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EVALUATION OF TROUT STOCKING PROGRAM
BELOW DAVIS DAM

Project F-7R-14
Work Plan 3
Job R-3

Completion Report
January 1, 1971 to
June 30, 1972

Abstract

During 1971 -72 approximately 150 man-days were spent on the Colorado River below Davis Dam conducting creel census, stocking of catchable trout, and evaluating the management program by analysis of the marking and tagging data.

Due to a change from a calendar to fiscal year, the reporting period encompasses eighteen months (January 1, 1971 to June 30, 1972). Creel census data has been divided into two segments; Segment I, January - June 1971; Segment II, July 1971 - June 1972. During Segment II a boat census was used to augment the data, which previously had been gathered only by a shore census. This, along with an increase in census area, provided a more realistic appraisal of fishing success and return rate of planted fish.

The Willow Beach National Fish Hatchery planted 208, 170 trout between Davis Dam and Needles, California.

Fifteen thousand of the stocked trout were marked (7, 500 adipose clipped, 7, 500 "flag" tagged) to determine percent return and downstream movement.

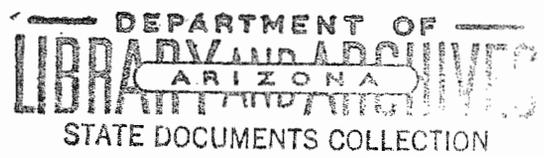
Live cages and analysis of striped bass stomachs were utilized to determine mortality and predation following stocking.

Recommendations

Recommendations for 1972-73 are as follows:

1. A boat type creel census should be conducted between Davis Dam and Holiday Shores, four times monthly on the basis of three weekdays and one weekend day.
2. The trout stocking rate should be continued as outlined in F-7-R-12, WP-3, except Unit C-1 should be increased from 25% to 40%. *
3. Stocking of Unit C-1 should be made on a semi-monthly schedule; with each plant consisting 700 lbs. *

F-7-R-14, WP3, JR-3



4. Continue "flag" tagging and monitoring return, to substantiate data already obtained*

* At the time of this writing, certain complications have arisen at the Willow Beach National Fish Hatchery which need to be mentioned due to their direct affect on the stocking program. On August 29, 1972, due to a blockage in the water intake system, some 400,000 trout were released into the river at Willow Beach. Due to this loss, fish for stocking will not be available until December, 1972. At this time the new stocking recommendations laong with additional tagging will be initiated.

Objectives

To determine fishing quality and to evaluate management procedures.

Creel Census - Below Davis Dam

During Segment I, (January - June, 1971) bank fishermen were interviewed on 24 randomly selected days (Table I). The sample area consisted of one-half mile of shoreline (both Arizona and Nevada shores) directly below Davis Dam. The censused anglers caught 209 fish in 1,239 hours for a success rate of 0.17 fish per hour.

In Segment II (July, 1971 - June, 1972) 63 random days were sampled (Table II). A total of 1,490 anglers were interviewed. These anglers caught 1,357 fish in 4,239 hours of fishing effort. The average rate of success was .32 fish per hour. In April, with the start of the boat census, the sample area was extended five miles downstream to Holiday Shores. This change in both sample area was extended five miles downstream to Holiday Shores. This change in both sample area and census techniques has affected the recorded fishing success. The fish per hour rate has increased from .11 (July - March) to 50 (April - June).

Stocking below Davis Dam

During Segments I and II, 49,822 lbs. of rainbow trout were planted in the Colorado River between Davis Dam and Needles, California. The fish were planted by area as recommended in F-7-R-12, WP-3. Tables III - VI give a breakdown of the stocking by areas.

Trout Marking and Tagging

On March 10, 1972, 7,200 rainbow trout were marked with an adipose clip and planted in the Colorado River one-half mile downstream from Davis Dam. Return data on the clipped fish was received during creel census interviews of boat and bank fishermen.

F-7-R-14, WP-3, JR-3

With the change in census method came an immediate increase in the fish per hour rate (.18 in May to .49 in April). The increase is primarily the result of the high fishing success of the boat fishermen. (.67, 1.2 and 1.3 for the last three months of the segment) (Table II).

