AYK Region
Yukon Salmon Escapement
Report No. 32

Population Size and Composition of Chinook Salmon Spawners in a Small Interior Alaska Stream, 1986

by

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ABSTRACT

A weir was installed in Clear Creek from 1 July through 5 August to enumerate chinook salmon escapement and estimate stream life by tagging and subsequent carcass recovery. A total of 168 chinook and 79 summer chum salmon returned to the weir. All chum and 108 chinook salmon were released upstream to spawn. Seventeen male and 29 female chinook salmon were artificially spawned with an estimated 209,100 eggs collected for Clear Hatchery brood stock.

An aerial census made under poor survey conditions during peak spawning accounted for 43.5% of the total chinook salmon escapement (108 fish) while the peak ground survey estimate accounted for 46.3% of the total escapement.

Although precise stream life of chinook salmon could not be determined, males were estimated to live slightly longer on the average than females. Age, sex, and size composition data on Clear Creek chinook salmon are presented.

KEY WORDS: chinook salmon, Oncorhynchus tschawytscha, escapement enumeration, aerial census, stream life, artificial spawning, egg-take, Yukon River, Tanana River, Clear Creek

INTRODUCTION

The Pacific Salmon Treaty, which was signed in March 1985, included the provision that Yukon River issues be taken up in separate negotiations between the U.S. and Canada. The specific issues to be addressed concern ownership and allocation of transboundary salmon stocks in this drainage. The two countries have met on several occasions since April 1985 and deliberations have dealt specifically with chinook and fall chum salmon stocks, the two transboundary species.

A significant percentage of Yukon River chinook and fall chum salmon are produced in Canadian waters. Estimates from recent studies have indicated that Alaska's average annual harvest of approximately 171,000 chinook salmon for the period 1982-1985 was composed of approximately 43% Canadian stocks (Appendix Table 1).

An evaluation of the allocation problem requires that total run size (catch plus escapement) of each species be determined annually. Estimation of total escapement to major spawning areas has been the most difficult information to acquire thus far.

The Yukon River drainage is too extensive in size for comprehensive escapement enumeration projects on all major spawning streams. Consequently, low-level, aerial surveys have been the primary method used to obtain escapement information. It has been shown however, that peak spawning abundance measured by aerial survey methods is significantly lower than actual seasonal stream population of spawners (Bevan 1961, Neilson and Geen 1981, Cousens et. al. 1982, Barton 1986). As a consequence, the existing escapement data base on Yukon River chinook salmon reflects trends in escapements based upon relative abundance of spawners, but does not portray total spawning abundance.

By obtaining a good aerial count of chinook salmon during peak spawning on a stream with known total escapement abundance, the proportion of total abundance represented by the aerial survey point estimate can be obtained. This will, in turn, eventually permit expansion of past aerial survey escapement records to total abundance for other chinook salmon spawning streams which are similar in physical and hydrological nature.

Clear Creek, a second order tributary of the Nenana River, was selected for study in 1986 as the Fisheries Rehabilitation Enhancement and Development (F.R.E.D.) Division operated a weir on this stream in 1985 to enumerate chinook salmon escapement. The 1986 weir operation was primarily funded and supervised by the Commercial Fisheries Division with equipment and logistical support provided by the F.R.E.D. Division. Egg-take operations were supervised by the latter Division. Although a portion of the chinook salmon which return to Clear Creek are of hatchery origin, such would not affect the relationship of aerial survey counts to total weir escapement. Further, it was felt that chinook salmon stream life data could be collected from this relatively small stream.

Funding for this study was provided in part by a federal grant in support of U.S./Canadian negotiations and in part by the State of Alaska.

OBJECTIVES

Overall objectives of the 1986 Clear Creek chinook salmon study were to determine timing and magnitude of adult salmon escapement and to collect age-sex-size information on the escapement. The following specific objectives were identified:

1. Determine the timing and magnitude of chinook salmon escapement in Clear Creek by operation of a weir and estimate the proportion of the run which is wild versus hatchery-produced.

2. Estimate the proportion of the total Clear Creek chinook salmon escapement represented by an aerial survey point estimate during peak spawning.

3. Estimate the age, sex, and size composition of the chinook salmon escapement in Clear Creek from a sampled portion of the run.

4. Estimate stream life of chinook salmon spawners in Clear Creek by tag and recovery methods.

5. Assist the F.R.E.D. Division in collecting up to 900,000 chinook salmon eggs for hatchery brood stock.

STUDY AREA

Clear Creek heads in springs located approximately 1-2 miles north of Anderson and flows north for 10 miles to Julius Creek (Figure 1). The Clear Creek system has natural runs of coho, chum, and chinook salmon (Raymond 1986). Whereas coho salmon spawn in the upper part of the drainage in Wood Creek, chinook salmon primarily utilize that portion of Clear Creek downstream of the confluence of Glacier Creek for spawning. In addition to wild stocks, hatchery releases of chum, chinook, and coho salmon have been made in upper Wood and Clear creeks annually since 1982 (Raymond and Skaugstad, in prep.).

