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ANNUAL REPORT OF PROGRESS, 1964 - 1965

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-6

SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME
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INTRODUCTION

This report of progress consists of Job Segment Reports from the State of Alaska Federal Aid in Fish Restoration Project F-5-R-6, "Sport Fish Investigations of Alaska."

The project during this report period is composed of 23 separate studies designed to evaluate the various aspects of the State's recreational fishery resources. Of these, eight jobs are designed to pursue the cataloging and inventory of the numerous State waters in an attempt to index the potential recreational fisheries. Four jobs are designed for collection of specific sport fisheries creel census while the remainder of the jobs are more specific in nature. These include independent studies on king salmon, silver salmon, grayling, Dolly Varden, a statewide access evaluation program and an egg take program.

A report concerning the residual effects of toxaphene accumulates the findings of a three-year study. The report presented here terminates this segment and is a final report. The information gathered from the combined studies will provide the necessary background data for a better understanding of local management problems and will assist in the development of future investigational studies.

The subject matter contained within these reports is often fragmentary in nature. The findings may not be conclusive and the interpretations contained therein are subject to re-evaluation as the work progresses.

JOB COMPLETION REPORT

RESEARCH PROJECT SEGMENT

STATE: ALASKA Name: Sport Fish Investigations of Alaska.

Project No.: F-5-R-6 Title: Egg Take Investigation in Cook Inlet Drainage and Prince William Sound.

Job No.: 7-F

Period Covered: July 1, 1964 to June 30, 1965.

ABSTRACT

Experimental silver salmon egg takes were conducted on two Kenai Peninsula streams. A temporary picket weir was again erected across the Swanson River on the Kenai National Moose Range to facilitate the capture of adult fish. During the period of weir operation (August 21 through October 18), 1,185 silver salmon were enumerated. Spawn was taken from 255 females, representing an estimated 812,300 eggs. Egg take procedures are discussed. Information was collected on abundance, distribution and timing of silver salmon in the upper Swanson River drainage.

Silver salmon eggs were also obtained from Dairy Creek, a tributary of Resurrection Bay. Fifty-two females, dip-netted from the stream, yielded an estimated 216,900 eggs.

RECOMMENDATIONS

It is recommended that other streams on the Kenai Peninsula be investigated for possible sources of silver salmon eggs.

It is recommended that the Swanson River weir be in place by August 1 to evaluate the early run.

It is recommended that fingerlings from Dairy Creek eggs be planted in Bear Lake in the Resurrection Bay drainage. Similarities between recipient and donor stocks are expected to enhance the success of such a transplant.

OBJECTIVES

To locate and establish economical and accessible sources for procuring silver salmon, rainbow-steelhead and cutthroat eggs from Cook Inlet and Prince William Sound drainages.

Fish stocks will be assessed with emphasis on the following characteristics:

1. A race with a lake-rearing background in the life cycle since it is anticipated a majority of the stocking, whether for a resident (land-locked) or an anadromous purpose, will utilize lake rearing.
2. Racial characteristics of rapid growth, good condition factor and sporting qualities.
3. Fish from waters of a type common throughout large portions of the State is also advisable in order to broaden the field of potential use.

TECHNIQUES USED

On August 21, a temporary weir was established on the Swanson River approximately 20 miles above its terminus with Cook Inlet. The 50-foot diagonal structure included a trap located in the acute angle formed by the upstream end of the weir and the stream bank. Fish encountering the downstream face of the weir moved diagonally upstream until entering the trap.

A detailed description of the weir and its location has been presented by Lawler (1962), with the only major change being the diagonal design.

The 3 x 3 x 8-foot trap included a manually-operated sliding gate for daytime operation and a conventional tunnel narrowing to a 3-inch opening for use at night. The sliding gate was the most effective of the two trapping methods.

Three 4 x 4 x 8-foot holding pens were placed in the river just upstream from the weir. The bottom and downstream end of each pen were of 1 x 2-inch pickets one inch apart, while the upstream end, sides and top consisted of solid marine plywood. Each pen rested on 2 x 6-inch skids and was held in the stream by weighted boxes attached on each end. The pen design provided upwelling water to the ripening fish which distributed them more evenly and lessened their swimming and jumping activity.

Dairy Creek silver salmon were dip-netted from the stream and immediately spawned at the point of capture.

Spawning techniques at both sites consisted of the following: the dorsal artery of the female was severed to permit bleeding; eggs were removed by incision and fertilized following standard dry methods; one male served approximately two females; fertilized eggs were allowed to water-harden about one hour in 5-gallon cans before shipment to the Fire Lake Hatchery.

