr.		May–Aug.		Annual	
		Total	Average per day	Total	Average per day	Total	Average per day	Total	Average per day
I. Operational costs (Rs.)									
i) Repairing and maintenance									
a) craft and engine		908	9	1,070	11	864	9	2,842	10
b) gears		780	8	647	7	670	7	2,097	7
c) sails		200	2	185	2	180	2	565	2
ii) Fuel		2,522	25	1,949	20	2,390	25	6,861	23
iii) Wages		7,272	72	13,077	135	8,455	89	28,804	98
iv) Auction charges		909	9	1,843	19	1,140	12	3,892	13
v) Other expenses		505	5	582	6	380	4	1,467	5
Total		13,096	130	19,353	200	14,079	148	46,528	158
II. Returns (Quantity caught (Q) in kg and value realised (V) in Rs.)									
i) *Sardinella gibbosa*	Q:	4,848	48	3,007	31	5,700	60	13,555	46
	V:	11,312	112	10,282	106	15,105	159	36,699	125
ii) *Sardinella albella*	Q:	1,415	14	—	—	190	2	1,605	6
	V:	3,234	32	—	—	475	5	3,709	13
iii) *Sardinella sirm*	Q:	—	—	2,134	22	—	—	2,134	7
	V:	—	—	12,804	132	—	—	12,804	44
iv) *Thryssa* spp.	Q:	1,212	12	5,335	55	3 610	38	10,157	35
	V:	1,516	15	6,014	62	3,990	42	11,520	39
v) *Ilisha* sp.	Q:	505	5	—	—	—	—	505	2
	V:	708	7	—	—	—	—	708	2
vi) Others	Q:	605	6	388	4	475	5	1,468	5
	V:	1,311	13	776	8	1,330	14	3,417	12
III. Total catch (kg)		8,585	85	10,864	112	9,975	105	29,424	101
IV. Gross revenue (Rs.)		18,081	179	29,876	308	20,900	220	68,857	235
V. Net operating income (Rs.)		4,985	49	10,523	109	6,821	72	22,329	76

from the gross income and 50% of the remaining is paid as crew wages. Repairs and maintenance of the craft, gear and sails which range from 10 to 14% of the operational costs are entirely borne by the owner. Food expenses range from 8 to 12%, auction charges 9 to 11% and miscellaneous expenses 1 to 3%. As a whole the operating expenditure of a sail boat operating *kolavalai* ranges from Rs. 93 to 164 per day for different seasons. The wages earned by a member crew range from Rs. 10 per day during season I to Rs. 19 per day during season II.

The peak fishing season for the *kolavalai* unit is found to be January–April. Major species of fish caught in these units are *Sardinella gibbosa, S. albella, S. sirm, Thryssa* spp. and *Ilisha* sp. Some other varieties like barracudas and sharks also come in these units occasionally. The study reveals that the existence of the *kolavalai* unit mainly depends on the catches of *S. gibbosa.* About 63 to 72% of the quantity caught and 65 to 86% of the gross returns are contributed by this species. *S. albella* contributes about 3% of the catches in season I and III with 2% of the gross returns. *S. sirm* is caught

in considerable quantity during January–April and it accounts for about 12% of the catches and 20% of the revenue for this season. About 15 to 28% of the catch is contributed by *Thryssa* spp. and the value realised by it ranges from 6 to 13% of the gross revenue for different seasons. *Thryssa* spp. are available throughout the year, with the maximum quantity caught during January–April and minimum during May–August.

About 13% of the catches and 7% of value in season I and 3% catches and 2% value in season II have been contributed by *Ilisha* sp. As a whole the average price realised for the fish caught by the sail boats operating gill nets has been Rs. 2.78 per kg.

The gross revenue realised for a sail boat operating gill net during September–December, 1986 is Rs. 13,580 with an average of Rs. 140 per day. Although the maximum quantity of fish is caught during this season the gross revenue realised has been minimum due to comparatively lesser price for all the varieties. Maximum gross revenue of Rs. 23,828 is realised during season II (Rs. 259 per day) mainly due to the availability of *S. sirm* which fetches comparatively better price than the other species. Minimum catch of 5,544 kg is obtained in season III realising a gross revenue of Rs. 17,864, with an average of Rs. 203 per day of operation.

The net operating income per day of operation ranges from Rs. 47 to 95 for different seasons. There are about 277 fishing days during September, 1986 to August, 1987. The overall gross income realised per day works out at Rs. 200/- and net operating income Rs. 72/- per day.

Sail boat with inboard engine operating gill nets: The operational cost per day of fishing ranges from Rs. 130 to 200 for different seasons (Table 3). The average number of fishing days is 101 for season I, 97 for season II and 95 for season III. Wages to the crew is the major operating expenditure accounting for 56% in season I, 68% in season II and 60% in season III. Fuel cost ranges from 10 to 19% of the operating expenditure for the three seasons. Repairing and maintenance of the unit which is entirely borne by the owner ranges from 10 to 14% of the operating costs. Auction charges ranges from 7 to 9% and miscellaneous expenditure 2 to 4% of the operating expenses for different seasons.

The species composition and the peak season of mechanised boats are almost similar to that of the non-mechanised sail boats operating *kolavalai*. The catches of *S. gibbosa* constitute 57% of total catch in season I, 28% in season II and 57% in season III the values realised being 63, 34 and 72% of the gross revenue respectively. The contribution of *S. gibbosa* in catch and revenue is less in season II but considerable quantity of *S. sirm,* is caught during this season. About 20% of the catches and 43% of the gross revenue are realised by this variety in season II. Similarly the abundance of *S. albella* is restricted to season I contributing 17% of the catches and 18% of the gross revenue in these units. Although *Thryssa* spp. are available throughout the year, maximum quantity has been caught during January – April season. The contribution of this variety ranges from 14 to 49% of the catch and 8 to 20% of the gross revenue for different seasons. The fish caught in mechanised sail boats realised comparatively better prices at the landing centre. The average price realised for *S. gibbosa* ranges from Rs. 2.33 to 3.41, *S. albella* Rs. 2.20 to 2.50 and *Thryssa* spp. Rs. 1.10 to 1.27 for different seasons.

As a whole the average price realised for the fish caught in mechanised sail boats operating gill nets ranges from Rs. 2.00 to 2.75 per kg for different seasons. The free mobility due to the inboard engines and non-dependence on the direction and velocity of wind by these units lead them to reach the landing centre earlier and enable them to get better prices for their catch than the non-mechanised sail boats. But the overall average price per kg of catch received by the sail boats with inboard engines are comparatively less due to the higher contribution of less priced varieties like *Ilisha* sp. and *Thryssa* spp. than the non-mechanised sail boats.

The gross revenue obtained by a mechanised sail boat operating gill net is Rs. 18,081 for season I, Rs. 29,876 for season II and Rs. 20,900 for season III. The gross revenue per day of operation ranges from Rs. 179 to Rs. 308 for the three seasons. The net operating income works out to Rs. 4,985, 10,523 and 6,821 for season I, II and III respectively. Net operating income per day of operating ranges from Rs. 49 in season I to Rs. 109 in season II. The actual number of fishing days for the whole year comes to 293 with an average daily gross income of Rs. 235 and net operating income of Rs. 76.

Comparative economics - annual income and expenditure

The average initial investment of a sail boat operating mini trawl net *(thallumadi)* comes to about Rs. 18,000 that of sail boat operating gill net *(kolavalai)* about Rs. 27,000 and sail boat with inboard engine operating the same gill nets about Rs. 42,700 (Table 4). Since most of the observed units are old ones the present value of the craft (resale values at the time of obser-

vation) has been taken as the initial investment. The life expectancy also varied from 3 to 10 years for the observed units. Hence an average life of 5 years has been considered to work out the depreciation of crafts. With regard to sails, gear and engine the life expectancy is short as it is 2, 3 and 4 years respectively.

The boats observed are 30 to 32 footers and the average initial investment worked out to Rs. 16,000 for non-mechanised sail boats operating mini trawl nets, Rs. 17,500 for same type of boat operating gill nets and Rs. 18,200 for mechanised sail boats operating gill nets. With regard to mini trawl net *(thallumadi)* the purchase price varied from Rs. 1,300 to 1,600, the average value worked out for the selected units being Rs. 1,500. For gill nets *(kolavalai)* each boat takes 15 to 22 pieces along with them, each piece costing around Rs. 500.