MATERIALS AND METHODS

An adult salmon weir was supplied by F.R.E.D. Division and installed in Clear Creek approximately 100 yards upstream from its confluence with Julius Creek on 1 July. The weir was approximately 35 feet in length and constructed of one inch aluminum conduit spaced approximately 2 to 2.5 inches apart (on center). A live trap measuring 4 by 8 feet was constructed on the upstream side of the weir into which fish could enter and remain until removed after sampling.

All salmon returning to the weir were enumerated daily by species. Chinook salmon were measured to the nearest 5 millimeters from mid-eye to fork-of-tail, sexed by external examination, sampled for scales (3 per fish), and tagged in the left jaw with a numbered metal locking tag.

It was anticipated that a portion of the chinook salmon returning to Clear Creek would be of hatchery origin. Upon their release as juveniles, 25% of all hatchery-released chinook salmon in Clear Creek were marked by removal

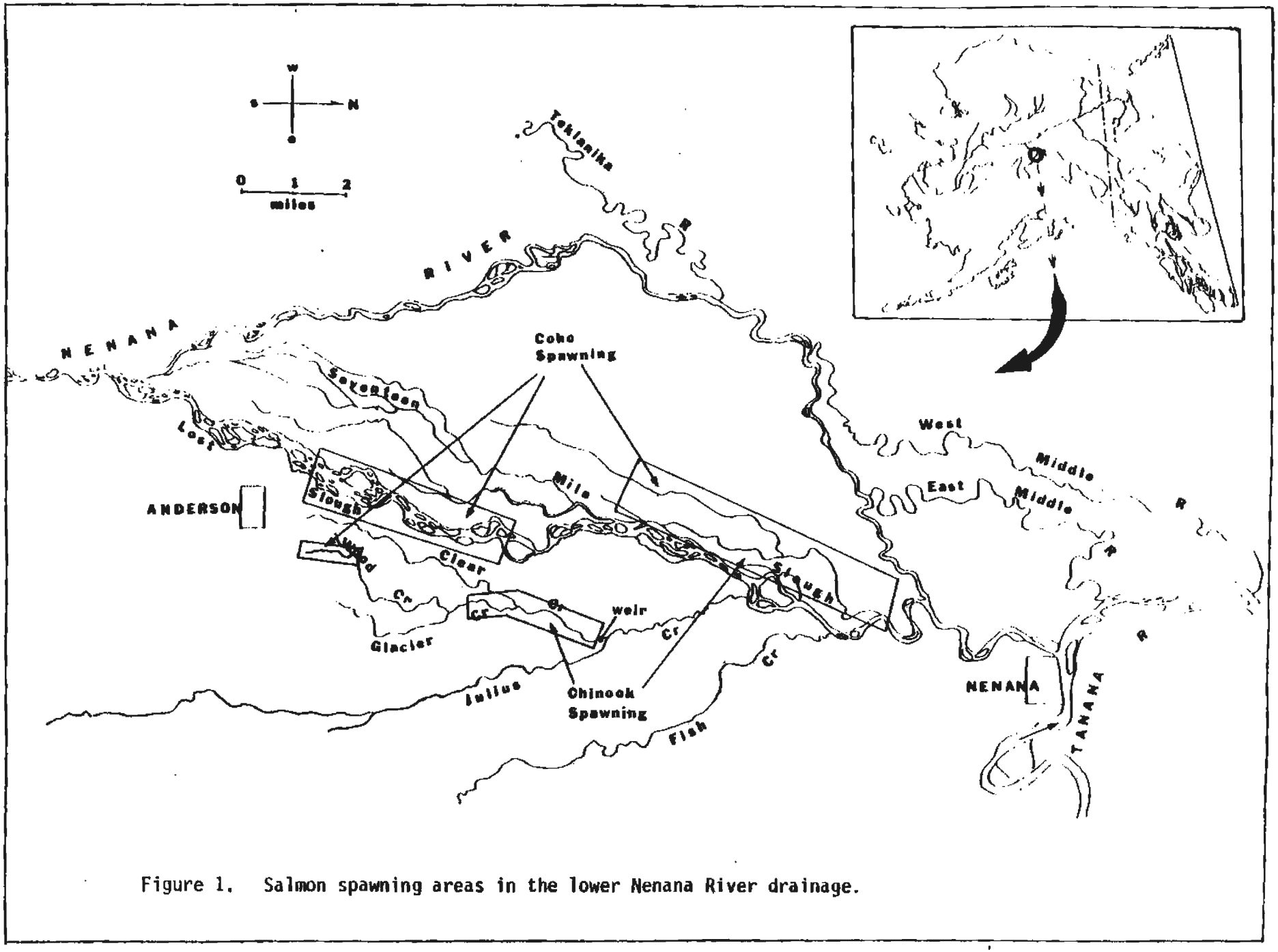

Figure 1. Salmon spawning areas in the lower Nenana River drainage.

of the adipose fin (Raymond, ADF&G, personal communication). Consequently, all adults returning in 1986 were examined for clipped adipose fins. In addition, male and female chinook salmon were periodically placed into separate holding pens and held for egg-takes for Clear Hatchery brood stock. Accurate records were maintained for all chinook salmon released upstream of the weir by date and tag number. All chum salmon were enumerated by sex and released.