FINDINGS

The Swanson River weir was operational on August 21 and was maintained daily until being dismantled on October 18 because of icing conditions. During the first day of operation, 58 silver salmon were counted through the structure, indicating the run was in progress. Observation of upstream spawning areas confirmed that a significant number of fish had passed prior to weir installation.

During the period of weir operation, 1,185 silver salmon were enumerated. This is similar to the 1963 count of 1,198 silver salmon (Lawler, 1963). On at least two occasions fish were known to have passed uncounted when water levels exceeded the height of the weir. Under-cutting also permitted an undetermined number of fish to escape. Increased fish movement was concomitant with periods of high water and weir malfunction.

The upstream silver salmon migration occurred in two distinct peaks. The first movement passed the weir about September 20 and the second on October 8. Table 1 shows the number of adults entering the trap daily. A predominance of males were noted during the first portion of the run, while females comprised the bulk of the later segment. The sex ratio at the weir was 1 male to 1.2 females. This is similar to the 1963 ratio of 1:1.1. However, neither ratio is believed indicative of the entire spawning population because each year the early portion of the run was not enumerated. The weir was also permeable to small male "jack" silver salmon.

Females were removed throughout the run in proportion to the daily weir catch to provide adequate escapement for discrete stocks within the system. Two to four weeks were required for females to ripen at the site, with early arrivals requiring the greater time. Spawn was taken from October 5 to October 21.

Statistics for the 1964 Swanson River egg take are as follows:

Silver salmon count at weir	1,185
Silver salmon released above weir	811
Silver salmon held for spawn take	374
Number of females	286
Number of males	88
Total holding mortality	44
Number of females spawned	255
Estimated number of eggs taken	812,300

Retention of adults during the ripening period resulted in an 11.8 percent mortality. This was a significant improvement over the 27 percent loss suffered when fish were held a similar period during the 1963 egg take. Three factors appear responsible for the reduced mortality: (1) an effort was made

to hold only fish close to maturation, (2) lower water temperatures during the confinement period inhibited fungal growth, (3) new holding pens lessened jumping and swimming activity which in turn reduced abrasion.

Fork lengths of spawned females ranged from 52.0 to 70.0 cm with a mean of 62.4. The length frequency distribution is presented in Figure 1. Average female fecundity was 3,186 eggs. Table 2 summarizes average fecundities for past Swanson River egg takes.

Water temperatures at the weir varied from a high of 52° F. to a low of 32° F. The stream began to freeze over on October 18 and was completely covered by November 6. Mean daily water temperatures for 1963 and 1964 are presented in Table 3.

Surveys in the upper Swanson River watershed revealed two important silver salmon spawning areas. Airport Creek, located about 2 miles above the weir, was foot surveyed on September 30 and 279 silver salmon were counted. Early spawning activity indicates this stock of fish passed upstream before the weir was erected. Canoe Creek, which flows through in a chain of lakes, before entering the Swanson River about 4.5 miles above the weir contained at least 416 silver salmon. Additional fish were observed ripening in the lakes during the surveys. Test netting indicated a lake rearing background for this stock of fish.

Dairy Creek

Dairy Creek is a small stream, not over 300 yards long, which terminates in a brackish water lagoon near the city of Seward. The stream was selected as a source for eggs because the lagoon where juvenile silver salmon rear was damaged by the March 27 earthquake and subsequent seismic sea waves. With the loss of a tide gate structure which regulated salinity, unfavorable rearing conditions are anticipated next spring when silver salmon fry move into the lagoon from Dairy Creek.

To obtain maximum production from the stream, 52 female silver salmon were utilized for artificial propagation and the remainder of the run allowed to spawn naturally. Fish dip-netted from the stream were spawned on October 6 and 10. These fish yielded 216,900 eggs with an average of 4,170 eggs per female. This is similar to the 1962 average of 4,183 eggs per female (Lawler, 1962). Fork lengths of spawned females ranged from 66.5 to 79.0 cm with a mean of 72.8. The estimated escapement in Dairy Creek, including those spawned artificially, was 245 silver salmon (Logan, 1964).

