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FEATHER RIVER SALMON AND STEELHEAD HATCHERY ANNUAL REPORT, 1969-70[1/]

by

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ABSTRACT

This report describes the operation of the hatchery from July 1, 1969 through June 30, 1970. Two species were reared: king salmon (Oncorhynchus tshawytscha), and steelhead (Salmo gairdnerii gairdnerii). The king salmon facilities include a spawning channel, but most king salmon and all steelhead are spawned artificially. Tables present numbers of adult salmonids trapped, juveniles reared and planted, and daily weather and water temperature data.

1/ Anadromous Fisheries Branch Administrative Report No. 74-5
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INTRODUCTION

This report describes operation of Feather River Salmon and Steelhead Hatchery from July 1, 1969 through June 30, 1970. Copies of previous annual reports are available upon request from the Anadromous Fisheries Branch, Sacramento.

Feather River Hatchery is located on the Feather River near the upper Thermalito Bridge in Oroville, California. The hatchery was constructed by the California Department of Water Resources as part of the California water project to compensate for the loss of king salmon and steelhead spawning and nursery areas formerly located above Oroville Dam. It is operated by the Department of Fish and Game with funds provided by the Department of Water Resources.

PRODUCTION SUMMARY

The first king salmon of the 1969 spring run entered the hatchery April 1. The last fish of this run was trapped August 25. Fall-run kings were trapped from September 24 through December 24. The first steelhead entered the hatchery October 19. The last was counted March 22, 1970.

Production data are summarized as follows:

Species/ brood year	Adults trapped or received	Females spawned	Eggs taken or received	Fish received	Fish planted fingerlings	Fish planted yearlings	On ha June 30, 1970
Fall-run KS							
1968 BY					1,790,000		
1969 BY	4,378*	1,245	8,506,760	1,132,260	1,170,500	0	2,499,825
Spring-run KS							
1968 BY						25,000	0
1969 BY	233	121	771,010	0	106,000	0	73,180
Winter-run KS							
1969 BY						17,450	
1970 BY	4	2	70,875	0	0	0	0
Steelhead							
1967 & 1968 BY						1,000**	4,940
1969 BY							505
1970 BY	224	1,721***	2,454,340	0	0	0	1,423,415

Spawning Channel			
Fall-run king salmon adults placed in channel		Estimated egg deposition	Assumed outmigrant production
Males	Females		
81	89	459,000	184,000

* Includes 89 females and 81 males placed in spawning channel.
** All broodstock adults; planted after spawning.
*** Includes 79 wild Feather River and 1,642 Feather River broodstock.

VISITOR USE

During the 1969-70 fiscal year, 126,453 people visited this installation, including 6,781 that were conducted through the hatchery on organized tours.

DISEASE

Significant disease-caused losses occurred among both king salmon and steelhead held at Feather River Hatchery during the fiscal year.

Ceratomyxa was responsible for the death of over 98% of 284,000 wild 1969 brood year steelhead fry on hand at the hatchery July 1, 1969. In 1969 we had no effective means of treating this disease. (An ultraviolet system was installed in 1970 to treat the pond water. This eliminated the severe Ceratomyxa problem.)

Beginning in May 1969, rainbow trout of five different origins were tested at the hatchery for relative resistance to Ceratomyxa. Fish used in the tests were held in live cages set in the hatchery rearing ponds. They were fed Oregon Moist Pellet (OMP). Results of the tests are summarized as follows:

Strain	Number tested	Size	Date test began	No. days until last fish died	Water temperature range (C*)
Whitney	50	fingerlings	5/20/69	28	10.0-13.9
Shasta	50	fingerlings	6/19/69	38	13.9-16.7
N. Fk. Feather R.	50	fingerlings	8/ 4/69	**	11.1-15.6
N. Fk. Feather R.	6	catchables	8/ 4/69	46	11.1-15.6
Oregon	150	fingerlings	5/20/69	64	10.0-16.7
Pit River	150	fingerlings	5/22/69	***	10.0-13.9

* Temperatures measured to nearest whole degree F, and later converted to C.
** Nineteen fish still alive 6/30/70.
*** One hundred and six still alive 6/30/70.

The hatchery's most serious king salmon disease problem has been Sacramento River Chinook Disease (SRCD). From December through April, the hatchery rearing pond water temperatures ordinarily range from about 6.7 to 11.1 C (44-42 F). This range was exceeded on only two days from December, 1969 through April 1970.

