PART I

GENERAL

A REVIEW OF EXPERIMENTAL TRAWLING FROM SMALL AND MEDIUM SIZED MECHANIZED VESSELS OFF KAKINADA

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Mechanization of fishing craft in this part of India started with the introduction of powered gill netters during the late fifties. Combined with the use of synthetic twines the performance of these gill netters was quite encouraging. But the success of this attempt was shortlived as returns started dwindling soon (Rao & Devara, 1962).

Concentration of large schools of fish is a rare phenomenon on the East Coast of India. However, concentration of fish at the bottom, in the form of numerous small schools have been observed (Poliokov, 1963). Due to the peculiar ecological and physical conditions prevalent on the east coast, such as narrow continental shelf, swift currents and limitation in the sizes of fish schools, the Bay of Bengal present special problems with regard to the exploitation of the fishery resources. It is in this background that the C. I. F. T. Sub-Station at Kakinada took up work on developing bottom trawling gear for small and medium sized mechanized boats. The results of the work during the years 1963-'70 are presented in this paper.

Two fishing vessels viz. Fishtech No.1 of length 9.1 m. (30'-0) overall length, representing a small mechanized boat (Deshpande 1960) and Fish Tech No. VII of length 12.2m. (40') representing a medium sized trawler (Narayanappa *et al* 1968) were used for the fishing experiments.

The trawl nets used for Fish Tech No.1 were of sizes 11.89 m. (39'-0) 2 seam (Narayanappa, 1968 a) and 12.9 m. (42'-6") 2 seam (Satyanarayana and Nair, 1962) trawls. The otter boards were flat rectangular, horizontal curved and oval hydrofoil types. (Mukundan *et. al*, 1967). From Fish Tech No. VII, however a variety of trawls were operated. They consisted of 18.26 m. (60'-0) 2 seam; 17.3 m. (57'-0) 4 seam and 23 m (75'-0) 4 seam trawls described by Satyanarayana *et. al* (1962). In addition a 16m (53'-0) 2 seam; 18.3m (60'-6") four seam trawls (Satyanarayana *et. al* 1971 a) and a 29.26m (96'-6") long winged shrimp trawl (Satyanarayana *et. al*, 1971 b) were also tried.

Fishing experiments were conducted off Kakinada between latitudes 16°-50' N to 17°-10' and longitude 82°-20' E to 82°-40' E. (Text Fig. 1).

While trawling from Fish Tech No.1 was limited to areas within depths of 35 m, operations with Fish Tech No.VII extended upto a depth of 100m.

Details of Fishing grounds.

Investigations from Fishtech No.1.

Initial experiments carried out with a beam trawl during 1963 for assessing the resources and locating suitable trawling grounds indicated the availability of prawn and fish, which could be exploited by otter trawling (Sebastian *et. al*, 1965). Further investigations were directed towards the selection of a suitable trawl gear for small mechanized boats. Results of comparative fishing experiments indicated that 11.89m (39'-0) and 12.9m (42'-6") 2-seam trawls were more or less equally effective with a catch rate of 68.36 kg and 72.57 kg per hr. respectively (Sreekrishna, 1970).

The experiments with the different otter boards showed the relative effectiveness of the horizontally curved doors. The horizontally curved otter board gave 39.5% and 36.0% more catch per hour compared to rectangular and oval otter boards respectively (Narayanappa, 1968 a).

Kuriyan (1965) observed that the method of rigging of the trawl also influences its working. In order to find out the most suitable method of rigging the following types of rigging were tried.

1. Directly attaching net with otter boards by means of extension of ropes (Hoover rig) and

2. By introducing a single sweep line in between the net and otter boards (V-D rig).

Table 1 shows the results of comparative fishing with the two types of rigging.

TABLE I RESULTS OF COMPARATIVE FISHING WITH TWO TYPES OF RIGGING

	Hoover rig	V-D rig.
Total trawling time.	43 hrs. 30mts	43 hrs. 45mts.
Total catch (Kgs)	1,690	2,962
Catch/hr. (kgs)	38.85	67.70

Analysis of the catch data indicated that the catch rate could be increased 1.74 times with the V-D rig. The apparent increase may be due to greater area covered by the trawl due to the attachment of the sweep line (Kuriyan, 1965). The optimum size of sweep line was later worked out to be 20m. (Narayanappa, 1968 b).

Subsequent investigations were aimed at increasing the vertical opening. The devices tried were 1) kite 2) additional float line and 3) side panels with wedge shaped wing ends.

Results of experiments led to the conclusion that the use of separate float line yielded better catches, even though the increase in vertical height of trawl mouth was more when a kite was used. The respective catch rates per hour were 50.06 kgs, 26.28 kgs, 53.91 kgs and 50.75 kge for the control net, net with kite, trawl with additional float line and net with side panels. The calculated vertical height of trawl mouth was 2.47m, 3.45m, 2.75m and 2.55m for the control and the three combinations (satyanarayana *et. al* 1970).

