

PRELIMINARY EXPERIMENTS TO EVALUATE THE RELATIVE EFFICIENCY OF DIFFERENT NATURAL BAITS IN LINE FISHING

R. BALASUBRAMANYAN,
Research Officer,
Central Institute of Fisheries Technology,
Cochin.

[A series of experimental hand-line fishing operations were conducted off the Madras coast employing five different types of natural fish baits. Based on the total catch of fish per day of fishing under each type of bait used, a comparative study on the catching efficiency of the different natural fish-baits were made. The reaction of the fish to a particular bait appears to be the result of a complex process. Live baits have the maximum catching efficiency as seen from the fishlandings when live prawns were employed as a bait. The procurement of live baits is a serious problem to the fishermen and as such suitable artificial fish lures can be profitably employed.]

In all the types of line-fishing operations, the different baits or lures employed have a tremendous influence on the catch. The author in a previous paper, Bala subramanyan (1964) has dealt in detail the different types of baits used by the coastal fishermen of India and the different varieties of fishes caught by hand lines, long-lines and trolling-lines. The present account deals with certain specific fishing experiments conducted with some selected fish-baits with a view to evaluating their relative efficiency in obtaining good catches through hand-lining. The feeding responses of the fishes thus caught has also been observed to some extent.

When the author was engaged in Deep-sea fishing operations off Madras his attention was drawn to the fact of the existence of a rich fishing ground where hand-line fishermen frequent in large numbers. Their daily fish landing were quite encouraging which prompted a detailed study of the fishing operations in the locality where a series of experimental fishing trials were undertaken using handlines as the main fishing gear and different types of natural fish-baits as lures.

Fishing Crafts Employed:

A 50' (15 M) admiralty type of mechanised boat was used as a mother-vessel mostly for offering towage to five indigenous sailing crafts (Catamarans) to and from fishing grounds:

The five Catamarans engaged for the actual fishing operations were of 18'-0" (5.4M) in length 4'-6" (1.35 M) in breadth, 1'-4" (.4M) in height normally operated by 3 to 4 men using mostly sails and oars or paddles. During the present fishing cruise the five Catamarans worked as five different fishing units with three fishermen working on board each craft. As the mother vessel was not provided with mechanical fishing aids, manual handling of the fishing lines had to be undertaken. However, the Catamarans offered a very stable platform throughout the fishing operations.

Fishing Gear Used

Simple hand-lines were the exclusive fishing gear used during the present experimental fishing operations. They were all fabricated and rigged as per the following specifications.

- Main hand lines : COTTON, 20 count, 3 ply, Hard Twist,
80 fathoms (144 M) in length
- Snood lines : Monofilament "CATS-GUT" 1 fathom
(1.8 M) in length.
- Hooks : Imported NORWAY MUSTAD CROWN-BRAND
KIRBY BENT SEA-FISH HOOK. Nos. 7, 8 & 9.
- Sinkers : Iron nuts of 80-90 gms. each and 2 Nos. for each line.

Cotton lines were treated with CUPRINOL preservative.

Each catamaran unit was provided with 6 fully rigged hand lines at the rate of 2 lines per head. Thus with a total number of 30 lines and 60 hooks on hand only 15 of them were put to actual fishing at a time during a day's fishing. Each line was attached with 2 hooks at different heights with sinkers at the extremity that goes down into the water. The different components of the gear could be detached and attached with ease in the field itself.

Fishing Grounds Exploited

The grounds selected for the present fishing investigations were located north-east of Madras harbour within a depth range of 36 to 42 fathoms (65.45 76.36). The sea-bottom was rocky with scattered patches of single and mud mixed with organic detritus. The present grounds were found suitable for line-fishing operations. The weather was perfectly calm throughout with clear water and mild current.

Method of Fishing

On reaching the fishing ground, the catamarans dispersed to vantage positions and checked the depth with their sounding lines. Before anchoring the

catamarans few try lines with baited hooks were let down with a view to having a preliminary assessment of the type of fish available in that locality. Once this was fairly ascertained, regular fishing commenced. Each catamaran unit used the different types of baits supplied to them by the mother vessel. The baits were procured earlier from the various net fishermen fishing very near the shore. Prawns and squids were carefully kept alive on board the mother vessel in specially fabricated containers with regular replenishment of sea-water. However, live fishes as bait could not be included in the present experiments.