Periodic ground (foot and boat) surveys were conducted upstream of the weir to enumerate chinook salmon and recover tags from carcasses. An aerial survey was flown during peak spawning to enumerate chinook salmon escapement.

RESULTS AND DISCUSSION

Run Magnitude and Timing

A total of 168 chinook salmon (91 males; 77 females) returned to Clear Creek during the period of 1 July through 5 August with the first fish arriving on 6 July (Table 1). It was estimated that 36 fish were of hatchery origin as a total of 9 (2 males; 7 females) possessed clipped adipose fins. Of the total which returned to the weir, 108 were released upstream (67 males; 41 females), 13 died in holding pens, 1 was entrapped and died in the weir, and 46 (17 males; 29 females) were used in egg-takes.

Mundy (1982, 1984) developed a time-density model to describe salmon migration run timing. The pattern of the migration is described by the mean date of passage (a measure of the central tendency) and the standard deviation (a measure of dispersion). These statistics are calculated from the proportion of the total escapement occurring each day. Further, the median date is the day on which 50% run-passage occurs. The mean date of run passage for chinook salmon in Clear Creek in 1986 was 20 July with a standard deviation of 5.7 days (Appendix Table 2). The median date was 19 July. No significant difference ($\alpha = 0.05$) was observed in timing by sex (Table 2). Timing in 1986 was similar but slightly earlier than in 1985 (Figure 2). The mean and median day in 1985 fell on the same date; 24 July (Appendix Table 3).

A total of 79 summer chum salmon (38 males; 41 females) were passed through the weir with the first fish arriving on 15 July. The weir was removed prior to the end of the run as the peak day of passage was 5 August with the arrival of 12 fish (Table 3).

Egg-Takes

Three chinook salmon egg-takes were made and supervised by F.R.E.D. Division personnel from Clear Hatchery:

23 July	-	11 females (54,000 eggs)
29 July	-	16 females (137,500 eggs)
5 August	-	2 females (17,600 eggs)

Table 1. Daily and cumulative weir counts of chinook salmon returning to Clear Creek in 1986.

	Total Chinook Return (mkd and unmkd)				Return of Marked Chinook Only a				Total Chinook Released Above Weir b			
	Daily			Cumulative	Daily			Cumulative	Daily			Cumulative
Date	Male	Female	M+F	M+F	Male	Female	M+F	M+F	Male	Female	M+F	M+F
06-Jul	1		1	1			0	0			0	0
07-Jul			0	1			0	0			0	0
08-Jul			0	1			0	0			0	0
09-Jul		1	1	2		1	1	1			0	0
10-Jul	2	1	3	5			0	1			0	0
11-Jul			0	5			0	1			0	0
12-Jul	1		1	6			0	1			0	0
13-Jul	4	1	5	11			0	1			0	0
14-Jul	10	7	17	28			0	1			0	0
15-Jul	3	2	5	33			0	1	21	12	33	33
16-Jul	6	1	7	40			0	1	6		6	39
17-Jul	16	15	31	71			0	1	15	15	30	69
18-Jul	8	3	11	82	1		1	2	7	3	10	79
19-Jul	4	4	8	90			0	2	1	2	3	82
20-Jul	5	7	12	102			0	2	1		1	83
21-Jul	2	2	4	106			0	2	1		1	84
22-Jul	7	8	15	121		1	1	3	5		5	89
23-Jul	2	2	4	125		2	2	5	2		2	91
24-Jul		3	3	128			0	5		1	1	92
25-Jul	1	6	7	135		1	1	6		2	2	94
26-Jul	2	3	5	140			0	6		1	1	95
27-Jul		3	3	143		1	1	7		1	1	96
28-Jul	3	6	9	152		1	1	8		2	2	98
29-Jul	4		4	156			0	8			0	98
30-Jul	3		3	159	1		1	9	3		3	101
31-Jul	1		1	160			0	9	1		1	102
01-Aug	2	1	3	163			0	9	2	1	3	105
02-Aug	1	1	2	165			0	9	1	1	2	107
03-Aug	2		2	167			0	9			0	107
04-Aug			0	167			0	9			0	107
05-Aug	1		1	168			0	9	1		1	108
	91	77	168		2	7	9		67	41	108	

a Chinook salmon returning with a clipped adipose fin were Clear Hatchery fish.

b Chinook salmon not released above weir were artificially spawned for Clear Hatchery brood stock or else died in holding pens.

Table 2. Chi-square contingency table for testing differences in run timing by sex in Clear Creek in 1986.

