

ON THE TROLL LINE INVESTIGATIONS OFF COCHIN DURING FIVE FISHING SEASONS

I. INVESTIGATIONS DURING 1960-61 AND 1961-62 SEASONS

* S. D. DESHPANDE AND *T. M. SIVAN

Central Institute of Fisheries Technology (Craft & Gear Wing), Cochin-5.

INTRODUCTION

Although trolling as a commercial method of fishing is of recent origin in this country, it can in no way be considered an innovation. Trolling lines were extensively used for salmon fishery towards the turn of the previous century (Jordan 1880). The actual development however took place only after the replacement of sails by engines in fishing boats (Scofield 1956.) According to Chapman (1950), Bates (1950) Milne (1955) Scofield (*op. cit.*) and Koyma (1956) trolls are indigenous and effective gear for the capture of predatory and fast moving fishes of commercial importance like seers, tuna, albacore, skipjack, salmon etc.

Surveys of marine fishing gear along the Indian coasts have shown that troll lines with baits such as coconut kernel, wooden plugs, coloured cotton rags, sisal or coir fibre are used by certain fishermen of Kerala, Madras and Andhra Pradesh as well as by those in Andaman, Laccadive and Minicoy Islands (Ayyangar

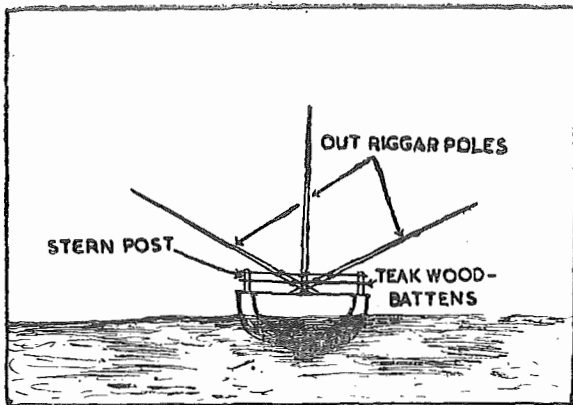
1962; Hornell 1924). Hornell (*op. cit.*) has named them as 'whiffing lines'. He is further of the opinion that this way of fishing is not known to the Indian fishermen and the limited use of the gear is due to intercourse with Ceylon.

There is apparently great scope for improvement of the design and operational aspects of the gear particularly for the effective exploitation of seasonal fisheries like that of seer, tunny, barracuda etc. In order to evolve improved, yet cheap trolling gear regular investigations were undertaken by the Craft & Gear Wing of the Central Institute of Fisheries Technology, off Cochin for five fishing seasons and the results of these studies are incorporated in this communication.

MATERIALS AND METHODS

Fishing vessel, Fisstech No. 1 (30 fishing boat) was used to conduct the studies. The rigging of the outrigger bamboos for securing the troll lines is shown in text Fig. 1.

* Present address: Central Institute of Fisheries Technology Substation, Veraval.



Text. Fig. 1. Rigging of outer-rigger bamboo poles.