The baited hook was let down into the deeps and was held there till such time the bite of the fish at the hook was felt. The depth of operation was altered every now and then by manipulating the length of the main line. Feeling the heaviness on the line and the pull exerted by the struggling fish, the operators quickly hauled the catch on board the craft and a fresh baited hook was let down again. In the meantime, the fish on the hook was freed and the hook was rebaited for the subsequent operation. Fishing was thus conducted for about 6 hours a day for a period of 12 days. At the end of the day's fishing, the catamarans returned to the mother vessel with their catches and bait particulars. The catches for each unit were carefully analysed in relation to the baits used. The catch and bait details are furnished in Tables I, II & III. The comparative efficiency of the different baits used is discussed in detail.

Discussion

During the present experimental fishing operations with hand lines, five different types of natural fish baits were tried. They were (1) live prawns, (2) dead prawns, (3) squids (4) small fishes and (5) fresh pieces of fish flesh. Live-fishes could not be tried as bait. Fishing was conducted for 12 days and on an average a total number of 142 fishes per day of fishing was obtained. The entire catch was composed of fishes belonging to 5 genera and 14 species as shown in table I. It is quite evident from the fishing data presented in Table II that live prawns appear to be the most effective bait for hand line fishing operations and the squids were the next best. The live prawns alone accounted for 41% of the total catch followed by squids with 31%. The remaining three types of baits got only 28%.

It was an interesting feature of observation regarding the great disparity in the luring and catching efficiency of live prawns and dead prawns. The former showed the maximum effectiveness accounting for 41% of the catch while the latter recorded only 6%. It is very probable that the kicking of the legs and other appendages of the live prawns fixed to the fishing hook is a source of quick attraction for the passing fish which is easily enticed to it. In the case of soft bodied squid (*Sepia* sp) as bait, the wriggling movements of the body as well as the swaying action of the tentacles when alive exhibit good luring tendencies.

As regards the other types of baits like small fish and pieces of fish flesh the catch was comparatively low (10% and 12% respectively). The whiteness of these baits in contrast to the colour of the sea-water at the depth at which they were displaced was the only attracting feature, but it had only lesser effect than live prawns and squids. It also appears that the dead prawns on the hook could not excite and entice the passing fish, probably they neither had the appropriate colour of attraction nor the desired motility. This phenomenon appears only to

be true to the hypothesis that motion is an essential component in visual attraction. Luminous (visual), sonorous (audial) mechanical or chemical under-water stimuli are the various methods by which the attention of a solitary fish or a shoal of fishes can be drawn. Sea tests conducted by Tester (1959) have indicated that vision of fish played an important part and that motility of a lure or bait whether living or dead, edible or non-edible was an important attribute. Tamura (1959) has found that the reaction of a fish to bait is the result of a complex process in which both the visual stimuli and the water motion produced by the bait are important.

It is seen from Table III that out of the day's average total catch, 45% were entirely made up of *Caranx* species indicating probably a favourable living or luring environment for them in the areas fished. They were found and fished in association with other fishes like *Chorinemus* 20%, *Trachynotus* 13%, *Acanthurus* 13% and *Sericlichthys* 9% in the same fishing ground. Out of the total number of fishes caught in a day using exclusively live prawns as bait 62% was represented by 8 different species of *Caranx*. Of the 44 fishes caught with squids (*Sepia*) as bait 41% were also *Caranx*. Apart from live-prawns and squids the other baits used had very little influence on *Caranx*. The reactions of *Chorinemus* and *Trachynotus* to the different baits were also some similar to that of *Caranx* whereas the other fishes landed did not show any striking preference to any particular bait and their catches were also considerably poor.

It is evident from the present observations that a good number of species of *Caranx* respond very well to live prawns and squids (*Sepia*) when they were used as bait in the hand-line fishing operations. Similar bait experiments conducted in Canada in Hake fishing showed that squid and mackerel yielded a greater net profit than the other cheap baits (Commercial Fisheries Review, (1950), Martin (1954) has found that different baits have different effectiveness and that good quality squid is better than other baits. In the present series of experiments, however, live-prawns have been found to be a better bait than the squids for catching particularly carangid fishes. Prawns and shrimps have also been recorded as part of the natural food in the stomach contents of many of the carangid fishes, Mahadevan (1950), Datar (1954) and Chaco and Mathew (1955).

Conclusions

A good knowledge on the feeding responses of the commercially important sea-fishes that are normally exploited by the luring lines appears to be a useful guiding factor while organising line fishing operations. By selecting proper fish baits and with the proper location of the rich fishing grounds one can predict to some extent the type of fish that could be caught. It is always hope of the fishermen to get the desirable variety of fish that has the greatest demand from the consumers. Natural live-baits like live-fish, live-prawns and live-worm are generally considered to be effective fish-baits. But in practice procurement of live-baits for a specific type of fishing involves many problems. Fortunately today numerous types of artificial lures or baits of varying types, shapes and colours are profitably employed in all time-fishing operations in many countries. As described

by Koyama (1959) the numerous jigs are only meant to imitate some kind of small fish and at the same time retain a fishing efficiency as high as that of the natural live-bait. The recent progress in the study of electro-physiology of fishes has offered three types of commercial fishing technique in Japan viz. (1) electrified hook for sword fish, tuna and sharks (2) electric shocks to whales through harpoon and (3) electricity for trolling lines mainly for spanish mackerel and small tuna. Comprehensive studies, detailed experiments and technological investigations in these lines might open a new era in the existing fishing methods in India particularly as regards to fishing with hand-lines, and trolling lines.