Investigations From Fish Tech No. VII.

Results of trials carried out with different sizes of trawls are given in Table II.

TABLE II RESULTS OF COMPARATIVE FISHING OPERATIONS WITH DIFFERENT TRAWLS.

Trawl net.	Towing time in hrs.	Catch/Hr.	% of prawns
18.26m (60'-0) two seam.	30.00	55.30	45%
17.36m. (57'-0) four seam.	10.00	30.70	38%
21.32m (70'-0) four seam	30.00	38 90	40%

Analysis of the results point to the conclusion that 18.26m. two seam trawl was the most efficient of the different sizes of the nets tried. Further investigations conducted to work out the optimum buoyancy/weight ratio indicated that the buoyancy/weight ratio of 0.75 gave the best results for fish trawls.

Hamuro (1967) showed some advantages in the use of a four seam type trawls over the conventional two seam net and the comparative experiments carried out with 18.26m. conventional two seam and 18.3m. newly designed four-seam trawl proved the effectiveness of four-seam net with an average catch rate of 105.55 kg/hr. of trawling as against 98.93 kg/hr of trawling by the 2-seam trawl (Satyanarayana, *et. al*, 1971a).

Kuriyan (1965) has observed that by using additional wings for a trawl, the prawn catch could be increased by 50% based on the results of fishing operations carried out off-Cochin. Studies were carried out to investigate the effectiveness of longwing trawls under conditions obtaining off-Kakinada and the results are presented in Table III.

TABLE III RESULTS OF COMPARATIVE FISHING WITH 20.26m, 4-SEAM LONG WING TRAWL AND 18.26m, 2-SEAM TRAWL

Discription of trawl	29.26m 4-seam long wing trawl.	18.26m 2-seam trawl
Period of investigations.	January, 1968 to June, 1970	
Depth ranges	10 to 40 m.	
Towing time	70 hrs. 40 mts.	70 hrs. 20 mts.
Catch/hr. of Trawling	14.7 (P)	7.8 (P)
	43.8 (F)	42.0 (F)
	58.5 (T)	49.8 (T)

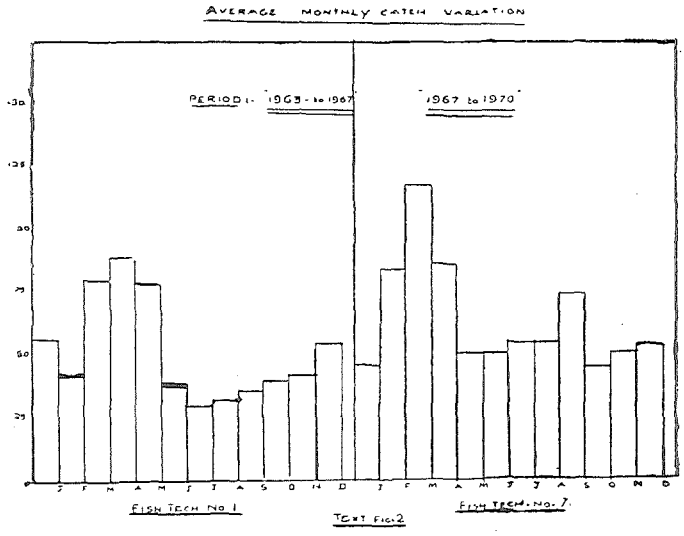
P=Prawn F=Fish T=Total fish

It would be seen from the Table that the catch of prawns can be nearly doubled by using a long wing trawl.

Trend of catch rates and their composition.

The catches have been maximum from Fish Tech No.1 in 1965 and that from Tech No.VII was in 1968. The average catch rate of the small boat during the years 1963 to '67 was 50.8 kgs. which compares favourably with that of M. T. Rana (37′ Trawler), whose catch rate ranged from 54.0 to 69.0 kgs. during the same period (Venkateswara Rao 1970). The average catch rate of medium boat was 67.9 kg which well exeeds the catch rate of 51.0 kg (Shariff '1961) obtained from the similar sized boats operated in the corresponding areas.

Monthly variation of catch rate as represented from the average catch per trawling hour during the periods for the boats is represented in Text. Fig. 2 as histograms.



TEXT FIG. 2

Histograms showing the average monthly catch variation in Fish Tech No. 1 (1963 to '67) and Fish Tech No. VII (1967 to '70).

The month wise catch rate apparently shows slight variation between the two boats; but the trend is same with two peak periods during the months of Jan. to May and August to September. Further it is clear from the figure that trawl fishing activity along this region, continues throughout the year unlike West Coast, except for few days during the transition periods of the mansoons.

The percentage composition of catch during the period in each of the boats is shown in Text. Fig. 3.