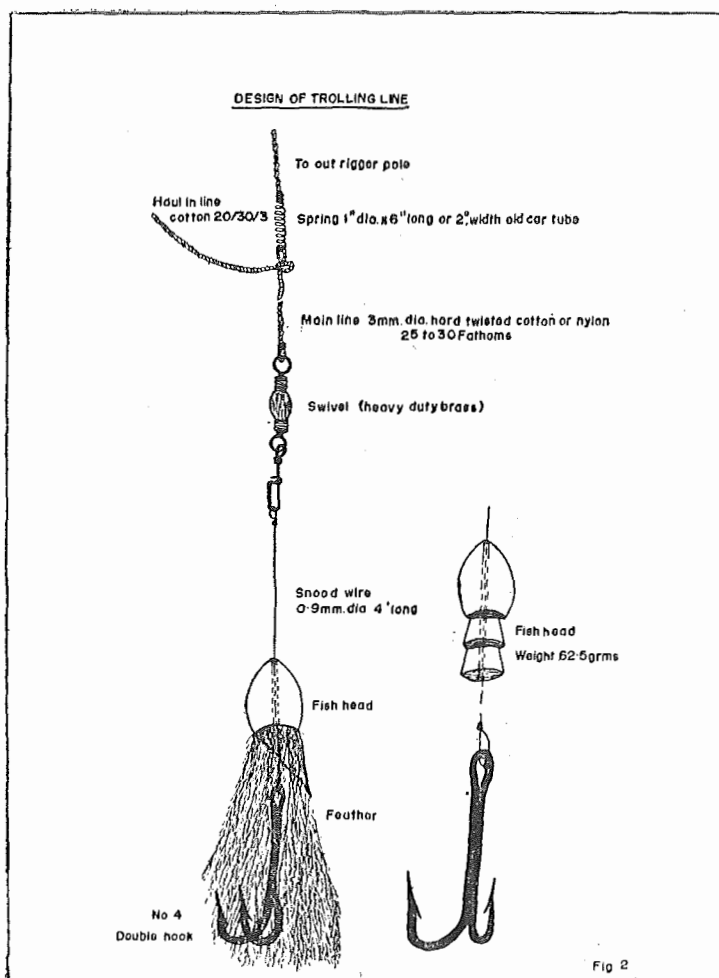
Design details of the gear are shown in Text Fig. 2.

Jigs of the following types were used for the investigations. i) Feather jigs,

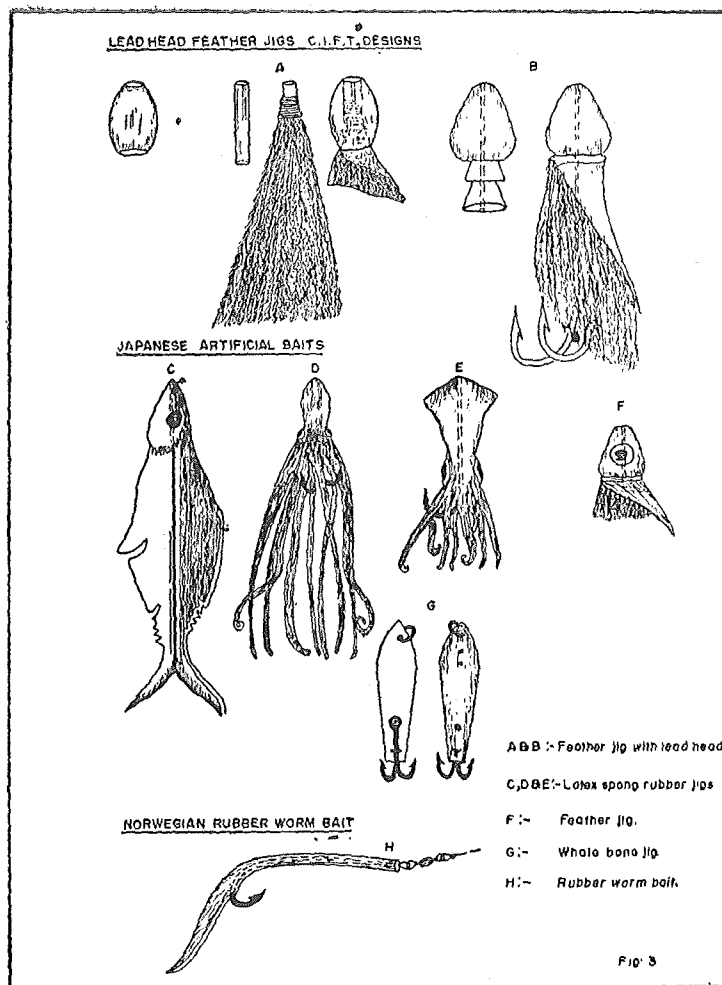
ii) Whale bone jigs, iii) Latex sponge rubber jigs (Japanese type), iv) Rubber worm jigs (Norwegian) and v) Feather jigs with lead head (CIFT design).