Average number of *kolavalai* pieces taken for fishing by a non-mechanised sail boat is 18 and a mechanised sail boat is 20, costing Rs. 9,000 and 10,000 respectively. The purchase price of sails ranges from Rs. 350 to 650, the average being worked out to Rs. 500 for all the three categories of units observed. The purchase price of a 10 H. P. inboard engine ranges from Rs. 12,500 to 15,500, the average being Rs. 14,000.

The annual fixed cost includes the depreciation of the unit and the interest for initial investment. Depreciation is worked out under straight line method by allocating equal values every year on the basis of expected life of each type of capital asset. The interest for the initial investment is worked out at the rate of 15% per annum. The annual depreciation is worked out at Rs. 3,950 for same type of boat operating gill nets and Rs, 10,723 for mechanised sail boat operating gill nets. The interest for initial investment varies from Rs. 2,700 for non-mechansied sail boats operating *thallumadi* to Rs. 6,405 for mechanised sail boats operating gill nets. The annual fixed cost for *thallumadi* units comes to about Rs. 6,650, non-mechanised sail boats Rs. 10,800 and sail boats with inboard engines Rs. 17,128. The annual total cost for *thallumadi* works out at Rs. 32,871, of which operating costs constitutes about 80%. The average catch per boat works out at 2.5 tonnes during the year realising a gross return of Rs. 36,141. With regard to non-mechanised sail boats the annual total cost comes to about Rs. 47,619 in which about 33% is incurred towards fixed cost and the rest operating expenses. The annual average catch per boat is 19.9 tonnes obtaining a gross revenue of Rs. 55,272. The annual total cost for a sail boat with IB engine comes to about Rs. 64,256 of which fixed cost alone constitute about 27% and the rest towards operating costs. The annual catch per boat is 29.4 tonnes realising a gross revenue of Rs. 68,857. The net operating income per annum works out to Rs. 3,270, 7,653 and 4,601 for *thallumadi* units, non-mechanised sail boats and sail boats with IB engines operating gill nets respectively (Table 4).

Table 4. *Annual average costs and earnings of different fishing units at Tuticorin* (1986-'87)

No.	Items	Sail boats operating trawl nets *(thallumadi)*	Sail boats operating gill nets *(kolavalai)*	Sail boats with 1 B engine operating gill nets *(kolavalai)*
A.	Initial investment (Rs.)			
	Craft	16,000	17,500	18,200
	Engine	—	—	14,000
	Gear	1,500	9,000	10,000
	Sails	500	500	500
	Total	18,000	27,000	42,700
B.	Fixed cost (Rs.)			
	Depreciation			
	Craft (20%)	3,200	3,500	3,640
	Engine (25%)	—	—	3,500
	Gear (33.3%)	500	3000	3333
	Sail (50%)	250	250	250
	Sub total	3,950	6,750	10,723
	Interest (15%)	2,700	4,050	6,405
	Total fixed cost	6,650	10,800	17,128
C.	Operating cost (Rs.)	26,221	36,819	47,128
D.	Total cost (Rs.) (B + C)	32,871	47,619	64,256
E.	Catch (tonnes)	2.5	19.9	29.4
F.	Gross revenue (Rs.)	36,141	55,272	68,857
G.	Net operating income (F–C)	9,920	18,453	21,729
H.	Profit of the units (G-D)	3,270	7,653	4,601

Key economic indicators

To highlight the comparative economic efficiency of the selected three types of units, some of the key economic indicators estimated on the basis of costs and returns data are given in Table 5.

Table 5. *Economic indicators of efficiency* (1986-'87)

Items	Sail boats operating trawl nets *(thallumadi)*	Sail boats operating gill nets *(kolavalai)*	Sail boats with I. B engine operating gill nets *(kolavalai)*
i) *Input-output efficiency*			
a) operating ratio	0.72	0.67	0.68
b) fixed ratio	0.18	0.19	0.25
c) gross ratio	0.90	0.86	0.93
ii) *Capital efficiency*			
a) capital turnover ratio	2.00	2.05	1.61
b) rate of return to capital (%)	70	83	66
c) pay back period (years)	2.49	1.87	2.79
iii) *Labour efficiency*			
a) No. of crew required for operation	4	6	6
b) average production per man-day (kg)	2	12	17
c) value of production per man-day (Rs.)	32	33	39
d) average wages per man-day (Rs.)	19	15	17
iv) *Break even analysis*			
a) break even production (tonnes)	2.3	17.10	27.6
b) break even price (Rs.)	13.15	2.39	2.18
c) break even revenue to cover operating expenses (Rs.)	10.49	1.85	1.60
d) average price realised per kg of fish (Rs.)	14.33	2.78	2.33
v) Average annual fishing days	280	277	293
vi) Average catch per day (kg)	59	72	101
vii) Gross revenue per day (Rs.)	129	200	235
viii) Net profit per day (Rs.)	11.68	27.63	15.70
ix) Net operating income per day (Rs.)	35	72	76
x) Net income of the owner including family labour (Rs.)	54	87	93

Input-output efficiency

The operating cost ratio indicates that 72% of the gross income for *thallumadi* units, 67% of non-mechanised *kolavalai* units and 68% of mechanised *kolavalai* units were spent towards operating expenses. Similarly the fixed ratio indicates that out of every rupee earned, 18% of gross income of *thallumadi* units, 19% of non-mechanised *kolavalai* units and 25% of the mechanised *kolavalai* units were fixed expenses. Gross ratio was 90, 86 and 93% for *thallumadi*, non-mechanised and mechanised units operating gill nets respectively. It may be noted that in terms of input-output efficiency, non-mechanised sail boats operating gill nets rank first followed by *thallumadi* units and mechanised boats operating gill nets.

Capital efficiency

Capital turn over ratio works out at 200% for *thallumadi* units, 205% for non-mechanised boats operating gill nets and 161% for mechanised boats operating gill nets. This ratio is used to measure the rate at which income is generated by capital investment. Rate of return to capital is found to be 70% for *thallumadi* units, 83% for non-mechanised sail boats and 66% for mechanised sail boats, both operating gill nets. Considering the opportunity cost of capital as 15%, the investment on all the three types of units are found to be profitable. However, maximum advantage is observed for non-mechanised sail boats followed by *thallumadi* and minimum for mechanised units. The pay back period is 2.5 years for *thallumadi* units 1.9 years for non-mechanised boats and 2.8 years for mechanised boats, both operating gill nets.

Labour efficiency

Average production per man-day in terms of quantity is worked out at 2 kg for *thallumadi* units, 12 kg for non-mechanised boats operating gill nets and 17 kg for mechanised boats operating gill nets, the value

received being Rs. 32, 33 and 39 respectively. The average wages received per day of operation by the labourers worked out at Rs. 19, 15 and 17 for these three types of units respectively. Although a minimum of Rs. 15 is received as wages by the labourers of non-mechanised sail boats, they are getting an additional food allowance of Rs. 2 to 3 per operating day which in the case of other type of units is included in their wages.

Break even analysis

Break even production based on the prevailing market price and catch composition is worked out at 2.3 tonnes per annum for *thallumadi* units, 17.1 tonnes for non-mechanised sail boats and 27.6 tonnes for mechanised sail boats as against the actual catch of 2.5, 19.9 and 29.4 tonnes by these units respectively.

Break even cost at the existing level of production worked out at Rs. 13.2, 2.4 and 2.2 per kg for *thallumadi* units, non-mechanised sail boats and mechanised sail boats respectively, the actual price realised by these units being Rs. 14.3, 2.8 and 2.3 respectively.

In the short run the unit can operate as long as its operating costs are covered. The fixed costs have to be incurred even if fishing operations are not carried out. Hence the break even cost per kg of fish to cover operating expenses is also worked out for all the three types of units. It is found to be Rs. 10.5 per kg for *thallumadi* units, Rs. 1.8 per kg for non-mechanised sail boats and Rs. 1.6 per kg for mechanised sail boats.

The average catch per day of a *thallumadi* unit is only about 9 kg. But about 40% of the penaeid prawns caught in this net fetches good prices due to its export demand. Further the investment required for this unit is also comparatively less than the other type of units. But it is feared that more than 30% of its catches comprise juvenile prawns which do not appear to be a good trend for the shrimp fishery of this region in the long run.