Percentage species composition as caught by Fish Tech No.1 during 1963 to 70 and Fish Tech No. VII during 1967 to 70.

The perusal of text figure reveal some difference in the catch composition between the boats which may be attributed to the difference of the depth-ranges in their fishing. The fishing area in the case of Fish Tech No.1 was limited to 35m. depth with intensity at 10 to 25m. depth range, whereas the maximum limit of fishing with Fish Tech No. VII is 100m. with cocentration between 25 to 50m. depth range. Prawn and Sciaenids form the major portion of trawl catch with Fish Tech No. 1 while Sciaenids followed by Upenoides and *Cynagris* sp. formed the major constituent in Fish Tech No. 7. The other Fishes caught in the trawl nets in order of abundance are Lactarius, Skates & rays, Silver bellies, Scles, Saurida and Caran-

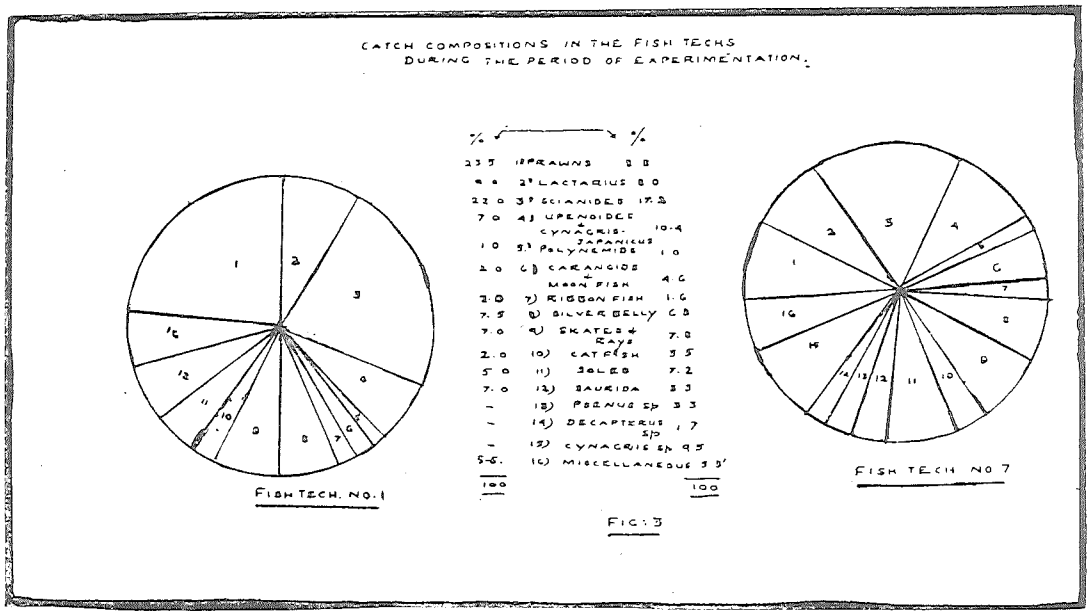


FIG. 3

gids including Moon fish. An interesting factor is that the catch composition within the depth ranges of upto 40/50m. is found to be similar in both types of boats. However, the catch rate as well as species composition is found to be different in deeper waters (i.e) in 50 - 100m. depth ranges. The catch rate in deep waters is observed to be about 5.7 times more than that of inshore areas with predominance of *Cynagris* sp. In terms of catch composition, Synagris, Psenus, Sciaenids, Decapterus and Soles are found in order of abundance in deep waters (Narayanappa *et. al*, 1968 b). Though prawns are normally available throughout the year either in small or large quantities, their abundance is found to be in the months of March to June and October to November. Small prawns which constituted the bulk of the prawn catch are available in the inshore waters (i.e) in 10 to 20m. depth range whereas the bigger varieties are caught within the depths between 20 to 45m.

Sciaenids, which form the main stay of otter trawling off the area, are available alround the year with major quantities during the period of January to October.

Lactarius and Upenoides including *Cynagris* japonicus which form nearly 9 and 10% of the total catch are fairly represented in most of the months with an abundance in January to April & August to October months in the case of Lactarius and September to April in case of Upenoides.

Soles and Skates including Rays are found in all the months with little variations.

SUMMARY :

1. The most suitable otter trawl for small boats was found to be 10.9 to 15m. two seam trawl with 100 cm. x 50 cm. x 35 kgs. horizontally curved otter boards together with long single sweep line.

2. For operation from medium sized trawls, 18.26 m. two seam 18.3 m. four seam and 29.26 m. long wing trawl were found suitable. 18.3 m. four seam trawl was netting considerable quantity of off bottom fishes. Shrimps predominated in the catches of 29.26 m. trawl.

3. Productive grounds for *Cynagris* sp., *Psenus* sp. and *Decapterus* sp. within 50 to 100 m. depth ranges off Kakinada were available for profitable exploitation.

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