

Volume 9



1967-1968

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STATE OF ALASKA
 Walter J. Hickel, Governor

ANNUAL REPORT OF PROGRESS, 1967 - 1968

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-9

SPORT FISH INVESTIGATIONS OF ALASKA

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INTRODUCTION

This report of progress consists of findings and work accomplished under the State of Alaska Federal Aid in Fish Restoration Project F-5-R-9, "Sport Fish Investigations of Alaska."

The project during this reporting period was composed of 21 separate studies. Of these, seven jobs continued the inventorying and cataloging of the numerous waters, providing a comprehensive index of the State's recreational waters. Nine jobs accomplished special studies involving Dolly Varden, grayling, silver salmon, king salmon and sheefish, among others. The remaining five jobs are designed to accomplish creel census, migration, access and silver salmon egg-take studies. The egg-take study, Job 7-F, was inactive because egg-takes were accomplished under other projects.

Special reports on specific phases of the Dolly Varden Life History Study have been published in the Department's Research Report series.

The information gathered from all of these studies provides the background necessary for better management and assists in 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.

RESEARCH PROJECT SEGMENT

STATE: ALASKA Name: Sport Fish Investigations of Alaska.
Project No. F-5-R-9 Title: Salmonid Rearing and Migration Study - Fire Lake System and Ft. Richardson and Elmendorf Rearing Ponds.
Job No.: 9-C-1

Period Covered: March 1, 1967 to February 29, 1968.

ABSTRACT

The Upper Fire Lake weir was in operation from May 5 to October 17, and the Lower Fire Lake weir operated from May 9 to October 17, 1967.

A total of 13,003 salmonids of all species was enumerated through the traps during the year. Fish were examined for marks, and samples were weighed and passed in the direction of migration.

Downstream migration of silver salmon, Oncorhynchus kisutch (Walbaum), smolts totaled 687 at Upper Fire Lake weir and 5,063 at Lower Fire Lake weir. Peak migration occurred the week ending June 4, at Lower Fire Lake and during the week ending June 11, at Upper Fire Lake. Silver salmon parr moved both upstream and downstream throughout the trapping period at Lower Fire Lake weir with peak movements during spring and fall. Few parr other than fin-marked fish were observed at Upper Fire Lake weir. Fifteen sea-run adults and one freshwater adult were captured.

Marked silver smolts of the 1964 and 1965 broods planted in Upper and Lower Fire Lakes during 1965 and 1966 were captured at the weirs.

Survivals of the 1964 brood were 55.7 percent from Upper Fire Lake and 32.4 percent from Lower Fire Lake, from time of planting to migration as age I and age II smolts. Only 32.6 percent of the smolts that migrated from Upper Fire Lake migrated through the Lower Fire Lake weir, resulting in a total 1964 brood smolt production of 18.0 percent from Upper Fire Lake.

Silver salmon of the 1965 brood had survivals of 18.4 percent from Upper Fire Lake and 24.2 percent from Lower Fire Lake from time of planting to migration as age I smolts; however, only 15.0 percent of the 1965 smolts from Upper Fire Lake passed through the Lower Fire Lake weir in 1967.

Two groups of 1966 brood silver salmon, 5,500 into Upper Fire Lake and 11,500 into Lower Fire Lake, were marked and planted.

Six marked king salmon O. tshawytscha (Walbaum), were captured at the Upper Fire Lake weir.

Fifty-one red salmon O. nerka (Walbaum), smolts were captured at the Upper Fire Lake weir and three smolts were captured at the Lower Fire Lake weir. Time of downstream migration for red salmon smolts coincided with that of silver salmon smolts.

Four hundred thirty-seven rainbow trout Salmo gairdneri (Richardson), were enumerated at both weirs. Peak movement occurred during the fall and was largely upstream.

Eight hundred fifty-eight Dolly Varden, Salvelinus malma (Walbaum), were captured at the weirs with peak movements recorded during spring and fall at both trapping sites.

Two lots of rainbow trout, three lots of king salmon, and one lot of silver salmon were handled at the Fort Richardson cooling pond during 1967. A total of 611,450 fish of all species, weighing 28,083 pounds, was planted from the pond during the year with 338,600 fish remaining on hand December 31, 1967.

Two lots of rainbow trout were reared in the Elmendorf AFB ponds during the year. Fourteen hundred fish, weighing 670 pounds, were planted in on-base lakes with 4,600 fish remaining on hand at the end of the calendar year.

RECOMMENDATIONS

It is recommended that the study be continued with the present objectives.

It is recommended that plans be formulated to rehabilitate both Upper Fire Lake and Lower Fire Lake during the summer of 1969.

OBJECTIVES

1. To investigate the rearing and migratory characteristics of various salmonid stocks in the Fire Lake system.
2. To determine the suitability of various stocks of fish in the Sport Fish Management Program.
3. To evaluate the potential of the Fort Richardson Cooling Pond and the Elmendorf rearing ponds for rearing salmonids.

TECHNIQUES USED

Fish captured in the weir traps were examined for missing fins, and released in the direction of migration. Some groups of fish marked before release from the hatchery were given an additional mark upon recapture. Marked fish and samples of unmarked fish were measured to the nearest millimeter, fork length, at time of capture.

Water temperatures were taken at both weirs with a maximum-minimum thermometer during most of the smolt migration period and at irregular times throughout the summer.

FINDINGS

The Upper Fire Lake (UFL) weir was installed on May 5, and removed on October 17; the Lower Fire Lake (LFL) weir was in operation from May 9 to October 17.

During the investigational period, 13,003 salmonids of all species were captured at the weirs.

Silver Salmon

A total of 11,648 silver salmon was captured at all traps during 1967 (Table 1). Silvers were designated as parr, smolt, or adult upon capture. Because of the different nature of migration in the three categories, each category is considered separately.

Smolt Migration

Downstream migration of silver salmon smolts totaled 687 at the UFL weir and 5,063 at the LFL weir. Upstream movement of smolts at both weirs was insignificant. At the LFL weir, 640 smolts were marked for later identification when they were released downstream. Five marked smolts were subsequently recaptured in the LFL upstream trap. At the UFL weir, none of the 298 smolts marked for later identification was recaptured in the UFL upstream trap.

Peak downstream movement of smolts at the LFL trap occurred during the week ending June 4. The peak day of movement was May 31, when 970 smolts were captured (Figure 1). Peak downstream movement past the UFL weir occurred during the week ending June 11, with 113 smolts recorded on the peak day, June 11.

The mean length of smolts from Upper Fire Lake was less than that for Lower Fire Lake (Figure 2).

Silver Salmon Parr Movements:

Seven silver salmon parr were captured in the upstream trap at the UFL weir (Table 1). Parr captured in the UFL downstream trap consisted entirely of marked fish which had been planted into Upper Fire Lake on August 31. Most of these fish were recaptured within two weeks after planting.

Parr moved both upstream and downstream through the LFL weir throughout the year (Figure 3). Upstream movement was relatively high throughout the year with distinguishable peak periods from late June to mid-July, and late July through September. A small increase in downstream movement occurred in July with a major movement in early September. The latter movement consisted largely of marked fish that had been planted into Lower Fire Lake on August 30.