Summary and conclusion

A preliminary investigation in Tuticorin region indicates that *chalavalai, valavalai, paruvalai, thirukkai-valai, sinkiralvalai, thallumadi* and hooks and line, are the prominant gears operated by sail boats. During the last few years, the traditional gears like *madivalai* and *ralvalai* have gone completely out of operation and the utilization of shore-seines declined drastically. The emerging new gears in recent years in this area are *thallumadi* and disco nets.

The peak season for the *thallumadi* units is found to be May–August and for gill net unit January–April. About 47% of annual gross revenue of *thallumadi* unit is generated during May-August period and 43% each of non-mechanised and mechanised units operating gill nets are generated during January–April period.

There is not much variation in the actual number of fishing days between different types of units. The number of annual fishing days for *thallumadi* units is 280, for non-mechanised sail boats operating gill nets 277 and mechanised sail boats operating gill nets 293. The minimum number of fishing days is observed for *thallumadi* units during January–April and for non-mechanised and mechanised sail boats during May–August period.

The average operational expenditure per day of fishing of a *thallumadi* unit works out at Rs. 94 per day. Wages to the crew form 77 to 82% of the operational costs in different seasons. For non-mechanised sail boats operating gill nets the operational cost per day is Rs. 128 of which labour charges alone ranges from 64 to 68% for different seasons. Average operational expenditure per day for mechanised sail boats operating gill nets worked out at Rs. 158, the share of labour ranges from 56 to 68%for different seasons.

Average initial investment of a sail boat operating *thallumadi* comes about Rs. 18,000, non-mechanised sail boat operating gill net comes about Rs. 27,000 and sail boat with inboard engine operating gill nets comes about Rs. 42,700. The annual total cost comes about 32,871 for *thallumadi* units, Rs. 47,619 for non-mechanised sail boat operating gill nets and Rs. 55,272 for sail boat with inboard engine operating gill nets.

Annual average catch per *thallumadi* unit works out at 2.5 tonnes, non-mechanised sail boats operating gill nets 19.9 tonnes and sail boats with inboard engines operating gill nets 29.4 tonnes generating a gross income of Rs. 36,141, 55,272 and 64,256 respectively. The net operating income per annum works out at Rs. 9,920 for *thallumadi* units, Rs. 19,829 for non-mechanised sail boats operating gill nets and Rs. 22,329 for sail boats with inboard engines operating gill nets, the same per day being Rs. 35, 72 and 76 respectively.

Net profit earned per annum works out at Rs. 3,270 for *thallumadi* units, Rs. 7,653 for non-mechanised sail boats operatng gill nets and Rs. 4,601 for sail boats with inboard engines operating gill nets, the same being Rs. 11.68, 27.63 and 15.70 per day respectively.

The study indicates that out of each rupee earned, 90 paise for *thallumadi* units, 86 paise for non-mechanised sail boats operating gill nets and 93 paise for sail boats with inboard engines operating gill nets accounted for cost of production, the share of operating expenses alone being 72, 67 and 68 paise respectively.

The capital turn over ratio for these three types of units indicated that each rupee invested generated an annual turn over of Rs. 2.00 for *thallumadi* units, Rs. 2.05 for non-mechanised sail boats operating gill nets and Rs. 1.61 for sail boats with inboard engines operating gill nets. Rate of return to capital is found to be 70, 83 and 63% for these units respectively. The pay back period is 2.5 years for *thallumadi* units, 1.9 years for non-mechanised boats operating gill nets and 2.8 years for sail boats with inboard engines operating gill nets.

Average production per man-day worked out at 2 kg for *thallumadi* units, 12 kg for non-mechanised sail boats operating gill nets and 17 kg for sail boats with inboard engines operating gill nets, the value realised being Rs. 32, 33 and 39 respectively. The average daily wages received by these labourers are Rs. 19, 15 and 17 for these units enabling them to earn an annual income of Rs. 5,320, 4,155 and 4,981.

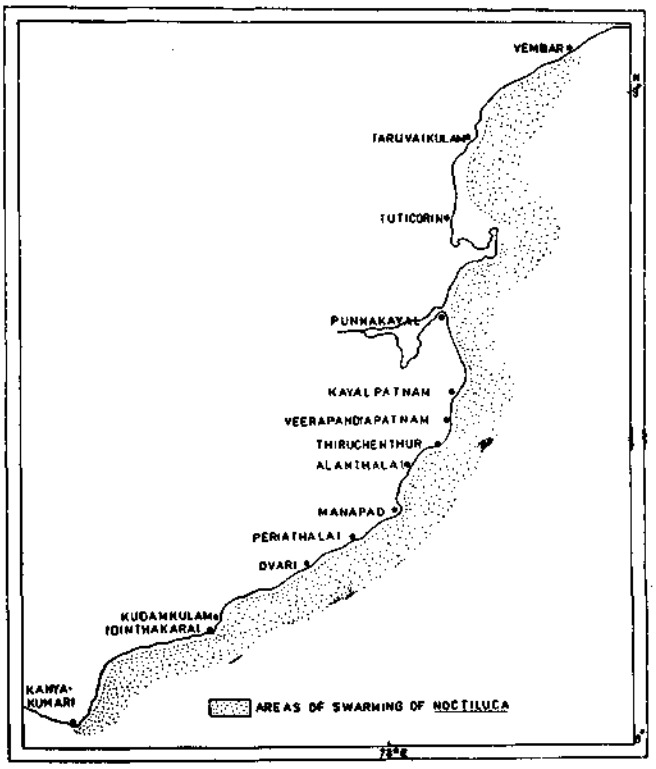
The cost of production per kg of fish worked out at Rs. 13.2 for *thallumadi* units, Rs. 2.4 for non-mechanised sail boats operating gill nets and Rs. 2.2 for sail boats with inboard engines operating gill nets and the average value realised per kg being Rs. 14.3, 2.8 and 2.3 for these units respectively.

Based on the key economic indicators, non-mechanised sail boats operating gill nets are found to be economically more efficient than the other two types of units. Among the non-mechanised boats operating *thallumadi* and mechanised boats operating gill nets, the former is found to be more efficient in terms of production, capital and labour efficiencies. But in terms of number of fishing days, level of income generated and net operating income of the owner, mechanised units are found to be better.

'GLOWING SEA' PHENOMENON DUE TO THE SWARMING OF *NOCTILUCA MILIARIS* ON THE SOUTHEAST COAST*

During October, 1988, a phenomenon of 'glowing sea' was observed in the night hours in the inshore area off Tuticorin and nearshore areas of Kayalpatnam, Thiruchendur, Manapad, Idinthakarai and upto Kanyakumari. The coastal people of these areas felt anxiety about this phenomenon and the 'glowing sea' condition was the talk of the villagers. Based on the newspaper reports, a visit was made to these places and collected water samples during night hours. On examination of the water samples, it was found that the dominance of the plankton, *Noctiluca miliaris* (a toxic dinoflagellate which is microscopic, baloon-like and green in colour) was responsible for the 'glowing sea' condition of the sea water. Since *Noctiluca* has the ability of producing phosphorescence or bioluminescence, the whole area became illuminated and this caused anxiety among the local people.

The blooming of *Noctiluca* is common along the coasts of India and they cause the 'red tide' in the inshore waters. However, the present observations of *Noctiluca* showed no 'red tide' since the organisms were green in colour due to the harbouring of green flagellates on *Noctiluca*.



* Reported by C.P. Gopinathan, Pon. Siraimeetan, J.X. Rodrigo and M. Selvaraj, Tuticorin Research Centre of CMFRI, Tuticorin.