TABLE 1. - Daily Disposition of Silver Salmon Captured at the Swanson River Weir, 1964

Date	Daily Weir Catch	Released Above Weir		Held For Spawn	
		Males	Females	Males	Females
Aug. 21	58	58*	-	-	-
22	--	--	-	-	-
23	--	--	-	-	-
24	4	4*	-	-	-
25	66	66*	-	-	-
26	6	--	-	6	-
27	2	--	-	1	1
28	4	--	-	3	1
29	6	--	-	5	1
30	5	1	-	3	1
31	3	2	-	1	-
Sept. 1	6	3	-	3	-
2	4	2	1	1	-
3	6	2	-	1	3
4	3	--	1	-	2
5	7	4	3	-	-
6	33	11	4	9	9
7	21	11	3	3	4
8	--	--	-	-	-
9	1	--	-	-	1
10	1	1	-	-	-
11	12	8	-	-	4
12	11	7	4	-	-
13	73	38	27	-	8
14	3	1	2	-	-
15	19	7	1	5	6
16	39	16	10	2	11
17	22	11	5	1	5
18	59	25	8	6	20
19	123	39	40	3	41
20	141	52	49	2	38
21	15	7	5	1	2
22	28	13	11	2	2
23	19	6	3	2	8
24	42	16	15	5	6
25	--	--	--	-	-
26	--	--	--	-	-
27	--	--	--	-	-
28	--	--	--	-	-
29	20	1	6	5	8
30	--	-	-	-	-

TABLE 1 (Cont.) - Daily Disposition of Silver Salmon Captured at the Swanson River Weir, 1964

<u>Date</u>	<u>Daily Weir Catch</u>	<u>Released Above Weir</u>		<u>Held For Spawn</u>	
		<u>Males</u>	<u>Females</u>	<u>Males</u>	<u>Females</u>
Oct. 1	18	-	5	7	6
2	8	-	-	5	3
3	8	1	1	2	4
4	5	1	1	1	2
5	-	-	-	-	-
6	-	-	-	-	-
7	61	24	13	2	22
8	126	41	56	-	29
9	53	18	13	-	22
10	19	6	4	-	9
11	11	4	7	-	-
12	9	2	2	-	5
13	-	-	-	-	-
14	5	1	1	1	2
15	-	-	-	-	-
16	-	-	-	-	-
17	-	-	-	-	-
18	-	-	-	-	-
TOTAL	1,185	382**	301	88	286

* Sex not determined.

** Do not include fish which were not sexed.

TABLE 2. - Average Fecundities of Silver Salmon at the Swanson River, 1962-1964

<u>Year</u>	<u>Females Spawned</u>	<u>Eggs Taken</u>	<u>Average Fecundities*</u>
1962	97	305,924	3,154
1963	308	970,083	3,149
1964	255	812,300	3,186

* The eggs remaining in each spawned female are not included in these figures.