Adult Silver Salmon Migration:

A total of 16 adult silver salmon was captured at both weirs in 1967 (Table 1). One fish was a resident, adult male and the remainder were sea-run fish. Of the 15 sea-run adults, 2 were females and 13 were males. Adults were held in one section of the UFL weir to await sexual maturity, but both females died before they were mature. Males ranged in length from 420 mm (16.5 inches) to 580 mm (22.8 inches) and the two females measured 590 mm and 620 mm (23.2 and 24.4 inches) respectively.

Eleven of the adults were captured at the LFL weir with the remaining four sea-run adults and one freshwater adult captured at the UFL weir. The adults captured at the UFL weir had to jump the screens at the LFL weir, negotiate one of three culverts at the outlet of Lower Fire Lake (approximately a three-foot jump), then pass through Lower Fire Lake and up the creek to the hatchery. Of the 11 adults captured at the LFL weir, 8 were netted from the uppermost section where the culverts spill above both traps. There were unconfirmed reports of anglers catching a few adult silvers in Lower Fire Lake.

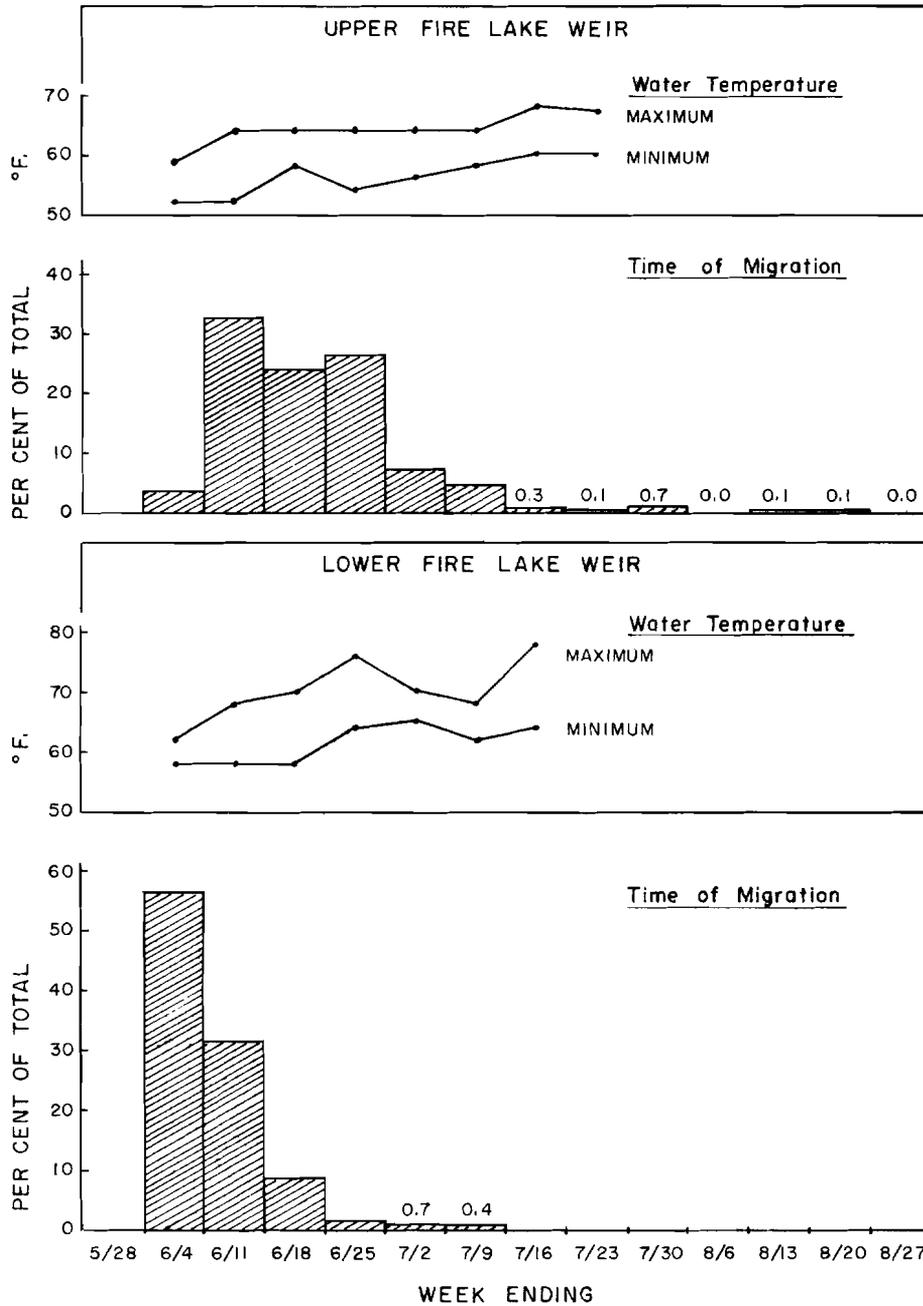


FIGURE 1 - TIME OF SILVER SALMON SMOLT MIGRATION FROM UPPER and LOWER FIRE LAKES, AND WATER TEMPERATURES BY WEEKLY PERIODS DURING 1967.