	(1 July - 5 August)						
	1-10	11-15	16-20	21-25	26-30	31-5	Total
Males Arriving	3	18	39	12	12	7	91
Females Arriving	2	10	30	21	12	2	77
Total Arriving	5	28	69	33	24	9	168
Arrival Rate Males	0.60	0.64	0.57	0.36	0.50	0.78	0.54
Arrival Rate Females	0.40	0.36	0.43	0.64	0.50	0.22	0.46
Total Chi-square (a) =	0.03 +	0.53 +	0.07 +	1.93 +	0.08 +	0.93 +	
	0.04 +	0.63 +	0.08 +	2.28 +	0.09 +	1.09 =	7.78 b

a Arranged in order of correspondence to the above contingency table.
b Non-significant ($\alpha = 0.05$ with 5 degrees of freedom $X^2 > 11.0705$)

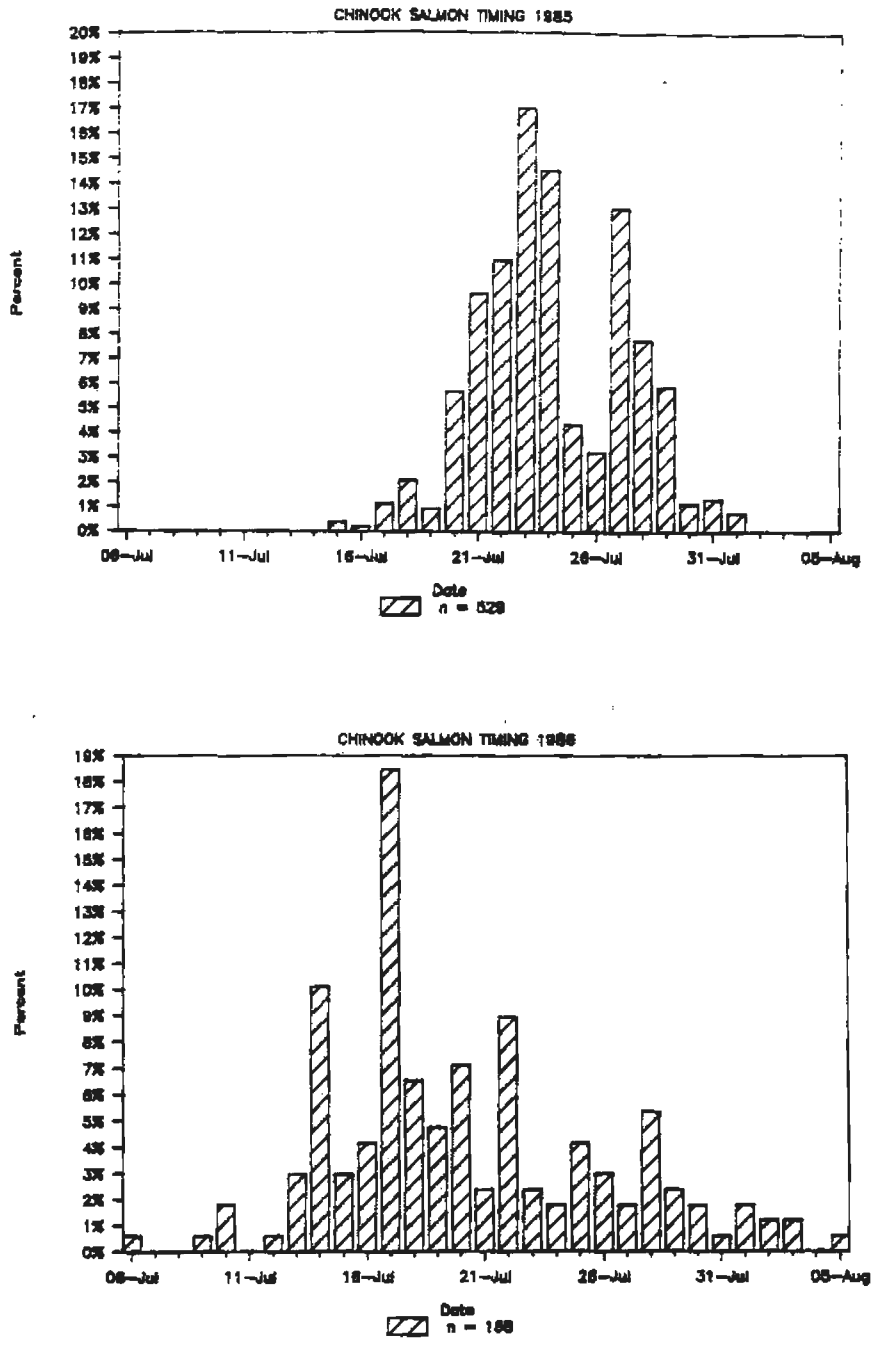

Figure 2. Chinook salmon escapement run timing in Clear Creek, 1985 and 1986.

Table 3. Daily and cumulative weir counts of chum salmon returning to Clear Creek in 1986.