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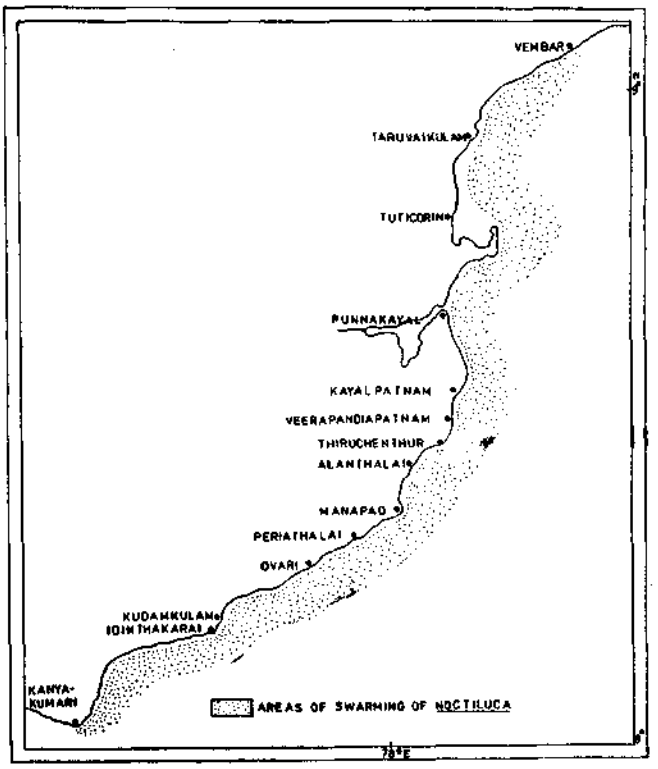
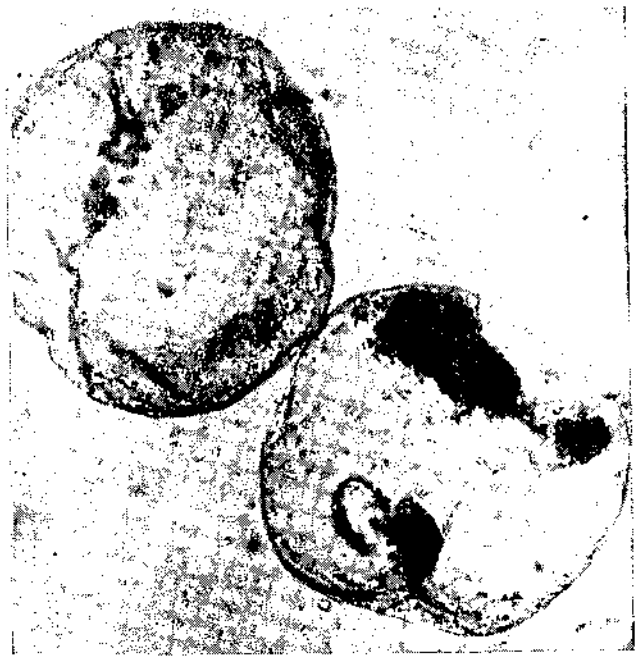


* Reported by C.P. Gopinathan, Pon. Siraimeetan, J.X. Rodrigo and M. Selvaraj, Tuticorin Research Centre of CMFRI, Tuticorin.

The 'glowing sea' was first recorded on 12th October, 1988, based on plankton samples collected from the inshore area of Tuticorin. Since the water current was having a southward drift, these organisms also moved to the south. On 31st October the nearshore waters between Kayalpatnam and Thiruchendur became illuminated. This was the first time in recent years such a phenomenon was observed here.



Noctiluca miliaris the toxic dinoflagellate responsible for the 'glowing sea' phenomenon.

The hydrological conditions indicated normal features with salinity of water 34 ppt, pH 8.2, temperature 25.5°C and dissolved oxygen content 4.2 ml/1. The concentration of *Noctiluca* was 10,000 cells/ml during the middle of October, while the samples of 5th of November showed less than 100 cells/ml. The samples of 11th of November showed the total absence of *Noctiluca* from the nearshore samples.

It has been reported earlier that there was significant reduction in the diatom population, when there was blooming of *Noctiluca;* the level being reduced almost to nil. Similar situation was observed in the present samples collected from Kayalpatnam and Thiruchendur areas. Practically no other phytoplankton organisms could be seen in the water. A few larvae of copepods, decapods and lucifers were present. The local fishermen could not get any fish catches during the two weeks of *Noctiluca* bloom. It is evident from this that high abundance of *Noctiluca* was responsible for the situation. Demersal forms such as crabs and eels were the only organisms fished from these areas during the period. It is assumed that the rapid reduction of diatom population might have seriously affected the other grazers, particularly the copepods and in turn the pelagic fishes.

THE IMPACT OF CYCLONE ALONG THE WEST BENGAL COAST IN NOVEMBER '88*

A severe cyclonic storm with a velocity of 250 km/hr swept through the coastal districts of 24 Parganas and Midnapur in the midnight of 29th November, 1988 which caused extensive damage to public and private properties. The cyclone played havoc with the crops like coconut, paddy and banana. Thousands of trees were uprooted and communication was totally disrupted. It was reported that, at least 245 people died in 24 Parganas. Maximum number of death occurred at Gasaba, Basanthi and Canning in the district of 24 Parganas. The loss of crops, livestocks and fisheries amounted to Rs. 8,00,000. Three mechanised boats along with 37 crew members were missing from Kalisthan.

Social impact

Fishermen who get advances from traders usually repay during the fishing season but due to cyclone and the consequent dislocations they were not able to do this in 1989. Besides, these fishermen had taken advances for repairing their boats and huts which also they could not return.

Relief and rehabilitation measures

Government of West Bengal arranged relief work promptly. Affected fishermen were given money and material in the form of craft and gear. Bamboos and hogla were supplied to them for the reconstruction of their huts. Essentials like clothes, blankets and food were supplied by Amarabati Grampanchayat.

* Reported by P. B. Dey and S. S. Dan, Field Centre of CMFRI, Contai, West Bengal.

Table 1. *Extent of damage due to cyclone*

Sl. No.	Name of Place	No. of persons affected	No. of persons missed (fisher-men)	Nets damaged		Boats damaged				Dry fish lost		Boats missed (mech. & non-mech.)		Nets lost		Fishermen's shed destroyed		Total
						Mech.		Non-mech.		Kg.	Rs.							
				No.	Amount	No.	Amount	No.	Amount			No.	Amount	No.	Amount	No.	Amount	Rs.
1.	Bakkhali (Canal)	30	—	1GN	250	1	800	—	—	400	2,000	—	—	—	—	10	5,000	8,050
2.	Bakkhali (stand)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.	Frazergunj	200	—	4GN 38BN	1,200 600	—	—	1	300	2,000	10,000	—	—	—	—	25	30,000	42,100
4.	Kalisthan	300	20	8BN	1,600	—	—	4	1,200	4,000	20,000	2 (mech.)	60,000	4	8,000	40	80,000	1,70,800
5.	Kaylaghata	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6.	Namkhana	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7.	Kakdwip	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8.	Beguakhali	250	—	7BN	1,400	—	—	6	1,800	3,000	15,000	—	—	—	—	30	45,000	63,200
9.	Zamboo	400	25	15BN	4,500	5	5,000	—	—	9,000	45,000	2 (mech.)	80,000	3	6,000	50	10,000	1,50,500
10.	Raydighi	—	2	1GN	3,000	1	8,000	—	—	—	—	—	—	—	—	—	—	11,000
11.	Diamond Harbour	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12.	Junput	400	—	20BN	4,000	1	3,000	4	800	2,000	10,000	—	—	—	—	40	8,000	25,800
13.	Digha Mohana	250	—	10GN	3,000	30	15,000	—	—	—	—	—	—	—	—	20	40,000	50,000
14.	Digha	500	—	4GN	12,000	60	18,000	—	—	4,000	20,000	—	—	—	—	45	90,000	1,40,000
15.	Jaldah	—	—	63 (Small BN) 10BN	6,300 2,000	7	21,000	22	4,400	1,200	6,000	—	—	—	—	—	—	39,700
	Total	2,330	51	85	39,850	104	70,800	37	8,500	25,600	1,28,000	4	1,40,000	7	14,000	260	3,08,000	7,09,150

Remarks: 1. Bakkhali (Canal): Fishing activities at Bakkhali Canal have been reduced drastically this year as most of the fishermen who used to make Bakkhali Canal as their fishing base have shifted to Kalisthan and as a result the loss from spoilage of dry fish at Bakkhali is less compared to Kalisthan.

2. Digha: A dry fish business has been started this year at Digha beach for drying fish from trawler fishing.

GN — Gill net; BN — Big Bag net.

Damages in fishing villages

Generally the fisheries sector is one of the worst affected by the cyclone especially in the districts of 24 Parganas. Fishing villages most affected are Gasaba, Basanthi, Canning, Raydighi, Bakkhali, Kalisthan, Zamboo and Gangasagar. About 2,000 huts were blown away by the wind exposing dry fish stock worth Rs. 4,00,000/-. Loss of life and property and boat in the district of Midnapur by this cyclone was comparatively less. The extent of damage caused by the cyclone is presented in Table 1.