Text Fig. 3 shows the details of the jigs. Norwegian Mustad single hooks Nos. 3, 4 and 5, two of the same size welded together, were used as double hooks with each jig.

The vessel towed 6 to 8 jigs each day from 7-00 A. M. to 4-00 P. M. Tows were made in different directions. The operations were concentrated in areas where signs such as jumping fish, bird dives and fish strikes were observed. The towing speed of the vessel ranged from 4 to 7 knots. On observing a fish bite, the



Text Fig. 2. Design details of Trolling line gear.



Text Fig. 3. Different jigs used for the experiments.

speed of the boat was reduced and the concerned line hauled in. The hooked fish was removed and the vessel regained the required speed. The line was released again and operations continued.

In order to enumerate the different factors affecting the landings of the gear particulars such as varieties, quantities of fish caught, time of hooking, temperature and turbidity of the water, length of each line, speed of tow, effectiveness of different lures and stabilisers and stomach contents of fish caught were recorded regularly during the operations.

RESULTS

Sixtythree fishing trips were made during the period from October 1960 to May 1961. The total trolling time was

325.75 hours using 6 to 8 lines each day. The catches landed were 1,056 fishes having a total weight of 1427 kgs. (Table I).

The fishing season during 1960-61 commenced in the month of October. The majority of the catches were landed during the months of November and December. The catches per day for these two months were 31.1 and 17.1 fishes respectively. From January 1961 onwards landings were considerably reduced.

During the 1961-62 season, fiftysix trips were made for the period extending from October 1961 to February 1962. The total time trolled was 314.5 hours using 4 to 7 lines per day. 601 fishes weighing 2,905.4 kgs. were landed. (Table II).

TABLE I RESULTS OF TROLLING OPERATIONS CONDUCTED DURING 1960—61.

Particulars	MONTH AND YEAR							Total	
	October 1960	November 1960	December 1960	January 1961	February 1961	March 1961	May 1961		
Total No. of trips made	11	18	13	8	6	4	3	63	
Total trolling duration (hours)	55	94.5	75	27	24.25	23	17	315.75	
Average number of lines used per day	6.2	6.2	8	8	8	7.5	6.5	6.2 to 8	
CATCH Seer	No	122	248	209	15	17	33	7	651
	Wt (Kg)	94.5	236	374	117	51.8	74.5	14.3	962.1
Tunny	No	22	346	10	0	5	5	3	391
	Wt (Kg)	22.7	351	13	0	13.1	7.3	6.4	413.5
Others	No	5	2	4	0	0	3	0	14
	Wt (Kg)	4	10	18	0	0	17.7	0	49.7
Total catch	No	149	596	223	15	22	41	10	1056
	Wt (Kg)	121.2	597	405	117	67	99.5	20.7	1427.4
Catch/day	No	13.5	33.1	17.1	1.9	3.7	10.3	3.3	16.7
	Wt (Kg)	11.02	33.2	31.2	14.6	11.2	24.9	7.0	22.66
Max. catch/day	No	46	106	88	4	10	20	7	—
	Wt (Kg)	58.2	96.4	100.5	13.2	25	45.4	14.3	—

TABLE II RESULTS TROLLING OPERATIONS CONDUCTED DURING 1961-62.