It is believed that this method of creel census provides an accurate picture of the fishing success below Davis Dam. Due to low water conditions a census further downstream than Holiday Shores is not practical. It is felt that the fishermen checked in this segment of the river is representative of the trout fishermen between Davis Dam and Topock Bridge.

From past studies (F-7-R-11, WP-3, JR-3) it was shown that fishing success (fish per hour) of the bank fishermen below Davis Dam is directly proportional to the stocking rate. In January, 1972 this was further expanded to determine the longevity of the fishing success following stocking. From Figure II it can be seen, that by the end of ten days, the influence of the stocking had significantly diminished. Of the "flag tagged" trout caught within the immediate area of the stocking, 64% were caught within ten days following their stocking. This high short-lived return further substantiates Figure II.

From the use of the live boxes, it was determined, that the survival rate following stocking is high; therefore, the drop in fishing success (in the area below Davis Dam) is due to the absence of fish as a result of downstream movement and/or heavy predation from striped bass. From the analysis of the striped bass stomachs (Table IX) it appears that predation is high. It is felt, that this high predation only occurs for a short period following stocking. During this period the stocked trout are adjusting to their new environment and are highly susceptible to predation. Once they have adapted, this high predation rate drops. If this were not true, then the percentage of trout found in striped bass stomachs during the 1969 food habits study (F-7R-13, WP-3, JR-3) would have been much higher. Based on tag return data (Table VIII) and the high catch rate (Table II) of the downstream boat fishermen, it appears that downstream movement is responsible for the absence of stocked fish in the area immediately below Davis Dam.

The shore area directly below Davis Dam, due to its accessibility and camping availability, receives the heaviest fishing pressure along the river to the Topock Bridge. It, therefore, becomes necessary to try to provide these anglers (who are unable to take advantage of the good downstream fishing) with higher fishing success. This may be accomplished without greatly increasing the number of fish stocked. The catch rate curve shown in Figure II was influenced by the stocking of 2,000 pounds of trout. If the stocking were reduced to 1,000 or even 500 pounds, it is believed the curve obtained would exhibit similar characteristics; but with a slight drop of its maximum peak. By making small frequent plants at the dam it may be possible to maintain a higher fish per hour rate throughout the year.

F-7-R-14, WP-3, JR-3

By June 30, 1972 - 195 (2.7%) clipped fish were checked in anglers' creels. These fish account for 16.4% of the total fish checked from March through June. Return of clipped fish by month is recorded in Table VII. Eighty-seven (44.6%) of the returned fish were caught in the vicinity of the plant. The downstream returns are shown in Figure I.

On April 11, 1972 - 7,500 "flag tagged" rainbow trout were planted in the same location as the above mentioned adipose clipped fish. The fish were marked with a yellow full flag tag.

Tag return information was received from the following five sources: (1) A tag return box at the location of plant. (2) Tags received from fishermen in conjunction with regular creel census interviews. (3) Prior to stocking the local newspaper ran an article informing anglers of the tags and requesting that the tags be turned in at the local bait shops. (4) Tags received through the mail. (5) Miscellaneous contacts.

By June 30, 841 tags (11.2% of the total tagged) were returned. Five hundred thirty-eight tags (64%) were returned within ten days following the stocking. Returns for the three month period are recorded in Table VIII. Location of returned tags by half mile sections of river can be seen in Figure I. Six hundred sixty-six (79.2%) were caught by bank fishermen within the immediate area of the stocking.

Seventy-five of the tagged fish were held in live boxes (25 to a box) to determine mortality immediately following stocking. Different boxes were placed at 20, 30 and 40 foot depths in the spillway area of the dam. The boxes were checked after seven days. All fish in the box at forty feet had escaped. Those in the remaining boxes all survived.

To determine striped bass predation on newly stocked trout, stomachs from 20 striped bass were examined over a 13 day period following stocking of tagged trout (Table IX). A total of 24 trout were found, 18 of which were tagged.