	Total Chum Salmon Return			
	Daily			Cumulative
Date	Male	Female	M+F	M+F
06-Jul			0	0
07-Jul			0	0
08-Jul			0	0
09-Jul			0	0
10-Jul			0	0
11-Jul			0	0
12-Jul			0	0
13-Jul			0	0
14-Jul			0	0
15-Jul	3	2	5	5
16-Jul	2	1	3	8
17-Jul	5	2	7	15
18-Jul	2	1	3	18
19-Jul	2	1	3	21
20-Jul		1	1	22
21-Jul		3	3	25
22-Jul		5	5	30
23-Jul			0	30
24-Jul	2	1	3	33
25-Jul	1		1	34
26-Jul	2	5	7	41
27-Jul	4	2	6	47
28-Jul	3	4	7	54
29-Jul	2		2	56
30-Jul	1	1	2	58
31-Jul	1	1	2	60
01-Aug	1		1	61
02-Aug	1	1	2	63
03-Aug		1	1	64
04-Aug	1	2	3	67
05-Aug	5	7	12	79
	38	41	79	

A total of 209,100 eggs from 29 females (7,210 eggs per female) were taken for hatchery brood stock (Parks, ADF&G, personal communication). Seventeen males were used; some in more than one egg-take operation. At least three of the females and one of the males used in the egg-takes were known to be of hatchery origin.

Spawning Ground Surveys

An aerial survey of Clear Creek was flown by fixed-wing aircraft on 27 July from the mouth upstream to approximately the confluence of Foster Creek, a tributary of Wood Creek. An overall rating of "poor" was given to the survey due to substantial cloud cover and difficulty in seeing fish as a result of a dark river bottom. A total of 47 live chinook salmon were observed: 3 immediately downstream of the weir; 34 between the weir and the confluence of Glacier Creek; and a total of 10 in Wood Creek and that portion of Glacier Creek downstream of the confluence of Wood Creek. No chinook salmon carcasses were observed. A total of 140 fish had returned to the weir with 95 released upstream by the date the aerial survey was flown. The aerial count represented 43.5% of the total number of chinook salmon released (108) above the weir in 1986.

By comparison, 444 chinook salmon were released upstream of the weir in 1985 (ADF&G files). An aerial survey flown under "fair" survey conditions on 9 August of that year by the same observer who flew the 1986 survey, resulted in documenting only 17.3% (77 fish) of the total season escapement (444 fish). However, the 1986 survey was flown after peak of spawning.

In 1986 a boat survey was attempted by motoring upstream of the weir on 28 July. However, due to shallow riffle areas the survey was aborted approximately 4-5 miles upstream. A total of 16 chinook and 1 chum salmon was counted. A second boat survey was made by floating downstream of the Wood Creek coho weir site on 31 July. A total of 48 live and 2 dead chinook salmon was counted. This ground count represented 46.3% of the total season escapement of 108 chinook salmon.

A final ground survey was made of Clear Creek by foot on 5 August upstream to the confluence of Glacier Creek. Seven carcasses and 19 live chinook salmon were observed.

Other ground surveys were attempted of the Clear Creek drainage in 1986 but with unsuccessful results. The most conducive ground surveys are by floating downstream from Wood Creek but logistical coordination prevented other surveys of this type from being made apart from the one on 31 July. Further, the Clear Creek drainage is not conducive to aerial surveys by fixed-wing aircraft due to the meandering nature of the stream, dark-colored stream bottom, channel braiding in spring-fed areas, and tall timber. These stream characteristics made daily surveys impractical and thus prevented collection of precise stream life data on chinook salmon.

Stream Life

A total of 9 chinook salmon carcasses (5 males; 4 females) was recovered from ground surveys and average time between tagging and recovery was 17.7 days (range 14-19 days). Males averaged 17 days to recovery and females

18.5 days. However, fish may have actually died prior to the date of the survey on which recovered and thus actual time between tagging and death was likely less than indicated for each sex.

The weir was examined daily for carcasses and 23 were recovered between 19 July and 5 August. The average number of days between tagging and recovery was 14.4 days (range 9-20 days). Average time from tagging to weir recovery for males was 15.1 days and 11.5 days for females. These figures include an unknown length of time for carcass wash out. Further, 19 of the 23 carcasses recovered from the weir were males. This may suggest that stream life for females in Clear Creek is somewhat longer than that for males. On the other hand, the low number of females recovered from the weir may be due to different spawning behavior and redd defense resulting in different wash out patterns. The larger, heavier female carcasses may have a tendency to settle in deep pools while the smaller males may be more prone to drift downstream. Major et al. (1978), when mentioning the difficulty in estimating sex ratio of chinook salmon on the spawning grounds, point out the ". . . tendency of females to die sooner than males; with their carcasses often disappearing from view . . . ."

Thirteen chinook salmon (7 males; 6 females) died in the holding pens prior to egg-take operations. The average time to death for these fish from date of tagging was 9.5 days for males and females combined (range 4-19 days). Females died on an average of 7 days (range 4-10 days) while males survived an average of 11.6 days (range 8-19 days). Actual stream life is probably somewhat longer than indicated here due to stress from being held in pens.