Particulars	Month and year					Total	
	October 1961	November 1961	December 1961	January 1962	February 1962		
Total no. of trips made	5	21	15	4	11	56	
Total trolling duration (hours)	8.15	109.45	89.45	19.30	86.45	314	
Average number of lines used per day	4	5 to 6	6	6	6 to 7	4 to 7	
<i>CATCH</i> Seer	No	18	409	100	11	18	556
	Wt (Kg)	88.7	1,980	472	45	85.5	2,671.2
Tunny	No	1	4	25	5	1	36
	Wt (Kg)	1.4	7.3	148	9	3.0	168.7
Others	No	1	4	0	3	1	9
	Wt (Kg)	4.5	44.5	0	7.5	9.0	65.5
Total catch	No	20	417	125	19	20	601
	Wt (Kg)	94.6	2,031.8	620	61.5	97.5	2,905.4
Catch/day	No	4	19.9	8.3	4.8	1.8	38.8
	Wt (Kg)	18.9	97.0	41.3	15.4	8.9	181.5
Max. catch/day	No	13	75	23	19	12	—
	Wt (Kg)	47.7	411.4	112.3	61.5	51.5	—

The fishing season commenced in the month of October. The bulk of the catches were in the month of November and showed average per day of 19.9 fishes weighing 97 kgs. From December onwards the catches dwindled.

DISCUSSION

Varieties of fish hooked: Table III shows the analysed data of the composition of the catches.

It would be evident from Table III that the varieties which dominate troll line catches are seer and tunny. Tunny catches were relatively poor in 1961-62 season when compared to the year preceding.

Size of fish caught: The monthly average of the body weight of seer hooked

in the 1960-61 and 1961-62 seasons is given in Table IV.

It would be clear from Table IV that during the months of October-November 1960 only small seers were hooked. As the months passed the sizes of seer in the landings also increased.

During 1961-62 season seers of relatively bigger sizes were landed. Tunnies were also bigger particularly those landed in the month of December.

Trolling speed: Observations on the effective trolling speed for enticing seer and tunny indicated that a speed between 4 and 6 knots was reasonably effective.

Length of main line: Table V shows the length of the main line for each

TABLE III COMPOSITION OF CATCHES

Name of fish	Number	percentage	Weight Kg.	Percentage
<i>1960-1961</i>				
Seer (<i>Cybiium sp</i>)	651	61.7	962.1	67.5
Tunny (<i>Euthynnus sp</i>)	391	37.1	413.5	29.0
Others	14	1.2	49.7	3.5
<i>1961-1962</i>				
Seer	556	92.5	2,671.2	92.0
Tunny	36	6.0	168.1	5.8
Others	9	1.5	65.5	2.2

TABLE IV MONTHLY AVERAGES OF BODY WEIGHTS OF FISH

Season	Name of fish	Monthly averages of body weight of fish in kgms						
		Oct.	Nov.	Dec.	Jan.	Feb.	March	May
1960-61	Seer	0.77	0.95	1.79	1.81	3.05	2.26	2.05
	Tunny	1.03	1.01	1.30	—	2.63	1.46	2.13
1961-62	Seer	4.93	4.84	4.72	4.90	4.76		
	Tunny	1.40	1.82	5.82	1.80	3.00		

operation and the corresponding catch recorded.

TABLE V CATCH IN RELATION TO LENGTH OF MAIN LINE.

Length of main line metres	fms	No of fish caught
9.1	5	47
18.3	10	198
27.4	15	220
36.5	20	196
45.7	25	32
54.8	30	15

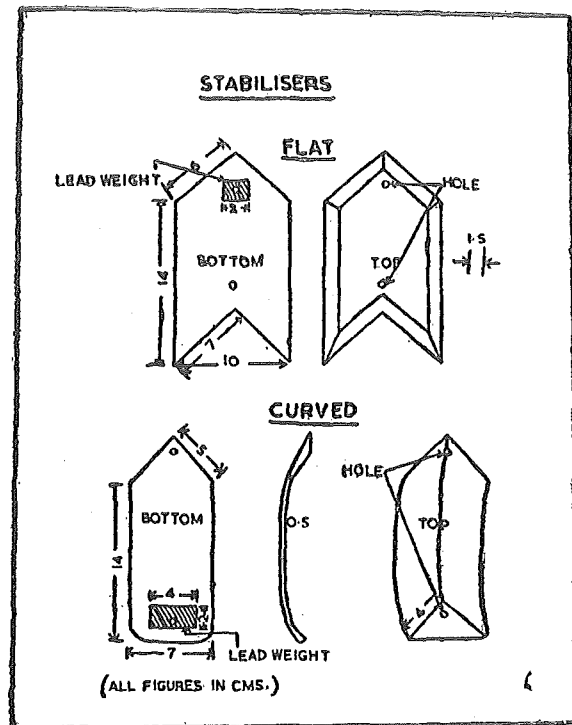
It would be clear from the above table that maximum catches were recorded when the length of the line was between 18.3 m and 36.5 m. Lines with length exceeding the above range proved to be less effective.

