

ON THE RESULTS OF PRELIMINARY EXPERIMENTS
WITH OTTER TRAWLS OFF VERAVAL

by

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ABSTRACT

The results of fishing operations with a variety of shrimp trawls in the sea off Veraval are presented. The gear which proved effective, under experimental conditions, was tested for increasing the shrimp catches and reducing the miscellaneous varieties of fishes. Based on these results, selective fishing for shrimps has been recommended.

INTRODUCTION

Veraval (20° - 54' N. Lat. and 70° 28' E. Long) is an important sea fishing port on the Kathiawar Peninsula on the Gujarat State. The area is particularly rich for quality fish like the silver pomfrets (*Pampus argentens* Euphr.). The establishment of the Deep Sea Fishing Sub-station by the Central Government at Veraval in 1958, marks the initiation of regular otter trawling operations with medium vessels. These operations, using mostly Russian type fishing gear, are aimed at the survey of the fishing grounds lying in and between the Gulf of Kuch and Cambay. This survey received further impetus from the year 1962-63 by the addition of three more medium vessels belonging to the State Fisheries Department. The catches

landed by the State survey boats, employing standard CIFT designs of shrimp trawls (Satyanarayana and Nair 1962); Satyanarayana et al (1862) revealed the availability of prawns along this part of the Gujarat coast, especially in the grounds lying between Madhwad and Chorwad at depths ranging from 21 to 45 m. To further evaluate the suitability of these designs of shrimp trawls, experimental fishing was carried out from January to May 1964 and the results of these operations are summarised in this communication.

TOPOGRAPHY OF THE COAST

The coast line of the Peninsula, especially between Diu and Okha, is cut open at different places by a number of small rivers. The river

mouths are normally narrow and barred with sand during the major part of a year. The entire in-shore belt of water is fringed with rocks, both submerged and exposed, upto almost 22 m depth. The 180 m line is about 60 nautical miles off Veraval (based on Admiralty chart No. 826 and 1470) The sea floor is muddy beyond 23 m. The mud tends to become thicker from depths over 28 m and harbour large quantities of live shells of *Tibia* sp. (Based on personal observation of Authors).

PERIOD OF OPERATION, FISHING GROUND AND PROCEDURE

The fishing operations were initiated on 15-1-1964 and continued till 5-5-1964 in the sea off Veraval within 20° 45' to 21° 00' N. Lat. and 70° 05' to 70° 20' E. Long. with the investigational fishing vessel Fishtech IV. During the period the vessel undertook 27 cruises and made 110 hauls of 90 hours and 45 minutes total duration. The period of actual fishing operations was usually between 7 A.M. and 2 P.M. each day, when calm sea prevailed. The depth of water at the grounds ranged between 12 to 36 m.

On each day of operation 4 to 10 hauls were made. Details as to the gear and accessories, depth of water, nature of sea bottom, length of warp paid, towing speed, duration of drag and catches landed were recorded for each haul. In addition, observations were also made on the performance of the nets.

The hauls each day were made over the same ground, in the same direction and using the same length of warp and trawling speed. One half of the hauls taken per day by the 13.7 m and 11.4 m trawls, were made by attaching a thin iron chain 0.6 metre ahead of the ground rope. The extra buoyancy of float line was reduced considerably, while operating the 11.4 m trawl. Damage to some of the nets curtailed the possibility of continued observations.

FISHING BOAT AND GEAR

FISHING BOAT: Fishtech IV is a mechanised wooden stern trawler. The general specifications of the vessel are as follows:

Main dimension:

Length (o.a.)	: 10.9 m
Beam	: 2.9 m
Draft (Max.)	: 1.2 m
Displacement	: 121 m ³

Engine

Type : 4 Cylinder, 4 cycle, marine diesel, developing 48 h.p.

The vessel is equipped with a mechanically operated trawl winch. Each winch drum holds 270 m of 9 mm diameter wire rope which makes it possible for the vessel to fish upto 55 m depth. Two identical tripod gallows (Kuriyan et al 1964) are installed on either side of the stern deck. The cables are taken through pulley blocks attached to the base plate of the mast prior to passing through the outer pulleys

shackled to the gallows.

