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A STUDY OF COHO SALMON IN SOUTHEAST
ALASKA, 1989: CHILKOOT LAKE, YEHRING CREEK,
AUKE LAKE, AND VALLENAR CREEK¹

By

Steven T. Elliott
and
David A. Sterritt

Alaska Department of Fish and Game
Division of Sport Fish
Anchorage, Alaska

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ABSTRACT

The return of coho salmon *Oncorhynchus kisutch* to Yehring Creek in 1989 was an estimated 7,520 (standard error = 413); 5,950 (79 percent) of these were caught by the various fisheries. Of the harvest, the troll fishery took 60 percent, the drift gill net fishery in Taku Inlet took 32 percent, the seine fishery took 5 percent, and the Juneau marine recreational fishery took 4 percent. The escapement was an estimated 1,570 or 21 percent of the return. The 1989 return had a smolt-to-adult survival rate of 9.5 percent. Smolt production from Yehring Creek in 1989 was an estimated 24,577 compared to 77,761 in 1987 and 79,568 in 1988. Based on past survival rates the expected return for 1990 is 1,700 - 2,500 adults and the expected escapement is 425 - 625 adults.

At Auke Lake, the return of 1,139 coho salmon was similar to the 1980-88 average of 1,121 coho salmon. The exploitation rate was 56 percent compared to the 1980-1988 average of 41 percent; the exploitation rate has increased from 25 percent to 56 percent during this period.

The escapement of 3,704 coho salmon to Chilkoot Lake was the largest escapement ever recorded. The increased escapement was due to closure of the District 115 Drift gill net fishery to protect a weak return chum salmon *Oncorhynchus keta*.

Indices of escapement in streams near Ketchikan and Sitka continued gradual declines that began five years ago; indices for Juneau did not decrease. The mean weighted index of escapement for all southeast Alaska suggests an overall decline since 1986.

KEY WORDS: coho salmon, *Oncorhynchus kisutch*, escapement, return, smolt, harvest rate, contribution, troll fishery, drift gill net fishery, sport fishery, forecast model, run-strength.

INTRODUCTION

The purpose of this research program is to determine the productivity of coho salmon stocks *Oncorhynchus kisutch* in Southeast Alaska to better manage the important recreational fisheries in the region. Escapements were estimated or indexed on a series of streams, exploitation rates of several stocks in commercial and recreational fisheries were estimated, and estimates of the abundance of smolts in several populations were made. These studies are a continuation of an ongoing program of stock assessment to better the management of Alaska's recreational fisheries (Elliott 1987; Elliott and Kuntz 1988; Elliott et al. 1989).

Studied Populations

In 1989, data were collected on coho salmon stocks that either passed through or returned to natal streams near important sport fisheries (Figure 1). Studies were conducted at:

1) Chilkoot Lake, Haines

This stock supports an intensive freshwater sport fishery and has the highest known harvest rate (85%) of any stock in southeast Alaska. These high rates of harvest have caused very poor escapement; in 1987 the escapement was an estimated 427 fish. Because the Lynn Canal Drift gill net fishery is managed for chum salmon catch, there may be little opportunity to optimize the production of this wild stock.

2) Yehring Creek, tributary to Taku River, near Juneau

Yehring Creek is a run-strength indicator for four major lower river tributaries of the Taku River. Coho salmon from these streams may contribute substantially to the Juneau marine sport fishery during August. Yehring Creek coho salmon typically have a harvest rate of 70-75% of an estimated return of 5,000 to 9,000 adults.

3) Auke Lake, Juneau

Research on dynamics of this population has been continuous since 1979. The weir constructed on the outlet is capable of catching all migrating fish and complete smolt, jack, and adult counts have been obtained since 1980. The population is used as an indicator of harvest rate for the recreational fishery in the Juneau area. However, because of its low abundance, this stock has no utility as a pre-season or in-season predictor of run-strength.

4) Vallenar Creek, Ketchikan

One year of field work was done at this site in 1988 to evaluate its utility as an indicator of run strength for small stocks in the Ketchikan area. The population has been dropped from the program because its abundance is too small to be used for in-season management.

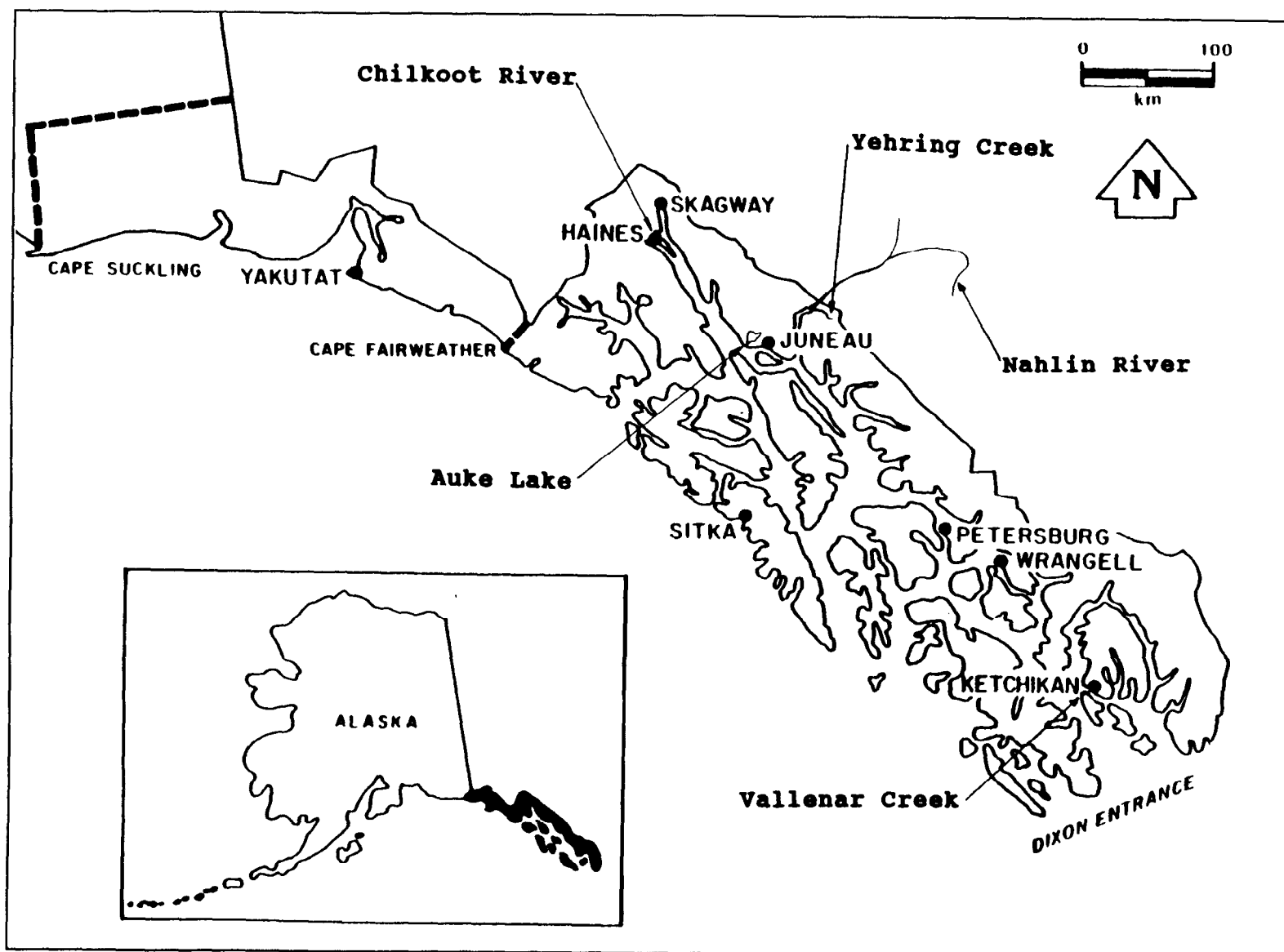


Figure 1. Sites of research in northern southeast Alaska in 1989.

METHODS

Smolt Sampling and Coded Wire Tagging

During 1989, coho salmon smolt were captured with trough traps (Elliott et al. 1989) as they migrated from off-channel beaver ponds (Figure 2) in Yehring Creek. The troughs directed fish to live boxes, from which they were removed daily from 5 May to 8 June 1989 at all sampling locations. All coho salmon with missing adipose fins that were caught in these traps were presumed to have been previously tagged with a coded wire tag (CWT) and were sent to the Coded Wire Tag Lab of the Alaska Department of Fish and Game (ADF&G), Fisheries, Rehabilitation, and Enhancement and Development (FRED) Division for dissection and decoding of these CWTs. All coho salmon <70 mm fork length were considered to be juveniles and were counted and released. All coho salmon ≥70 mm were defined as smolt, were counted, transported back to camp, tranquilized with tricaine-methane sulfonate (MS 222), marked by removing the adipose fin, and tagged with CWTs following instructions in Koerner (1977).