Holding fish in water with temperatures above 13.9 C (57 F) helps control SRCD. The Thermalito Irrigation District had warm well water, more than 15.6 C (60 F), available for purchase. In December 1969 we tested the adaptability of the Feather River king salmon fry to this water by holding approximately 500 of them in hatchery troughs supplied with two parts well water to one part river water. Water temperatures in the troughs ranged from 14.4 to 15.6 C (58-60 F). The water was aerated to keep dissolved oxygen at 11 ppm. No apparent losses to SRCD were noted among this experimental group by the end of January.

Based on the test results, enough well water was purchased from the irrigation district to supply two of our eight pond series with a similar mixture of well and river water. The new supply system to deliver the combined well and river water to the ponds was completed January 17, 1970.

We treated all the 1969 brood year king salmon fingerlings by rearing them in the warm water. Because of the total numbers of fingerlings on hand, it was necessary to rotate various lots of fish through the series receiving the warm water. Each lot was treated with the warm water for approximately 25 days.

The warm water treatment probably reduced mortality caused by SRCD, but mortalities were still high. The fish had been started in cold water. This, plus the relatively short time each lot of fish was in the warmer water probably combined to reduce the overall effectiveness of the treatment.

Gill bacteria and white spot disease also contributed to juvenile king salmon losses during the year.

MARKING PROGRAM

No fish were marked at Feather River Hatchery during fiscal year 1969-70. Fish marked in previous years that returned and were recovered this year are listed in the following sections by species.

KING SALMON MAINTENANCE PROGRAM

Spring Run

History of the 1969 Spring Run

A total of 112 adult spring-run king salmon were received between April 1 and May 20, 1969. The ladder was closed May 20 because the fish we had been holding had developed severe fungus infections. By May 19, 30 badly fungused fish were returned to the river. By July 11, 32 of the remaining fish had died. Six more died between July 11 and October 9, bringing the total loss in the group to 68 (60.7%).

The ladder was reopened August 25, 1969, and 233 more adult spring-run salmon entered the hatchery. Of this group, 48 (20.6%) died prior to spawning.

A combined total of 229 early- and late-returning adult spring-run salmon survived to spawning. A total of 121 females was spawned. They produced 771,010 eggs. Egg survival to hatching was 87%. There was no apparent difference in egg quality between early and late groups of salmon, so it was concluded that the fish should be left in the river during the summer months. Repeated heavy outbreaks of gill bacteria and SRCD resulted in total losses of 489,558 (73%) of the fingerlings produced. We planted a total of 106,000 of the spring-run 1969 brood year fingerlings May 11 and 12, 1970. These fish weighed an average of 7.2 g (63.0/lb) when released. Approximately 73,000 fingerlings were on hand June 30, 1970.

1968 Brood Year

We had approximately 25,000 1968 brood year spring-run king salmon on hand July 1, 1969. These fish suffered no significant mortality from that date until they were planted in the Feather River November 28 and 29, 1969. Their average weight when planted was 45 g (10/lb).

Fall Run

History of the 1969 Fall Run

A total of 4,378 1969 adult fall-run king salmon entered the hatchery between September 24 and December 24, 1969; 1,104 males, 1,514 females and 1,760 grilse. Of these, 89 females and 81 males were placed in the spawning channel (see SPAWNING CHANNEL OPERATION, 1969-70 SEASON, p. 7), leaving 1,425 females and 1,023 males available for artificial spawning.

We artificially spawned 1,245 females that yielded 7,475,360 green eggs. Egg survival to hatching was 89.2%; a total of 6,665,360 fry were transferred to the ponds. Fry and fingerling losses due to gill bacteria disease and SRCD were severe, amounting to approximately 5 million. A total of 730,500 1969 brood year fall-run kings was released in the Feather River as follows:

Date	Average weight (g)	Number
2/4 - 3/30/70	0.5	345,000
4/24 - 5/28/70	6.0	385,500
	TOTAL	730,500

We had approximately 900,000 1969 brood year fall-run king salmon on hand June 30, 1970.

1969 Brood Year from Nimbus and Coleman Hatcheries

To make up for the severe disease losses that occurred among the 1969 brood year Feather River king salmon fingerlings, we imported 1969 brood year fall-run fry from Nimbus Hatchery and eyed eggs from Coleman Hatchery. We received 1,132,260 fry from Nimbus during February and March, 1970, and 1,031,400 eyed eggs from Coleman on April 13 and 14, 1970.

Between May 10 and June 26, 1970, 440,000 of the fish received from Nimbus Hatchery were planted in the Feather River. The average weight of these fish at release was 6.0 g (75/lb). We had 654,095 fish from this group left on hand June 30, 1970.