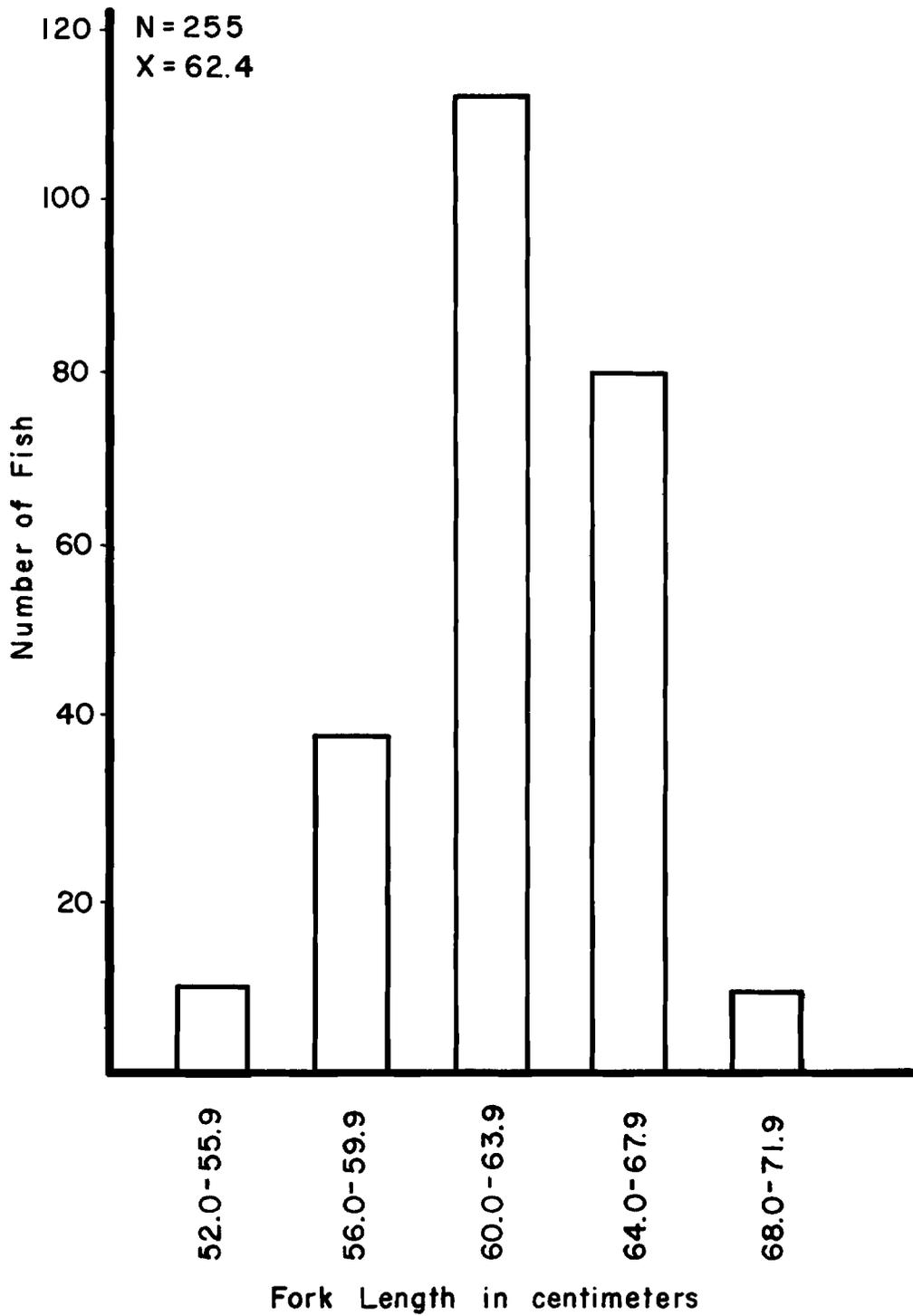


Figure 1. Length frequency of female Silver Salmon spawned at the Swanson River, 1964.

TABLE 3. - Mean Daily Water Temperatures at the Swanson River Weir, 1963 and 1964

<u>Date</u>	<u>Temperatures (°F)</u>		<u>Date</u>	<u>Temperatures (°F)</u>	
	<u>1963</u>	<u>1964</u>		<u>1963</u>	<u>1964</u>
Aug. 19		51.0	Sept. 23		45.0
20		52.0	24	46.5	45.0
21		52.0	25	46.0	45.0
22		50.0	26	46.0	44.0
23		49.0	27		43.0
24		49.0	28		42.0
25		49.0	29	45.5	42.0
26		52.0	30	45.5	43.0
27		51.0	Oct. 1	44.5	43.0
28		50.0	2	44.0	43.0
29	54.0	50.0	3	42.0	42.0
30	54.5	49.0	4	40.5	41.0
31	54.5	51.0	5	39.5	41.0
Sept. 1	55.5	51.0	6	42.5	42.0
2	56.0	50.0	7	43.0	42.0
3	57.0	50.0	8	43.5	42.0
4	56.0	50.0	9	41.0	40.0
5	59.0	49.0	10	40.0	40.0
6	58.0	49.0	11	37.5	39.0
7		48.0	12	36.0	39.0
8		49.0	13	35.5	37.0
9		49.0	14	38.0	37.0
10	56.5	50.0	15	38.0	37.0
11	55.5	49.0	16	39.0	35.0
12	55.5	48.0	17	38.0	34.0
13	51.0	49.0	18	37.0	32.0
14	52.0	49.0	19	37.5	32.0
15	50.5	49.0	20	37.0	
16	50.0	49.0	21	35.5	
17	49.5	48.0	22	34.5	
18	50.0	48.0	23	35.0	
19	49.5	49.0	24	34.0	
20	50.0	49.0	25	33.5	
21		46.0	26	32.0	
22		46.0	27	32.0	

DISCUSSION

In general, the quality of the Swanson River eggs appeared higher than those from Dairy Creek. Frequent sorting of females at the Swanson River weir permitted spawning at optimum maturity whereas females taken directly from spawning redds in Dairy Creek were often slightly green or overripe. Also, better fertilization may have occurred at the Swanson River where spawning was performed by three men under favorable conditions. At Dairy Creek, only two men were available for concomitantly capturing and spawning the fish. Because of the aforementioned, it is anticipated that the Dairy Creek eggs may have a lower rate of survival.

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The taking of eggs from salmon for artificial propagation provides a method for population manipulation.