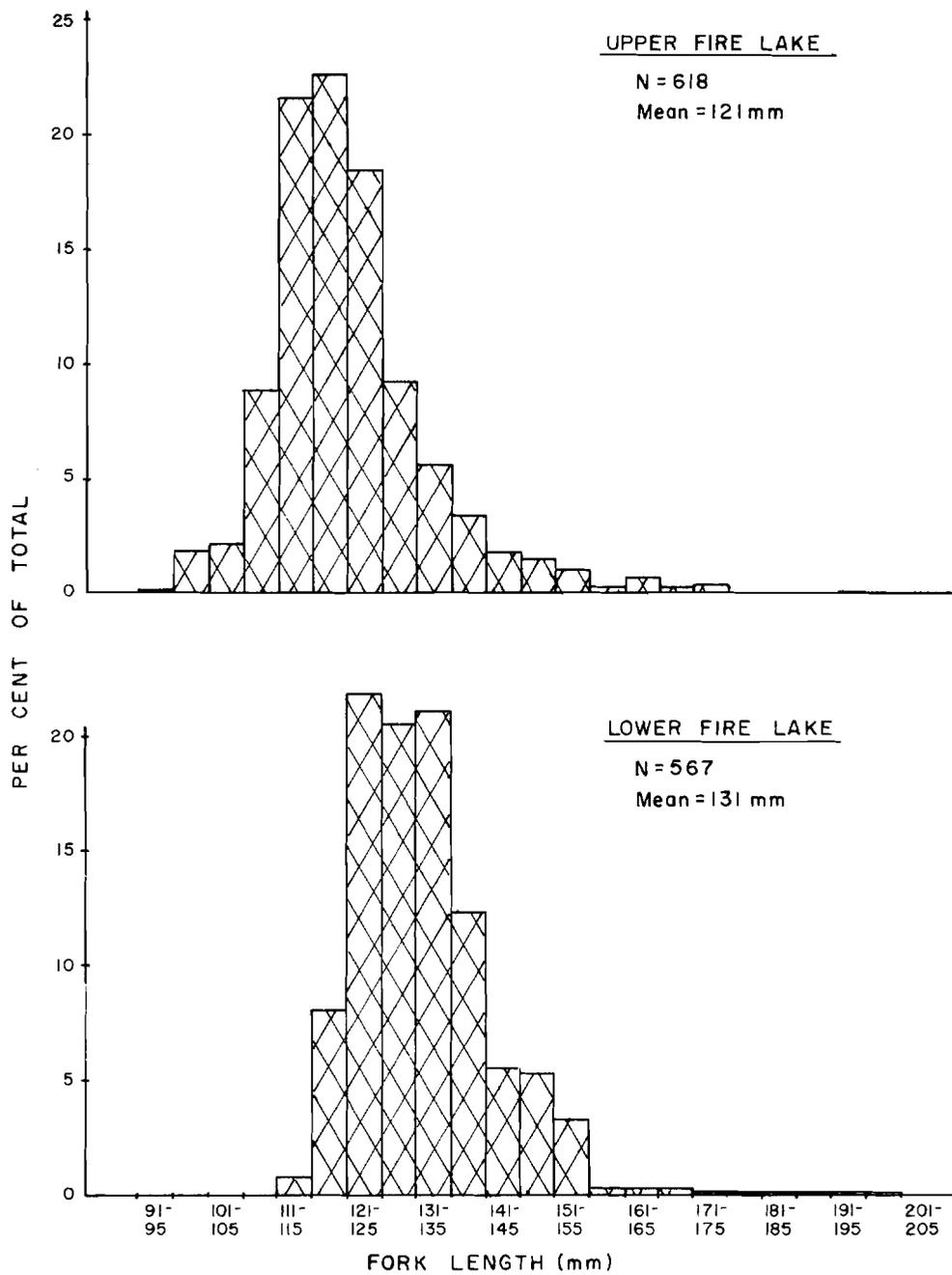


FIGURE 2 - SIZE COMPOSITION OF SILVER SALMON SMOLTS FROM UPPER and LOWER FIRE LAKES DURING 1967.

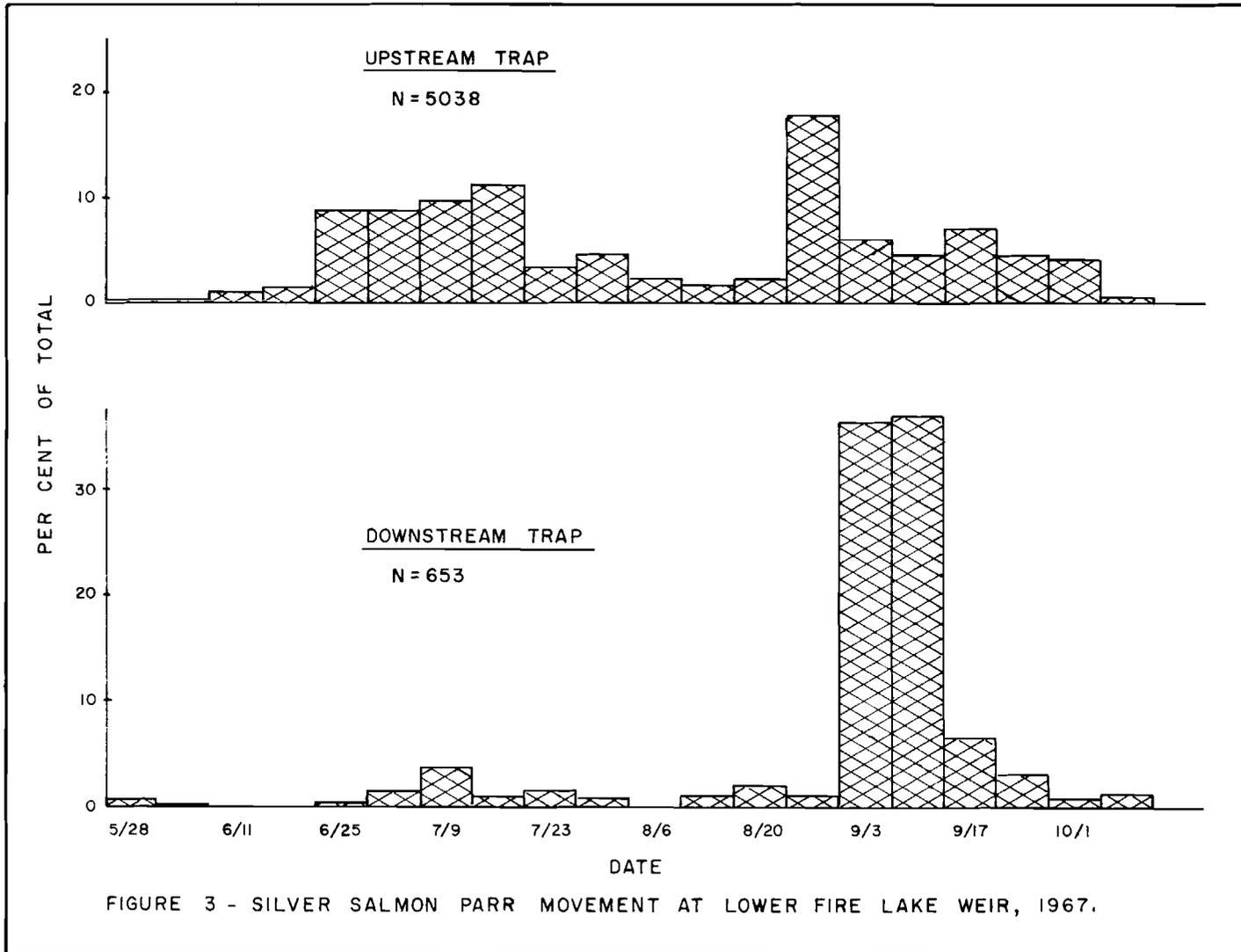


FIGURE 3 - SILVER SALMON PARR MOVEMENT AT LOWER FIRE LAKE WEIR, 1967.

TABLE 1 - Number of Silver Salmon Trapped at the Upper and Lower Fire Lake Weirs During 1967, by Weekly Periods, and Parr, Smolt, and Adult Designations.