None of the fingerlings produced from the eggs received from Coleman Hatchery had been planted by June 30, 1970. We had 945,730 of these fish on hand on that date.

1968 Brood Year

We had 1,8 million 1968 brood year fall-run king salmon on hand July 1, 1969. Of these, 0.7 million were progeny of Feather River fish; the rest had been received as fingerlings from Nimbus Hatchery last season. During July and August 1969, 1,790,000 fish from this group were released as follows:

Date	Origin	Release site	Average weight (g)	Number
7/8 - 17/69	Feather River	Feather River	5.7	384,000
7/7 - 16/69	Feather River	Sacramento River	5.7	292,000
8/22/69	Nimbus Hatchery	Sacramento River	5.0	647,500
8/22/69	Nimbus Hatchery	Feather River	5.0	466,500
		TOTAL		1,790,000

Winter Run

1968-69 Run (1969 Brood Year)

In June 1969 (last report period) 277 winter-run females were spawned at Red Bluff Diversion Dam. They produced 1,398,900 eggs (5,050/female). These eggs were shipped to Feather River Hatchery in June. Losses of both eggs and fry were extremely heavy. Only 17,450 fish survived to be planted. They were planted between October 27, 1969 and January 15, 1970 at an average weight of 5.3 g (85/lb).

1969-70 Run (1970 Brood Year)

One male and three female winter-run king salmon entered the hatchery January 16, 1970. We spawned two females, but all eggs were infertile, apparently because the only available male was sterile.

In June 1970 59,450 winter-run eggs were taken at Red Bluff Diversion Dam and shipped to Feather River Hatchery. The eggs had not hatched by June 30, 1970.

So far, we have had little success with rearing winter-run king salmon, probably because our summer water temperatures are too high.

Recovery of Marked King Salmon

During the 1969-70 season, 53 marked king salmon were trapped; 2 different marks were represented as follows:

Mark	Brood year	Release data				Number recovered
		Date	Area	Number	Average wt.(g)	
Ad-An	1967	January, 1969	Sacramento River at Rio Vista	50,400	38	18
Ad-RP	1967	January, 1969	Feather River	56,400	38	35

Spawning Channel Operation

A total of 89 female and 81 male fall-run king salmon were placed in the spawning channel between October 21 and November 22, 1969. Only the largest fish entering the hatchery were selected for the spawning channel.

Carcasses of all adults were removed from the channel. Females were examined for egg retention as they were removed. Seventy-one of the females released in the channel were fully spawned; 18 were partially spawned. An estimated 459,000 eggs were deposited in the channel.

We made several attempts, all unsuccessful, to estimate fingerling production in the channel. Early in the season we attempted to use a trap in a side flume and a rotating screen in the tailworks to estimate outmigration. The catches indicated no significant numbers were migrating while the trap and screen were operating. We think improper design of the flume, trap and the migrant screen may have prevented outmigration.

On May 26 & 27 we tried to estimate the channel population by electroshocking. We were unsuccessful because of thick algae growth in the channel.

On May 28 the migrant screen was removed from the channel tailworks to allow downstream migrants free access to the river via the fish ladder. To encourage emigration, the channel flow was continually fluctuated throughout June. During this time, a number of downstream migrants were observed in the ladder.

On July 1, 1970 the channel flow was reduced to almost zero to force fish out of the gravel into the resting pools. The pools containing fish were seined, and approximately 5,000 fish were captured and released into the river. These fish weighed an average of 11.3 g (40/lb).

Although total outmigrant production was not determined, we observed great numbers of fish jumping in the channel in early mornings. The fish appeared to be in good condition. We assumed production was 40% of the egg deposition, or 184,000 fish.

STEELHEAD MAINTENANCE PROGRAM

History of the 1969-70 Run

A total of 224 adult steelhead was trapped between October 19, 1969 and March 27, 1970. We spawned them between January 16 and April 13, 1970. The fish were not sexed until spawning. The count during spawning operations was 104 males and 107 females. Seventy-nine females were successfully spawned, producing 138,380 eggs. We transferred 107,000 swim-up fry to the rearing ponds (77.4%). On June 30, 1970 we still had 105,275 of these fish on hand. They will be planted next fiscal year as yearlings.

Steelhead Brood Stock Spawning (1970 BY)

A total of 1,642 Feather River brood stock strain females were spawned between January 14 and April 24, 1970. They produced 2,123,790 eggs. Egg loss was 597,990 (29.2%). Through June 30, 1970 another 207,660 fish were lost in the ponds, primarily to Ceratomyxa. A total of 1,318,140 brood stock strain fingerlings was on hand June 30, 1970.