In summary, it is conjectured that male chinook salmon in Clear Creek possess a slightly longer stream life than females, falling somewhere between 11.6 and 15.1 days on the average. The average for females is estimated to lie between 7 and 11.5 days. Neilson and Geen (1981) estimated spawner residence time for female chinook salmon in the Morice River, British Columbia, Canada to vary throughout the spawning season with a longer average residence time (13.1 days) for early arrivals to the spawning grounds and shorter average residence time (7.7 days) for females arriving late in the season. They defined spawner residence time as the period from first defense of the redd site by a female until it permanently vacated the redd. This differs from the total stream life definition adopted in the Clear Creek study. Neilson and Geen did not estimate spawner residence time for males.

Age-Sex-Size Composition

The male to female ratio of chinook salmon returning to Clear Creek was 1.00:0.82 (54.2% males; 45.8% females). Percent age composition was determined from scales from 139 fish and 5 age groups from 4 brood years were represented (Table 4). Approximately 29% of the sample was 6-year-old females (1980 brood year) which returned as 1.4's. By comparison, nearly 52% of the sample was represented almost equally by 5- and 6-year-old males returning either as 1.3's or 1.4's. The most abundant age groups for sexes combined were 56.8% age 1.4; 25.9% age 1.3; 14.4% age 1.5; and 1.4% age 1.2. Less than 1.5% of the sample possessed 2 freshwater annuli. Length frequency distribution for each sex is shown in Figure 3.

Table 4. Mean length at age (by sex) of chinook salmon in Clear Creek, 1986. a

	Brood Year and Age Group a					
	1982	1981	1980	1979		
	1.2	1.3	1.4	1.5	2.4	Total
FEMALE						
Length	0	700	789	814	914	
S.E.	-	50.0	7.7	12.2	84.5	
Sample Size	0	2	41	18	2	63 (45.3%)
MALE						
Length	585	700	774	795	0	
S.E.	95.0	10.3	12.7	35.0	-	
Sample Size	2	34	38	2	0	76 (54.7%)
						139 (100%)

a Mid-eye to fork-of-tail length in millimeters; S.E. is standard error.