Ending	Upper Fire Lake Weir					Lower Fire Lake Weir				
	Upstream			Downstream		Upstream			Downstream	
	Parr	Smolt	Adult	Parr	Smolt	Parr	Smolt	Adult	Parr	Smolt
5/28	0	0	0	0	0	17	1	0	4	0
6/4	0	0	0	0	25	18	4	0	1	2,903
6/11	0	0	0	0	226	51	3	0	0	1,590
6/18	0	0	0	0	166	73	2	0	0	437
6/25	0	0	0	0	180	438	2	0	3	68
7/2	1	1	0	0	49	431	1	0	10	36
7/9	0	0	0	0	31	485	1	0	25	20
7/16	1	0	0	0	2	557	2	0	7	2
7/23	1	0	0	0	1	168	2	0	11	3
7/30	0	0	0	0	5	234	0	0	5	2
8/6	0	0	0	0	0	118	0	0	0	0
8/13	0	0	0	0	1	88	0	0	7	0
8/20	0	0	0	0	1	116	2	0	13	1
8/27	1	0	1 ^{1/}	0	0	888	2	0	8	1
9/3	2	0	0	119	0	304	0	0	238	0
9/10	0	0	2	38	0	230	1	3	242	0
9/17	1	0	0	1	0	360	0	1	44	0
9/24	0	0	2	1	0	229	0	4	21	0
10/1	0	0	0	0	0	211	0	1	6	0
10/8	0	0	0	0	0	22	0	2	8	0
10/15	0	0	0	1	0	0	0	0	0	0
Total	7	1	5	160	687	5,038	23	11	653	5,063
Dead or Killed	0	0	5	1	49	0	0	11	71	264
No. Released	7	1	0	159	638	5,038	23	0	582	4,799

^{1/}Freshwater Adult.

TABLE 2 - Numbers of Marked Silver Salmon Captured in the Upper and Lower Fire Lake Downstream Traps by Weekly Period During 1967.

Week Ending	Upper Fire Lake Weir						Lower Fire Lake Weir					
	Mark at Capture Mark Added	LV Ad	RP Ad	Ad-RV RM	LV -	Ad-LV* -	RP Ad	Ad-RP -	RV -	LP -	Ad-LV** LM	
5/28		0	0	-	0	0	0	0	0	0	-	
6/4		8	6	-	29	0	0	0	33	73	-	
6/11		29	88	-	8	3	2	5	3	306	-	
6/18		4	112	-	7	2	3	20	3	84	-	
6/25		5	112	-	0	2	4	16	0	12	-	
7/2		2	28	-	0	0	5	9	0	6	-	
7/9		2	18	-	0	1	1	3	0	2	-	
7/16		0	1	-	0	0	0	0	0	0	-	
7/23		0	0	-	0	0	0	0	0	0	-	
7/30		0	2	-	0	0	0	0	0	0	-	
-												
9/3		0	0	119	0	0	0	0	0	0	216	
9/10		0	0	38	0	0	0	0	0	0	158	
9/17		0	0	1	0	0	0	0	0	0	10	
9/24		0	0	1	0	0	0	0	0	0	1	
-												
10/15		0	0	1	0	0	0	0	0	0	0	
Total		50	367	160	44	8	15	53	39	483	385	
Dead or Killed		5	14	1	0	0	0	2	0	0	34	
Total Released		45	353	159	44	8	15	51	39	483	351	

*1964 brood marked LV upon release into Upper Fire Lake; Ad added at UFL in 1967.

**1966 brood marked Ad-LV upon release into Lower Fire Lake, August 1967.

Several groups of marked silver salmon were recovered at the weirs during 1967. A summary of fish recovered, by mark and time period, is presented in Table 2. A summary of fin-marks used in the Fire Lake system during the period 1965-1967 is presented in Table 3.

TABLE 3 - Summary of Fin-Marks Used on Silver Salmon in the Fire Lake System, 1965-1967.

<u>Brood</u>	<u>Year</u>	<u>Fin Mark</u>	<u>Remarks</u>
-	1965	Adipose	All seaward migrating fish
1964	1965	Left Ventral	2,000 fingerlings planted into Upper Fire Lake, August 1965; 986 age I smolts into Lower Fire Lake.
1964	1965	Adipose-Left Ventral	45 of above lot with adipose removed as age II smolts at UFL weir.
1964	1965	Right Ventral	2,000 fingerlings planted into Lower Fire Lake, August 1965.
1965	1966	Right Pectoral	2,000 fingerlings @ 224/lb. planted into Upper Fire Lake, August 10, 1966.
1965	1966 1967	Adipose-Right Pectoral	1 Parr (1966) and 353 age I smolts (1967) from above group with adipose removed at UFL weir.
1965	1966	Left Pectoral	2,000 fingerlings planted into Lower Fire Lake, August 10, 1966.
1965	1966 1967	Adipose-Left Pectoral	25 parr (1966) and 483 age I smolts (1967) from above lot with adipose removed at LFL weir.
1966	1967	Adipose-Right Ventral	5,500 fingerlings @ 153/lb. planted into Upper Fire Lake August 31, 1967.
1966	1967	Adipose-Right Ventral-Right Maxillary	160 parr of above lot with RM removed at UFL weir.
1966	1967	Adipose-Left Ventral	11,500 fingerlings @ 156/lb. planted into Lower Fire Lake, Aug. 30, 1967.
1966	1967	Adipose-Left Ventral Left Maxillary	385 parr of above lot with LM removed at LFL weir.

1964 Brood Silver Salmon Marked LV and RV:

In August 1965, two thousand silver salmon of Swanson River stock were marked by removal of the left ventral fin (LV) and planted into Upper Fire Lake; another 2,000 fish marked right ventral (RV) were planted into Lower Fire Lake at the same time. A summary of the numbers of smolts recaptured from these two groups is presented in Table 4.

Survival from time of planting to smolt migration at the UFL weir was 55.7 percent for both age I and age II LV-marked fish from Upper Fire Lake. However, only 361 LV-marked smolts were enumerated through the LFL weir for an effective smolt production of 18.0 percent through the system.

Total smolt survival of RV-marked fish from Lower Fire Lake was 32.4 percent.

1965 Brood Silver Salmon Marked Ad-RP and Ad-LP:

Two thousand silver salmon of Swanson River stock were marked by removal of the right pectoral fin (RP) and planted into Upper Fire Lake, and 2,000 marked left pectoral (LP) were planted into Lower Fire Lake in 1966. Upon recapture at the weirs, the adipose (Ad) was removed for further identification. A summary of the smolts captured from these two groups is presented in Table 4.

Survival of the 1965 brood RP-marked group from time of planting to capture at the UFL weir as age I smolts was 18.4 percent. However, only 15.0 percent of these age I RP smolts released below the UFL weir entered the LFL downstream trap during 1967, resulting in an effective age I smolt production of 2.6 percent. In addition, 15 RP-marked smolts were recovered at the LFL weir. These apparently represented an unknown number of fish which migrated from Upper Fire Lake when the UFL weir was not in operation. From planting to age I smolts, survival of the LP-marked group amounted to 24.2 percent.

1966 Brood, Silver Salmon Marked Ad-RV-RM and Ad-LV-LM:

Two lots of silver salmon of Big Creek, Oregon origin were marked and planted into Upper and Lower Fire Lakes during August, 1967. The group planted into Upper Fire Lake was marked Ad-RV before release and totaled 5,500 fish, at an average size of 153 fish per pound. The right maxillary (RM) was removed upon recapture at the UFL weir trap. The Lower Fire Lake group consisted of 11,500 fish at an average size of 156 per pound and were marked Ad-LV with the left maxillary (LM) to be removed upon recapture.

