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Swimming Behaviour of Fish toward Pots

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Introduction

Pots are most effective in capturing slow-moving creatures that move about on or just above the sea or lake bottom. Some improvements on pots have been intended by the authors. The present paper describes an experimental study on the swimming behaviour of the sample fish, *Therapon jarbua* enticed around the pots by bait. This information is expected to be used as some fundamental data for improving the pots.

Material and Method

Experiments were carried out at the brackish area in the lower Minato River, Kagoshima Prefecture, August 10 1969 (Fig. 1). Four half-round linked pots were set at the river-bed, with their openings kept against or to the current, or at a right angle to it. While watching the swimming behaviours of the gathered *Therapon jarbua* the authors timed the intervals between the pots-setting and the fish-arrival near the pots, counting the number of the gathering fish at the

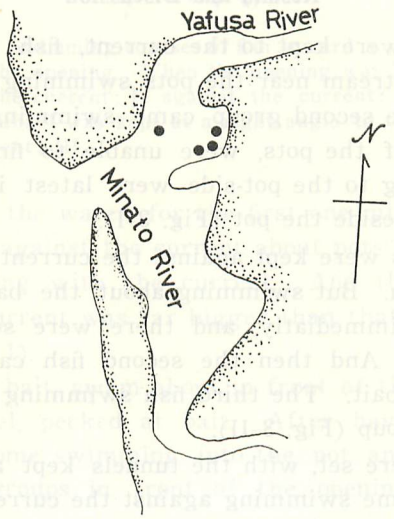

Fig. 1. Map showing the area where the experiments were carried out. Closed circle show the positions where pots were set.

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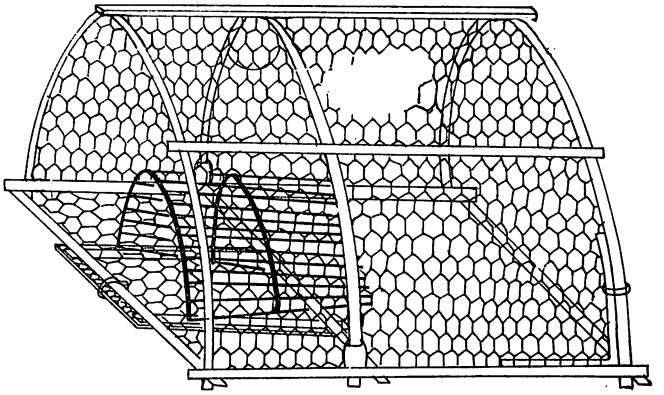

Fig. 2. Half-round pot with 30cm. length by 22 cm. width and 22 cm. height. This pot was covered with wire-netting with 1cm. mesh-size.

interval of one minute. And the moment fish entered a pot through a tunnel, the number of the pecking fish and the entered fish was counted. It took five minutes for a experiment. These experiments were carried out in the water-depth varying from 1 to 0.7 m., water temperature being 23°C. The number of the small fish passing through the net-mesh was put out of counting. Crabs and mackerels were used for baits.

Results and Discussion

I When the opnings were kept to the current, fish of the first group came swimming against the stream near the pots, swimming straight to a bait in the tunnel. Then fish of the second group came swimming with the current, and, hesitating at the back of the pots, were unable to find the bait immediately. The third fish swimming to the pot-side were latest in finding the bait, kept hesitating for a while beside the pot (Fig. 3-I).

II When the openings were kept against the current, the first fish came swimming against the stream. But swimming about the back of the pot they were unable to find the bait immediatly, and there were some which swam away, unable to find any bait. And then the second fish came swimming with the current straight to the bait. The third fish swimming to the pot-side behaved similarly to the first group (Fig. 3-II).

III When the pots were set, with the tunnels kept at a right angle to the current, the first fish came swimming against the current to find out the bait. Then the second fish came swimming with the current, finding difficulty in arriving at the bait. The third fish came swimming the back of pots dashed against the back net though they seemed to be swimming straight to the baits, reaching the bait latest (Fig. 3-III).