Every 30th smolt was systematically drawn for the collection of age-length data. Each fish was measured to the nearest 1 mm fork length and scales were removed from the preferred area (Anas 1963). Up to four scale samples were compressed between two microscope slides. Ages were determined from slides using a microfiche reader equipped with 10 mm objective lens.

Estimate of 1989 Smolt Abundance

A mark-recapture experiment based on Chapman's modification of the Peterson method (Seber 1982) was used to estimate the abundance of smolt:

$$\hat{N} = \frac{(M+1)(C+1)}{(R+1)} - 1 \quad (1)$$

$$V[N] = \frac{\hat{N}(M-R)(C-R)}{(R+1)(R+2)} \quad (2)$$

where:

- \hat{N} = estimated abundance;
- M = number of marked smolt released alive into the population during the first sampling event;
- C = number of smolt caught in the second sampling event; and
- R = number of marked smolt recaptured second sampling event.

Smolts tagged with CWTs released just upstream of Big Pond were considered the marked population. Smolts captured in two fyke nets (Figure 2) were used as the captured and recaptured fish for the second sampling event.

Smolts were captured using a "river-type" fyke net 1.5 km downstream and a "lake-type" fyke net 2 km downstream (Figure 2) of the release site. The river-type fyke net had an entrance 1.5 m tall and 3.0 m wide and was 12 m long - tapering to a 10 cm diameter throat. The webbing was 10 mm square knotted mesh, except for the terminal 2 m which was 6 mm square knotless mesh. The lake-type fyke net was a hoop net design and was hung with 1 cm knotless square mesh. It had a 1.2 m² entrance containing an internal net that tapered to a vertical slot. This

entrance led to two internal hoops with throats. A 10 m lead was connected to each side of the entrance. Floating live boxes were attached to the cod ends of each net and contained a webbed throat which prevented trapped fish from escaping and baffles to provide shelter from current.

Smolt to Adult Survival Rates

The smolt-to-adult survival rate (ocean survival rate) was estimated by:

$$S = \frac{R^2}{\hat{N}^2} \quad (3)$$

and the variance and standard error of the ocean survival rate were approximated using the delta method from Seber (1982):

$$V[S] \approx S \frac{V[P]}{P^2} + \frac{V[\hat{N}]}{\hat{N}^2} \quad (4)$$

where:

- S = the ocean survival rate;
- P = the return (escapement + catch) of adults; and
- \hat{N} = the estimated smolt abundance.

Adult Escapement and Sampling

Tripod and picket weirs were operated continuously from 13 August to 3 October 1989 at Yehring Creek and from 1 September to 30 October 1989 at Chilkoot Lake. The weirs had 1.9 cm (3/4 in) diameter pickets spaced 5.2 cm (2-1/16 in) on-center in a 43 picket aluminum channel. Adult coho salmon at Yehring Creek were captured in a 2.4 X 2.4 m (8 x 8 ft) fish trap. At Chilkoot Lake, fish were not captured or sampled because of concern for handling mortality. Adults were counted as they passed through a slot in the weir and crossed over a flashboard.

A minimal escapement estimate of adults at Yehring Creek was obtained from the sum of the number of coho salmon counted at the Yehring Creek weir prior to 3 October and unmarked fish captured in samples of adults taken with a beach seine in headwater areas after 6 October.

All coho salmon captured at the Yehring Creek weir were checked for missing adipose fins (indicating the presence of a CWT). Every fourth fish was tranquilized with a 12 volt DC electric shocking basket (Gunstrom and Bethers 1985), measured to the nearest 1 mm fork length (mid-eye to fork of tail) and sexed by examination of external characteristics. To determine age, four scales were removed from the preferred area (Anas 1963) and mounted on gum cards. The scales were pressed on acetate cards and read with a microfiche reader equipped with an objective lens of 10 mm.

Estimates of Age and Sex Composition

Proportions by age were estimated for smolts leaving Yehring Creek and by age and sex for adults sampled at the Yehring Creek weir as follows:

$$\hat{p}_i = \frac{n_i}{n} \quad (5)$$

$$V[\hat{p}_i] = \frac{\hat{p}_i(1-\hat{p}_i)}{n-1} \left(1 - \frac{n}{N_e}\right) \quad (6)$$

where:

- p_i = the proportion in the population in group i ;
- n_i = the number in the sample of group i ;
- n = the sample size; and
- N_e = the number in the population.

Estimates of Harvest

Coded wire tags from Auke Lake, Vallenar Creek, and Yehring Creek were recovered from the troll, purse seine, and gill net fisheries by the ADF&G Division of Commercial Fisheries port sampling program and from the sport fisheries by the marine and freshwater creel surveys (Division of Sport Fish).

The procedures listed in Clark and Bernard (1987) were used to estimate harvests in commercial and sport fisheries of stocks tagged with CWTs. The estimates were based on the following information from the FRED Division:

- 1) number of coho salmon harvested;
- 2) fraction of the harvest inspected for missing adipose fins;
- 3) number of coho salmon in the sample with missing adipose fins;
- 4) number of fish heads that reached FRED Division;
- 5) number of these heads that contained CWTs;
- 6) number of these CWTs that were decodable;
- 7) number of decodable tags of the appropriate code(s); and
- 8) the tag ratio observed in the adult escapement or in the smolt population.

Each calculation was stratified by fishing quadrant and by fishing period. Since information from FRED Division by fishing district were tallies from landings of fishermen that fished exclusively in that district, data from fishermen that fished several districts were excluded from the tallies. Since almost no fishermen fish in more than one of the larger quadrants during an opening, data stratified by quadrants was more comprehensive than data from fishing districts. Estimates were stratified by fishing period because of the delay between the inspection and the reporting of the catch. Inspection for missing adipose fins often occurs on tenders that deliver and record their catch 7-10 days later (Ben Van Alen, Alaska Department of Fish and Game, Division of Commercial Fisheries, Douglas, Alaska, personal communication). Under those circumstances, stratifications finer than two weeks would often bias the estimates. Since the samples drawn during each stratum were independent samples, the estimate of total harvest was the sum of all the stratified estimates. The variance of the total harvest was likewise the sum of the stratified variances.

The harvest rate, e.g., the exploitation rate, was calculated as the estimated harvest of a stock divided by the total estimated return of the stock. The

variance of the harvest rate was approximated using the delta method from Seber 1982):

$$V[E] = \frac{V[\hat{H}]J^2}{R^4} + \frac{V[\hat{J}]H^2}{R^4} \quad (7)$$

where:

E = the exploitation rate;
 \hat{H} = the estimated harvest;
 \hat{J} = the estimated escapement; and
R = the return.

Escapement Indices

Indices of coho salmon spawner abundance were obtained in a designated set of streams in the region. The indices were stratified by stream length and each stratum was weighted by the estimated number of those streams in southeast Alaska using criteria listed in Elliott et al. (1989). The products of the weighted means were summed to obtain a weighted mean index. The calculation was made using post stratification on non-proportional allocation of sampling (Sukhatme et al. 1984):

$$\bar{X} = \sum_{h=1}^L w_h \bar{x}_h \quad (8)$$

$$w_h = \frac{n_h}{N_r} \quad (9)$$

$$V[\bar{X}] = \sum_{h=1}^L w_h^2 V[\bar{x}_h] \quad (10)$$

where:

\bar{x}_h = mean of the survey counts in stratum h;
 w_h = weighting for stratum h;
 n_h = number of streams in the region in stratum h; and
 N_r = total number of streams in the region.

RESULTS AND DISCUSSION

Auke Lake

The return of coho salmon to Auke Lake in 1989 was an estimated 1,139 adults (Table 1). An estimated 637 (SE = 42) fish (Appendix A1) were caught by the various fisheries for a harvest rate of 56%. Elliott et al. (1989) reported that in 1988, there were 7,893 smolt and 436 jacks counted at the weir. The 1988 smolt cohort had an ocean survival rate of 1,139/7,893 = 15% (SE = 1%). Total harvest rate of Auke Creek coho salmon has increased from 25% to 56% from 1980

Table 1. Estimated catch and harvest rate of coho salmon returning to Auke Lake in 1989.

Fishery	Catch (SE)	Exploitation Rate
Troll	565 (37)	50%
Drift Gill Net	11 (4)	1%
Purse Seine	7 (3)	<1%
Juneau Marine Sport	54 (19)	5%
Total Harvest	637 (42)	56%
Escapement	502 (-)	44%
Total Return	1,139 (42)	100%

to 1989 (Table 2). The increase is attributed to increased rates of harvest among all the fisheries.