A total of 160 Ad-RV marked fish were recaptured at the UFL weir with most of them taken during the two weeks following planting (Table 2). Three hundred eighty-five of the Ad-LV marked fish were recaptured in the LFL downstream trap, again with the majority being taken during the first two weeks following planting. Eighty of the Ad-LV-LM fish were subsequently recaptured in the LFL upstream trap and placed back into Lower Fire Lake.

Growth of Marked Silvers:

A summary of length data for the marked silver salmon groups planted during 1966 and 1967 is presented in Table 5. The size composition of marked smolts captured in 1967 are shown in Figure 4. Marked, age I smolts of both the 1964 and 1965 broods from Lower Fire Lake attained a greater mean length than their counterparts from Upper Fire Lake. Age II smolts of the 1964 brood from Lower Fire Lake were larger than age II smolts from Upper Fire Lake, but age II smolts which spent their first year in Upper Fire Lake and their second in Lower Fire Lake were approximately the same size as those which spent two years in Lower Fire Lake. There are several variables which may be involved in these differences, and speculation as to why the differences occur would be premature at this time.

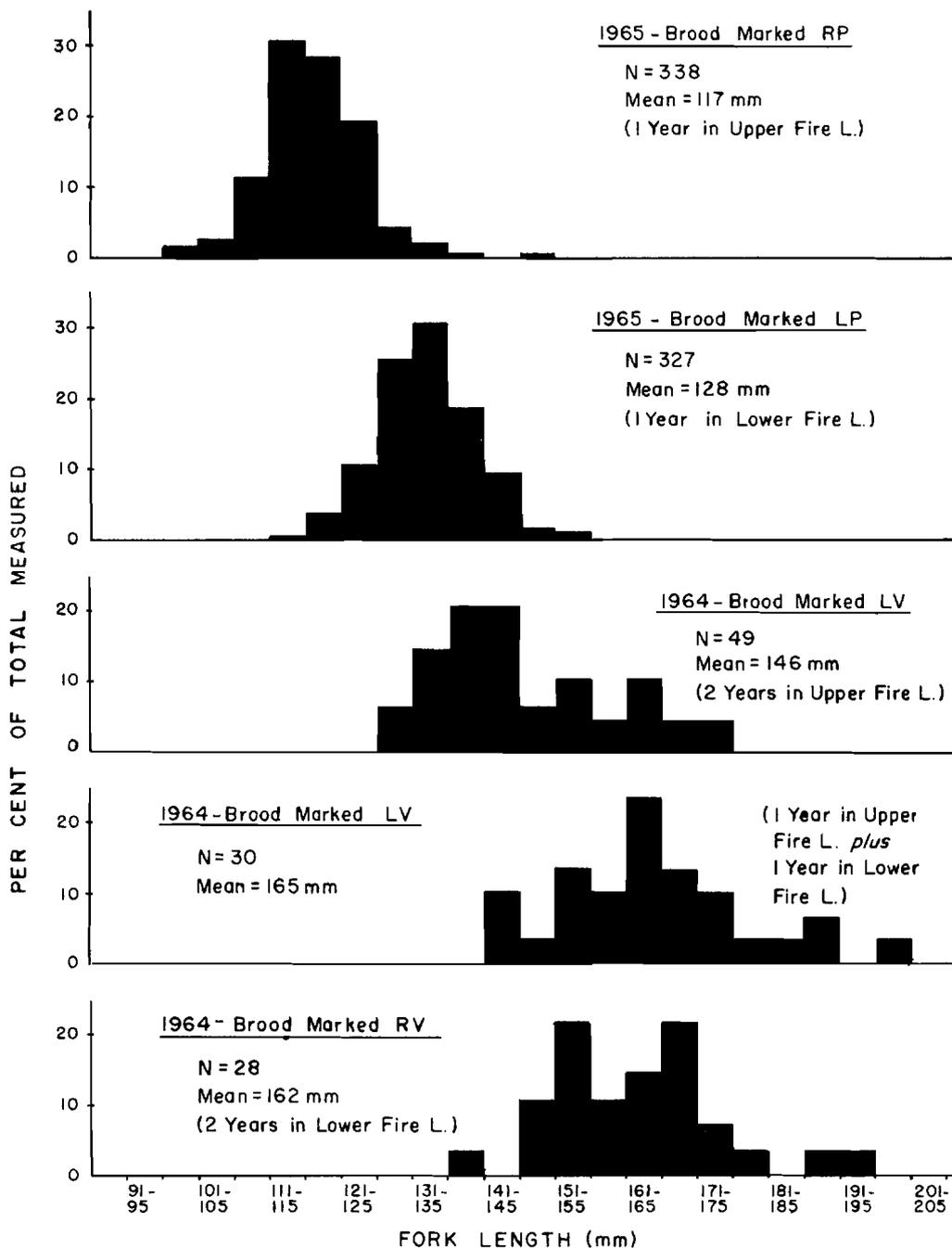


FIGURE 4 - SIZE COMPOSITION OF MARKED SILVER SALMON SMOLTS AT UPPER and LOWER FIRE LAKES WEIRS DURING 1967.

TABLE 4 - Numbers of Marked 1964 and 1965 Brood Silver Salmon Smolts Recaptured at Upper and Lower Fire Lake Weirs During 1966 and 1967.

Brood	Source	Planted				Recaptured			
		Where Planted	Date	Mark	Number	Number of Smolts Age-I To UFL Weir	Age-II	Total	Percent of Original Plant
1964	Swanson R.	UFL	8/65	LV	2,000	1,064	50	1,114	55.7
		LFL	6/7/66	LV	1,064	<u>309</u>	44	353	17.6
		LFL	6-7/67	Ad-LV	<u>45</u>	-	<u>8</u>	<u>8</u>	<u>0.4</u>
			Total		1,109	309	52	361	18.0
1964	Swanson R.	LFL	8/65	RV	2,000	609	39	648	32.4
						<u>To UFL Weir</u>			
1965	Swanson R.	UFL	8/66	RP	2,000	367	0	367	18.4
						<u>To LFL Weir</u>			
		LFL	10/66- 5/67	RP	Unknown*	15	0	15	0.8
		LFL	6-7/67	Ad-RP	<u>353</u>	<u>53</u>	<u>0</u>	<u>53</u>	<u>2.6</u>
		Total		-	68	0	68	3.4	
1965	Swanson R.	LFL	8/66	LP	2,000	483	0	483	24.2

*Unknown numbers migrated from Upper Fire Lake to Lower Fire Lake During October, 1966 to May, 1967 when the weir was not in operation.

TABLE 5 - Mean Lengths of Marked 1964 and 1965 Brood Silver Salmon Smolts at Upper and Lower Fire Lake Weirs, 1966 and 1967.