Discussion of Trout Management

A catch rate (fish per hour) of .17 was recorded for Segment I (Table I). That equaled the 1970 catch rate, but was still below the .71 and .56 obtained in 1968 and 1969. As stated in Project F-7-R-13, WP-3, JR-3, this decrease may be due to the change in stocking without a corresponding change in census method. To substantiate this, in April 1972 a boat census was initiated to sample boat fishermen in addition to those fishing from shore. The census area was increased five miles downstream to Holiday Shores.

Presently, 25% of the trout stocked in the river are planted directly below Davis Dam (Unit C-1). The elimination of the 10% scheduled for Unit C-2 (which is being supplied from downstream movement from C-1) and the reduction of Unit C-6 from 25% to 20% would make available 45% for C-1, allowing semimonthly stockings of approximately 700 pounds.

F-7-R-14, WP-3, JR-3

Table I - Creel Census Summary - Arizona Game and Fish Department

Lake or Stream Below Davis Dam Year 1971

Month	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total
Total Anglers	--	--	--	--	--	--	35	38	67	74	58	104	376
Male	--	--	--	--	--	--	18	30	53	59	44	78	282
Female	--	--	--	--	--	--	17	8	14	15	14	26	94
Week Day	--	--	--	--	--	--	10	22	30	32	19	23	136
Boat	--	--	--	--	--	--	--	--	--	--	--	--	--
Shore	--	--	--	--	--	--	10	22	30	32	19	23	136
Weedend Day	--	--	--	--	--	--	25	16	37	42	39	81	240
Boat	--	--	--	--	--	--	--	--	--	--	--	--	--
Shore	--	--	--	--	--	--	25	16	37	42	39	81	240
Residents	--	--	--	--	--	--	15	20	19	28	19	54	155
California	--	--	--	--	--	--	14	8	23	38	11	32	126
Nevada	--	--	--	--	--	--	6	6	11	7	26	12	68
Other	--	--	--	--	--	--	0	4	14	1	2	6	27
Total Man Hrs.	--	--	--	--	--	--	105	119	179	206	236	394	1239
Total Fish	--	--	--	--	--	--	8	19	68	8	19	87	209
Fish Per Hour	--	--	--	--	--	--	.08	.16	.38	.04	.08	.22	.17
Boat	--	--	--	--	--	--	--	--	--	--	--	--	--
Shore	--	--	--	--	--	--	.08	.16	.38	.04	.08	.22	.17
No Successful	--	--	--	--	--	--	4	5	27	7	5	36	84
% Successful	--	--	--	--	--	--	11.4	13.2	40.3	9.5	8.6	34.6	22.3
Aver. Day (Hrs.)	--	--	--	--	--	--	3.0	3.1	2.7	2.8	4.1	3.8	3.3
Days Chkd/mo.	--	--	--	--	--	--	4	3	3	5	4	5	24

Table I (Cont.)

Month Species	Jan.			Feb.			March			April			May			June		
	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.
L. M. Bass																1	1.1	
Bluegill																		
Gr. Sun																		
Crappie																		
Chan. Cat																3	3.4	
Bullhead																		
Carp																		
R. Trout	8	100.		19	100.		68	100.		8	100.		19	100.		83	95.5	
Others																		
Total	8	100.		19	100.		68	100.		8	100.		19	100.		87	100.	

Month Species	July			Aug.			Sept.			Oct.			Nov.			Dec.		
	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.
L. M. Bass																		
Bluegill																		
Gr. Sun																		
Crappie																		
Chan. Cat																		
Bullhead																		
Carp																		
R. Trout																		
Others																		
Total																		

	Yearly Total		
	No.	Tot.	Av. Lg.
L. M. B	1	.5	
B. G.			
G. S.			
Cra.			
C. Cat	3	1.4	
Blhd			
Carp	205	98.1	
R. Tr.			
Others			
Total	209	100.	