FISHING GEAR: Satyanarayana and Nair (*loc. cit.*) and Satyanarayana et. al (*loc. cit.*) have described the design and construction details of most of the nets used in the course of these experiments. Table I enumerates the particulars of nets and accessories used.

FISHING OPERATIONS

Trawling operations were conducted following the conventional stern trawling technique for otter trawls. The length warp paid for each drag was $5\frac{1}{2}$ times the depth of water for small nets while in the bigger nets the proportion was reduced to $4\frac{1}{2}$ to 5 times. The trawling speed ranged between 1.75 to 2.25 knots depending on the towing resistance offered by each net.

RESULT

The results of fishing operations are presented in Table II.

DISCUSSION

(a) Comparison of catches: It would be clear from Table II that the combined averages of catch per day and catch per hour for all the nets are 396 kgs. and 108 kgs. respectively. The catches are further analysed in Table III. The analysis shows that the averages of catch per day of the 21.2 m, 18.1 m, 12.95 m extended to 18.1 m, 13.7 m and 11.4 m trawls were in the order of 387 kg, 262 kg, 265 kg, 428 kg and 639 kg. The figures indicate that the catch

landed by the 11.4 m net was relatively more among all the nets tried.

The catch per one trawling hour of the different nets in the above order works out to 145 kg, 75 kg, 71 kg, 110 kg and 142 kg. The average catch per hour for each net was further computed keeping the trawling speed constant (2.25 knots) and these figures are shown in last column of Table III. The catch per hour of effort of both the 21.2 m and the 11.4 m trawls appear to be more or less similar.

The quantity of shrimps landed by the different nets indicate that the smaller nets were relatively more effective. It appears reasonable to assume that a small net drags more closely on the sea floor thereby increasing its effectiveness for shrimps. This is probably one factor which has induced the Mexican fishermen to use two small trawls from a single vessel (Ringhaven, 1960). The fact that the 12.9 m trawl, when extended to 18.1 m by addition of wings, proved less effective than 11.4 m trawl, further substantiates this conclusion. The addition of wings, while probably helping the coverage of more area above the sea bed, obviously fails to disturb the shrimp population sheltering in the mud below.

Further, the percentage compositions of shrimps and fish (Table II) show that the former is more in the catches of the 11.4 m net while the latter dominates the catches of the bigger nets. (22.2 m and 18.1 nets).

(b) Effect of chain and extra buoyancy of floats on shrimp catches: The data gathered on the catches by attaching a thin chain (tickler chain) to the ground-rope and by reducing the number of floats on the head-rope of the 13.7 m and 11.4 m trawls are tabulated in Table IV. It would be noticed from this table that the average catch per hour of shrimps and fishes landed by these two nets works out to 59 kg and 79 kg. The percentage composition is 43% shrimps and 70% fish.

Assuming that both the nets are of similar size the catch per hour of shrimps landed with and without chain is shown in Fig. 1.

It would be evident from Text Figure 1 that the catch per hour of shrimps landed by the attachment of the tickler chain is more for landings ranging between 25 to 50 and 125 to 150 kg. The catch per hour of shrimps landed without chain is maximum in the initial frequency range of 0 to 25 kg. The average catch per hour with and without chain comes to 70 kg of shrimps and 81 kg of fish and 42 kg of shrimp and 81 kg of fish respectively. The rise in percentage composition of shrimps due to the attachment of chain is 70%. It was further

observed that the maximum catch of shrimps is during the tows when the chain is attached to the ground-rope and the head-rope had the minimum number of floats. The average catch per hour during such hauls is 110 kg of shrimps and 77 kg of fish.

Similar analysis of the fish caught in each drag revealed that the reduction in the quantity of fish by decreasing (8 kg) the extra buoyancy of the head-rope is 31 kg. The percentage reduction of fish catch works out to about 30%.

The results of the comparative hauls suggest the possibility of introducing selective fishing for shrimps. Such selective fishing, it is felt, will increase the shrimp landings of the existing trawls.