Effect of depressor: Metal stabilizers are commonly used by the trolling vessels in California particularly in a rough sea. The device has been subsequently used as a measure to ensure sinking of the lure below the water surface. Such depressors or diving boards have a hydrofoil shape and are usually constructed with a light wood. (Isouli and Kawakami 1951). The Japanese wooden stabilizers (Text Fig. 4) were tried in the course of the present study.

Table VI shows the analysed data recorded.

TABLE VI

	With depressor	Without depressor
No of operations	29	29
Total no of lines used	84	100
Trolling time	149.2 hrs	149.2 hrs.
No of seer caught	184	184
No of tunny caught	201	164
Others	2	6
Total catch	387	354



Text Fig. 4. Details of Japanese wooden Stabilisers.

The lines rigged with depressor landed more catch of particularly tunny.

Efficiency of different lures: Tables VII (a) and (b) show efficiencies of the different lures experimented with.

It would be seen from Table VII (a) that whale bone jig is extremely effective for both tunny and seer. Cuttle fish jigs also landed seer in good numbers but the jig was damaged very easily. The octopus jig and rubber worm baits were less effective compared to others.

White and green coloured feather jigs and jigs with combination of red and white feathers landed the maximum catch. Red and yellow coloured feather jigs were next in order of efficiency. Crimson and blue coloured jigs were inferior.

Data presented in Table VII (b) would show that colour of feather had apparently no effect on the catches of tunny.

TABLE VII a COMPARATIVE SEER CATCHES LANDED BY DIFFERENT TYPES OF JIGS.

Type of jig	Colour of jig	Total no of days operated (a)	Total no of days fish hooked (b)	Total no fish hooked (c)	Ratio b/a	Average no of fish hooked per day c/a
Feather jig	White	29	20	88	0.69	3.03
	Red	36	22	83	0.61	2.31
	Red & White	10	6	48	0.60	4.80
	Green	31	22	77	0.71	2.49
	Yellow	30	18	63	0.60	2.10
	Blue	21	9	31	0.43	1.47
	Crimson	13	6	24	0.46	1.85
TOTAL		170	103	414	0.61	2.43
Whale bone jig	White	14	12	118	0.86	8.43
Cuttle fish	Pink & White	3	2	11	0.67	3.67
Octopus	Pink & White	3	3	3	1.00	1.00
Rubber worm baits	Green	11	3	7	0.27	0.64
	Red	8	1	2	0.13	0.25
	Yellow	9	3	4	0.33	0.45
	Blue	11	1	1	0.09	0.09
TOTAL		39	8	14	0.21	0.36

