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Variations in the Catch Success of Channel Catfish and Carp in Baited Hoop Nets

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SYNOPSIS: Baits were tested for their ability to attract channel catfish and carp into hoop nets. Treatments tested were cheese alone, soybean cake alone, cheese and soybean cake combined, and an unbaited control. A 4 x 4 Latin Square design was used for the experiment. The factors which influence catch success were assessed by the analysis of variance. Cheese bait was best for increasing the catch success of channel catfish; in nets containing soybean cake the increase was not statistically significant. There were significant differences in the catch success of channel catfish among netting sites and among locations of nets within each site. Most of this variation was attributed to the chumming power of cheese bait. Carp were attracted in significantly higher numbers to nets containing soybean bait, while cheese bait had little attraction. Variation in the monthly mean catch success of carp was highly significant.

INDEX DESCRIPTORS: Commercial fish bait, catfish, carp, catch success.

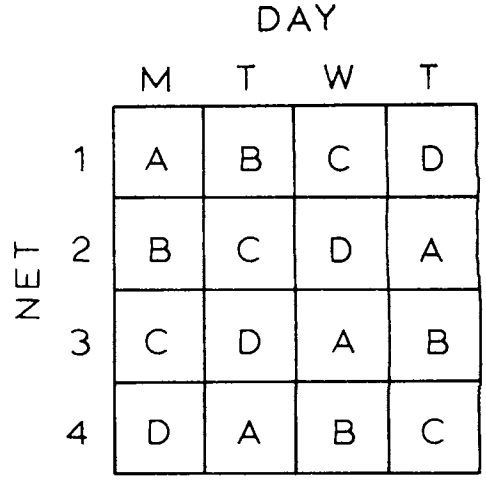
Various bait preparations are used to attract channel catfish and carp into hoop nets. Two of the most commonly used commercial baits are unmarketable cheese from clipping during processing and soybean cake, a by-product of soybean oil extraction which is frequently used in domestic livestock food. Both baits work by slowly permeating into the stream current and chumming fish from downstream. Fish follow the bait scent to its source and are captured.

Observations of net lifts indicated considerable variation in the catch success and selectivity of fish species when nets were baited with these products. Since baits were usually combined at each set it was difficult to ascertain differences in bait preferences by fish, but usually when a single bait was used there was greater species selectivity depending primarily on the product.

METHODS AND ANALYTICAL PROCEDURE

The experimental procedure was designed so the unique effects of different bait treatment could be separated while accounting for variations in catch due to uncontrolled factors. Two netting sites were selected near the upper headwaters of Red Rock Reservoir in a portion of the Des Moines River where extensive pre-impoundment netting studies were conducted. These sites were approximately 4-km apart in similar stream habitat, and were designated sites 1 and 2. Four hoop nets with 61 cm circular frames and 3.8 cm stretch measure nylon web were set at each site. Nets were located at intervals ranging from 48 to 114 m along the stream within each site and numbered consecutively from 1 through 4 from the upstream location. Maximum length of the series was about 230 m. Nets were kept in the same location throughout the experiment.

Bait treatment was scheduled according to a random 4 x 4 Latin Square commencing with the sequence



where, A represented soybean cake, B represented cheese, C represented soybean plus cheese, and D represented unbaited control nets. These treatment combinations represent the factorial combination of two factors, soybean and cheese. A randomized baiting regime was achieved by changing one column in the Latin Square at the start of each replication.

The daily baiting schedule started Monday A.M. and continued through Thursday P.M. Captured fish were enumerated by species and released from a common point. Nets were carefully emptied of remaining bait before they were rebaited with the next scheduled treatment.

Previous hoop netting (Mayhew and Mitzner, 1969) indicated seasonal variation in the catch of channel catfish. Most of the variation was related to intensified movement associated with spawning during the June-July period and unexplained accelerated movement in early autumn. Hoop nets are stationary self-entrapping gear, and periodic irregularity in movement patterns of fish is usually reflected in catch success. Variations attributable to seasonal activity were measured by replicating each square at monthly intervals in June, July, August and September.