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REFERENCES

- Kuriyan, G.K., A.V.V. Satyanarayana and R.S. Nair (1964). Designs of Trawling Gear (Unpublished records).
- Ringhaven, L.C. (1960). Design and mass production of Shrimp trawlers. Fishing Boats of the World, 2: 615-623.
- Satyanarayana, A.V.V. and R.S. Nair (1962). The designs of otter trawls for shrimps. Ind. Fish. Bull., 9(4): 4-23.
- Satyanarayana, A.V.V., G.K. Kuriyan and R.S. Nair (1962). Commercial prawn trawling gear of Cochin (India). IPFC Procs., 10(2): 226-263.

TABLE I

Particulars of the trawl nets and accessories

Size of Gear	I	II	III	IV	V
Head-rope	21.2 m (70 ft)	18.1 m (60 ft)	18.1 m (60 ft) ^a	13.7 m (45 ft)	11.4 m (37.5 ft)
Ground-rope	25.3 m (83.5 ft)	20.6 m (68 ft)	21.25 m (70 ft)	15.2 m (50 ft)	13.2 m (43.5 ft)
Design & Construction	Four-seam, over-hang otter trawl. (C.I.F.T. design)	Two-seam, over-hang, otter trawl. (C.I.F.T. design)	Two-seam, over-hang, otter trawl. (C.I.F.T. design)	Four-seam, over-hang, otter trawl. (C.I.F.T. design)	Two-seam, over-hang, otter trawl. (C.I.F.T. design)
Material used for fabrication	Cotton	Cotton	Cotton	Cotton	Cotton
Mesh Size:					
Cod-end	3.1 cm	3.1 cm	3.75 cm	2.5 cm	2.5 cm
Moyleh region	7.5 cm	7.5 cm	7.5 cm	5.0 cm	5.0 cm
Particulars of otter boards:					
Size	1.4 m x 0.6 m	1.4 m x 0.6 m			
Weight	64 kg	64 kg	64 kg	64 kg	64 kg
Length of sweeps (including legs):					
Head-rope (1.25 cm dia. Manila)	4.4 m	4.4 m	5.0 m	5.0 m	7.3 m
Foot-rope (1.9 cm dia. Manila)	4.7 m	4.7 m	5.3 m	5.3 m	7.0 (7.6) m
Extra-buoyancy of floats attached	14.6 kg	13.5 to 14.3 kg	14.3 kg	11 kg	1.6 to 9.7 kg
Weight of lead sinkers used per foot of foot rope length	225 g	225 g	225 g	225 g	225 g
Particular of chain used:	-	GI link chain, 2 mm dia & 24.25 m in length	GI link chain, 3 mm dia & 24.84 m in length	GI link chain, 3 mm dia & 20.30 m in length	GI link chain, 3 mm dia & 20.30 m in length

^a12.9 m (42.5 ft) net modified to 18.1 m (60 ft) head rope length by extension of 2.6 m (8.75 ft) wings on either side.

TABLE II

The results of fishing operations with different trawls.

Sl. No.	Gear used	Depth of water in fathoms	No of days fished	No of hauls made	Duration		Average speed in knots	Catch (in kg)			% composition		
					Hrs.	Min.		Prawn	Fish.	Total	Prawn	Fish.	
1	21.2 m (70 ft) otter trawl	12 to 22	5	16	13	20	2	156	1779	1935	8	92	
2	18.1 m (60 ft) otter trawl	14 to 18	9	29	25	40	1.75	428	1932	2360	18	82	
3	18.1 m (42.5 ft modified to 60 ft by extension of wings on either side) otter trawls	12 to 14	1	4	3	45	2.25	85	180	265	32	68	
4	13.7 m (45 ft) otter trawl	13 to 16	10	46	39	00	1.75	1003	3276	4279	23	77	
5	11.4 m (37.5 ft) otter trawl	12 to 14	2	15	9	00	2	595	684	1279	47	53	
			Total	47	110	90	45	-	2267	7851	10118		