तिरुवनन्तपुरम के विषिञ्जम तट में तटीय ट्यूना मात्स्यकी की वर्तमान स्थिति*

प्रस्तावना

निकट के सालों में केरल के तटीय ट्यूना मात्स्यकी की वार्षिक प्राप्ति 6,000 टन है और यह सारे देश के ट्यूना स्थलन के 32 % है। 1979-81 के दौरान ट्यूना उत्पादन पर किये गये जिलावार विश्लेषण ने सूचित किया कि राज्य के कुल ट्यूना स्थलन के 70% तिरुवनन्तपुरम जिले के तटीय मात्स्यकी से प्राप्त हुई है। विषिञ्जम में साल भर मत्स्यन का काम चलता रहता है और यहाँ की पकड का लगभग 20% तटीय ट्यूना है जो कुल समुद्री मत्स्य स्थलन के 20 % है। इस क्षेत्र में वर्तमान मात्स्यकी लघु-उद्योग की प्रगति ट्यूना मात्स्यकी के विकास पर निर्भर सा लगता है इसलिये इस सेक्टर के आगे के विकास केलिये इस मात्स्यकी के वर्तमान स्थिति की जानकारी अत्यंत आवश्यक है। इसके अतिरिक्त जब विषिञ्जम में निर्माण करनेवाला मत्स्यन बंदरगाह जब प्रावृतिक होगा तब ट्यूना की यंत्रीकृत मत्स्यन बढ जायेगी। तब भी विविध स्पीशीज़ों की पकड एवं अधिक पकड मिलनेवाले ऋतुओं के बारे में जानकारी की आवश्यकता बढ जायेगी।

मत्स्यन गिअर और क्राफ्ट

ट्यूना मात्स्यकी केलिए प्रयुक्त दो मुख्य संभार है ड्रिफ्ट जाल और कांटा डोर। इन्हें कटामरैन से या ख्वात डोंगी से परिचालित करते हैं। विषिञ्जम में 1983 से परंपरागत क्राफ्टों का आगमन मात्स्यकी लघु-उद्योग सेक्टर में महत्वपूर्ण दीख पडा। अयंत्रसज्जित परंपरागत क्राफ्टों के प्रयोग में भारी कमी महसूस हुई। यंत्रसज्जित नौकों का मत्स्ययन क्षेत्र 20-25 कि. मी. और गहराई रेंच 60 से 80 मी. थी तो अयंत्रसज्जित नौकों का मत्स्यन क्षेत्र 20 कि. मी. और गहराई रेंच 40-50 मी. थी।

वार्षिक उत्पादन

1983 में पकड 472 टन थी तो 1985 में 2037 टन। इसका वार्षिक औसत पकड 1401 टन थी। कुल पकड में ट्यूना मात्स्यकी का प्रतिशत 1983 में 7.3% था और 1987 में यह 21.6% तक बढी। 1984 से ट्यूना मात्स्यकी की पकड एवं पकड दर में वृद्धि स्पष्ट थी।

* बी. गोपकुमार और पी. एस. सदाशिव शर्मा केन्द्रीय समुद्री मात्स्यकी अनुसंधान संस्थान के विषिञ्जम अनुसंधान केन्द्र

ट्यूना मात्स्यिकी की मौसमी पकड

ट्यूना मात्स्यकी की औसत मासिक पकड फरवरी और अक्तूबर में यथाक्रम 70.0 टन और 230.4 टन थी। मासिक औसत पकड 116.8 टन दिखायी पडी। प्रतियात्रा पर कैच फरवरी और अक्तूबर में 9.9 कि. ग्रा. से 22.8 कि. ग्रा. था। मई और सितंबर-नवंबर अवधि ट्यूना मात्स्यकी का अच्छा मत्स्यन मौसम था।

विविध गिअरों से प्राप्त उत्पादन

जैसा विदित है ड्रिफ्ट नेट और कांटे डोर प्रचालन सिर्फ ट्यूना पकड केलिये ही नही अन्य मछली पकडने केलिये भी किया करता है। मोटोर घटित नौकों में दोनों कांटे डोर और ड्रिफ्ट जाल प्रचालन द्वारा प्राप्त मछली का यथाक्रम 53.5% और 39.1% ट्यूना थी।

अयंत्र घटित और यंत्र घटित परंपरागत नौकों के द्वारा ट्यूना पकड में 1984 से व्यतियान स्पष्ट होने लगा। 1983 से 87 तक की अवधि में यंत्र घटित नौकों से प्रचालित कांटा डोर, ड्रिफ्ट जाल आदि के ज़रिए यथाक्रम 46.8% और 33.1% पकड मिली। इस अवधि में अयंत्र घटित नौकों के ज़रिए प्राप्त पकड यथाक्रम 10.6% और 9.5% थी।

(क) ड्रिफ्ट जाल

यंत्र घटित एवं अयंत्र घटित दोनों नौकों से ड्रिफ्ट जाल प्रचालन किया जाता है। 1983-87 में अयंत्र घटित नौकों से प्रचालित ड्रिफ्ट जालों से ट्यूना की कम पकड मिली थी। जुलाई - अगस्त के अलावा अन्य सभी महीनों में इसका प्रचालन हुआ और अप्रिल-मई और अक्तूबर-नवंबर में प्रचालन तीव्र था। अप्रिल-जून और सितंबर-नवंबर में तुलनात्मक दृष्टि से ट्यूना की अच्छी पकड और अच्छी पकड दर मिली। अयंत्र घटित नौकों से प्रचालित ड्रिफ्ट जालों से ट्यूना की पकड केलिए मई अच्छा महीना ठहरा।

यंत्र घटित नौकों से ड्रिफ्ट जालों का प्रचालन 1985 से प्रबल हुआ। वार्षिक प्रयास 1983 में 2,590 एकक था तो 1987 में 27,058 एकक बन गया। वार्षिक ट्यूना पकड 1983 में मिली 102.8 टन से 1987 में 779.3 टन तक पहुँच गयी। यंत्र घटित नौकों से प्रचालित ड्रिफ्ट जालों के ज़रिए प्राप्त पकड अयंत्र घटित नौकों से प्राप्त पकड की दुगुनी थी। ट्यूना का अधिकतम पकड मई-जून और सितंबर-अक्तूबर के दौरान प्राप्त हुई। 1987 के पहले ड्रिफ्ट जालों का प्रचालन दक्षिण-पश्चिम

मानसून महीनों में अतः जुलाई-अगस्त में नहीं किया करता था। लेकिन 1987 में इन महीनों में ड्रिफ्ट जाल प्रचालन से काफी अच्छी पकड और पकड दर मिली।

(ख) कांटा डोर

अयंत्र घटित नौकों से कांटा डोर प्रचालन का वार्षिक प्रयास में 1984 के 1,37,439 एकक से 1987 में 8,540 एकक हो गया। ट्यूना पकड में भी कमी दीख पडी। लेकिन मत्स्यन प्रयास कम होते हुए भी पकड दर में वृद्धि दीख पडी।

यंत्र घटित नौकों से कांटा डोर प्रचालन 1985 से प्रबल हुआ। इसके ज़रिए वार्षिक प्रयास 1983 के 5,124 एकक से 1987 में 39,873 एकक तक बढा। यहाँ भी अयंत्र घटित एककों की तुलना में यंत्र घटित एककों की पकड में भारी वृद्धि दिखायी पडी। इस एकक का अधिकतम प्रयास जुलाइ-दिसंबर के दौरान और अधिकतम ट्यूना पकड अक्तूबर-नवंबर के दौरान हुई।

स्पीशीज़ मिश्रण

मात्स्यिकी में ट्यूना के सात स्पीशीज़ प्राप्त हुये। पकड में बुलेट ट्यूना, और ऑक्सिस रोचेई (45.3%) मुख्य थे। छोटी टनी और यूथिन्नस एफिनिस (34.5%), ऑक्सिस ताज़ाड (10.2%), साडा अरियन्टालिस (5.5%), थून्नस टोनगोल (2.5%), टी. अलबाकेरेस (1.5%) और काट्सुवोनस पेलामिस (0.5%) आदि अन्य स्पीशीज़ थे।