Chilkoot Lake

The escapement of coho salmon to Chilkoot Lake spawning grounds was an estimated 3,704 adults during 1989. This value was obtained by subtracting the estimated sport harvest of 124 adults above the weir (Suchanek and Bingham 1990) from the escapement count of 3,830 counted at the weir (Table 3). Sport fishermen caught 135 adult coho salmon below the weir and 124 fish above the weir for a harvest in freshwater of 259 fish, or 7% of the escapement to the river. The escapement count in 1989 was the highest recorded in the 11 years of operating the weir, most likely because the drift gill net fishery in District 115 was closed after 23 September to protect weak stocks of chum salmon.

Yehring Creek

Estimated Smolt Abundance in 1989:

Approximately 9,654 coho salmon smolt (≥ 70 mm) were captured by trough traps at four sites (Figure 2) between 5 May and 8 June (Table 4) and an additional 362 smolt were captured in fyke nets for a total catch of 10,016. Sixty six percent (6,573) of the coho salmon smolt captured were caught between 23 May and 29 May with the largest daily catch of 1,387 smolt occurring on 23 May. Catch rates gradually decreased from that date, and few smolt were captured after 8 June. Big Pond, an extensive series of beaver ponds, produced 7,183 (71.7%) of all smolt captured within the Yehring Creek watershed.

The estimated smolt abundance in 1989 was 24,577 (SE = 1,276). Of 9,368 smolt released 2 km upstream of the mouth of Yehring Creek 222 were recaptured in a sample of 584 smolt taken with two fyke nets near the mouth of the stream. Since the fraction of marked fish caught in each net were not significantly different ($\chi^2 = 1.77$, df = 1, $0.25 > P > 0.10$), data were pooled across nets (Table 5):

$$\frac{(9,368 + 1)(584 + 1)}{(222 + 1)} - 1 = 24,577 \text{ smolt; SE} = 1,276$$

The abundance of smolt in 1989 was lower than in 1987 (77,761) or in 1988 (79,568). All age classes were reduced in number (Table 6), but the decrease in abundance was most apparent for age 1. smolt. This decrease and the decrease in overall decrease in mean length suggests a relationship between freshwater survival rate and size. Of the 329 smolt sampled, 305 had readable sets of scales. Smolt averaged 101 mm long and 91% were age 2 (Table 7).

1989 Valid Release of Coded Wire Tagged Smolt:

The valid number of coho salmon released at Yehring Creek with valid coded wire tags was:

Table 2. Estimated harvest rates of coho salmon returning to Auke Lake in various fisheries, 1980-1989. Estimates of harvest in the troll fishery are computed by period.

Year	<u>Troll</u>		<u>Drift Gill net</u>		<u>Purse Seine</u>		<u>Marine Sport</u>		<u>Total Harvest</u>		Escapement	Return
	No.	%	No.	%	No.	%	No.	%	No.	%		
1980	128	15	29	3	0	0	16	2	173	20	698	871
1981	266	27	31	3	9	1	9	1	315	32	678	993
1982	157	21	24	3	117	16	3	0	301	40	447	748
1983	429	34	33	3	8	1	83	7	553	44	695	1,248
1984	379	32	121	10	0	0	43	4	543	46	648	1,191
1985	599	36	71	4	3	0	72	4	745	44	942	1,687
1986	433	44	68	7	0	0	38	4	539	54	453	992
1987	457	37	79	6	0	0	23	2	559	46	668	1,227
1988	308	26	75	6	9	1	48	4	440	37	756	1,196
1989	565	50	11	1	7	1	54	5	637	56	502	1,139
Ave.	351	31	59	5	16	1	37	3	463	41	665	1,128

Table 3. Daily counts of age .1 adult coho salmon, water temperature, and water depth at Chilkoot Lake weir, 01 September - 30 October 1989.

Date	Daily Count	Cumulative (3,830)	Temp. (°C)	Depth ^a (cm)
01-Sep			9.0	35.0
02-Sep			9.0	33.0
03-Sep			8.0	37.0
04-Sep			9.0	43.0
05-Sep			8.0	41.0
06-Sep			8.0	38.5
07-Sep			8.0	39.5
08-Sep			8.0	45.0
09-Sep			9.0	47.0
10-Sep	1	1	9.0	46.0
11-Sep	3	4	9.0	44.0
12-Sep	2	6	8.0	40.5
13-Sep	3	9	8.0	35.5
14-Sep	5	14	8.0	34.0
15-Sep	8	22	8.0	31.0
16-Sep	10	32	8.0	27.0
17-Sep	10	42	8.0	23.0
18-Sep	6	48	7.0	21.0
19-Sep	5	53	7.0	17.0
20-Sep	7	60	8.0	15.0
21-Sep	7	67	9.0	14.0
22-Sep	19	86	8.0	39.0
23-Sep	8	94	9.0	49.0
24-Sep	8	102	8.0	43.0
25-Sep	5	107	8.0	40.0
26-Sep	8	115	9.0	38.0
27-Sep	15	130	9.0	36.5
28-Sep	51	181	8.0	35.0
29-Sep	141	322	8.0	33.5
30-Sep	82	404	8.0	31.5
01-Oct	130	534	8.0	28.0
02-Oct	205	739	8.0	30.0
03-Oct	167	906	8.0	49.0
04-Oct	168	1,074	8.0	40.5
05-Oct	47	1,121	8.0	32.0
06-Oct	13	1,134	8.0	27.5
07-Oct	319	1,453	6.0	50.0
08-Oct	83	1,536	7.0	54.0
09-Oct	401	1,937	7.0	47.0
10-Oct	165	2,102	7.0	39.5

-(Continued)-

Table 3. (page 2 of 2)

Date	Daily Count	Cumulative (3,830)	Temp. (°C)	Depth ^a (cm)
11-Oct	506	2,608	7.0	35.0
12-Oct	343	2,951	6.5	30.5
13-Oct	176	3,127	6.5	30.5
14-Oct	199	3,326	4.0	20.0
15-Oct	144	3,470	5.0	18.0
16-Oct	61	3,531	5.0	15.0
17-Oct	178	3,709	6.0	14.0
18-Oct	45	3,754	6.0	14.0
19-Oct	7	3,761	6.0	13.5
20-Oct	1	3,762	6.0	14.0
21-Oct	0	3,762	6.0	12.5
22-Oct	65	3,827	4.0	12.0
23-Oct	0	3,827	4.0	10.0
24-Oct	0	3,827	5.5	8.0
25-Oct	0	3,827	5.5	7.5
26-Oct	3	3,830	5.0	7.0
27-Oct	0	3,830	5.0	4.5
28-Oct	0	3,830	5.0	4.0
29-Oct	0	3,830	5.0	6.0
30-Oct	0	3,830	5.0	6.5

^a Twenty-five cm were added to each water level to compensate for negative values.