On April 22, 1970, 1,000 brood stock adults (males and females) of the 1967 and 1968 brood year were planted.

Planting 1969 Brood Year Steelhead

On July 1, 1969 the hatchery had 284,200 steelhead fry on hand. By the end of June 1970 only 505 fish from this total remained alive; the rest had succumbed to Ceratomyxa. These survivors were apparently resistant to Ceratomyxa and so were kept for brood stock.

Appendix Table 1
Feather River Salmon and Steelhead Hatchery
Weather, Water and Fish Data Report

July	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped: King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	32.8	16.7	15.0	14.4	clear					
2	31.1	14.4	15.0	14.4	clear					
3	33.3	13.3	15.6	14.4	clear					
4	33.3	14.4	15.6	15.6	clear					
5	31.1	16.7	15.6	15.0	clear					
6	31.7	13.9	16.1	14.4	clear					
7	33.3	18.9	16.7	15.0	clear					
8	35.6	17.8	16.1	15.6	clear					
9	31.7	18.3	16.1	15.6	clear					
10	33.9	16.1	16.7	15.6	clear					
11	34.4	16.7	16.7	16.1	clear					
12	33.3	17.8	16.7	15.6	clear					
13	34.4	17.8	16.7	15.6	clear					
14	31.7	16.7	16.1	15.6	clear					
15	33.3	15.6	16.7	16.1	clear					
16	36.7	17.8	17.2	16.1	clear					
17	38.9	21.7	16.7	15.0	clear					
18	36.7	18.9	16.1	15.6	clear					
19	37.8	24.4	16.1	15.6	clear					
20	37.8	17.8	15.6	15.6	clear					
21	36.7	19.4	15.6	15.0	clear					
22	36.7	18.3	16.1	15.6	clear					
23	35.0	21.1	16.7	15.0	cloudy					
24	31.1	16.7	15.0	13.9	clear					
25	31.7	15.0	15.6	13.9	clear					
26	33.9	15.6	15.6	15.0	clear					
27	32.8	15.0	15.0	14.4	clear					
28	34.4	14.4	15.6	14.4	clear					
29	33.9	16.1	15.6	14.4	clear					
30	34.4	14.4	16.1	15.0	clear					
31	36.1	14.4	16.7	16.1	clear					
Totals										

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

August	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	38.3	16.1	16.7	16.1	clear					
2	37.8	19.4	16.7	15.6	clear					
3	39.4	18.9	16.1	16.1	clear					
4	35.6	19.4	16.7	15.6	clear					
5	35.6	14.4	16.7	16.1	clear					
6	36.1	18.3	17.2	15.6	clear					
7	36.1	15.6	17.2	16.1	clear					
8	36.7	15.6	17.2	16.7	clear					
9	36.7	20.0	16.7	16.1	clear					
10	35.6	19.4	16.7	16.7	clear					
11	34.4	16.7	16.7	15.6	clear					
12	36.1	15.6	17.8	16.1	clear					
13	36.7	18.9	17.8	16.7	clear					
14	36.7	17.8	17.2	16.7	clear					
15	35.6	17.2	17.2	15.0	clear					
16	36.1	17.8	15.0	13.9	clear					
17	33.3	20.0	14.4	13.9	clear					
18	30.0	14.4	15.6	14.4	clear					
19	32.8	13.3	15.6	15.0	clear					
20	34.4	17.8	16.1	15.0	clear					
21	37.2	18.9	16.1	14.4	clear					
22	38.3	16.7	15.0	13.9	clear					
23	32.2	16.7	15.0	14.4	clear					
24	30.0	15.6	14.4	13.9	clear					
25	32.2	17.8	15.0	13.3	clear		70			
26	32.2	13.3	15.6	15.0	clear		144			
27	32.2	14.4	15.6	15.0	clear		11			
28	28.9	13.9	15.6	15.0	clear		8			
29	33.9	16.1	15.0	13.9	clear					
30	34.4	14.4	15.6	13.3	clear					
31	36.1	14.4	12.2	11.7	clear					
Totals							233			