स्पीशीज़ों के गीअर-वाईस प्रचुरता

यंत्र घटित और अयंत्र घटित नौकों से प्रचालित ड्रिफ्ट जालों के ज़रिए प्राप्त पकड में ई. अफिनिस मुख्य था और इसके बाद आया था ए. थाज़ाड। यंत्र घटित और अयंत्र घटित नौकों से प्रचालित कांटा डोर के ज़रिए प्राप्त पकड में मुख्य ए. रोचेई था और इसके पीछे था ई. अफिनिस। यहाँ उल्लेखनीय बात यह है कि यंत्र घटित नौकों से प्रचालित कांटा डोर से प्राप्त ए. रोचेई कुल पकड के 74% था।

ड्रिफ्ट जाल (अयंत्र घटित नौका) में मई और अक्तूबर के दौरान ई. अफिनिस अप्रिल में ए. थासाड और ए. रोचेई और सितंबर-अक्तूबर में एस. ओरियन्टालस की प्रचुरता दिखायी पडी। अयंत्र घटित नौकों से प्रचालित कांटा डोर में ई. अफिनिस अप्रिल में और ए. रेचेई अप्रिल-मई में अधिक मात्रा में पकडी गयी। यंत्र घटित नौकों से प्रचालित वही गीअर के जरीए मार्च, मई और नवंबर में ई. अफिनिस, मार्च में ए. थासार्ड और मई में और जुलाई से दिसंबर तक ए. रोचेई की काफी अच्छी पकड मिली।

स्पीशीज़ों की मौसमी प्रचुरता

ई. अफिनिस की पकड केलिए प्रसिद्ध मौसम अप्रिल-जन और सितंबर-नवंबर तथा उच्च स्थलन प्राप्त महीने मई और अक्तूबर थे। ए. थसार्ड का मत्स्यन मौसम फरवरी-अप्रिल था और उच्च पकड प्राप्त महीना मई थी। मई और जुलाई से दिसंबर तक की अवधि ए. रोचेई के मत्स्यन केलिए अनुकूल थी। इसकी उच्चतम पकड अक्तूबर में प्राप्त हुई। एस. ओरियन्टालिस की पकड मई से अक्तूबर तक काफी अच्छी थी। सितंबर में सबसे अधिक पकड मिली थी। टी. अलबाकरेस केलिए जनवरी और अक्तूबर, टी. टोनगोल केलिए जून, अक्तूबर और नवंबर और के पेलामिस केलिए जनवरी और अक्तूबर अच्छे महीने थे।

परंपरागत नौकों में मोटोरों का प्रयोग

विषिज्जम में ट्यूना पकड एवं पकड दर में 1983 से हुई प्रगति यंत्रीकृत मत्स्यन का परिणत फल है। ट्यूना पकड में 1984 से अभिलेखित वृद्धि का मुख्य कारण मोटोर सज्जित एककों की पकड एवं पकड दर है। मोटोर सज्जित नौकों से प्रचालित्त ड्रिफ्ट जालों के ज़रिए ट्यूना पकड दर 29.0 कि. ग्रा. था जब कि मोटोरों के बिना नौकों से प्राप्त पकड दर था सिर्फ 15.5 कि. ग्रा. कांटा डोर प्रचालन में भी यही फर्क दिखायी पडी। मोटोरैसेशन की दूसरी मुख्य विशेषता स्पीशीज़ों की प्रचुरता में आये अन्तर है। मोटोरों के प्रयोग के बाद ई. अफिनिस जो पहले ज्यादा मिलते थे उसके स्थान पर ए. रोचेई अधिकाधिक मात्रा में पकडने लगे।

निर्णय और सिफारिशें

1) ट्यूना की पकड और पकड दर में 1984 से भारी वृद्धि महसूस हुई। अध्ययन के समय ट्यूना की वार्षिक पकड 1401 टन थी जो इस क्षेत्र के कुल मत्स्य पकड का 17.2% था।

2) ट्यूना मत्स्यन केलिए सब से अनुयोज्य महीने मई और सितंबर-नवंबर थे।

3) परंपरागत नौकों में मोटोरों के प्रयोग से ट्यूना की पकड एवं पकड दर में वृद्धी हुई।

4) 1987 के जुलाई-अगस्त, महीनों में किये गये ड्रिफ्ट नेट, प्रचालन से अच्छी पकड और पकड दर मिली।

5) पहले के अधिक प्रचुर स्पीशीज आक्सी रोचेई था। ड्रिफ्ट जाल में ई. अफिनिस की प्रमुखता थी तो कांटा डोर में ए. रोचेई मुख्य था।

6) मई और अक्तूबर में ई. अफिनिस की प्राप्यता काफी थी। ए. थासार्ड केलिए मई, ए. रोचेई केलिए अक्तूबर और एस. अरियन्टालिस केलिए सितंबर अच्छे महीने थे।

7) मोटोरों के प्रयोग के बाद ए. रोचेई केलिए नया मत्स्य क्षेत्र निर्धारित किया गया।

8) साल भर के ट्यूना पकड एवं पकड दर और मोटोर सज्जित परंपरागत नौकों के ज़रिए ट्यूना की बढती प्राप्ति से ऐसा महसूस होता है कि ट्यूना मत्स्यन के क्षेत्र, में विकास की गौकायें हैं।

9) भारत में ट्यूना मात्स्यकी विकास की मुख्य आवश्यकता लघु मात्स्यकी सेक्टर का विकास होगा। इस संदर्भ में विषिज्जम में लघु मात्स्यकी सेक्टर में मोटोरों के प्रयोग से प्राप्त बढती पकड मात्स्यक विकास अभिकरणों केलिए प्रोत्साहजनक है।

10) पाब्लो टाइप बोटों की प्रस्तुति द्वारा ड्रिफ्ट जाल मात्स्यिकी में जो विविधता आयी है इस पर तत्काल ध्यान देना आवश्यक है। पाब्लो बोटों के साथ ड्रिफ्ट जाल मत्स्यन पर चलाये अध्ययन से यह ज्ञात हुआ कि ट्यूना के अतिरिक्त सुरमई, सुरा, करैन्जिडस, पॉम्फ्रेट्स और शिंगटी आदि अच्छा दाम मिलनेवाली अन्य वेलापवर्ती मछली भी उप-पकड के रूप में प्राप्त होती हैं।

11) इस क्षेत्र में ट्यूना उत्पादन, विशेषतः ई. अफिनिस, ए. थासार्ड, ए. रोचेई और टो-टोनगोल आदि की पकड बढाने केलिए, 40 फैदम से अधिक गहराई में तलीय आनायन कांटा डोर मत्स्यन का प्रस्तुतीकरण आदि अन्य सुझाव है।

12) शेल्फ जलों से छोटे कोष संपाशों (ओएएल 11.5–13.5 मी) से ट्यूना की अच्छी मात्रा में स्थलन होता है। इसलिए भारत के दक्षिण पश्चिमी तट पर ट्यूना केलिए एक नियमित कोष संपाश मत्स्यन काफी लाभदायक सिद्ध होगा। विष्ञ्जम के बंदरगाह के निर्माण के बाद छोटे कोष संपाशों की प्रस्तुति भी लाभदायक होने की संभावना है।

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तमिलनाडु में विविध संभारों के प्रचालन करनेवाले पाल नावों की आर्थिक कार्यकुशलता का तुलनात्मक अध्ययन*

प्रस्तावना

प्रस्तुत अध्ययन तमिलनाडु के टूटिकोरिन क्षेत्र में किया गया। इसका प्रधान लक्ष्य 1. मत्स्यन केलिए वायु शक्ति की वर्तमान साध्यतायें निर्धारित करना 2. परंपरागत मत्स्यन क्रियाओं के व्यय एवं लाभ की तुलना करना और 3. निकट तट आनायन में अन्य विद्यमान रीतियों की तुलना में वायुशक्ति की आर्थिक कार्यक्षमता निर्धारित करना आदि है।

डाटा और क्रिया पद्धति

पोलनावों के ज़रिए वायु शक्ति के उपयोग की वर्तमान स्थिति निर्धारित करने और मत्स्यन क्रियाओं के गहरे अध्ययन केलिए केन्द्र निर्धारित करने केलिए दक्षिण में वीरपाण्डियपट्टनम से टूटिकोरिन क्षेत्र की उत्तर दिशा में वेम्बार तक के मत्स्यन गावों में एक मार्गदर्शी सर्वेक्षण किया गया। इस अध्ययन के आधार पर तेरेसपुरम और दक्षिण टूटिकोरिन मत्स्ययन केलिए चुना गया। निरन्तर अवलोकन केलिए तीन प्रकार के क्राफ्ट-गिअर संयोजन भी निर्धारित किया। 1. वायु शक्ति के जरिए छोटे ट्राल नेट (तल्लुमडै) का प्रचालन करनेवाला फलक निर्मित पाल नावें। 2. वायु शक्ति से गिल नेट (कोलावलै) का प्रचालन करनेवाला फलक-निर्मित नावें और 3. गिलनेट (कोलावलै) से प्रचालित फलक-निर्मित नावें।