The actual catch counts (X) were transformed to

$$X' = \sqrt{X + 1/2}$$

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before the analyses were made to achieve more uniform variance in the residuals. Examination of the empirical cumulative distribution of residuals by probability plotting indicated normality was a reasonable assumption.

RESULTS AND DISCUSSION

Overall catch success of channel catfish in the hoop nets ranged from 0.3 to 143.8 fish per net day (FND) with a mean of 31.8 FND (Table 1). Treatments containing cheese had a profound effect upon catches of channel catfish (Figure 1). In the nets containing cheese alone mean catch success was 56.8 FND and in the nets containing both cheese and soybean catch success was 58.7 FND. The small increase in catch with the addition of soybean to cheese was not significant ($P > .05$). The difference in the catch of catfish between the unbaited control and nets containing soybean was 13.6, which was significant at the 10% level but not at the 5% level. There was little doubt catfish were seeking baited nets.

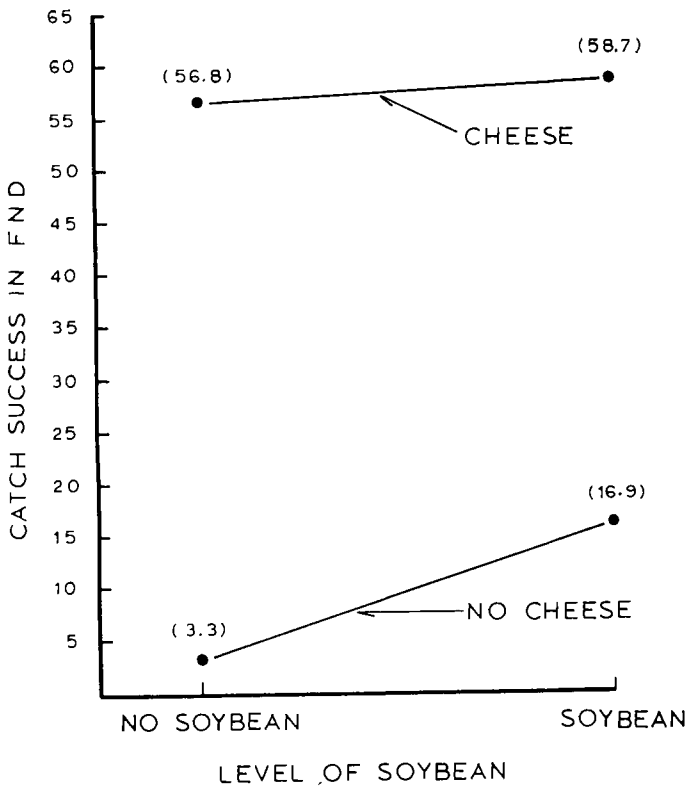

Figure 1. Treatment means for catch success of channel catfish.

Analysis of variance in catch success (Table 2) showed highly significant difference between the netting sites ($P < .01$). Mean catch success for site 1 was 23.3 FND compared to 44.6 FND at site 2. Catch effort was not significantly different between monthly replicates ($P < .25$). Means for the replicates were 14.9 FND in June, 40.9 FND in July, 44.7 FND in August and 35.8 FND in September. These values approximate those reported in netting studies by Mayhew and Mitzner (1969), but monthly distribution of the catch was quite different. In the previous investigation highest catch success was reported in June followed by a precipitous decline in July and an increase during late August to a secondary mode by mid-September with a decline later in autumn. Highly significant ($P < .01$) F-ratios were also obtained from the site x month interaction.

TABLE 1. CATCH SUCCESS OF CHANNEL CATFISH IN HOOP NETS CONTAINING VARIOUS BAIT COMBINATIONS. ALL VALUES ARE FISH PER NET DAY.