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

September	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	38.3	16.1	12.2	11.7	clear					
2	37.8	19.4	12.8	11.7	clear					
3	39.4	18.9	11.7	11.7	clear					
4	35.6	19.4	12.2	11.7	clear					
5	35.6	14.4	12.2	11.7	clear					
6	34.4	15.6	12.2	12.2	clear					
7	33.3	20.0	12.2	12.2	cloudy					
8	33.9	19.4	12.8	12.2	cloudy					
9	33.9	17.2	12.8	12.2	cloudy					
10	33.9	17.2	13.3	12.8	clear					
11	33.3	16.7	13.3	12.8	clear					
12	32.2	16.7	12.8	11.7	clear					
13	28.9	13.9	12.2	11.7	clear					
14	25.6	11.1	13.3	12.2	clear					
15	26.1	9.4	13.3	11.7	clear					
16	25.6	10.0	12.8	12.2	cloudy					
17	26.7	10.0	12.8	11.7	cloudy					
18	25.0	14.4	13.3	12.8	cloudy					
19	24.4	13.9	13.3	12.8	cloudy					
20	23.3	11.1	13.3	11.7	cloudy					
21	28.9	11.1	12.2	11.7	clear					
22	30.0	11.1	12.2	11.1	clear					
23	30.0	13.9	11.7	11.1	clear					
24	31.1	11.7	12.2	11.7	clear	4				
25	32.2	13.9	12.2	11.7	clear					
26	32.2	15.6	12.8	11.7	clear	11				
27	27.8	13.3	13.3	12.2	cloudy					
28	30.6	12.2	13.3	12.8	clear					
29	30.6	15.6	13.3	11.7	cloudy	15	3			
30	30.0	14.4	12.2	11.1	clear	7	2			
Totals						37	5			

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

October	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	29.4	10.0	12.2	10.6	clear	13	3			
2	23.9	10.0	12.2	10.6	clear	12	3			
3	24.4	8.9	12.2	11.1	clear	5	2			
4	23.9	8.3	12.2	11.1	clear	42	7			
5	25.0	15.6	12.2	11.1	clear	47	24			
6	25.6	8.3	12.8	11.1	cloudy	16	12			
7	22.2	8.9	12.2	11.1	cloudy	36	13			
8	20.0	14.4	12.2	11.1	rain	69	21			
9	22.2	10.0	12.2	11.1	cloudy	132	42			
10	23.3	11.7	12.2	11.1	clear	132	36			
11	22.8	7.8	12.2	10.6	clear	66	36			
12	21.1	7.8	11.1	10.0	clear	55	43			
13	17.2	7.8	11.1	10.6	cloudy	35	42			
14	12.8	10.6	10.0	10.0	rain	20	12			
15	12.8	10.6	10.6	10.0	rain	76	63			
16	17.2	12.2	11.1	10.0	rain	187	166			
17	17.2	8.3	11.1	9.4	cloudy	134	133			
18	19.4	6.7	11.1	10.0	cloudy	66	30			
19	26.7	7.2	12.2	10.0	clear	51	78			4
20	29.4	8.9	12.2	10.0	clear	13	27			2
21	21.1	10.0	11.7	10.6	clear	132	83			3
22	17.2	8.9	10.0	8.3	clear	89	72			4
23	20.0	12.2	10.0	8.9	cloudy	28	29			1
24	17.2	12.2	10.0	8.9	cloudy	38	31			3
25	20.0	7.8	11.1	8.9	cloudy	47	30			
26	18.9	9.4	11.1	10.0	cloudy	103	99			
27	17.2	8.3	11.1	10.0	cloudy	64	80			1
28	21.7	6.7	11.1	10.0	clear	25	25			
29	23.3	8.3	11.7	10.6	clear	84	72			4
30	23.3	8.9	11.7	10.6	clear	77	60			2
31	24.4	7.8	11.7	10.0	clear	61	67			2
Totals						596	307			27

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

November	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped: King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	25.0	7.8	11.7	10.0	clear	68	47			
2	24.4	8.3	11.7	10.0	clear	52	38			
3	23.3	8.9	11.7	10.6	clear	42	23			1
4	22.2	12.2	11.7	11.1	cloudy	20	10			
5	13.3	8.9	11.1	10.0	rain	93	33			4
6	17.8	8.9	11.1	10.0	rain	65	41			6
7	15.6	11.1	11.7	10.0	rain	35	22			10
8	21.1	9.4	11.1	9.4	cloudy	3	7			
9	20.0	9.4	11.1	10.0	cloudy	32	17			
10	22.2	5.6	10.0	8.9	clear	25	7			
11	19.4	7.8	11.1	10.0	clear					
12	22.2	7.8	11.1	10.0	clear	21	12			
13	21.7	8.9	11.1	10.0	clear	21	12			1
14	20.0	7.8	11.1	10.0	clear	25	7			
15	15.6	8.3	11.1	10.0	cloudy	15	3			
16	15.6	7.8	11.1	10.0	cloudy	10	9			
17	14.4	2.8	10.6	8.3	clear	9	3			
18	15.6	3.3	11.1	8.3	clear	15	4			
19	20.0	11.1	11.1	8.3	clear	7	3			3
20	17.8	3.3	11.1	8.3	clear	6	3			
21	17.2	5.6	11.1	8.9	clear	4	1			
22	16.1	3.3	11.1	8.9	clear	3	2			
23	16.7	5.6	11.1	8.9	clear	3	2			1
24	17.8	3.3	11.1	8.3	clear	12	1			1
25	17.2	3.9	11.1	8.9	clear					
26	18.3	4.4	10.0	8.9	clear					
27	16.7	3.9	10.6	8.3	clear	6				
28	17.8	3.3	10.6	8.9	clear					
29	15.0	3.3	10.6	8.3	clear	1				
30	16.1	1.1	10.6	7.8	clear	3				
Totals						596	307			27