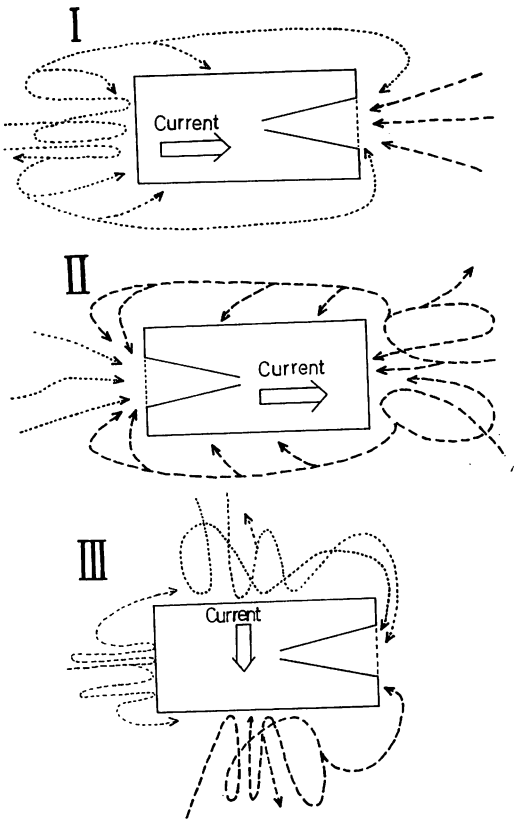

Fig. 3. Swimming courses of fish toward a pot and the opening. When the opening was kept to the cuerent: I, against the current: II, the tunnel was kept at a right angle to the current: III.

After pots were set in the water, for the first one minute, the number of the gathered fish swimming against the current about pots was always bigger than that of the ones swimming with the current. And the total number of fish swimming against the current was far bigger than that of the ones swimming with the current (Table 1).

Fish, having noted the bait, swam about in front of the opening, and some of them, entering the tunnel, pecked at bait. After having pecked, they swam away from the tunnel, some swimming into the pot and others out of it, and joined swimming-about-groups in front of the opening, which was repeated frequently (Fig. 4).

Relationship between the number of the fish swimming about the pot and catch by the pot was shown in Fig. 5. The correlation coefficient between them was $r_1=0.448$, hence the catch-increase in right proportion to the number of fish swimming about the pot ($t=2.119$, df: 28, $P<0.05$). This does not mean that

Table 1. The number of the gathered fish at intervals of one minute after pots were set.

Set of pots \ Interval in minute	0–1	1–2	2–3	3–4	4–5	Remark
I	8	13	4	7	0	To the current
	6	8	2	0	0	
	10	1	0	0	0	
	5	8	2	0	0	
	24	30	8	7	0	
	32	17	5	7	0	Against the current
	29	14	6	0	1	
	31	4	0	0	0	
	21	17	5	0	0	
	113	52	16	7	1	
II	13	5	3	4	0	To the current
	9	4	2	0	0	
	9	3	5	0	0	
	5	10	11	0	0	
	36	22	11	4	0	
	22	10	3	3	2	Against the current
	28	7	6	0	0	
	34	9	12	0	0	
	22	15	10	0	0	
	106	41	31	3	2	
III	7	6	4	3	0	To the current
	6	3	3	0	0	
	4	6	3	1	0	
	17	15	10	4	0	
	27	7	16	10	2	Against the current
	15	19	5	0	0	
	20	13	6	3	0	
	62	39	27	13	2	

all gathered fish entered the tunnel in a mass but it means that it is some of the gathered fish, and especially some of the pecking fish that enter the pot through the tunnel. The relationship between the number of fish pecking the bait in the tunnel and the number of the entered fish was shown in Fig. 6. The correlation coefficient between them was $r_2=0.680$, hence the entered-fish-number-increase in right proportion to the number of pecking fish in the tunnel ($t=2.609$, df: 46, $p<0.025$).

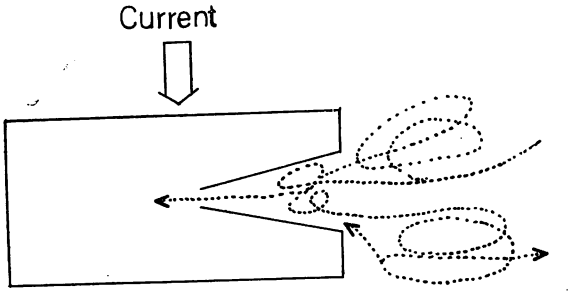

Fig. 4. Swimming courses of fish near the opening and in the tunnel.

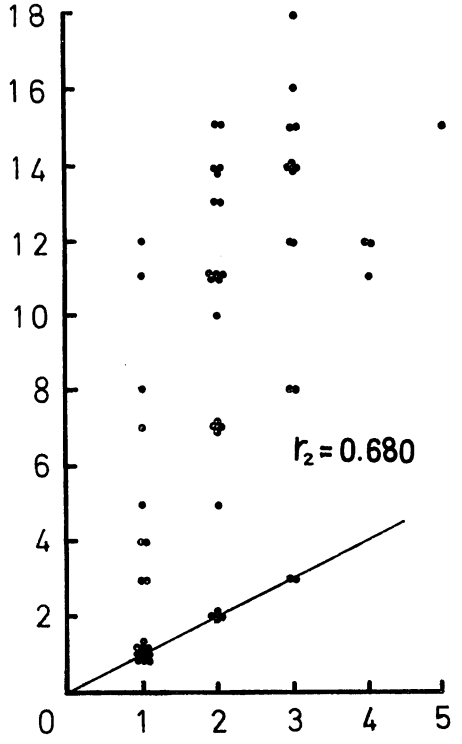

Fig. 5. Relationship between the number of the fish pecking the bait in the tunnel (ordinate) and the number of the entered fith (abscissa).