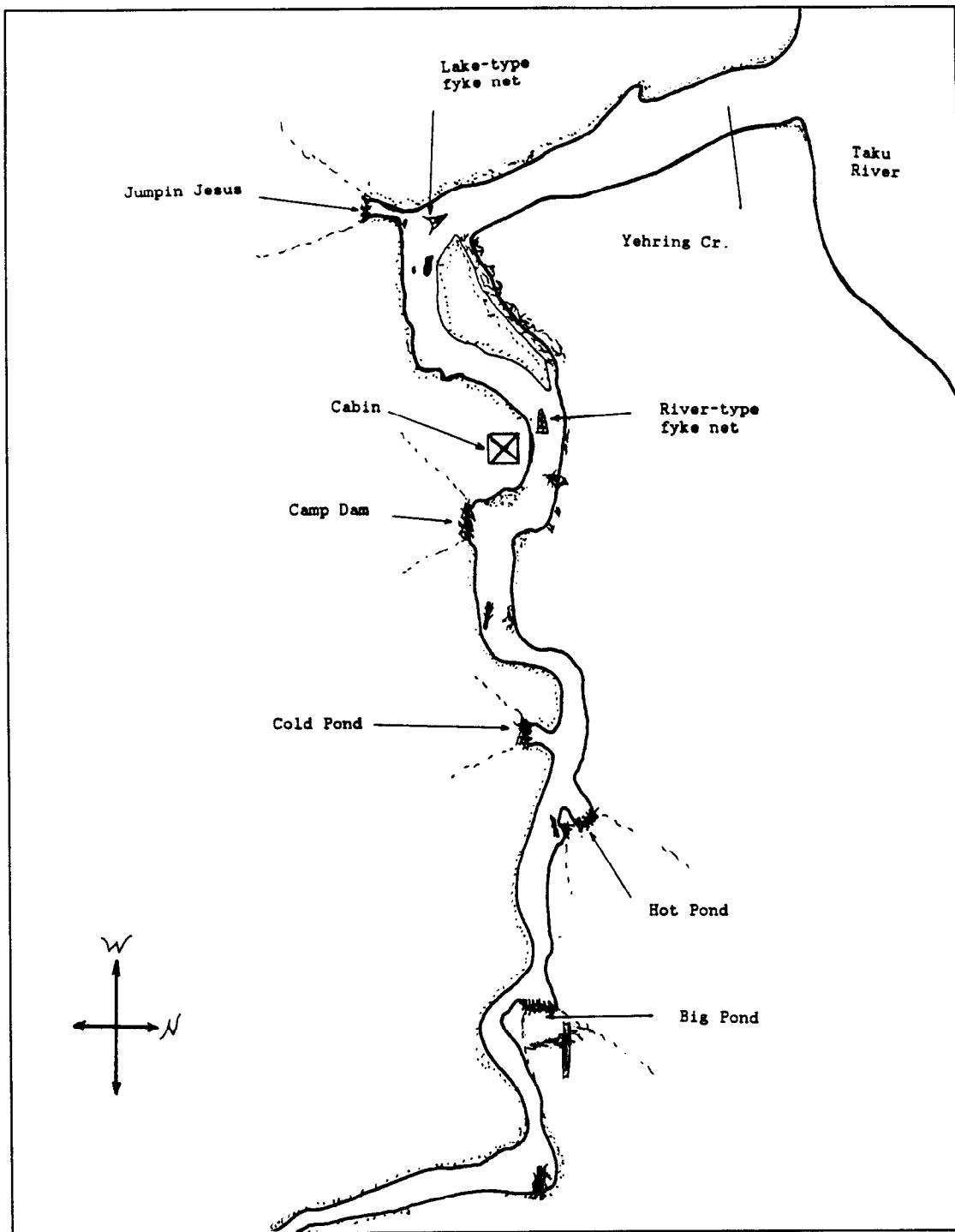


Figure 2. Sampling sites for coho salmon smolts in Yehring Creek, 1989.

Table 4. Daily counts of coho salmon smolt (≥ 70 mm) and water temperature at different sites in Yehring Creek, 1989. These data are rough counts and may not agree with the number of fish coded wire tagged.

Date	Camp Site			Jumpin J.	Camp Dam		Hot Pond		Big Pond		Lower Cold Pond		Total	
	H2O Temp (°C)	Air Temp (°C)	Depth (cm)	Catch Temp (°C)	Catch	Temp (°C)	Catch	Temp (°C)	Catch	Temp (°C)	Catch	Temp (°C)	Catch	Cum.
May 5				3	28		3						34	34
May 6	4.0	8.0		5 8.0	3 4.0		8 11.0		4 7.0				20	54
May 7	4.0	8.0		6 7.0	0 4.0		1 11.0		3 7.0	4 4.0			14	68
May 8	4.0	8.0		3 7.0	6 4.0		7 12.0		17 7.0	22 4.0			55	123
May 9	4.0	14.0		9 7.0	10 4.0		26 11.5		8 6.0	9 4.0			62	185
May 10	4.0	12.0		1 8.0	14 5.0		27 11.5		9 6.0	14 4.5			65	250
May 11	4.0	14.0	67.0	1 6.5	20 4.0		34 11.0		10 8.0	10 5.0			75	325
May 12	4.5	8.0	60.0	16 6.5	9 4.0		28 11.0		18 8.0	9 6.0			80	405
May 13	5.0	10.0	48.0	6 6.5	4 4.0		25 11.0		40 7.5	7 6.5			82	487
May 14	5.0	9.0	43.0	1 7.0	0 5.0		35 11.0		23 7.5	1 6.5			60	547
May 15	4.5	9.0	46.0	0 8.0	2 5.0		42 11.5		171 7.5	28 6.5			243	790
May 16	4.0	11.0	52.0	0 8.0	2 4.5		16 10.0		90 5.5	16 4.5			124	914
May 17	4.5	12.0	41.0	8 8.0	24 4.0		41 9.5		130 7.0	15 4.5			218	1,132
May 18	4.5	11.0	32.5	1 10.0	23 4.0		25 12.5		58 9.0	6 8.0			113	1,245
May 19	5.5	16.0	28.5	0 9.0	4 5.5		152 12.5		32 9.0	8 9.0			196	1,441
May 20	8.0	11.0	23.5	4 11.0	4 6.0		63 9.0		39 9.5	8 9.5			118	1,559
May 21	7.0	11.0	25.5	3 10.0	0 6.0		188 14.0		85 10.5	17 9.0			293	1,852
May 22	6.0	21.0	37.0	1 9.5	7 5.5		116 14.0		305 10.0	21 9.0			450	2,302
May 23	6.0	15.0	46.0	5 11.0	17 5.0		132 13.5		1,177 9.0	33 7.0			1,364	3,666
May 24	6.0	17.0	48.0	4 11.5	17 5.0		149 14.0		565 9.5	17 8.5			752	4,418
May 25	6.5	15.0	47.0	2 10.0	1 7.0		213 14.0		390 10.0	24 8.0			630	5,048
May 26	6.5	11.0	48.5	11 11.0	18 6.0		66 13.0		342 10.0	17 8.0			454	5,502
May 27	8.0	18.0	52.5	7 9.0	1 8.0		55 18.0		1,048 10.0	17 10.0			1,128	6,630
May 28	7.5	20.0	66.0	1 9.0	3 8.0		29 15.0		768 10.0	22 8.0			823	7,453
May 29	8.0	14.0	72.0	24 11.0	0 7.5		42 15.0		1,167 9.0	42 8.0			1,275	8,728
May 30	8.0	19.0	101.0	0	0		16 11.0		165 9.0	11 8.0			192	8,920
May 31	8.0	16.0	119.0	0	0		2		214 9.0	0			216	9,136
Jun 1	8.0	12.0	129.0	0	0		0		0	0			0	9,136
Jun 2	9.0	14.0	112.5		0		51 15.0		41 9.0				92	9,228
Jun 3	8.0	18.0	94.0	8 11.0	0 8.0		24 14.0		85 10.0	0 8.0			117	9,345
Jun 4	8.0	17.0	100.0	12 10.0	0 8.0		56 14.0		65 9.0	3 8.0			136	9,481
Jun 5	8.0	14.0	119.0		0		17 13.0		15 9.0	0			32	9,513
Jun 6	7.5	12.0	109.5	0			12 13.0		46 9.5	0 7.5			58	9,571
Jun 7	8.0	15.0	92.5				18 14.0		53 9.5	0 8.5			71	9,642
Jun 8							12						12	9,654
TOTALS				142	217		1,731		7,183	81				9,654

Table 5. Mark-recapture data used to estimate the abundance of coho salmon smolts in Yehring Creek in 1989.

Date	Number Released	No. Unmarked Smolts			No. Marked Smolts			Total Recapture Sample
		River Fyke	Lake Fyke	Total	River Fyke	Lake Fyke	Total	
May 09	97	-	-	-	-	-	-	-
May 10	0	0	-	0	0	-	0	0
May 11	0	0	-	0	0	-	0	0
May 12	192	0	-	0	0	-	0	0
May 13	0	4	6	10	0	0	0	10
May 14	30	0	0	0	0	0	0	0
May 15	198	1	0	1	0	0	0	1
May 16	0	0	0	0	0	0	0	0
May 17	351	2	2	4	0	0	0	4
May 18	194	0	0	0	0	0	0	0
May 19	0	5	-	5	5	-	5	10
May 20	0	36	-	36	6	-	6	42
May 21	0	25	6	31	4	4	8	39
May 22	943	41	12	53	2	3	5	58
May 23	1,361	23	-	23	5	-	5	28
May 24	195	1	18	19	1	6	7	26
May 25	1,270	3	12	15	13	16	29	44
May 26	187	20	12	32	35	26	61	93
May 27	1,377	0	14	14	0	14	14	28
May 28	811	32	7	39	60	9	69	108
May 29	1,269	2	3	5	0	5	5	10
May 30	199	1	40	41	0	5	5	46
May 31	0	0	15	15	0	2	2	17
Jun 1	192	-	1	1	-	0	0	1
Jun 2	199	-	3	3	-	0	0	3
Jun 3	0	-	1	1	-	0	0	1
Jun 4	0	1	1	2	-	0	0	2
Jun 5	0	-	4	4	-	1	1	5
Jun 6	0	-	4	4	-	0	0	4
Jun 7	303	-	0	0	-	0	0	0
Jun 8	0	-	4	4	-	0	0	4
Totals	9,368	197	165	362	131	91	222	584

Table 6. Comparison of abundance and mean fork length (mm) by age class of coho salmon smolt emigrating from Yehring Creek, 1987 - 1989.