Brood	Mark	Number* Measured	Fork Length (MM)		Remarks
			Range	Mean	
1964	LV	899	97-152	117	Planted into Upper Fire Lake August 1965; Age I smolts at UFL weir 1966.
1964	Ad-LV	499	126-172	146	Same plant as above; Age II smolts at UFL weir, 1967.
1964	LV	30	142-188	165	Same plant as above; Age I smolts at UFL weir 1966, then age II smolts at LFL weir 1967.
1964	RV	190	102-145	124	Planted Lower Fire Lake August 1965; Age I smolts at LFL weir 1966.
1964	RV	28	140-192	162	Same plant as above; Age II smolts at LFL weir 1967.
1965	Ad-RP	338	97-150	117	Planted into Upper Fire Lake August 1966; Age I smolts at UFL weir 1967.
1965	RP	12	112-131	123	Same plant as above; moved into Lower Fire Lake during period October 1966 to May 1967; Age I smolts at LFL weir 1967.
1965	LP	327	108-148	128	Planted into Lower Fire Lake August 1966; Age I smolts at LFL weir 1967.

* Sample size.

King Salmon

In June, 1966 1,300 king salmon fingerlings were planted into Upper Fire Lake and 1,500 fingerlings were planted into Lower Fire Lake. Both groups were marked by removal of the posterior portion of the dorsal fin (D), with the right maxillary to be removed upon recapture at the UFL weir and the left maxillary to be removed at the LFL weir. During 1966, 16 marked fish were recaptured at the UFL weir and 8 marked fish were recaptured at the LFL weir.

In 1967, six marked king salmon smolts were captured at the UFL weir. They ranged in length from 112 mm to 140 mm, but were noticeably emaciated and in very poor condition. No king salmon smolts were observed at the LFL weir.

Red Salmon

Fifty-one red salmon smolts were captured at the UFL weir; the adipose fin was removed for subsequent identification and 48 were released. Three red salmon smolts were captured at the LFL weir, but none were marked.

The time of the red salmon smolt migration coincided with that for silver salmon with two peak weeks ending June 4 and June 11. Recorded smolts ranged in length from 93 mm to 125 mm with an average of 106 mm.

Rainbow Trout

A total of 437 rainbow trout was enumerated at both weirs during 1967, (Table 6). Four mature adult males were captured at the UFL trap during May, but extremely low streamflow in Fire Creek during May hampered upstream migration. The major movement occurred during the fall and was upstream at both weirs. No length data were obtained for rainbows.

Dolly Varden Char

A total of 858 Dolly Varden was captured at the weirs (Table 6). Peak movements occurred during spring and fall. Sexually mature fish were observed during the fall among the fish trapped in both the upstream and downstream traps at the LFL weir, and in the UFL upstream trap. No length data were obtained.

TABLE 6 - Numbers of Rainbow Trout and Dolly Varden Char Trapped at the Upper and Lower Fire Lake Weirs by Weekly Periods in 1967.

<u>Week</u> <u>Ending</u>	<u>Upper Fire Lake Weir</u>				<u>Lower Fire Lake Weir</u>			
	<u>Upstream</u>		<u>Downstream</u>		<u>Upstream</u>		<u>Downstream</u>	
	<u>RB</u>	<u>DV</u>	<u>RB</u>	<u>DV</u>	<u>RB</u>	<u>DV</u>	<u>RB</u>	<u>DV</u>
5/21	4	0	3	0	-	-	-	-
5/28	0	0	0	0	15	20	0	0
6/4	3	2	1	0	8	16	3	1
6/11	3	1	0	0	5	24	1	9
6/18	0	6	0	0	2	36	0	6
6/25	2	3	0	0	6	57	0	6
7/2	1	5	1	0	7	10	1	4
7/9	2	6	0	1	3	15	0	5
7/16	6	10	0	0	7	3	1	7
7/23	2	1	0	0	1	13	1	1
7/30	2	0	1	0	3	7	0	2

TABLE 6 Cont. - Numbers of Rainbow Trout and Dolly Varden Char Trapped at the Upper and Lower Fire Lake Weirs by Weekly Periods in 1967.

Week Ending	Upper Fire Lake Weir				Lower Fire Lake Weir			
	Upstream		Downstream		Upstream		Downstream	
	RB	DV	RB	DV	RB	DV	RB	DV
8/6	0	0	0	0	0	0	0	0
8/13	1	1	0	0	0	7	0	0
8/20	6	3	0	1	0	9	0	1
8/27	3	10	0	0	9	47	0	4
9/3	16	0	10	0	12	23	9	8
9/10	17	5	3	0	91	145	29	43
9/17	3	0	0	0	49	119	3	16
9/24	0	0	0	0	33	62	0	5
10/1	0	0	0	0	20	25	0	14
10/8	0	0	0	0	17	20	0	11
10/15	0	0	3	0	7	1	1	1
Total	71	53	22	2	295	659	49	144

Miscellaneous Species

Five grayling, Thymallus arcticus (Pallas), were captured at the UFL weir. These probably resulted from a small number of adult fish which escaped from a section of the UFL weir while awaiting trans-shipment to Kodiak, although survival of fry which have escaped from the hatchery during the past few years is a possibility.

Three juvenile arctic blackfish, Dallia pectoralis (Bean) were captured in the LFL downstream trap. A small number of blackfish were accidentally released from the hatchery aquarium into Fire Creek in 1965 and these fish apparently resulted from that introduction.

Fort Richardson Ponds

Two lots of rainbow trout, three lots of king salmon, and one lot of silver salmon were reared at the Fort Richardson Cooling Pond during 1967. Two fiberglass ponds were transferred from the hatchery to Fort Richardson and installed at the cooling pond site to provide suitable ponds for starting king salmon fry to feeding. Water was provided to the ponds by an electric pump capable of delivering a maximum of 180 gpm to the two ponds. An identical pump was provided as a standby in event of mechanical failure. Water was discharged either back into the cooling pond or directly into the pond drain as desired.

1966 Rainbow Trout - Winthrop, Washington Stock:

A production summary for the 1966 brood rainbows reared at the cooling pond is presented in Table 7.

TABLE 7 - Production Summary for 1966 Brood Rainbow Trout Reared at the Fort Richardson Cooling Pond.

Date Pond Stocked	September 6 & 7, 1966
Initial Number	50,000
Total Recorded Loss	4,400
Total Unaccounted Loss	10,700
Total Loss	15,100 (30.2%)
Total Number Planted and Transferred	34,900
Total Weight Planted and Transferred	16,165 pounds
Total Fish Weight Gain	15,993 pounds
Total Pounds Food Fed	27,200
Food Conversion	1.7

Fish with white areas and hemorrhagic lesions on various parts of their bodies were observed in the ponds, as well as in the ponds at Elmendorf, in February. No appreciable mortality occurred, but the incidence of such fish increased with time. It was estimated that approximately 25 percent of the fish in the Ft. Richardson pond evidenced visible lesions. From a distance the lesions resembled those found in furunculosis infections. On close examination it was revealed that the lesions were largely restricted to surface layers and rarely extended into the musculature. Occurrence and symptoms of the disease closely resembled published descriptions and symptoms of ulcer disease. The assistance of Mr. Floyd Woods, bacteriologist for the Arctic Health Laboratory, was obtained and he succeeded in isolating a culture tentatively identified as Hemophilis piscium, the causative agent of ulcer disease.