Month	Treatment	Site 1	Site 2	Means
June	A	11.0	3.5	7.3
	B	32.3	38.3	35.3
	C	20.3	3.8	12.1
	D	22.0	1.8	1.9
	Means	21.4	11.9	14.2
July	A	3.5	32.8	18.0
	B	21.5	93.8	57.7
	C	32.3	141.8	87.1
	D	0.3	2.0	1.2
	Means	14.4	67.6	41.0
August	A	11.0	45.0	28.4
	B	8.0	126.0	67.0
	C	18.0	143.8	80.9
	D	4.5	0.5	2.5
	Means	10.4	78.8	44.7
September	A	22.5	5.3	13.9
	B	57.0	9.3	33.2
	C	57.0	52.5	54.8
	D	2.0	13.0	7.5
	Means	34.6	20.0	27.4
	Overall Means	20.2	44.6	31.8

TABLE 2. ANALYSIS OF VARIANCE IN MEAN CATCH SUCCESS OF CHANNEL CATFISH. DATA ARE TRANSFORMED BY $\sqrt{X + 1/2}$.

Source of variation	df	SS	MS
Squares	(7)	383.3	
Sites	1	59.7	59.7*
Months	3	68.1	22.7
Sites x months	3	255.5	85.2**
Locations within squares	24	538.9	22.5*
Days within squares	24	259.9	10.8
Treatments	(3)	367.1	
Soybean	1	30.7	30.7
Cheese	1	315.4	315.4**
Soybean x cheese	1	21.0	21.0
Residual	69	767.2	11.1
Total (corrected)	127	2316.4	

* Significant at .05 level.
** Significant at .01 level.

Significant difference ($P < .05$) in catch success among locations within a site and a systematic increase in mean catch values from location 1 through 4 demonstrated the chumming power of cheese bait (Figure 2).

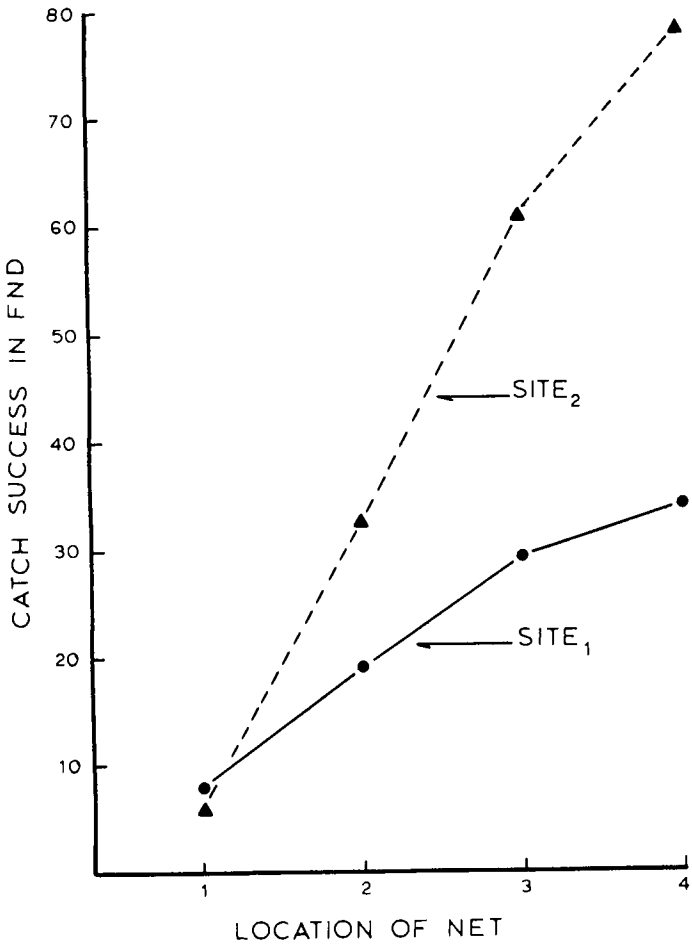

Figure 2. Catch success of channel catfish by location within netting site.

Although nets were spaced at intervals ranging up to 114 m the daily use of cheese at two locations within each site apparently caused chumming in the entire series rather than individual nets. When cheese treatments were in upper sets some catfish were apparently being incidentally captured in lower nets while moving toward bait in the upstream nets. Maximum catches of catfish frequently resulted from treatments containing cheese located in lower sets because fish could follow the bait scent directly to the trap without interference or capture in other nets. During the experiments cheese treatments were placed in location 4 a total of eight times. Of these, six ranked highest in catch success. Separating the nets at further intervals would minimize the effect of cheese bait on nearby sets, but the distance would have to be carefully selected to prevent differences in sites from becoming a significant source of variation.