Year		Age 1.	Age 2.	Age 3.	Total
1987					
	Number	24,884	50,545	2,332	77,761 ^a
	Mean Length (SD)	84 (11)	94 (13)	106 (13)	91 (13) ^b
1988					
	Number	24,666	54,106	796	79,568
	Mean Length (SD)	86 (8)	99 (8)	110 (3)	95 (10) ^c
1989					
	Number	737	22,365	1,475	24,577
	Mean Length (SD)	85 (7)	101 (10)	103 (13)	101 (10)

^a Elliott et al. (1989, p. 59)

^b Elliott and Kuntz (1988, p. 9)

^c Elliott et al. (1989, p. 58)

Table 7. Mean fork length (mm) and age composition of coho salmon smolts sampled at Yehring Creek, 1989.

Period	Age 1.	Age 2.	Age 3.	Total
No. Sampled	9	278	18	305
Mean Length	85	101	103	101
SD	7	10	13	10
SE	2	1	3	1
Percent Comp.	3.0%	91.1%	5.9%	100.0%
SE	5.9%	1.7%	5.7%	-

Code	Tags Used	Adipose Clipped Fish Released	Tag Retention Ratio	Valid Release
04-28-55	10,053	9,951	0.985	9,802

Adult Escapement:

The minimum estimate of escapement to Yehring Creek in 1989 was 1,570. From 13 August through 2 October, 1,444 adults were counted through the weir (Table 8). On the latter date, the weir was breached by high water and was not reinstalled. On 6 October, 56 adults were captured above the weir site with a beach seine, nine of which had been marked at the weir. Since one of every four fish had been marked at the weir, approximately 16 of the 52 caught had passed the weir after 2 October. On 16 October, 152 coho salmon were caught with seines above the weir site. Eight of these had been marked at the weir and 10 had been marked on 6 October sampling event. This indicates that 110 of these fish had passed the weir site after 2 October.

Two hundred and forty nine (75%) of 329 scale samples taken at the weir were readable (Table 9). Sampled adults averaged 615 mm long and ranged from 400 mm to 725 mm in length. There were no age .0 (jacks) adults in the sample, though some fish were only 400-500 mm long. Small age .1 adults are common at Yehring Creek (Elliott 1987). Typically, they arrive at the stream in mid-August suggesting that a shorter time at sea was responsible for their shorter length.

Estimated Return, Harvest, and Migratory Timing:

The 1989 return of Yehring Creek coho salmon was an estimated 7,520 fish (SE = 413) (Table 10) of which 5,950 were harvested (Appendix A2) by the various fisheries for a total harvest rate of 79% (SE = 1%). Of the catch, the troll fishery took 60%, the drift gill net fishery in Taku Inlet took 32%, the seine fishery took 5%, and the Juneau marine Recreational fishery took 4%.

Based on catch, Yehring Creek coho salmon first appeared off the outer coast in late June (Figure 3). Through late July their abundance increased off the coast, and they were present in Chatham Straits and in low numbers in Taku Inlet. By mid to late August, they were in equal abundance off the coast and in Taku Inlet, and began to appear on the spawning grounds. In early September, small but equal numbers of fish were caught off-shore and in Taku Inlet. No fish were caught after 17 September as fish moved into freshwater. In 1989, coho salmon bound for Yehring Creek were available to the Juneau marine sport fishery from 17 July to 28 August, or nearly two months. The peak of the catch occurred during the first two weeks of August (bi-week 16) (Figure 4). They were present in the Taku Inlet (District 111-32) Drift gill net fishery from 7 July to 30 September with the peak catch occurring from 20 August to 26 August (statistical week 34) (Figure 4). The peak catch in the sport fishery occurred about two weeks earlier in 1989 than in 1988, and was about one week earlier in drift gill net fishery compared to 1988 (Elliott et al. 1989).

Table 8. Daily counts of adult salmonids at Yehring Creek, Taku River, 1989.

	Water Temp. (°C)	Water Depth (cm)	<u>Coho Salmon</u>		Sockeye	Pink	Chum	Dolly Varden
			Adip. Clip	Not Clipped				
Aug 13	12.0	84.0	0	0	1	0	0	0
Aug 14	12.0	91.0	0	0	0	0	0	0
Aug 15	13.0	109.5	0	2	1	0	0	0
Aug 16	12.5	152.0	0	0	0	0	0	0
Aug 17	12.0	200.0+	0	0	0	0	0	0
Aug 18	12.0	178.0	0	0	0	0	0	0
Aug 19	12.5	67.5	0	0	0	0	2	0
Aug 20	12.0	64.5	0	0	4	0	1	0
Aug 21	11.5	57.5	0	0	0	0	0	0
Aug 22	11.5	55.0	0	1	4	0	0	0
Aug 23	12.5	57.0	0	2	2	0	0	0
Aug 24	11.0	51.5	0	1	17	3	0	0
Aug 25	11.5	47.0	2	6	30	5	0	0
Aug 26	11.0	42.5	0	7	7	3	2	0
Aug 27	11.5	44.0	2	3	0	1	0	0
Aug 28	11.5	44.0	2	6	10	4	0	2
Aug 29	11.5	44.0	11	27	111	0	1	1
Aug 30	11.5	42.0	0	0	6	0	0	0
Aug 31	11.0	32.5	0	1	10	0	0	0
Sep 1	10.5	22.5	0	0	9	0	0	0
Sep 2	11.0	16.5	0	0	4	0	0	0
Sep 3	11.0	27.5	8	36	122	0	0	0
Sep 4	10.5	47.0	11	46	77	0	0	1
Sep 5	11.0	39.5	0	3	3	0	1	0
Sep 6	10.5	33.0	0	8	5	0	0	1
Sep 7	10.5	43.5	5	29	18	0	1	0
Sep 8	10.5	48.5	9	46	25	0	0	0
Sep 9	10.5	43.0	14	53	38	0	0	0
Sep 10	10.5	39.0	1	2	9	0	0	0
Sep 11	10.5	39.5	1	5	7	0	1	0
Sep 12	11.0	39.0	1	17	19	0	0	0
Sep 13	10.5	33.0	0	3	2	0	1	0
Sep 14	10.5	39.0	1	3	11	0	0	0
Sep 15	10.0	43.0	2	4	1	0	0	0
Sep 16	10.0	9.0	0	0	0	0	0	0
Sep 17	8.0	-6.5	0	0	0	0	0	0
Sep 18	9.0	-6.5	0	0	1	0	0	0
Sep 19	9.0	-6.5	0	0	0	0	0	0
Sep 20	9.5	-0.5	0	0	0	0	0	0

-(Continued)-

Table 8. (page 2 of 2)

	Water Temp. (°C)	Water Depth (cm)	<u>Coho Salmon</u>		Sockeye	Pink	Chum	Dolly Varden
			Adip. Clip	Not Clipped				
Sep 21	10.0	5.0	0	2	13	0	6	0
Sep 22	10.0	40.5	51	288	101	0	4	0
Sep 23	10.0	128.0	0	5	1	0	0	0
Sep 24	9.0	83.5	40	219	17	0	0	1
Sep 25	9.0	52.0	1	36	6	0	5	0
Sep 26	9.5	48.0	2	75	24	0	2	2
Sep 27	9.5	55.0	18	111	5	0	0	1
Sep 28	9.0	34.5	6	60	4	0	2	1
Sep 29	9.0	47.5	10	49	16	0	1	0
Sep 30	8.0	47.0	9	59	13	0	0	0
Oct 1	8.5	25.5	0	12	2	0	4	0
Oct 2	9.0	20.5	0	9	1	0	2	0
Oct 3	8.0	132.5	----- weir out -----					
Oct 4	8.0	93.0						
Oct 5	8.0	58.0						
Oct 6	8.0	39.0						
Total			207	1,237	757	16	36	10

Table 9. Mean length (mm mid-eye to fork), age, and sex composition of adult coho salmon at Yehring Creek weir, 1989.

	Parent Year			
	<u>1986</u>	<u>1985</u>	<u>1984</u>	
	1.1	2.1	3.1	Total
<hr/>				
<u>Males</u>				
No. Sampled	15	110	0	125
Mean Length (mm)	581	590	-	589
SD	76	88	-	86
SE	20	8	-	8
Percent Composition	6.0	44.2	0	50.2
SE	6.0	4.5	-	4.2
 <u>Females</u>				
No. Sampled	10	113	1	124
Mean Length (mm)	643	646	605	645
SD	47	48	-	48
SE	16	5	-	4
Percent Composition	4.0	45.4	0.4	49.8
SE	6.2	4.4	-	4.3
<hr/>				
<u>Total</u>				
No. Sampled	25	223	1	249
Mean Length (mm)	606	618	605	617
SD	72	76	-	75
SE	15	5	-	5
Percent Composition	10.0	89.6	0.4	100.0
SE	5.8	1.9	-	-

Table 10. Estimated return, catch, and exploitation rate of coho salmon returning to Yehring Creek in 1989.