On May 13, a 10-day treatment with terramycin fed at a rate of 3 grams of drug per 100 pounds of fish was started at Fort Richardson. By May 29, no evidence of lesions could be observed on the fish from casual observation in the pond. A close macroscopic examination of fish on June 5 revealed that five fish in approximately 2,000 examined still had small lesions. Many fish exhibited areas which appeared to be healed lesions.

1967 Rainbow Trout - Winthrop, Washington Stock:

A total of 45,300 fingerlings at an average size of 172 fish per pound was transferred to the cooling pond on October 2. Fish had been suffering a severe mortality at the hatchery at the time of transfer, due to an unknown cause. Within two weeks the mortality rate had declined to normal and to date there has been no further indication of the disease. A few crippled fish, symptomatic of some of the diseased fish, are still present in the pond but are active and growing. At the end of the year, 41,100 fish averaging 28 per pound remained on hand.

1966 King Salmon - Ship Creek Stock:

A production summary for the local stock of 1966 brood king salmon reared at the Fort Richardson Cooling Pond is presented in Table 8. King salmon fingerlings were marked by removal of the adipose fin. A total of 63,800 were released directly into Ship Creek during the period May 8-12 as smolts.

Fish started to feed on the Abernathy Mash diet, were switched to Abernathy Pellets when size permitted, and were then reared on this feed throughout their entire period. The growth rate of from 1,085 per pound to an average of 18.6 per pound in 4.5 months of rearing was exceptionally good. (Figure 5). This was due to a combination of constant warm water temperatures, diet and exceptionally good care by Army personnel at the pond. No problems with disease or other disorders were encountered during the rearing period.

TABLE 8 - Production Summary for 1966 Brood King Salmon of Ship Creek Stock Reared at the Fort Richardson Cooling Pond.

Date Pond Stocked	December 27, 1966
Initial Number	70,000
Total Recorded Loss	1,900
Total Unaccounted Loss	4,300
Total Loss	6,200 (8.9%)
Total Number Planted	63,800
Total Weight Planted	3,429 pounds
Total Fish Weight Gain	3,364 pounds
Total Pounds Food Fed	6,331
Food Conversion	1.9

1966 King Salmon - Green River, Washington Stock:

A production summary for 1966 brood Green River king salmon is presented in Table 9. Fish were marked by removal of the adipose fin. During the period May 22 - June 21, 474,500 smolts were released into Ship Creek.

TABLE 9 - Production Summary for 1966 Brood King Salmon of Green River, Washington Stock, Reared at the Fort Richardson Cooling Pond.

Date Pond Stocked	March 13, 1967
Initial Number	489,700
Total Recorded Loss	9,000
Total Unaccounted Loss	6,200
Total Loss	15,200 (3.1%)
Total Number Planted	474,500
Total Weight Planted	8,125 pounds
Total Fish Weight Gain	7,569 pounds
Total Pounds Food Fed	12,550
Food Conversion	1.7

Fish started to feed on the Abernathy Mash diet, then switched to Oregon Pellets when they were approximately 700 per pound. Their growth rate from 880 to 58 per pound in approximately three months was very good. Fin-rot was present during the first week on feed, but was controlled by formalin treatment and no other problem with disease was encountered.

1966 Silver Salmon - Big Creek, Oregon Stock:

A total of 229,400 silvers was placed into the medium sized section of the cooling pond to be reared to smolts; 204,500 at 409 per pound on July 17 and 24,900 at 196 per pound on August 31. On October 3, 38,250 at an average of 105 per pound were planted into Johnson Lake near Soldotna. At the end of the year 187,900 at an average size of 43 per pound remained in the pond.

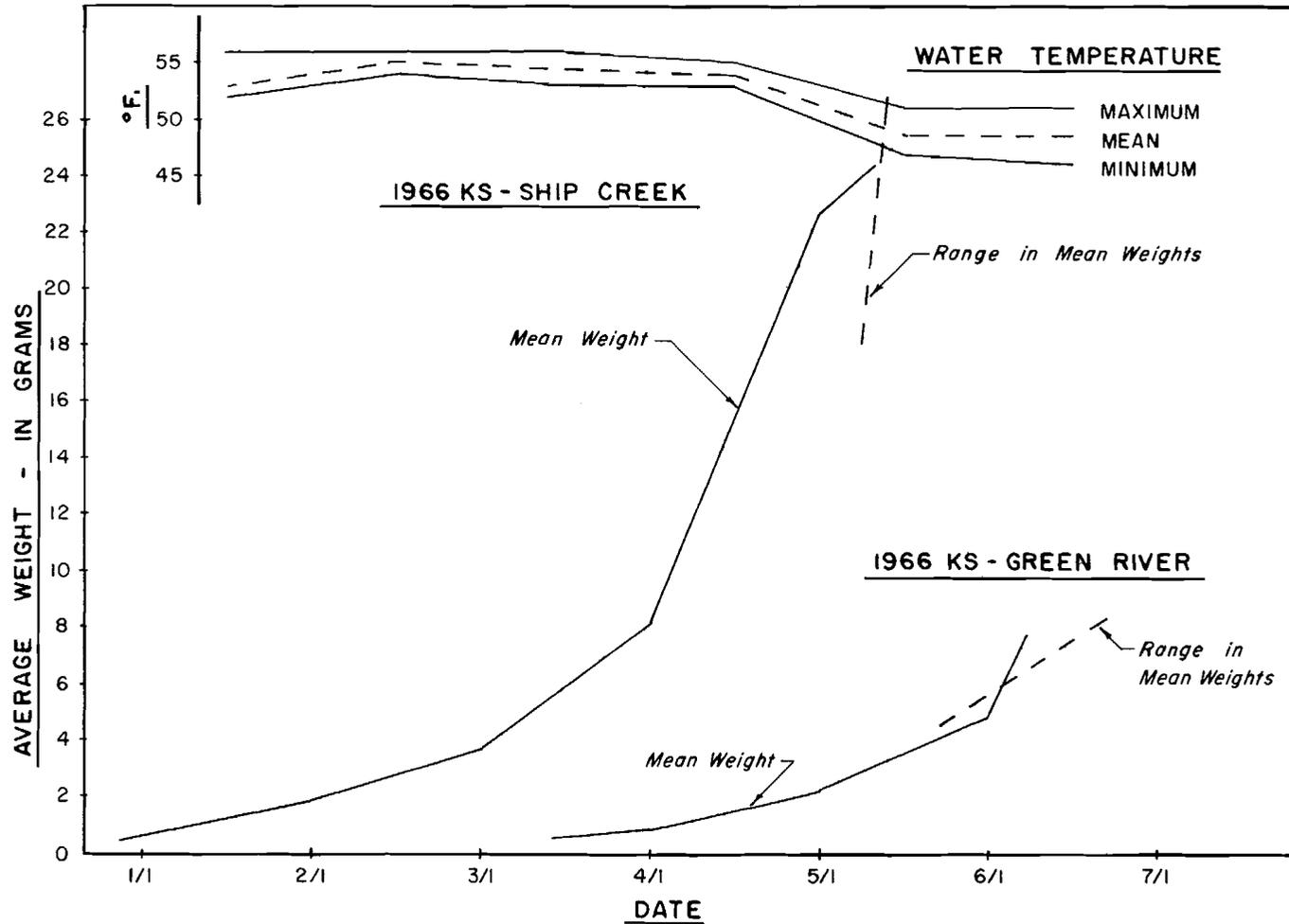


FIGURE 5. MEAN WEIGHT OF 1966 BROOD KING SALMON REARED AT FT. RICHARDSON COOLING POND BY TIME AND MONTHLY WATER TEMPERATURES, 1967