Latent chumming by residual bait in nets was successfully controlled by carefully emptying the net of all previous treatments. Differences in catch success on successive days were not significant ($P < .25$). Means for day periods were 47.5, 22.4, 34.5 and 31.2 FND for Monday through Thursday, respectively.

Overall mean catch success of carp in baited hoop nets was 39.5 FND and ranged from 0.5 to 150.0 FND (Table 3). Carp sought nets containing soybean cake (Figure 3).

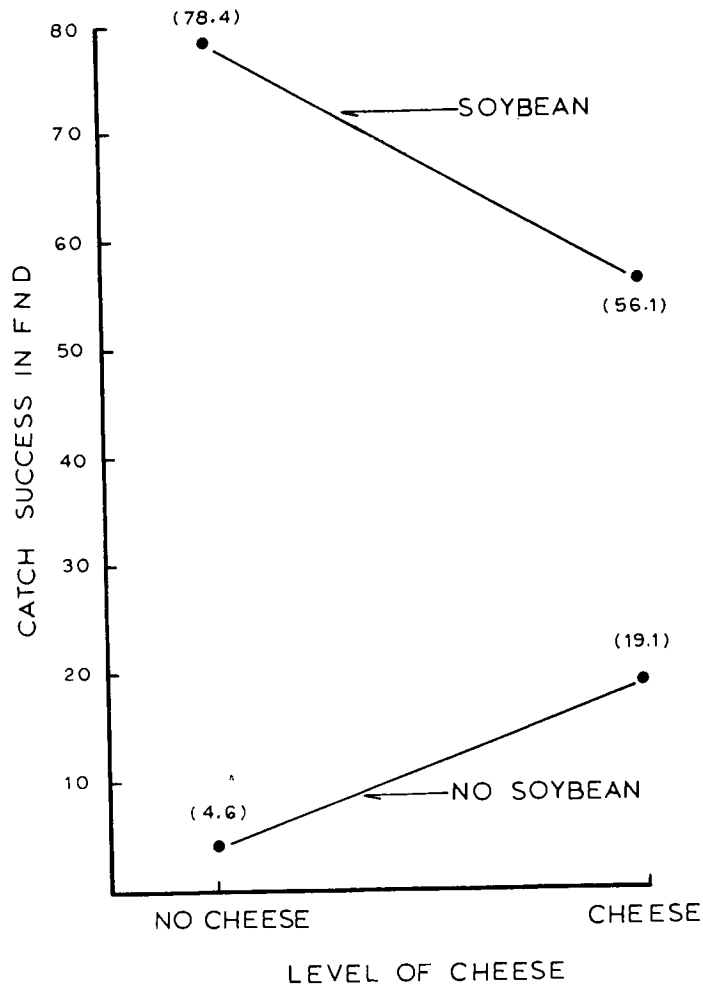

Figure 3. Treatment means for catch success of carp.

Significantly more fish were caught when soybean bait was used alone than when combined with cheese ($P < .01$). However, without soybean, carp preferred the nets with cheese over the unbaited control.

A decline in catch success with the combined treatments could be the result of several factors. If carp were avoiding a net because it contained cheese, catch success in those nets would be lower. Since catch success was 19.9 FND in nets baited with cheese alone it causes some doubt in the validity of this explanation. Another possibility is that carp avoided nets with large catches of channel catfish. Since nets with the combined bait treatments caught the highest number of catfish this may partially explain the lower carp numbers for this combination. The low catch effort in unbaited control nets of 4.4 FND showed carp were seeking baited traps.

Variations in catch success attributable to concomitant fac-

TABLE 3. CATCH SUCCESS OF CARP IN HOOP NETS CONTAINING VARIOUS BAIT COMBINATIONS. ALL VALUES ARE FISH PER NET DAY.