Fishery	Area	Catch	(SE)	Exploitation Rate
Troll	(Quad. NE)	151	(61)	2.0%
	(Quad. NW)	3,340	(273)	44.4%
	(Quad. SE)	17	(17)	0.2%
	(Quad. SW)	28	(27)	0.4%
	Subtotal	3,536	(282)	47.0%
Drift Gill Net	(Dist. 106)	21	(21)	0.3%
	(Dist. 111)	1,773	(240)	23.6%
	(Dist. 115)	102	(41)	1.4%
	(Dist. 212)	21	(1)	0.3%
	Subtotal	1,917	(244)	25.5%
Purse Seine	(Dist. 110)	39	(39)	0.5%
	(Dist. 112)	239	(146)	3.2%
	(Dist. 221)	9	(9)	0.1%
	Subtotal	287	(151)	3.8%
Juneau Marine Sport		210	(94)	2.8%
Total Catch		5,950	(413)	79.1%
Escapement		1,570	-	20.9%
Total Return		7,520	(413)	100.0%

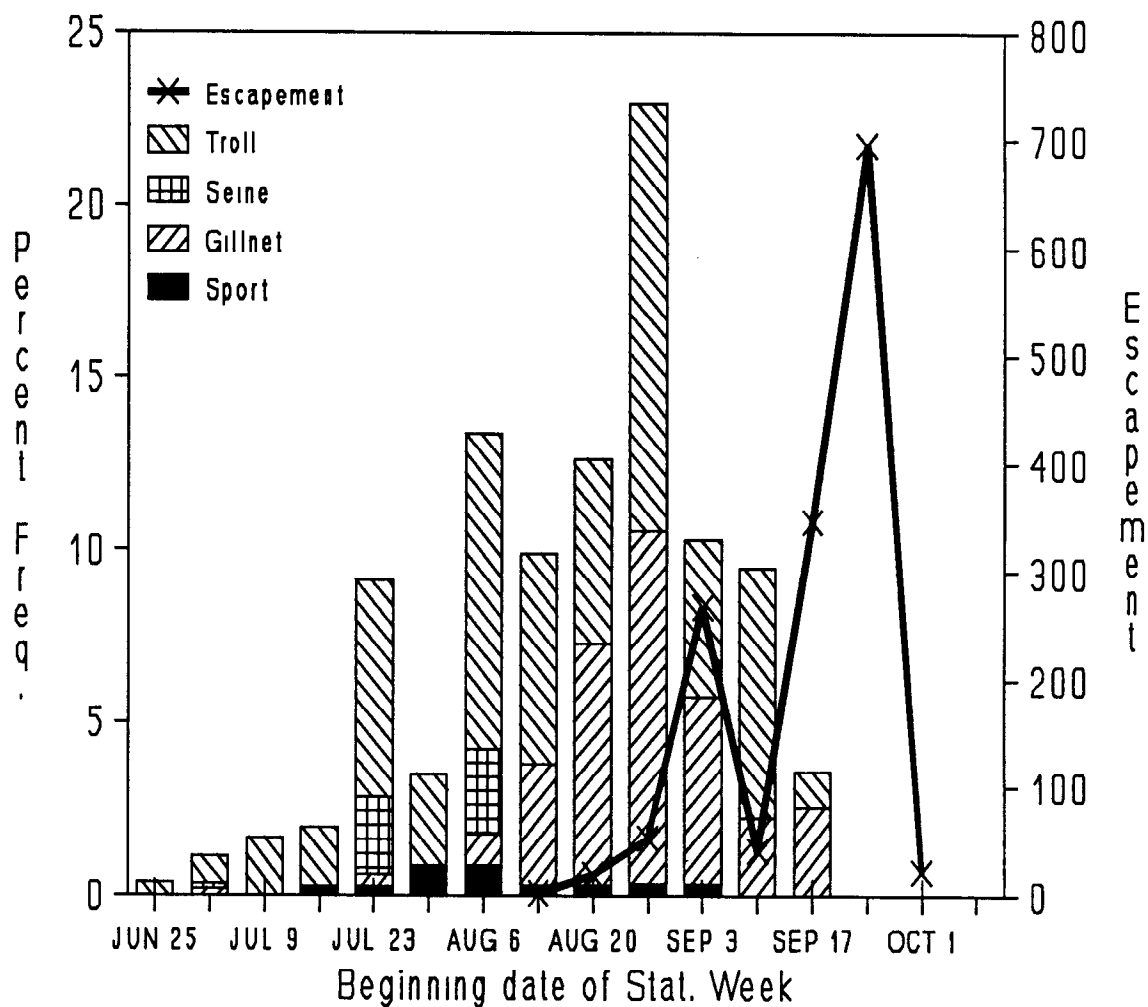


Figure 3. Comparison of harvest of coho salmon bound for Yehring Creek in several fisheries and the migratory timing of the escapement of this stock past the weir in 1989.

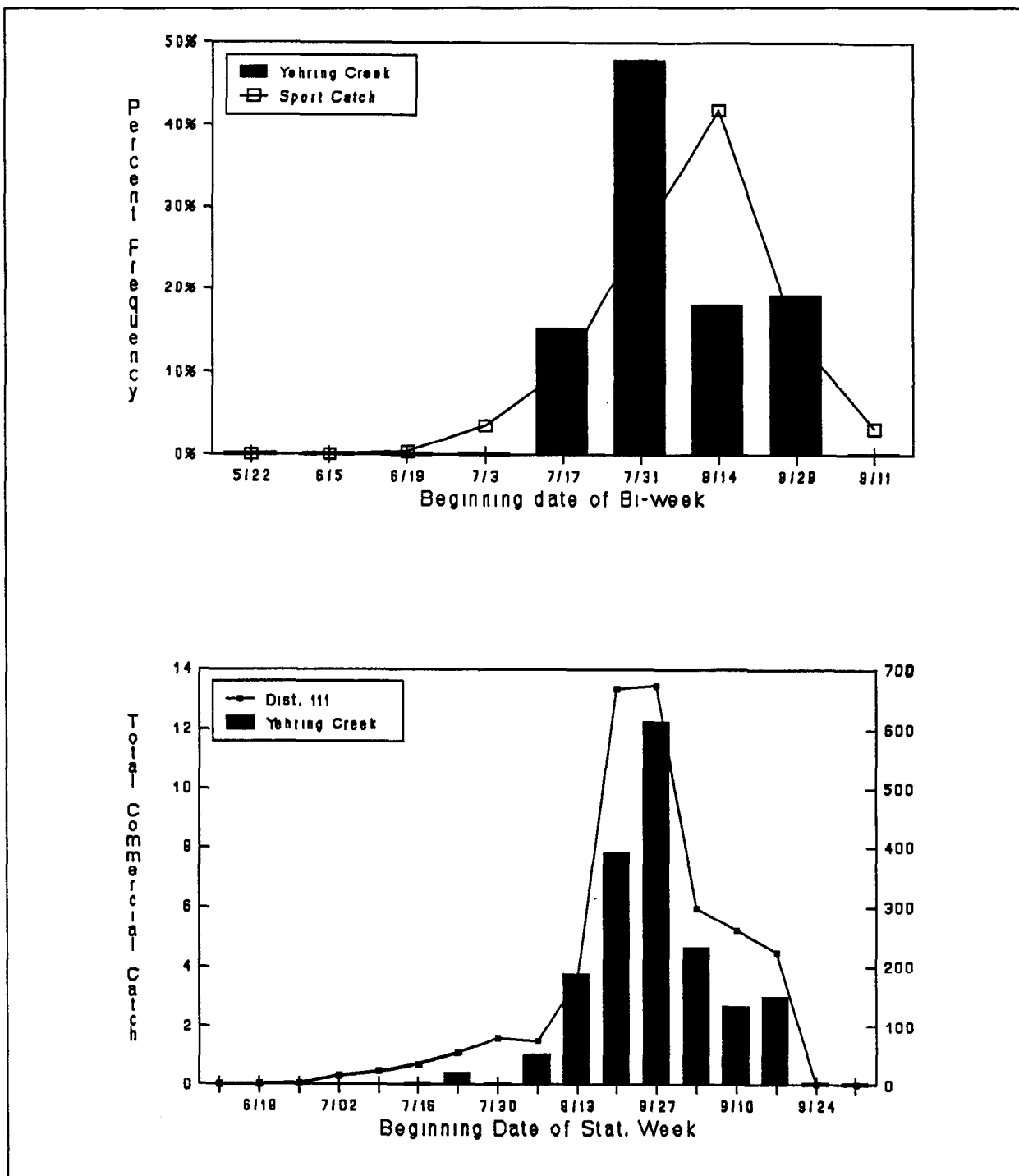


Figure 4. Comparison of the biweekly catch of coho salmon bound for Yehring Creek and all coho salmon caught in the Juneau marine recreational fishery (top) and the catch of Yehring Creek coho salmon in the District 111 drift gill net fishery compared to the catch of all coho salmon in that fishery (bottom), 1989.