Table II - Creel Census Summary - Arizona Game and Fish Department

Month	Lake or Stream						Year						Total
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	
Total Anglers	50	43	59	56	31	15	145	94	205	470	245	77	1490
Male	40	33	44	44	20	10	114	68	167	356	180	56	1076
Female	10	10	15	12	11	5	31	26	38	114	65	21	414
Week Day	16	6	22	24	5	6	73	26	58	332	184	41	793
Boat	--	--	--	--	--	--	--	--	--	62	105	26	193
Shore	16	6	22	24	5	6	73	26	58	270	79	15	600
Weekend Day	34	47	37	32	26	9	72	68	147	138	61	36	707
Boat	--	--	--	--	--	--	--	--	--	70	--	5	75
Shore	34	47	37	32	26	9	72	68	147	68	61	31	632
Residents	19	25	32	27	21	5	62	41	84	262	136	50	714
California	22	14	11	22	7	1	48	35	87	166	91	17	599
Nevada	7	4	16	2	3	8	25	11	12	18	17	8	103
Other	2	0	0	5	0	1	10	7	22	24	1	2	74
Total Man Hrs.	242	186	205	225	123	71	441	260	503	1360	623	216	4239
Total Fish	3	17	46	7	4	1	84	5	92	665	321	112	1357
Fish Per Hour	.01	.09	.22	.03	.03	.01	.19	.02	.18	.49	.52	.52	.32
Boat	--	--	--	--	--	--	--	--	--	.67	1.2	1.3	.90
Shore	.01	.09	.22	.03	.03	.01	.19	.02	.18	.43	.18	.19	.22
No. Successful	3	9	17	7	3	1	36	5	36	206	107	36	466
% Successful	6.0	20.9	28.8	12.5	9.7	6.7	24.8	5.3	17.1	43.8	43.7	46.8	31.3
Aver. Day (Hrs.)	4.8	4.3	3.5	4.0	4.0	4.7	3.0	2.8	1.3	2.9	2.5	2.8	2.8
Days Chkd/mo.	4	4	5	4	4	4	11	4	6	8	8	5	63

Table II - Creel Census Summary (Cont.)

Month Species	Jan.			Feb.			March			April			May			June		
	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.
L. M. Bass																		
Bluegill																		
Gr. Sun																		
Crappie																		
Chan. Cat																		
Bullhead																		
Carp																		
R. Trout	84	100.		5	100.		92	100.		665	100.		319	100.		112	100.	
Others																		
Total	84	100.		5	100.		92	100.		665	100.		319	100.		112	100.	

Month Species	July			Aug.			Sept.			Oct.			Nov.			Dec.		
	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.	No.	Tot.	Av. Lg.
L. M. Bass							2	4.3		2	28.5							
Bluegill				1	5.9		9	19.6										
Gr. Sun																		
Crappie																		
Chan. Cat	1	33.3		7	41.2		5	10.9										
Bullhead																		
Carp										2	28.5							
R. Trout	2	66.6		8	47.0		30	65.2		2	28.5		4	100		1	100	
Others				1	5.9					1	14.5							
Total	3	100.		17	100.		46	100.		7	100.		4	100		1	100	

	Yearly Total		
	No.	Tot.	Av. Lg.
L. M. B	4	.3	
B. G.			
G. S.			
Cra.			
C. Cat	13	1.0	
Blhd			
Carp	2	.1	
R. Tr.	1336	98.5	
Others	2	.1	
Total	1357	100.0	

F-7-R-14, WP-3, JR-3

Table III - Trout Stocking Below Davis Dam - January 1971 - June 1971

Area	No. Fish	Avg. Lgt.	Total Wt.	Date
C-1	7,700	8"	1,839	1/21/71
C-2,3	7,000	9"	1,959	2/10/71
C-1	6,018	9"	2,040	3/2/71
C-4,5	6,760	9"	2,000	3/3/71
C-6	7,600	9"	2,000	4/6/71
C-6	9,056	8"	2,000	4/7/71
C-2,3	6,900	9"	2,000	5/4/71
C-6	6,600	9"	2,000	5/27/71
C-6	6,534	9"	2,000	5/28/71
C-4,5	6,600	9"	2,000	6/1/71
C-1	6,152	9"	1,856	6/4/71
Total	76,920		21,694	