टूटिकोरिन तट पर क्राफ्ट और गिअर संयोजनें

टूटिकोरिन तट पर साल भर मत्स्य की मौसमी सुलभता के अनुसार कटमरैन और फलक-निर्मित नावों और विविध प्रकार के जालों का प्रचालन करते हैं। क्लोम जाल अयंत्रीकृत क्राफ्टों के जरिए इस्तेमाल करनेवाले प्रमुख संभारें अपवाही जाल और क्लोम नेट (गिअर) गिलनेट आदि है। चालावलै या कोलावलै, वालावलै या पोडिवलै, पारुवलै, शिंगिरावलै, तिरुक्कैवलै और तल्लुमडै इस क्षेत्र के पाल नावों द्वारा उपयोग करनेवाले विशेष जाल हैं। तट संपाशक (करवलै), रालवलै (झींगा जाल) और मडा वलै (बैग नेट) आदि प्रायः गायब हो चुके है।

हाल में धीवरों ने अधिक झींगे पकडने केलिए तल्लुमडै और डिस्कोनेट आदि दो मत्स्यन संभारों को प्रस्तुत किया है। तल्लुमडै पालनावों के जरिए निकट नट क्षेत्र में 5 मी. गहराई के अन्दर और डिस्कोनेट 6 से 15 मी. तक की गहराई में इनबोर्ड यंत्रों से जोडकर प्रचालित करते है।

प्रचालन खर्च और आय

मत्स्यन एककों का प्रचालन खर्च में मरम्मत और अनुरक्षण, इन्धन, मछुओं का वेतन नीलाम और मत्स्यन प्रचालन का अन्य दैनिकी व्यय आदि शामिल है। एक एकक का कुल आमदनी पकडी गयी विविध जाति मत्यों केलिए प्राप्त कुल मूल्य है। शुद्ध प्रचालन आय कुल आमदनी से प्रचालन खर्च घटाने पर मिलता है।

ट्रॉलजाल का प्रचालन करनेवाला पाल नाव तल्लुमडै

तल्लुमडै एककों का वास्तविक मत्स्यन दिन मौसम 1, 2 व 3 केलिए यथाक्रम 93, 85 और 103 है। प्रचालन खर्च हर मौसम में 4,097 रुपये से 12,246 रुपये तक पहुँचता है। प्रचालन खर्च में सबसे मुख्य श्रमिकों का वेतन है। यह मौसम I, II और III में यथाक्रम 81%, 77% और 82% तक जाता है। दल के वेतन केलिए शेयरिंग प्रणाली का अनुसरण करता है। उन्हें कुल आमदनी 60% मज़दूरों के बीच समान रूप से बाँटने केलिए देता है। लेकिन अध्ययन से मालूम पडता है कि सभी मौसम में यह उतनी नियमितता से नहीं पालन करते जाते है। नीलाम खर्च भी कुल आय पर आश्रित रहता है। नीलामकार कुल आय के 4 से 6% कमीशन लेते है। कुल मिलाकर एक तल्लुमडै एकक का दैनिक प्रचालन खर्च मौसम II में 48 रुपये होते तो मौसम III में 120 रुपये तक पहूँचते हैं।

पेनीआइड झींगा, कर्कट, मुल्लन, करैन्जिडस, सीनेइडस, एपिनेफिलिस आदि तल्लुमडै एकक द्वारा पकडे जाते है। पेनिआइड झींगे की पकड में पेनीअस सेमिसुलकाटेस, पी. इन्डिकस और मेटापेनिअस डोबसोनी आदि शामिल है। मौसम I के दौरान पेनिअइड झींगे की पकड तुलनात्मक दृष्टि से कम थी। एक तल्लुमडै एकक से प्राप्त मौसमी पकड 0.66 से 1.07 टन तक होती है। मौसम I में कुल पकड में पेनीअइड झींगे का देन 55% था और मौसम II और तीन में यथाक्रम 37% और 79%। झींगे पकड के 60% एम. डोबसोनी और पी. इन्डिकेस और पी. सेमिसुलकाटेस थे। विविध मौसम में मुल्लन 6–28% कर्कट 7-14% और अन्य 8–22% प्राप्त हुये थे। तीनों मौसम में एक तल्लुमडै का दैनिक पकड 7.2 से 11.5 कि. ग्रा. तक थी। 1986 सितंबर-दिसंबर के दौरान तल्लुमडै एकक की कुल अमदनी प्रति दिन का मत्स्यन औसत 145 रुपये के साथ 13,458 रुपये थे। जनवरी-अप्रिल के दौरान झींगों की असुलभता के कारण कुल आमदनी में कमी पडी। मई-आगस्त 87 के दौरान प्रति प्रचालन दिन में 165 रुपये के साथ 16,320 रुपये क कुल आमदनी प्राप्त हुई। एक तल्लुमडै एकक का औसत वार्षिक मत्स्यन दिवस 280 और कुल अर्जन 129 रुपये और निवल प्रचालन आय 35 रुपये दीख पडे।

*आर. सत्यदास, केन्द्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान, कोचिन

गिलनेट का प्रचालन करनेवाला पाल नाव

"कोलावलै" का प्रचालन करनेवाला एक पाल नाव का प्रचालन खर्च विविध मौसम में प्रति दिन 93 रुपये से 164 रुपये तक पहुँचती है। दल के एक सदस्य की दैनिक मज़दूरी मौसम I में दस रुपये होती है तो मौसम II में 19 रुपये तक पहुँचती है।

जनवरी-अप्रैल का समय कोलावलै एकक के मत्स्यन केलिए काफी उचित दीख पडा। इस से पकडे गये मुख्य स्पीशीज़ सारडिनेला गिब्बोसा, एस. आलबेल्ला, एस. सिरम, थ्रिस्सा एस. पी. पी. और पेल्लोना एस. पी. आदि थे।

मौसम I की कुल पकड के 13% और मूल्य के 7% और मौसम II के पकड के 3% ओर मूल्य में 2% पेल्लोना एस. पी. का देन था।

गिलनेट से प्रचालन करनेवाला एक पाल नाव की कुल आमदनी सितंबर–दिसंबर, 1986 के दौरान 13,580 रुपये थी। यद्यपि इस मौसम में अधिकतर मात्रा में मछली प्राप्त होते थे फिर भी कम दाम के कारण आमदनी न्यूनतम थी। मौसम दो के दौरान अधिकतम कुल आमदनी 23,828 रुपये थी। मौसम III में 5,544 कि. ग्रा. की न्यूनतम पकड मिली। इस मौसम में कुल आमदनी 17,864 रुपये थी और औसत दैनिक प्रचालन 203 रुपये।

विविध मौसम में प्रतिदिन निवल राशी 47 रुपये से 95 रुपये तक पहुँचती थी। सितंबर 86 से अगस्त 87 तक की अवधि में लगभग 277 मत्स्यन दिवस थे। कुल आमदनी प्रतिदिन 200 रुपये और निवल प्रचालन आय प्रतिदिन 72 रुपये दीख पडी।

गिलनेट का प्रचालन करनेवाला इनबोर्ड इंजन से जुडे हुए पाल नाव

विविध मौसम में प्रतिदिन का प्रचालन खर्च 130 रुपये से 200 तक होता है। मौसम I, II और III में औसत मत्स्यन दिवस यथाक्रम 101, 97 और 95 होता है। प्रचालन खर्च में सब से अधिक भाग दलों की मज़दूरी है। इन्धन खर्च 10 से 19% तक आता है इसके अलावा मरम्मत और अनुरक्षण केलिए भी 10 से 14% तक खर्च पडता है जिसे स्वयं मालिक को ही वहन करना पडता है। नीलाम खर्च 7 से 9% तक होता है और अन्य खर्च 2 से 4% तक।

यंत्रीकृत नौकों से स्पीशीज़ मिश्रण एवं पकड का चरम मौसम कोलावलै का प्रचालन करनेवाले अयंत्रीकृत पाल नावों के समान ही है।