The ocean survival rate of coho salmon smolting in 1988 was an estimated 9.5% (SE = 1%). The fraction of these smolt that were captured in fyke nets at the mouth of Yehring Creek in that year was 16.9% (47/278 in Elliott et al. 1989). Since this fraction was not significantly different than the fraction of returning adults sampled at the weir in 1989 (206/1,444 = 0.143) ($\chi^2 = 0.95$; df = 1; 0.50 > p > 0.25) these data were pooled to produce a revised estimate of smolt abundance in 1988 as follows:

$$N = \frac{(11,775 + 1) (1,444 + 278 + 1)}{(207 + 47 + 1)} - 1 = 79,568 \text{ smolt; SE} = 4,540$$

where:

- M = 11,775, the number of adipose fin clipped smolt released in 1988;
- C₁ = 1,444, the number of adults inspected fin clips at the Yehring Creek weir in 1989;
- C₂ = 278, the number of smolt captured by downstream fyke nets during 1988;
- R₁ = 207, the number of adipose clipped adults observed in the sample of 1,444;
- R₂ = 47, the number of adipose clipped smolt observed in the sample of 278.

Straying of Adults:

Failure to reject the hypothesis of equal proportions of marked fish in samples of the 1988 smolt and 1989 adult populations is consistent with little or no straying of adults from other streams into Yehring Creek and with negligible numbers of juveniles from other stocks rearing and smolting out of Yehring Creek. In spring 1989, seven smolt with adipose fin clips that had been applied prior to 1989 were captured as they emigrated from off-channel rearing areas of Yehring Creek. Five of these had been tagged in Yehring Creek in 1988, and were hold-overs. Two (codes 25627 and 24346) had been tagged as juveniles in 1988 and 1987 respectively in the "Lower Taku River" (probably Wilms Creek located 7 miles upstream of Yehring Creek-Taku River). This indicates that juveniles from upstream sites have migrated downstream, entered Yehring Creek and reared there for one to two years, and emigrated from Yehring Creek as smolt.

Although present, the straying of juveniles from Wilms Creek was negligible. In 1988, CWT code 025627 was applied to 5,679 juveniles at Wilms Creek. Wilms Creek has an estimated annual escapement of 5,000. The average pre-smolt to adult survival rate is 6.5% (L. Shaul, ADF&G, Division of Commercial Fisheries, Douglas, Alaska, personal communication) and the typical exploitation rate is 75% for a juvenile population of 308,000. The tag ratio was therefore 5,679/308,000 or 0.0184. If 9,368 of an estimated 24,577 Yehring Creek smolt were examined for adipose fin clip/CWT and one was tagged with code 025627, then the estimated number of emigrants with that code was three. If the tag ratio was 0.0184 then the total number of Wilms Creek fish leaving Yehring Creek was 163. Assuming an ocean survival rate of 10% and an exploitation rate of 75%, then four fish in the 1990 escapement to Yehring Creek could be from Wilms Creek stock.

Catch of Taku River Stock by the Juneau Sport Fishery

The total catch and cumulative catch per angler hour (CPUE) of coho salmon in the Juneau marine recreational fishery was highly correlated with the return of coho salmon to Taku Inlet (Figure 5) for the years 1987 through 1989. This suggests that the Taku River is the major contributor of coho salmon to the Juneau recreational fishery. Secondly, the fishery can be viewed as a "test fishery" to indicate the abundance of Taku River stock in the inside waters. Accordingly, the cumulative catch or CPUE could be used to determine whether sufficient numbers of fish are reaching Taku Inlet to provide for allocation to the drift gill net fishery or to meet desired escapement goals.

The return to the Inlet was the sum of the catch of coho salmon in the District 111-32 Drift gill net fishery and the estimated escapement of coho salmon above Canyon Island (Appendix A3). Since escapement data downstream of Canyon Island is limited, those data were not included in the estimated return.

Vallenar Creek

The harvest of coho salmon returning to Vallenar Creek was an estimated 467 (SE = 103) (Appendix A4). Of this catch, the U.S. troll fishery took 38% of the catch, the Canadian fisheries took 15% of the catch, the combined net fisheries took 47% of the catch, and the sport fishery caught none. Spawner counts were unsuccessful due to high water and an accurate mark ratio of adults was not obtained. Consequently, the return could not be estimated using the Vallenar Creek escapement. The harvest was estimated using the CWT ratio of the smolt population (Elliott et al. 1989) rather than from the adults.

Based on harvest rates (80%) for coho salmon returning to the Neets Bay Hatchery (about 30 mi. NE of Vallenar Creek) and to Whitman Lake hatcheries (about 14 mi. SE of Vallenar Creek), the estimated return to Vallenar Creek was 583 fish ($= 467/0.80$). The escapement is approximately 116 ($= 583 - 467$). Since, Elliott et al. (1989) estimated the 1988 smolt abundance as 11,944 (SE = 489), the estimated ocean survival rate is $583/11,944 = 5\%$ (SE = 1%). The ocean survival rates of smolt released at Neets Bay and Whitman Lake in 1988 were 1.3% and 1.8% respectively.

Escapement Indices

Escapement indices of coho salmon spawner abundance were obtained at 69 sites in 1989 (Appendix A5). Indices have been obtained at these sites since 1981. In the Ketchikan area, continuous data is present from the Eulachon River and Hugh Smith Lake (Figure 6A). In the Sitka area, indices are obtained from weirs operated on the outlets of Salmon Lake and Ford Arm Lake and from foot surveys conducted on St. Johns Creek, Sinitzin Creek, Nakwasina River, and Starrigavan Creek. The indices from these streams are summed and presented as a "spawner index" for the Sitka area (Figure 6B). Likewise, in the Juneau area, indices are obtained from a weir on Auke Creek and from foot surveys on Jordan Creek, Steep Creek, Montanna Creek, Peterson Creek, and Switzer Creek. Indices from Juneau area streams are summed and termed the "index" for the Juneau area (Figure 6C). Finally, spawner indices collected from the entire region are stratified and weighed by stream size and a mean weighed index for the region is estimated (Table 11) and presented in (Figure 6D).