F-7-R-14, WP-3, JR-3

Table IV - Percent of Stocked Trout by Unit Below Davis Dam -
January 1971 - June 1971

Area	No. Fish	% Fish	Total Wt.	% Wt.
1	19,870	25.8	5,735	26.4
2-3	13,900	18.1	3,959	18.3
4-5	13,360	17.4	4,000	18.4
6	29,790	38.7	8,000	36.9
Total	76,920	100.0	21,694	100.0

F-7-R-14, WP-3, JR-3

Table V - Trout Stocking Below Davis Dam - July 1971 - June 1972

Area	No. Fish	Avg. Lgt.	Total Wt.	Date
C-2, 3	7,990	8"	1,700	7/1/71
C-4-5	6,400	9"	2,000	8/3/71
C-1	6,400	9"	2,000	9/1/71
C-6	8,000	9"	2,000	9/2/71
C-2, 3	8,800	8"	2,000	12/8/71
C-1	8,400	9"	2,000	1/3/72
C-2, 3	7,200	9"	2,000	2/8/72
C-2, 3	7,200	8"	2,000	3/7/72
C-6	9,000	8"	2,000	3/30/72
C-6	9,000	8"	2,000	3/31/72
C-1	7,560	8"	1,890	4/11/72
C-2, 3	9,200	8"	2,000	5/2/72
C-6	7,300	8"	2,000	5/25/72
C-6	4,026	8"	1,046	5/26/72
C-4, 5	11,040	8"	2,000	6/6/72
C-3	3,910	8"	850	6/27/72
C-4	3,910	8"	850	6/27/72
C-1	2,957	9"	896	6/28/72
C 2	2,957	9"	896	6/28/72
Total	131,250		32,128	

F-7-R-14, WP-3, JR-3

Table VI - Percent of Stocked Trout By Unit Below Davis Dam
 July 1971 - June 1972

Area	No. Fish	% Fish	Total Wt.	% Wt.
1	25,317	19.3	6,786	21.1
2-3	47,257	36.0	11,446	35.6
4-5	21,350	16.3	4,850	15.1
6	37,326	28.4	9,046	28.2
Total	131,250	100.0	32,128	100.0

F-7-R-14, WP-3, JR-3

Table VII - Adipose Fin Clip Data From Monthly Creel Census

	March		April		May		June	
	Day	Return	Day	Return	Day	Return	Day	Return
	11	52	12	12	1	6	6	3
	12	2	13	23	3	4	14	4
	14	6	14	18	11	5	17	6
	26	3	16	7	12	8	20	1
			18	17	16	3		
			24	4	31	11		
Total	4	63	6	81	6	37	4	14

Table VIII - Flag Tag Returns Below Davis By Month

Days	April	May	June
1		3	2
2		0	2
3		8	2
4		2	5
5		4	0
6		4	5
7		14	3
8		1	4
9		6	0
10		3	0
11	159	4	0
12	102	14	2
13	41	3	6
14	64	0	5
15	31	25	0
16	59	10	0
17	3	3	2
18	35	21	3
19	26	0	0
20	18	2	3
21	3	0	6
22	17	0	2
23	4	0	0
24	14	0	6
25	7	4	0
26	4	4	0
27	1	1	3
28	2	11	1
29	3	0	0
30	7	25	0
31		7	
Total	600	179	62