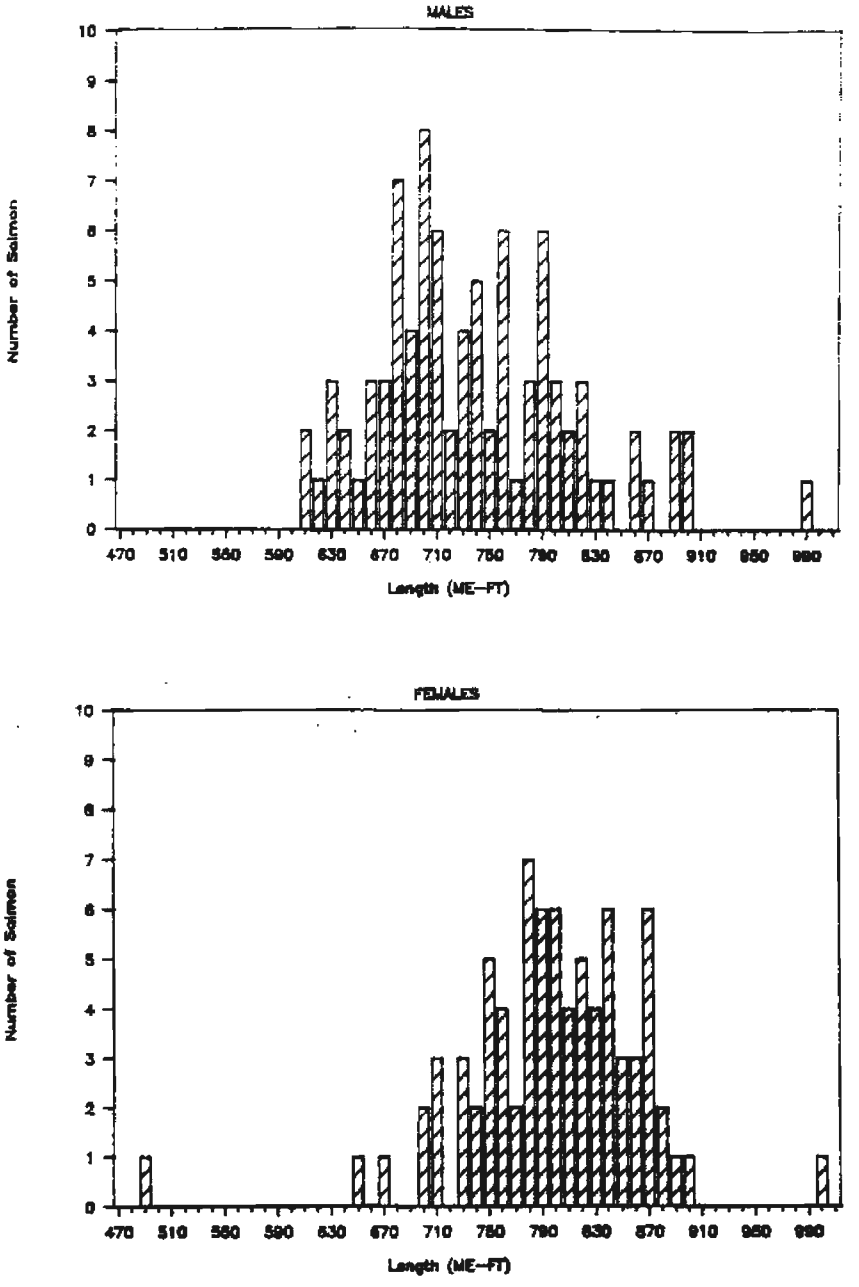

Figure 3. Length frequency distributions of male and female chinook salmon sampled at Clear Creek, 1986.

SUMMARY

1. A total of 168 chinook and 79 summer chum salmon returned to the Clear Creek weir during operation dates of 1 July through 5 August in 1986. It is estimated that 36 chinook salmon (21.4%) were of hatchery origin based upon the return of 9 marked adults.

2. Timing of the chinook salmon run in 1986 was slightly earlier than in 1985 based upon mean date of run passage; occurring on 20 July in 1986 and 24 July in 1985. The weir was removed in 1986 on 5 August; prior to the end of the summer chum salmon run.

3. All chum salmon and 108 chinook salmon were released above the weir to spawn. A total of 46 chinook salmon (17 males and 29 females) were artificially spawned for Clear Hatchery brood stock in 1986. An estimated 209,100 eggs were obtained for an average of 7,210 eggs/female.

4. An aerial survey flown under poor survey conditions during the peak spawning period on 27 July accounted for 43.5% of the total chinook salmon escapement (108 fish). A peak ground count on 31 July accounted for 46.3% of the total chinook salmon escapement.

5. Precise stream life data was not obtained for chinook salmon in 1986 due to difficulty associated with conducting replicate ground surveys in the Clear Creek drainage.

6. The chinook salmon male to female ratio was 1.00:0.82. The most abundant age group was 6-year-olds returning as 1.4's. Females were dominated by older aged fish than males: age groups 1.4 and 1.5. Males were primarily composed of equal numbers of 1.3's and 1.4's. Less than 1.5% of the fish scales examined possessed 2 freshwater annuli.

CONCLUSIONS

Although precise stream-life data were not obtained for chinook salmon during these studies, there was some evidence from which to conclude that males possessed a longer stream-life than females. The average for males was estimated to lie between 11.6 and 15.1 days and between 7 and 11.5 days for females.

The Clear Creek drainage is not conducive to intensive ground surveys. Heavy vegetative undergrowth (alders and willows) along stream banks, numerous deep pools, and water depth, severely hinder accurate foot survey observations. Further, the drainage is not conducive to aerial survey by fixed-wing aircraft due to the meandering nature of the stream, poor contrast between fish and stream bottom, and channel braiding in spring-fed areas.

RECOMMENDATIONS

Although determination of total run size and age, sex, and size composition data can be easily collected by operation of a weir on Clear Creek, it is

recommended that studies which require intensive ground survey effort not be continued in this stream in subsequent years. It is recommended, however, that aerial surveillance (although made difficult by the nature of the stream) be continued to estimate the proportion of total escapement observed during peak spawning, should the weir be operated in the future by F.R.E.D. Division. Surveys may be of more significance in those years when chinook salmon returns are of a larger magnitude than observed in 1986; such as was observed in 1985.

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PERSONAL COMMUNICATION

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Appendix Table 1. Percentage of total Alaskan commercial and subsistence catch of chinook salmon estimated to be of Canadian origin (1982-1985). a

Year	Total Alaskan Catch	Catch of Canadian Origin Fish	Percent of Catch which is Canadian Origin	Source
1982	152,205	83,419	54.81%	Wilcock and McBride 1983
1983	185,033 b	85,138	46.01%	Wilcock 1984
1984	162,293	46,542	28.68%	Wilcock 1985
1985	185,959	82,541	44.39%	Wilcock 1986
Total	685,490	297,640		
Average	171,373	74,410	43.42%	

a Proportion of Canadian origin chinook salmon in the Alaskan catch was estimated each year based upon scale pattern analyses.

b Does not include District 4 commercial and subsistence catch as enough samples were not collected from that District to include in apportionment exercise.

Appendix Table 2. Average daily and cumulative proportion of chinook salmon run timing in Clear Creek, 1986.