एक गिलनेट का प्रचालन करनेवाले यंत्रीकृत पाल नाव की कुल आमदनी मौसम I, II और III में यथाक्रम 18,081, 29,876, और 20,900 रुपये है। निवल प्रचालन आय मौसम I, II और III में यथाक्रम 4,985, 10,523 और 6,821 रुपये है। औसत दैनिक कुल आमदनी 235 रुपये और निवल प्रचालन आय 76 रुपये और साल भर की असली वास्तविक मत्स्यन दिवस 293 है।

तुलनात्मक आर्थिकि–वार्षिक आय एवं खर्च

तल्लुमडै का प्रचालन करनेवाला एक पाल नाव का औसत प्रारंभिक इनवेस्टमेन्ट 18,000 रुपये होते है तो गिलनेट प्रचालन करनेवाला पाल नाव केलिए 27,000 रुपये और इनबोर्ड इंजन के साथ वही गिलनेट प्रचालन करनेवाले पालनाव केलिए 42,700 रुपये होते है।

आर्थिक सूचकों के आधार पर गिलनेट का प्रचालन करनेवाला पाल नाव अर्थिकी की दृष्टि में सब से कार्यक्षम दीख पडी। तल्लुमडै का प्रचालन करनेवाले अयंत्रीकृत नौकों और गिलनेट प्रचालन करनेवाला यंत्रीकृत नौकों में उत्पादन, मूलधन और मज़दूर दक्षता की दृष्टी में पहला, कार्यकुशल महसूस हुआ। लेकिन मत्स्यन दिवस, आय का स्तर और मालिक के निवल प्रचालन आय आदि में यंत्रीकृत एककों का देन महत्वपूर्ण है।

दक्षिण पूर्वी तट पर नॉक्टीलूका माइलरिस के वृन्दन से हुई दीप्त समुद्र परिघटना*

टूटिकोरिन के उपतटों में और कायलपट्टनम, तिरुचेन्दूर, मनापाट, इडिन्तकरै और कन्याकुमारी के निकटस्थ तटों में 1988, अक्तूबर के दौरान रात के समय में समुद्र का दीप्त हो जाने की एक परिघटना दिखाई पडी। तटीय प्रदेश के निवासियों में यह परिघटना उत्कंठा जगा दी. अखबार रिपोर्टों के आधार पर रात के समय वैज्ञानिकों ने इन स्थलों का सन्दर्शन किया और जल का सांपिल निरीक्षण केलिये इकट्ठा किया। परीक्षण में प्लवक नाक्टीलूका माइलरिस (एक आविषालु डाइनोफ्लैजेलेटा जो मइक्रोस्कोपिक, बालून जैसा और हरे रंग के होते है) की अधिकता महसूस हुई जो इस दीप्त समुद्र का कारण साबित हुआ।

नॉक्टीलूका में स्फुरदीप्ति और जीव संदीप्ति उत्पन्न करने की शक्ति है। इसके कारण सारे समुद्र प्रकाशमान बन गया और स्थानीय लोगों में उत्कंठा फैला दिया।

भारत के तटों पर नाक्टीलूका का प्रस्फुटन सर्वसाधारण है और इससे उपतट जलों में "लाल-ज्वार" होता है। लेकिन इस बार नाक्टीलूका में हरे प्लैफ्लजेलेटे की उपस्थिति के कारण "लाल-ज्वार" नही दीख पडी।

"दीप्त समुद्र" का पहला अभिलेखन 1988, 12 अक्तूबर में टूटिकोरिन में अभिलेखित किया गया। जल प्रवाह का अपवाह दक्षिण की ओर होने के कारण इन जीवों की गति भी दक्षिण की ओर बन गई। अक्तूबर 31 को कायलपट्टनम और तिरुचेन्दूर के बीच का जल दीप्तमान बन गया। निकट के वर्षों में ऐसी परिघटना यहाँ पहली बार हुई है।

* सी. एम. एफ. आर. आइ. के टूटिकोरिन केन्द्र के पोन. सिरेंमीतन, जे. एक्स. रोढ्रगो और एम. सेल्वराज द्वारा तैयारित।

जल वैज्ञानिक स्थिति ने लवणीयता, तापमान विलीन आक्सिजन की मात्रा आदि बातों में सामान्य लक्षण सूचित की। अक्तूबर के मध्य में नॉक्टीलूका का सांद्रण प्रति मि. ली. पानी में 10,000 कोशिका थी जब कि 5 नवंबर में प्रति मि. ली. पानी में 100 कोशिका थी। 11 नवंबर में पानी में नॉक्टीलूका उपस्थित नही था।

नॉक्टीलूका के प्रस्फुटन के कारण डायटम की जनसंख्या में बडी कमी रिपोर्ट की गयी। कायलपट्टनम और तिरुचेन्दूर में भी यही स्थिति हुई। जल में अन्य कोई पादप्लवक नही दिखायी पडी। अरित्रपाद दशपाद और ल्यूशिफेर आदि के कुछ पश्चडिम्भकें मौजूद थे। स्थानीय धीवरों को नॉक्टीलूका प्रस्फुटन के कारण दो हफ्ते तक कोई पकड नही मिली। कर्कट, सर्पमीन आदि तलमज्जी वर्ग की मछली इस अवधि में यहाँ से प्राप्त हुई।

पश्चिम बंगाल तट पर नवंबर 1988 को हुई चक्रवात का असर*

29-1-88 को तटीय जिलों में स्थित 24 परगाने और मिडनापूर में हुई चक्रवात ने भारी नाश किया। नारियल, चावल, केला आदि उपजों का सर्वनाश हुआ। हजारों पेडों का उन्मूलन हुआ और संचार पूर्ण रूप से विच्छेदित हुये 24 परगाने में 245 लोगों की मृत्यु हुई। गस्बा, बासन्ती और कानिंग आदि स्थानों पर मृत्यु संख्या अधिक थी। उपज, पालतू पशु और मात्स्यिकी आदि में करीब 800,000 रुपये का नष्ट हुआ। कालिस्थान से तीन यात्रिक नौका 37 कर्मियों सहित गयब हुये।

सामाजिक प्रभाव

मछुआरे साधारणतया व्यापारियों से अग्रिम लेते है और मत्स्यन मौसम में वापस देते हैं। लेकिन चक्रवात और इसके कारण हुई अव्यवस्थता के कारण इस साल वे ऐसा नही कर पाये।

*पी. बी. डेइ व एस. एस. डान द्वारा प्रस्तुत रिपोर्ट

समाश्वासन और पुनर्निवास कार्रवाई

पश्चिम बंगाल सरकार ने समाश्वासन कार्रवाई केलिए उचित प्रबन्ध की। चक्रवात से पीडित धीवरों को काफ्ट और गिअर दिया गया। झोंपडियों के पुनर्निर्माण केलिए आवश्यक चीज़ों की सप्लाई की। इसके अलावा कपडे, कंबल, आहार आदि अनिवार्य चीजें का वितरण किया गया।

मत्स्यन गाँवों में क्षति

चक्रवात का असर मुख्यत: 24 परगाना जिले के मत्स्यन सेक्टर पर पडा है। गस्बा, बासन्ती, कानिंग, रायडिगी, बक्काली, कालिस्थान, ज़म्बू और गंगासागर आदि मत्स्यन गाँवों में चक्रवात का असर तीव्र था। लगभग 2,000 झोपडियाँ हवा में उड़ गये और 4,00,000/- रुपये कीमत की शुष्क मछली पानी में भीग गयी। मिडनापुर जिले में नाशनष्ट कम था।

GUIDE TO CONTRIBUTORS

The articles intended for publication in the MFIS should be based on actual research findings on long-term or short-term projects of the CMFRI and should be in a language comprehensible to the layman. Elaborate perspectives, material and methods, taxonomy, keys to species and genera, statistical methods and models, elaborate tables, references and such, being only useful to specialists, are to be avoided. Field keys that may be of help to fishermen or industry are acceptable. Self-speaking photographs may be profusely included, but histograms should be carefully selected for easy understanding to the non-technical eye. The write-up should not be in the format of a scientific paper. Unlike in journals, suggestions and advices based on tested research results intended for fishing industry, fishery managers and planners can be given in definitive terms. Whereas only cost benefit ratios and indices worked out based on observed costs and values are acceptable in a journal, the observed costs and values, inspite of their transitionality, are more appropriate for MFIS. Any article intended for MFIS should not exceed 15 pages typed in double space on foolscap paper.

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