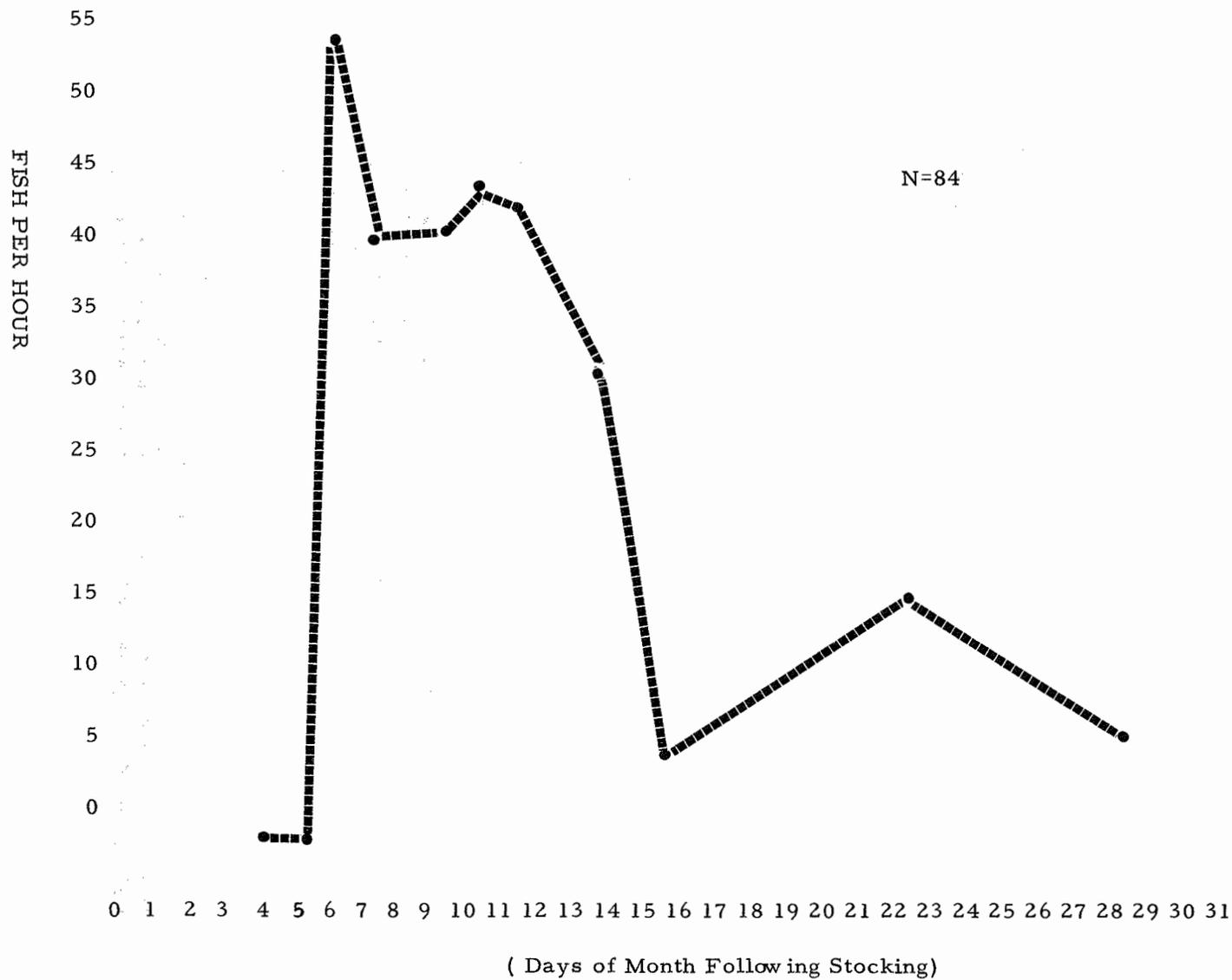
F-7-R-14, WP-3, JR-3

Table IX - Striped Bass Predation On Tagged Trout As Indicated By Stomach Analysis

Date	Stomachs Examined	Contents
April 12	1	Empty
13	4	8 trout - 6 tags
14	5	8 trout - 4 tags
18	8	8 trout - 8 tags - 3 shad - 1 carp - 2 empty
24	1	1 empty - 7 shad
Total 5	24	24 trout - 18 tags - 10 shad - 1 carp 3 empty