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

December	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	15.6	2.2	10.0	7.8	clear	2				
2	16.7	3.3	11.1	8.3	clear	1				
3	15.0	3.3	11.1	10.0	cloudy	6	4			1
4	15.6	2.8	10.6	8.3	clear					
5	12.8	8.3	10.0	8.3	clear	2	1			1
6	13.3	4.4	10.0	8.9	cloudy					
7	12.2	1.7	10.0	7.8	clear					
8	10.0	6.7	10.0	8.9	rain	5				1
9	10.0	7.8	10.0	8.9	cloudy					
10	10.0	7.8	8.9	8.3	rain	2	2			2
11	13.3	8.9	9.4	7.8	rain					
12	13.9	10.6	10.0	8.9	rain					
13	16.7	10.6	10.0	9.4	clear					1
14	16.7	7.2	10.0	8.9	rain	1				1
15	11.1	6.7	10.0	8.3	cloudy					
16	12.8	5.0	10.0	7.8	cloudy					
17	12.2	5.6	10.0	8.3	cloudy					
18	12.2	8.3	9.4	8.9	rain					
19	12.8	8.9	9.4	8.9	rain					
20	15.6	11.1	9.4	8.9	rain	1				16
21	12.2	10.0	9.4	8.9	clear					3
22	10.0	8.3	8.9	8.3	clear					
23	10.0	7.2	10.0	8.9	rain	6				7
24	10.6	7.8	9.4	8.9	rain	4				
25	13.3	4.4	9.4	7.8	cloudy					
26	11.1	3.3	8.9	7.2	clear					2
27	12.2	2.2	9.4	7.8	clear					
28	10.6	7.8	8.3	7.8	clear					
29	13.9	1.7	9.4	6.7	clear					3
30	8.9	3.3	8.9	7.2	clear					
31	10.6	1.7	8.9	6.7	clear					1
Totals						30	7			39

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

January	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	7.8	2.2	7.8	7.8	clear					
2	17.2	0.0	7.8	7.8	clear					
3	11.7	0.6	7.8	7.8	clear					
4	10.6	1.7	7.8	7.8	clear					
5	8.9	-0.6	7.8	7.8	clear					1
6	7.8	-1.7	7.2	4.4	cloudy					
7	7.8	3.3	7.8	7.2	cloudy					4
8	10.0	5.6	7.2	7.2	rain					
9	11.7	7.2	7.2	7.2	rain					
10	11.7	8.3	7.2	7.2	cloudy					
11	9.4	7.8	7.2	7.2	rain					
12	11.1	8.3	7.2	7.2	rain					
13	12.2	8.9	7.2	7.2	rain					1
14	13.3	11.1	7.2	7.2	rain					
15	12.2	8.9	7.2	7.2	rain					1
16	11.1	6.1	7.2	6.7	rain	4				1
17	13.3	8.9	7.2	6.7	cloudy					1
18	13.9	8.3	7.2	7.2	clear					
19	11.1	9.4	7.2	7.2	rain					
20	14.4	10.6	7.2	7.2	rain					3
21	14.4	12.8	7.2	7.2	rain					1
22	12.2	7.2	7.2	7.2	cloudy					
23	13.3	11.1	7.2	7.2	rain					1
24	11.7	8.9	7.2	7.2	cloudy					
25	13.9	6.7	7.2	7.2	clear					
26	11.7	8.9	7.2	7.2	rain					
27	12.8	4.4	7.2	7.2	cloudy					
28	11.7	2.2	7.2	7.2	clear					
29	10.0	2.2	7.2	7.2	clear					
30	10.6	1.1	7.2	7.2	clear					
31	11.1	0.6	7.2	7.2	clear					
Totals						4				14