1967 King Salmon - Ship and Campbell Creek Stock:

On November 29, 113,700 king salmon fry of local origin were transferred to the cooling pond and put into the fiberglass ponds. Some had been feeding for a short time at the hatchery before transfer, but approximately one-half were started to feeding at Fort Richardson. When transferred, the fish ranged in size from 1,170 to 1,240 per pound. At the end of the year, 108,600 fish at an average size of approximately 500 per pound remained in the pond.

Elmendorf AFB Ponds

Two broods of rainbow trout were reared in the ponds at the Elmendorf Cooling Pond during the year.

1966 Rainbow Trout - Winthrop, Washington Stock:

A total of 9,000 fingerlings was transferred to the ponds on September 7, 1966. Recorded losses were generally low except for two occurrences noted below. Detailed records of amount of food fed were not maintained; therefore, no meaningful data on food utilization are available.

On March 19, a serious loss of approximately 5,500 fish occurred. It was not possible to determine the cause of loss immediately. A second loss of approximately 1,900 fish occurred on April 5 when the water level in the cooling pond dropped below the pond intake pipe, thereby stopping the water flow. A similar occurrence was the most probable cause of the loss on March 19, although it was not observed.

Fish were badly infected with ulcer disease during the spring, although it did not cause an appreciable mortality. It was estimated that 40 to 50 percent of the fish evidenced visible lesions. A 10-day treatment with terramycin at a level of 3 grams per 100 pounds of fish was started on May 18. By May 29, no evidence of lesions was seen from casual observation. Close macroscopic examination of the fish on June 2, showed no external lesions, but many fish exhibited areas which appeared to be healed lesions.

A total production on 1,400 fish which averaged 2.1 per pound was realized and were stocked in Green Lake on June 2.

1967 Rainbow Trout - Winthrop, Washington Stock:

Five thousand fingerlings which averaged 172 per pound were transferred to the ponds on October 2. The fish were suffering a very high mortality at time of transfer, but the losses dropped to an insignificant level within two weeks. At the end of the year, approximately 4,600 fish remained in the ponds.

Prepared by:

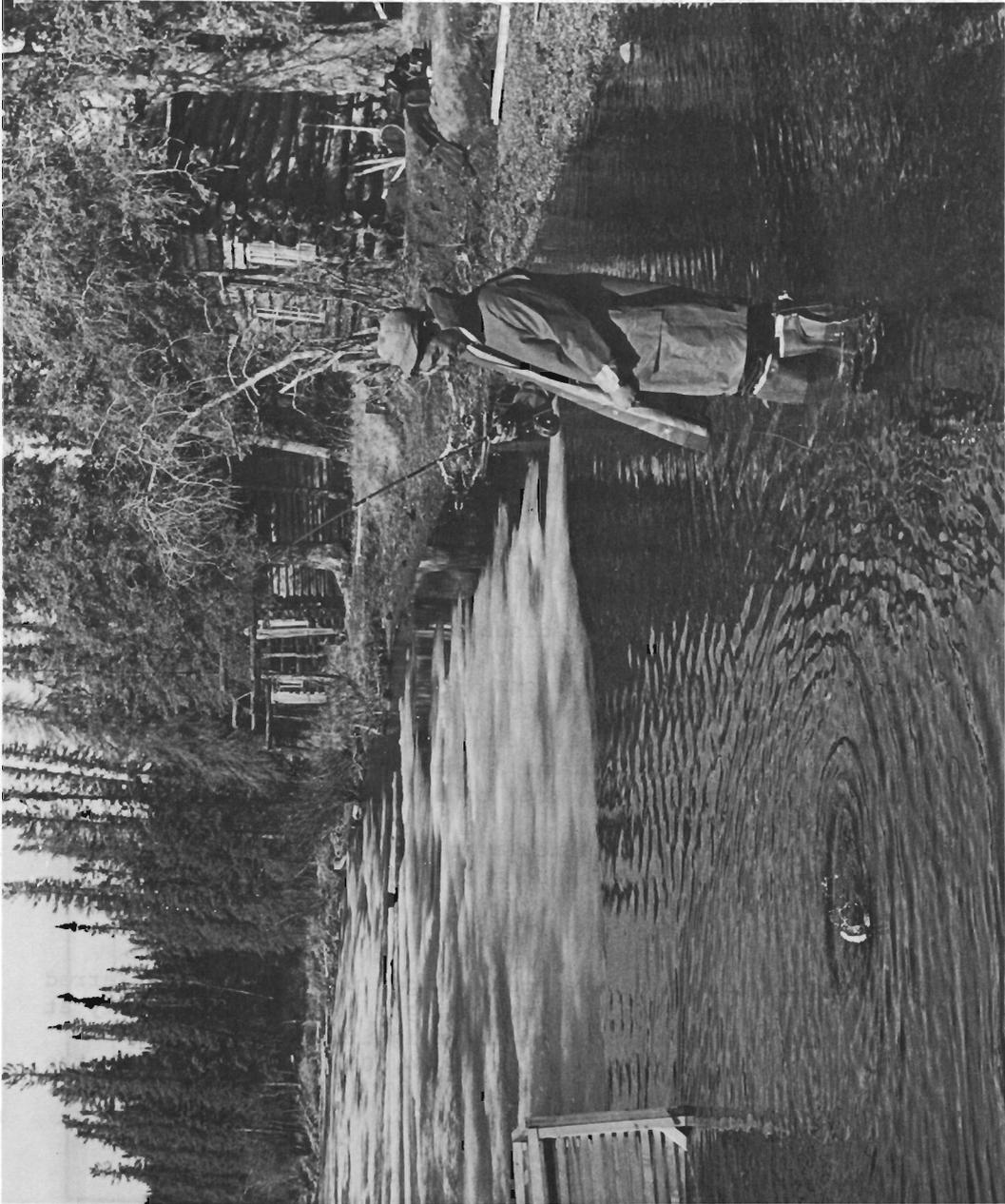
Joe Wallis
Fishery Biologist

Date: March 1, 1968

Approved by:

s/ Louis S. Bandirola
D-J Coordinator

s/ Alex H. McRea, Director
Sport Fish Division



Under Certain Conditions, a Rod and Reel Prove to be the Best Method to Sample a Fish Population.