Summary

Baits play an important part in all line-fishing operations. Each type of bait yields primarily an abundance of the species of fish for which the particular bait is intended. Comparison of the relative effectiveness of five different natural baits under the present series of experiments has revealed the superiority of live-prawns and squids over others. A large quantity of carangid fishes have shown striking preference to live-prawn baits. The catch data for each type of bait used is analysed in detail and is presented in Tables I, II, & III.

Acknowledgement

The author is very much indebted to Sarvashri Selvaraj and Balakrishnan with whose help the private catamaran fishermen were persuaded to accompany the author to the fishing grounds during the present investigations. Grateful thanks are due to Dr. A. N. Bose, Director, Central Institute of Fisheries Technology for going through the manuscript and offering useful suggestions.

References

1. Balasubramanian R. *Fishery Technology* Vol. No. 1 (1964)
2. Chacko, P. I. and Mathew, M. J. Government Fisheries, Madras, *Contribution from the Marine Biological Station, West Hill, Molabar Coast*, No. 2 1954. (1955).
3. Datar, G. G. *Proc. 41st Indian Sci. Congr* 3, 181-182 (1954).
4. Koyama, T. *Modern Fishing Gear of the world*, F.A.O. (1959).
5. Mahadevan, S. *Journ. Madras Univ.* 20, 24-48, (1950)
6. Martin, W. R. and McCracken, F. D. *Fish Res. Bd. of Canada* 58, 17. (1954).
7. Tamura, T. *Modern Fishing Gear of the world*, F.A.O. (1959)
8. Tester, A. L. *Modern Fishing gear of the World* F.A.O. (1959).

TABLE I

Showing the different types of baits used and the composition of the catch obtained.

Baits used	Fishes caught
LIVE PRAWNS:	
<i>Penaeus indicus</i>	<i>Garanx malabaricus</i>
<i>Penaeus carinatus</i>	" <i>affinis</i>
<i>Metapenaeus dobsonii</i>	" <i>carangus</i>
<i>Metapenaeus monoceros</i>	" <i>lie</i>
	" <i>nigrescens</i>
	" <i>atropus</i>
	" <i>rotleri</i>
	" <i>hippos</i>
DEAD PRAWNS:	
<i>Penaeus indicus</i>	
<i>Penaeus carinatus</i>	
<i>Metapenaeus dobsonii</i>	
<i>Metapenaeus monoceros</i>	
SQUIDS	
<i>Sepia</i> sp.	
SMALL FISHES:	
<i>Clupea fimbriata</i>	<i>Chorinemus moadetta</i>
<i>Engraulis hamiltonii</i>	" <i>toloo</i>
	" <i>lysan</i>
PIECES OF FISH FLESH:	
<i>Chirocentrus dorab</i>	<i>Trachymotus russellii</i>
<i>Trichiurus savala</i>	<i>Acanthurus gahm</i>
	<i>Seriichthys bipinnulatus</i>

TABLE II

Showing the average number of fishes caught per day per each fishing unit against the type of bait used

Type of bait	Average catch per day					Total Nos. caught	% of the total and Ranking
	Unit-1	Unit-2	Unit-3	Unit-4	Unit-5		
Live Prawns	15	12	10	12	10	59	41-I
Dead Prawns	2	3	..	1	2	8	6-V
Squids	10	12	8	6	8	44	31-II
Small fish	2	2	2	4	4	14	10-IV
Pieces of Fish Flesh	3	4	3	4	3	17	12-III

TABLE III

Showing the different variety of fish caught against each type of bait used.

Type of bait	CARANX		CHORINEMUS		TRACHYNOTUS		ACANTHURUS		SERIOLICHTHYS	
	Numbers	% of the total	Numbers	% of the total	Numbers	% of the total	Numbers	% of the total	Numbers	% of the total
Live prawns	36	62	12	20	6	10	2	3	3	5
Dead prawns	2	25	1	12	3	38	2	25
Squids	18	41	10	23	8	18	5	11	3	7
Small fish	3	21	2	15	1	7	5	36	3	21
Pieces of Fish Flesh	5	29	3	18	3	18	4	23	2	12