Average catch per day : 396 kg

Average catch per hour : 108 kg

TABLE III

Showing Analysis of the Catch Data

Sl. No.	Gear used	Average catch per day			Average catch per hour			Average catch per hour at uniform speed of 2.25 knots (in kg)		
		Prawn (in kg)	Fish (in kg)	Total	Prawn (in kg)	Fish (in kg)	Total	Prawn	Fish.	Total
1	21.2 m (70 ft)	31	366	397	12	133	145	13.5	149.5	163
2	18.1 m (60 ft)	47.5	214.5	262	13.5	61	74.5	18	78	96
3	18.1 m (42.5 ft modified to 60 ft)	85	180	265	23	48	71	23	48	71
4	13.7 m (45 ft)	100	328	428	26	84	110	33	108	141
5	11.4 m (37.5 ft)	297	342	639	66	76	142	74	86	160

TABLE IV.
SHOWING DETAILS OF COMPARATIVE FISHING OPERATIONS.

Date.	Net used.	No. of floats attached	Hauls made.	Duration			Catch (in Kgs)			Catch per hour (in Kgs.)			Composition	
				Hrs.	Mts.	Total.	Prawns.	Fish.	Total.	Prawns.	Fish.	Total.	Prawns.	Fish.
I	II	III	IV	V		VI	VII			VIII				
28-4-64	13.7 M Trawl	14 Nos.	1*	07	45	20	130	150	27	173	200	13	87	
	-do-	"	2*	00	45	15	90	105	20	120	140	14	86	
	-do-	"	3*	00	45	15	90	105	20	120	140	14	86	
	-do-	"	4	00	45	15	110	125	20	147	167	14	105	
	-do-	"	5	00	45	15	105	120	20	140	160	12	87	
	-do-	"	6	00	45	65	59	124	37	197	266	52	48	
29-4-64	-do-	"	1	00	30	25	37	62	50	74	124	40	60	
	-do-	"	2	00	10	2	5	7	12	30	42	29	71	
	-do-	"	3	00	30	30	45	75	60	90	150	40	60	
	-do-	"	4	00	45	7	35	42	9	47	56	17	33	
	-do-	"	5*	00	45	35	51	86	47	68	115	38	62	
	-do-	"	6*	00	45	110	32	142	147	43	190	77	88	
	-do-	"	7*	00	45	140	60	200	168	90	257	70	30	
	-do-	"	8*	00	45	20	30	50	27	40	67	40	60	
30-4-64	-do-	"	1*	00	30	45	40	85	90	90	170	52	47	
	-do-	"	2*	00	45	48	23	76	64	37	101	63	37	
	-do-	"	3*	00	45	10	46	56	13	61	74	19	32	
	-do-	"	4*	00	30	18	30	48	36	60	96	37	62	
	-do-	"	5*	00	30	3	20	23	6	40	46	13	37	
	-do-	"	6	00	45	80	30	110	107	40	147	73	27	
2-5-64	11.4 M Trawl	10 Nos.	1	00	30	10	41	51	30	82	102	20	90	
	-do-	6 Nos.	2	00	40	55	90	145	32	136	217	33	82	
	-do-	4 Nos.	3	00	30	35	40	75	70	90	150	47	53	
	-do-	"	4	00	30	30	45	75	60	90	150	40	60	
	-do-	"	5	00	40	20	32	62	30	48	73	39	51	
	-do-	"	6*	00	45	20	22	42	27	29	56	48	52	
	-do-	"	7*	00	30	90	40	120	160	90	240	67	33	
	-do-	"	8*	00	30	70	37	107	140	74	214	65	36	
	-do-	"	9*	00	25	90	20	180	216	43	264	82	18	
5-5-64	-do-	2	1	00	45	20	46	66	37	61	88	34	70	
	-do-	"	2	01	00	25	75	100	25	75	100	26	75	
	-do-	"	3	00	45	20	40	60	27	53	80	33	67	
	-do-	"	4*	00	30	15	33	53	30	76	106	28	72	
	-do-	"	5*	00	30	40	75	115	90	150	230	35	65	
	-do-	"	6*	00	30	65	43	108	130	86	216	60	40	
T O T A L			35	22	10	1,313	1,757	3,070	AV: 59	79	138	43	67	

Note: * Indicate hauls made by attaching a tickler chain.

FIG. 1: Histogram showing catch per hour (frequency) of shrimps caught with and without tickler chain.