Month	Treatment		Site 1	Site 2	Mean
June	A		70.0	13.8	41.9
	B		21.3	4.0	12.7
	C		25.3	20.3	22.8
	D		6.5	1.8	4.2
		Means	30.8	10.0	20.4
July	A		68.3	91.8	80.1
	B		20.0	13.8	16.4
	C		56.8	66.0	61.4
	D		4.5	2.8	3.7
		Means	37.4	43.6	40.4
August	A		150.0	137.8	143.9
	B		55.0	25.8	40.4
	C		40.8	140.5	90.7
	D		6.8	2.8	4.8
		Means	63.2	76.7	70.0
September	A		49.8	45.3	47.6
	B		8.8	4.0	6.4
	C		77.0	21.8	49.8
	D		0.5	10.5	5.5
		Means	34.0	20.4	27.3
		Overall Means	41.4	37.7	39.5

tors showed differing factors important. Catch effort was not significantly different ($P < .25$) between netting sites for carp (Table 4). Means were 41.3 FND at site 1 and 37.6 FND at site 2. The analysis of variance revealed highly significant difference ($P < .01$) between monthly replications. In general, catch success increased linearly from June through August followed by a sharp decline during September (Figure 4). Overall mean catch success for the four replicated months was 20.3, 40.5, 69.9 and 27.2 FND, respectively. There was no significant difference ($P < .25$) in catch success between net locations.

TABLE 4. ANALYSIS OF VARIANCE IN MEAN CATCH SUCCESS OF CARP. DATA ARE TRANSFORMED BY $\sqrt{X + 1/2}$.

Source of variation	df	SS	MS
Squares	(7)	264.1	
Sites	1	6.9	6.9
Months	3	194.3	64.8**
Sites x months	3	62.9	21.0
Locations within squares	24	353.4	14.7
Days within squares	24	428.0	17.8*
Treatments	(3)	639.9	
Soybean	1	559.0	559.0**
Cheese	1	< .1	< .1
Soybean x cheese	1	80.9	80.9
Residual	69	653.8	9.2
Total (corrected)	127	2339.2	

* Significant at the .05 level.
** Significant at the .01 level.

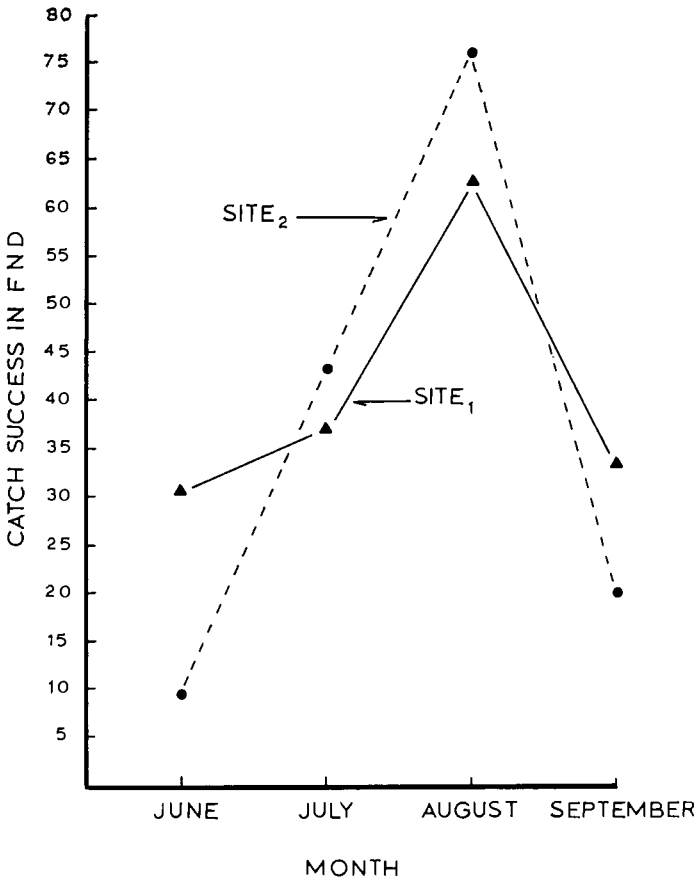

Figure 4. Monthly catch distribution of carp in baited hoop nets.

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LITERATURE CITED

MAYHEW, J. and L. MITZNER. 1969. Commercial fisheries investigations: A report on the third year studies at the Des Moines River and Coralville Reservoir. Biol. Sect. Rep., State Conserv. Comm., Des Moines, Iowa. 87 p.