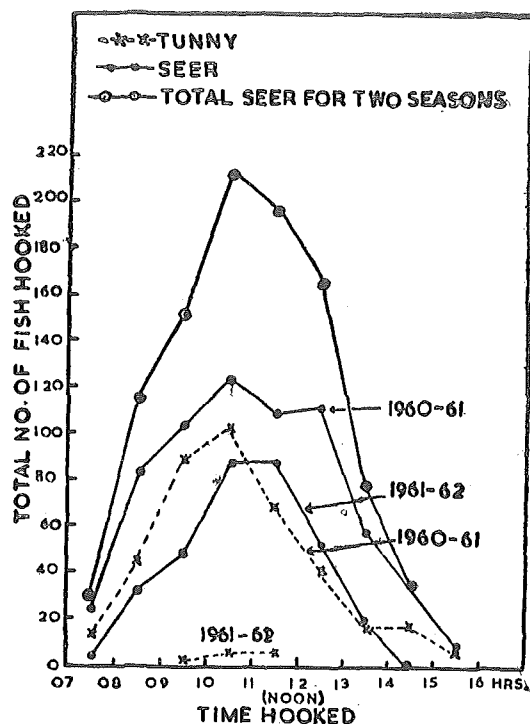
NOTE: Days on which Seer was not hooked are not included in the Table.

TABLE VII b COMPARATIVE TUNNY CATCHES LANDED BY DIFFERENT TYPES OF JIGS.

Type of jig	Colour of jig	Total no of days operated (a)	Total no of days fish hooked (b)	Total no fish hooked (c)	Ratio b/a	Average no of fish hooked per day c/a
Feather jig	White	20	14	61	0.70	3.05
	Red	19	12	54	0.63	2.84
	Red & White	2	1	6	0.50	3.00
	Green	18	12	66	0.67	3.66
	Yellow	18	11	69	0.61	3.83
	Blue	20	9	52.5	0.45	2.63
	Crimson	14	7	56	0.50	4.00
TOTAL		111	66	364.5	0.50	3.29
Whale bone jig	White	5	3	8.5	0.60	1.70
Rubber worm bait jig	Green					
	Red	2	0	0	0	0
	Yellow					
	Blue					

NOTE: Days on which tunny was not hooked are not included in the Table.

Time of hooking: The no. of fish caught in every hour was recorded and graphically represented in Text Fig. 5.



Text Fig. 5. Graph showing the variation of catch in different hours.

As per the figure there is progressive increase till 11 A. M. reaching the peak between 10 A. M. and 11 A. M.

Observation on the stomach content: The gut contents of 41 seer and 30 tunny were observed and qualitative analysis was also made. It is interesting to note that about 49% of the seer and 30% of tunny had empty stomachs. It is also recorded that tunny and seer are generally fed on pelagic fishes such as sardines, whitebaits, mackerel, and cuttle fish.

Table VIII shows that seer and tunny catches are more when the surface water temperature is 29° and 30°C. Observations

TABLE VIII CATCH IN RELATION TO WATER TEMPERATURES

Temperature °C	No. of seer	No. of tunny	Other fish	Total
27	10	—	—	10
28	66	30	2	98
29	157	75	2	234
30	139	86	2	227
31	10	1	1	12

on certain other meteorological factors show that seer was caught more on sunny days than cloudy days and when the turbidity of the water ranged from 1 to 9 fathoms.

REFERENCES

- Ayyangar, S. R. 1922 *Madras Fish Bull* 15: 63-66.
- Bates, D. H. 1950 *U. S. Fish & Wild Life Service Fishery Leaflet* 35: 1-32.
- Chapman, W. M. 1946 *California Fish & Game* 32, 4: 165-70.
- Hornell, J. 1937 "Fishing Methods of Madras Presidency." *XXVIII, 1*: 40.
- Isouti, N. and Kawakami, T. 1957 *Memoirs of the College of Agri Kyoto University*. 76: 1-8.
- Koyama, T. 1959 *Modern Fishing gear of the world: 567-70. Fishing News Books London*.
- Milne, D. J. 1955 *Progress report of the Pacific coast stations*, 103.
- Scofield W. L. 1956 *Fish Bulletin* No. 103. State of California Dept. of Fish and Game.
- Welsch, J. P. 1950 *Territory of Hawaii Spl. Bull.* 2.
- Wigutoff, N. B. 1950 *U. S. Dept. of Interior, Fish & Wild Life Service Fishery Leaflet* 387; 1-8.