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table (Continued)

February	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	17.2	5.6	7.2	7.2	clear					8
2	15.0	7.8	7.2	7.2	clear					18
3	12.8	4.4	7.2	7.2	clear					
4	15.6	3.3	7.2	7.2	clear					5
5	13.3	7.2	7.2	7.2	clear					
6	15.6	5.6	7.2	7.2	clear					
7	18.3	5.0	7.2	7.2	clear					
8	12.8	4.4	7.2	7.2	clear					
9	17.8	10.0	15.6	13.3	cloudy					
10	16.1	8.9	7.2	7.2	cloudy					
11	16.7	10.0	7.2	7.2	cloudy					11
12	14.4	10.0	7.2	6.7	rain					3
13	10.0	6.7	6.7	6.7	rain					
14	13.3	4.4	7.2	7.2	clear					
15	17.2	6.7	7.2	7.2	cloudy					6
16	12.2	10.0	7.2	7.2	rain					3
17	10.6	6.7	7.8	7.2	rain					
18	15.6	1.7	7.8	7.2	clear					5
19	17.8	6.1	7.8	7.2	clear					4
20	21.1	8.9	7.8	7.2	clear					
21	17.2	5.6	7.8	7.8	clear					13
22	17.2	5.6	7.8	7.8	clear					
23	15.0	4.4	7.8	7.8	clear					
24	20.0	6.7	7.8	7.8	clear					
25	21.1	7.8	7.8	7.8	clear					
26	20.0	6.7	8.3	7.8	clear					11
27	18.9	6.7	7.8	7.2	clear					
28	12.8	10.0	7.8	7.8	rain					
Totals										87

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

March	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	12.2	8.3	7.8	7.8	rain					4
2	12.8	4.4	7.8	7.8	clear					2
3	16.1	13.9	7.8	7.8	cloudy					
4	10.0	5.6	7.8	7.8	rain					
5	15.6	2.2	7.8	7.8	clear					5
6	15.0	6.1	7.8	7.2	clear					
7	13.9	8.9	7.2	7.2	rain					
8	16.1	5.6	7.2	7.2	cloudy					
9	11.7	6.1	7.8	7.2	cloudy					
10	13.3	5.6	7.8	7.8	clear					
11	11.7	7.2	7.8	6.7	rain					4
12	17.2	8.9	7.8	7.2	cloudy					
13	20.0	7.2	7.8	7.8	cloudy					4
14	20.0	11.1	8.3	7.8	cloudy					
15	21.1	6.7	8.3	8.3	cloudy					
16	23.3	8.3	8.9	8.3	clear					
17	18.9	6.1	8.3	8.3	clear					4
18	18.9	5.6	8.9	8.3	clear					5
19	20.0	5.6	8.9	8.3	clear					
20	18.9	5.6	8.3	7.8	clear					
21	21.1	4.4	8.3	7.8	clear					
22	21.1	8.3	8.3	7.8	clear					
23	24.4	7.2	7.8	7.8	clear					
24	25.6	8.9	8.3	7.8	clear					
25	27.8	9.4	8.9	8.3	clear					
26	24.4	7.8	8.9	8.3	clear					3
27	22.2	5.6	8.9	8.3	clear					
28	20.0	6.7	8.9	8.3	clear					
29	22.2	11.1	8.9	8.3	clear					
30	18.9	7.2	8.9	8.9	clear					
31	20.0	3.9	8.9	8.3	clear					
Totals										31

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

April	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	22.2	7.8	11.1	10.6	clear					
2	23.9	9.4	11.1	10.6	clear					
3	24.4	7.2	10.6	10.0	clear					
4	23.3	7.8	11.1	10.6	clear					
5	25.0	6.1	11.7	10.6	clear					
6	23.3	6.7	11.7	10.6	clear					
7	18.9	3.3	11.1	10.0	clear					
8	21.7	7.2	10.6	10.0	clear					
9	16.1	6.7	10.6	10.0	cloudy					
10	21.1	8.9	11.1	10.6	cloudy					
11	20.0	11.7	10.6	10.6	clear					
12	21.1	2.8	10.6	10.6	clear					
13	8.9	6.7	11.1	10.0	rain					
14	11.1	5.6	10.6	10.0	rain					
15	15.0	3.9	10.6	10.0	rain					
16	14.4	3.9	10.6	10.6	cloudy					
17	21.1	3.3	11.1	10.6	clear					
18	17.8	5.6	11.1	10.6	cloudy					
19	17.2	7.2	11.7	10.6	cloudy					
20	16.7	1.7	11.1	10.6	cloudy					
21	17.8	2.8	11.1	10.6	clear					
22	17.8	5.6	10.6	10.6	clear					
23	18.3	5.6	11.1	10.6	clear					
24	21.1	5.0	11.1	10.6	cloudy					
25	18.3	8.3	13.9	10.0	cloudy					
26	13.3	8.3	12.2	10.0	cloudy					
27	12.2	2.2	11.1	10.6	cloudy					
28	17.8	2.8	11.1	10.0	cloudy					
29	21.1	5.6	11.1	11.1	clear					
30	25.0	13.3	11.1	11.1	clear					
Total										