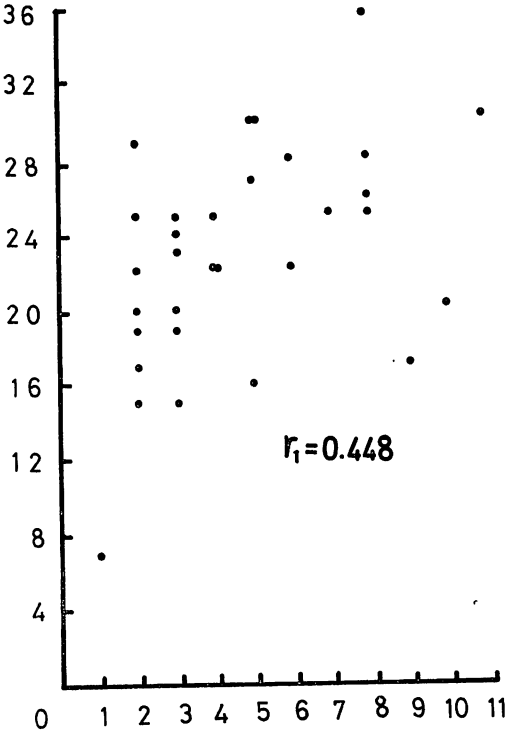

Fig. 6. Relationship between the number of the fish swimming about the pot (ordinate) and the number of catch (abscissa).

Dots plotted on the line of the equation $y=x$ show the fact that all the pecking fish entered the pot and dots above it show that some of the pecking fish entered the pot. In the former occasion, it might be supposed that fish entered the pot incidently. And in the latter, the entered fish might be supposed to have been affected by other pecking fish, in other words, it may be said that the

entered fish were prevented from fleeting out of the opening because of the existence of other pecking fish, being compelled to enter back into the pot.

Rate of the number of the entered fish to the ones swimming about near the pot was shown in Table 2. When the opening was kept to the current the rate was greatest; and when the opening was kept against the current, it was smallest (Table 3).

Table 2. Rate of the number of the entered fish (a) to that of the ones swimming about near the pot (b).

I			II			III		
a	b	b/a	a	b	b/a	a	b	b/a
30	12	0.400	26	8	0.308	22	5	0.227
25	8	0.320	20	3	0.150	22	7	0.317
20	11	0.550	15	4	0.267	20	4	0.200
17	10	0.588	11	2	0.182	25	5	0.200
22	3	0.136	24	4	0.167	19	4	0.211
23	4	0.176	29	3	0.103	22	5	0.277
35	9	0.257	25	3	0.120	15	3	0.200
30	6	0.200	27	6	0.222	25	9	0.360
28	7	0.250	25	4	0.160			
30	6	0.200	28	9	0.321			
			17	3	0.176			
			19	3	0.158			

Table 3. Test of comparison in the averages of the rate of the number of the entered fiish to that of the ones swimming about near the pot.

Set of pots	I	II	III	Average
I		t=2.110 df: 20 P<0.05	t=1.198 df: 16 P>0.1	0.1945
II	F=4.968 df: 9, 11 P>0.05		t=1.578 df: 18 P>0.1	0.3077
III	F=6.574 df: 7, 9 P>0.05	F=1.323 df: 7, 11 P<0.05		0.2428
S^2	0.02465	0.00496	0.00375	

(F—test)

(t—test)

From the fact described above, we may concluded that more catch may be obtained when the pots were set, with the opening kept to the current, and as r_2 was bigger than r_1 it was assumed morenecessary to let more fish enter the tunnel in a mass with more frequency than to gather more fish near the pot.

And in further study it must be cleared that by what enticing factors the fish are to be led on to the bait, and whether it is by chance that the fish enter the pot or otherwise.

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Summary

We set half-round experimental pots with baits at the brackish area in the lower Minato River, observing the swimming behaviour of fish toward pots; with the result summarized as in the following:

1) Fish reached the pots from all quaters with various manners, namly swimming with the current, against the current or across the current. The fish that came swimming against the current reached the pot ealiest of the three. Some of the fish coming from the back of the pots were unable to reach the opening, swimming away from them.

2) The number of the entered fish in the pots increases in proportion to the number of the pecking fish in the tunnel, and to the number of the gathered fish swimming around the pot.

Reference

Allen, R. F. (1964): "Modern Fishing Gear of the Warld 2" 263-270 (Fishing News Books LTD, London, England).

Rounsefell, G. A. and Everhart, W. H. (1953): "Fishery Science" 147-151 (John Wiley and Sons, INC., London, England).