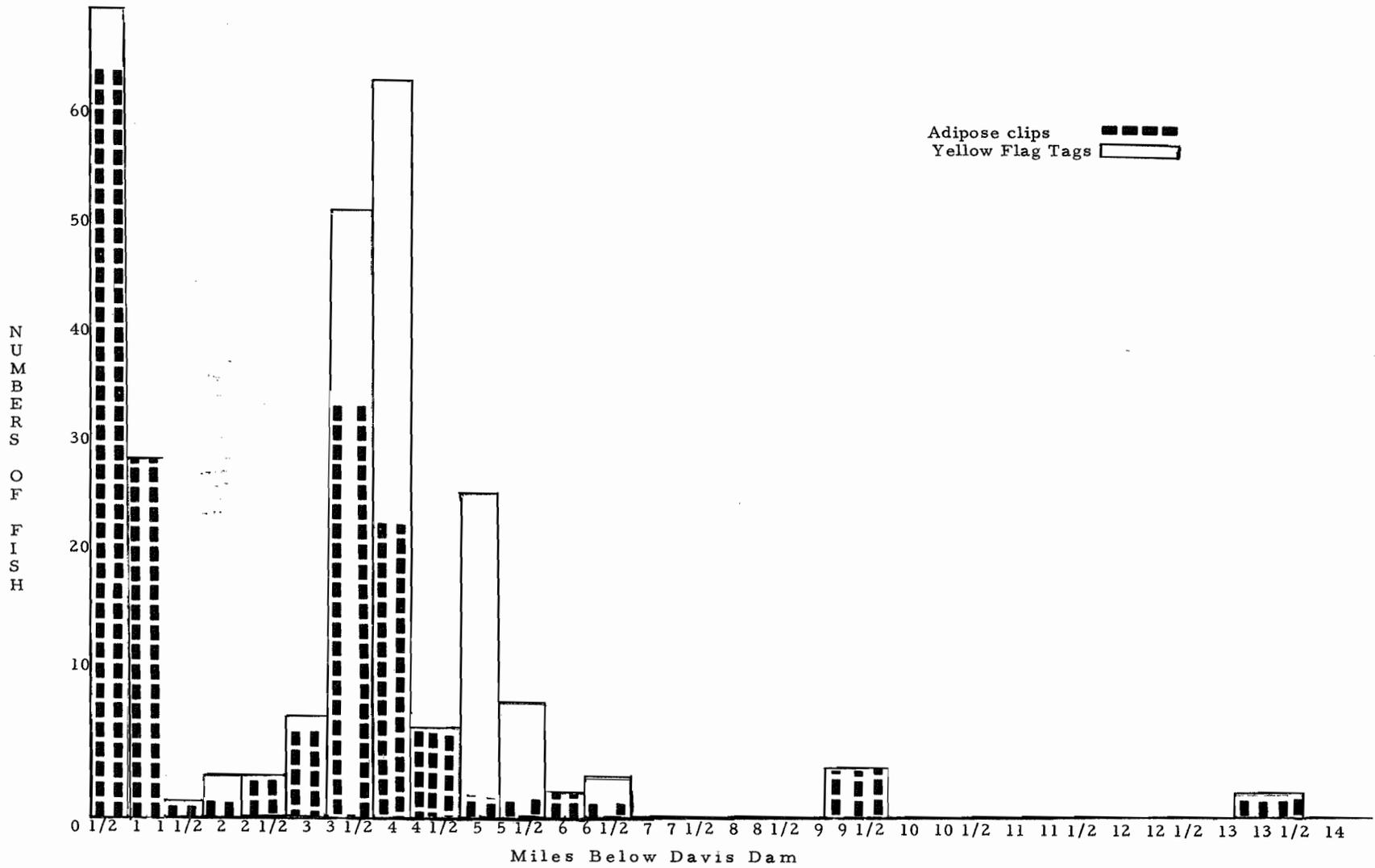
F-7-R-14, WP-3, JR-3

Figure II - Catch Rate of Bank Fishermen Below Davis Dam Subsequent to Stocking



F-7-R-14, WP-3, JR-3

F-7-R-14, WP-3, JR-3
-18-



Spatial Distribution of Fin Clipped and Tagged Trout Below Davis Dam