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

May	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	27.8	13.3	11.7	11.1	clear					
2	30.0	16.7	11.7	11.7	clear					
3	30.0	11.1	12.2	11.7	clear					
4	30.0	8.9	12.2	11.7	clear					
5	21.7	14.4	12.2	11.7	cloudy					
6	16.1	10.0	11.7	11.1	cloudy					
7	21.1	7.8	11.7	11.1	cloudy					
8	18.3	9.4	11.7	11.7	cloudy					
9	20.0	10.0	12.2	11.7	cloudy					
10	31.7	8.9	12.8	11.7	clear					
11	16.1	8.9	14.4	12.2	cloudy					
12	16.7	5.6	12.2	10.6	cloudy					
13	22.2	10.0	11.7	11.1	clear					
14	32.2	12.2	12.8	11.7	clear					
15	31.1	13.3	13.3	12.2	clear					
16	35.6	12.8	13.3	12.8	clear					
17	26.7	14.4	13.3	12.8	clear					
18	26.7	11.7	13.3	12.8	cloudy					
19	22.2	10.0	12.8	12.8	cloudy					
20	24.4	7.8	12.8	12.2	clear					
21	30.0	13.3	13.3	12.2	clear					
22	30.0	12.2	13.3	12.8	clear					
23	30.6	13.3	13.9	13.3	clear					
24	33.9	17.2	13.9	13.3	clear					
25	30.6	15.0	13.3	12.8	clear					
26	27.2	12.2	13.9	12.8	clear					
27	23.3	11.7	13.3	13.3	cloudy					
28	27.8	9.4	13.9	13.3	clear					
29	28.9	11.7	13.9	13.3	clear					
30	32.2	13.3	14.4	13.3	clear					
31	34.4	15.6	14.4	13.3	clear					
Totals										

* Temperature measured to nearest whole degree F, and later converted to C.

Appendix Table 1 (Continued)

June	Temperature (C*) Air Maximum	Air Minimum	Water Maximum	Water Minimum	Weather	Fish trapped King salmon Adults	King salmon Grilse	Silver salmon Adults	Silver salmon Grilse	Steelhead
1	35.0	18.3	14.4	13.3	clear					
2	36.7	20.0	14.4	13.9	clear					
3	36.7	18.9	14.4	13.9	clear					
4	40.0	15.6	14.4	13.9	clear					
5	31.7	16.7	14.4	13.9	clear					
6	31.7	12.2	14.4	13.3	clear					
7	28.3	13.3	14.4	13.9	clear					
8	17.2	11.1	14.4	13.9	rain					
9	18.3	11.1	14.4	13.9	rain					
10	24.4	13.3	13.9	13.9	cloudy					
11	26.7	12.2	15.0	14.4	clear					
12	26.7	13.3	15.6	14.4	clear					
13	25.6	12.2	15.6	15.0	clear					
14	17.2	11.7	15.6	15.0	rain					
15	24.4	11.1	15.0	14.4	clear					
16	26.7	13.3	15.0	14.4	clear					
17	28.9	13.9	15.0	14.4	clear					
18	31.1	16.7	15.0	14.4	clear					
19	31.7	15.6	15.6	15.0	clear					
20	36.7	16.7	15.6	15.0	clear					
21	37.8	17.8	15.6	15.0	clear					
22	38.9	18.3	16.1	15.0	clear					
23	27.8	18.9	16.1	15.0	clear					
24	35.0	15.6	16.1	15.6	clear					
25	35.0	17.2	16.1	15.6	cloudy					
26	25.6	16.7	16.1	15.6	cloudy					
27	24.4	17.8	16.1	16.1	cloudy					
28	37.8	17.8	16.1	15.6	cloudy					
29	37.8	18.3	16.1	15.0	clear					
30	33.3	18.9	16.1	15.6	clear					
Totals										

* Temperature measured to nearest whole degree F, and later converted to C.