Day	Date	Daily	Cumulative	P(C)	CP(C)	P(C)*DAY	Var Calc
1	06-Jul	1	1	0.0060	0.0060	0.00595	1.189596
2	07-Jul	0	1	0.0000	0.0060	0.00000	0.000000
3	08-Jul	0	1	0.0000	0.0060	0.00000	0.000000
4	09-Jul	1	2	0.0060	0.0119	0.02381	0.738278
5	10-Jul	3	5	0.0179	0.0298	0.08929	1.834944
6	11-Jul	0	5	0.0000	0.0298	0.00000	0.000000
7	12-Jul	1	6	0.0060	0.0357	0.04167	0.394102
8	13-Jul	5	11	0.0298	0.0655	0.23810	1.515935
9	14-Jul	17	28	0.1012	0.1667	0.91071	3.810995
10	15-Jul	5	33	0.0298	0.1964	0.29762	0.785351
11	16-Jul	7	40	0.0417	0.2381	0.45833	0.713083
12	17-Jul	31	71	0.1845	0.4226	2.21429	1.815746
13	18-Jul	11	82	0.0655	0.4881	0.85119	0.298988
14	19-Jul	8	90	0.0476	0.5357	0.66667	0.061550
15	20-Jul	12	102	0.0714	0.6071	1.07143	0.001339
16	21-Jul	4	106	0.0238	0.6310	0.38095	0.017737
17	22-Jul	15	121	0.0893	0.7202	1.51786	0.309922
18	23-Jul	4	125	0.0238	0.7440	0.42857	0.195174
19	24-Jul	3	128	0.0179	0.7619	0.33929	0.266491
20	25-Jul	7	135	0.0417	0.8036	0.83333	0.985404
21	26-Jul	5	140	0.0298	0.8333	0.62500	1.023092
22	27-Jul	3	143	0.0179	0.8512	0.39286	0.841109
23	28-Jul	9	152	0.0536	0.9048	1.23214	3.312229
24	29-Jul	4	156	0.0238	0.9286	0.57143	1.870344
25	30-Jul	3	159	0.0179	0.9464	0.44643	1.737154
26	31-Jul	1	160	0.0060	0.9524	0.15476	0.702422
27	01-Aug	3	163	0.0179	0.9702	0.48214	2.513090
28	02-Aug	2	165	0.0119	0.9821	0.33333	1.969753
29	03-Aug	2	167	0.0119	0.9940	0.34524	2.287922
30	04-Aug	0	167	0.0000	0.9940	0.00000	0.000000
31	05-Aug	1	168	0.0060	1.0000	0.18452	1.497844
	Total	168			Mean:	15.1	
						Variance:	32.7
						STD:	5.72

Appendix Table 3. Average daily and cumulative proportion of chinook salmon run timing in Clear Creek, 1985.

Day	Date	Daily	Cumulative	P(C)	CP(C)	P(C)*DAY	Var Calc
1	06-Jul	0	0	0.00000	0.0000	0.00000	0.000000
2	07-Jul	0	0	0.00000	0.0000	0.00000	0.000000
3	08-Jul	0	0	0.00000	0.0000	0.00000	0.000000
4	09-Jul	0	0	0.00000	0.0000	0.00000	0.000000
5	10-Jul	0	0	0.00000	0.0000	0.00000	0.000000
6	11-Jul	0	0	0.00000	0.0000	0.00000	0.000000
7	12-Jul	0	0	0.00000	0.0000	0.00000	0.000000
8	13-Jul	0	0	0.00000	0.0000	0.00000	0.000000
9	14-Jul	0	0	0.00000	0.0000	0.00000	0.000000
10	15-Jul	2	2	0.00378	0.0038	0.03781	0.314266
11	16-Jul	1	3	0.00189	0.0057	0.02079	0.124554
12	17-Jul	6	9	0.01134	0.0170	0.13611	0.574532
13	18-Jul	11	20	0.02079	0.0378	0.27032	0.778113
14	19-Jul	5	25	0.00945	0.0473	0.13233	0.247502
15	20-Jul	30	55	0.05671	0.1040	0.85066	0.961324
16	21-Jul	51	106	0.09641	0.2004	1.54253	0.936795
17	22-Jul	58	164	0.10964	0.3100	1.86389	0.491470
18	23-Jul	90	254	0.17013	0.4802	3.06238	0.212349
19	24-Jul	77	331	0.14556	0.6257	2.76550	0.001999
20	25-Jul	23	354	0.04348	0.6692	0.86957	0.033884
21	26-Jul	17	371	0.03214	0.7013	0.67486	0.113920
22	27-Jul	69	440	0.13043	0.8318	2.86957	1.083981
23	28-Jul	41	481	0.07750	0.9093	1.78261	1.168470
24	29-Jul	31	512	0.05860	0.9679	1.40643	1.397151
25	30-Jul	6	518	0.01134	0.9792	0.28355	0.392521
26	31-Jul	7	525	0.01323	0.9924	0.34405	0.626863
27	01-Aug	4	529	0.00756	1.0000	0.20416	0.469856
28	02-Aug	0	529	0.00000	1.0000	0.00000	0.000000
29	03-Aug	0	529	0.00000	1.0000	0.00000	0.000000
30	04-Aug	0	529	0.00000	1.0000	0.00000	0.000000
31	05-Aug	0	529	0.00000	1.0000	0.00000	0.000000
	Total	529			Mean:	19.1	
					Variance:		9.9
					STD:		3.15