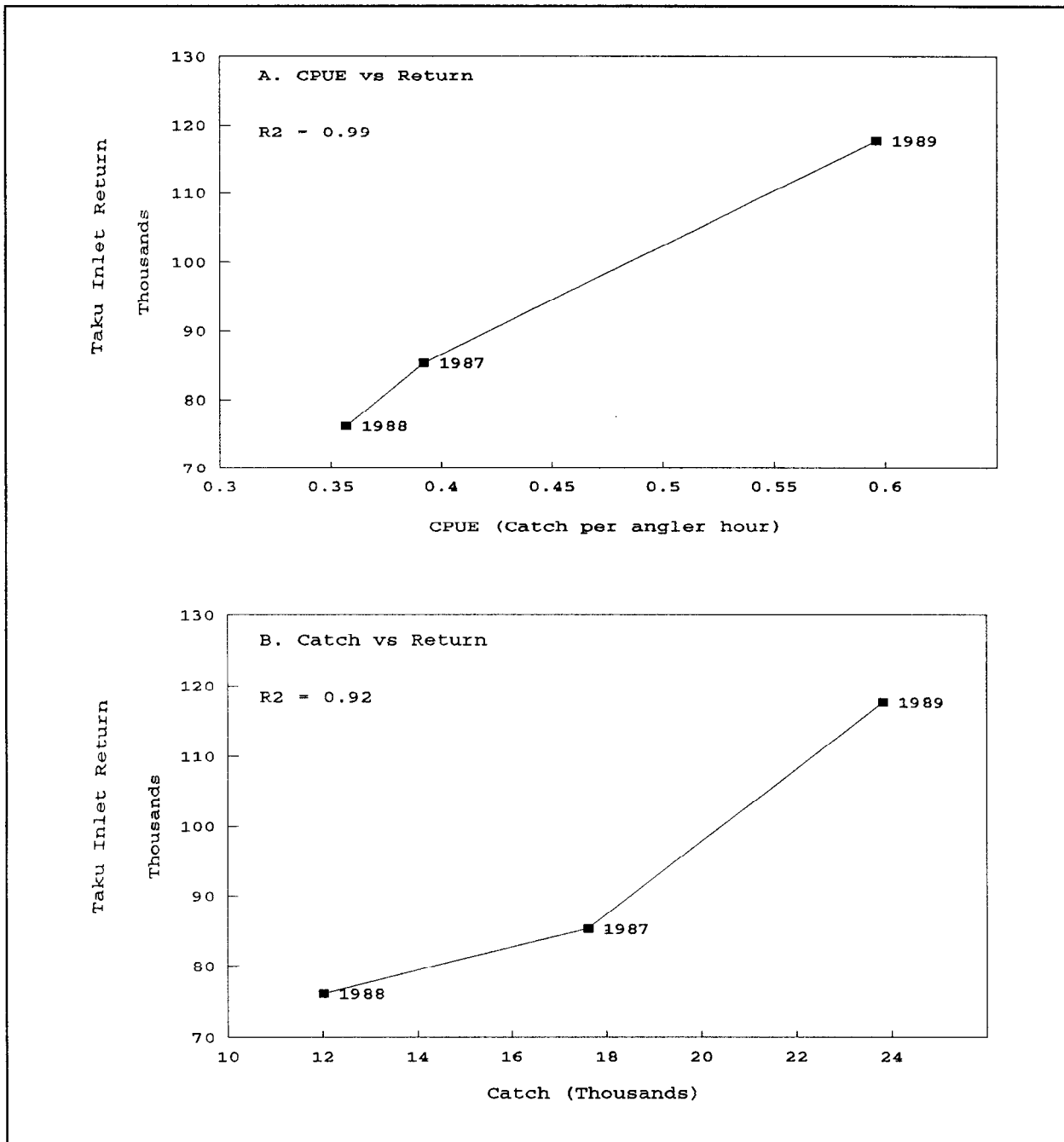


Figure 5. Relationship of catch per angler hour (A) of coho salmon and the catch of coho salmon (B) in the Juneau marine recreational fishery to the estimated return of coho salmon to Taku Inlet, 1987 - 1989.

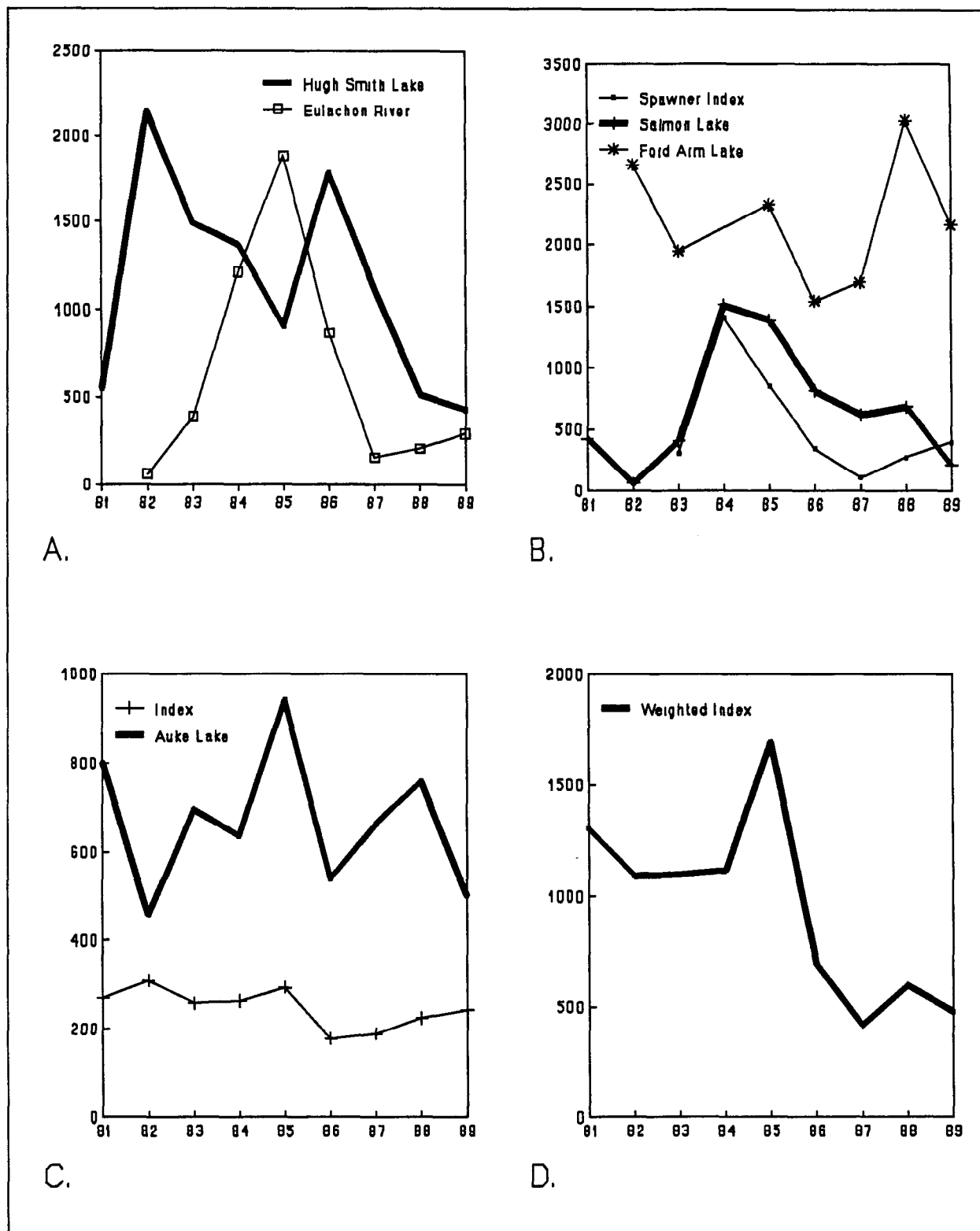


Figure 6. Indices of escapement of coho salmon near Ketchikan (A), Sitka (B), Juneau (C), and for all southeast Alaska (D), 1981 - 1989.

Table 11. Mean weighted index of abundance of spawning coho salmon for southeast Alaska 1981 - 1989.

Year	N	Mean of Observations	Weighted Mean	Variance	SE
1981	49	6,533	1,304	216,563	465
1982	61	5,976	1,094	294,443	43
1983	55	5,617	1,101	126,541	356
1984	55	7,041	1,118	324,032	569
1985	63	8,873	1,694	697,755	835
1986	64	3,796	693	54,660	234
1987	78	2,443	419	12,256	111
1988	60	4,261	596	68,128	261
1989	68	3,074	479	14,033	118

In general, spawner abundance appear to be declining throughout the region except for the Juneau area - observers are seeing fewer fish on the spawning grounds than in previous years. Spawner indices, however, are subject to many sources of error and may not accurately describe the true status of the escapement. Additionally, the annual weighted means for the region are not significantly different ($P > 0.05$) due to the large variances associated with the means.

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APPENDIX A

Appendix A1. Estimated harvest of coho salmon bound for Auke Creek by statistical week and by period in 1989. There were 502 adults in the escapement, of which 479 were coded wire tagged (tagged/untagged ratio = 0.9542; SE = 0). The tag code was 42707.

Date	Area		Stat.		N	n2	mc	m1	m2	a1	a2	Est.	SE
	Quadrant	District	Week	Period	Catch	Sample	Tags	Detected	Decoded	Ad Clip	Heads	Catch	
Troll Fishery by Statistical Week													
02-Jul - 08-Jul	NE	-	27	6	8,344	4,407	1	33	33	44	42	2	1
16-Jul - 22-Jul	NW	-	29	7	68,932	10,472	1	81	81	112	104	7	7
23-Jul - 29-Jul	NW	-	30	7	129,960	29,406	6	228	228	304	294	29	10
23-Jul - 29-Jul	NE	-	30	7	25,363	6,830	1	47	47	61	56	4	4
30-Jul - 05-Aug	NW	-	31	7	99,460	27,185	3	234	234	316	311	12	6
06-Aug - 12-Aug	NW	-	32	7	128,228	52,815	14	494	494	637	596	38	8
13-Aug - 19-Aug	NW	-	33	7	72,822	31,021	13	389	389	495	491	32	7
13-Aug - 19-Aug	NE	-	33	7	4,869	2,123	1	20	20	21	21	2	2
20-Aug - 26-Aug	NW	-	34	8	37,790	4,275	3	82	82	95	93	28	15
27-Aug - 02-Sep	NW	-	35	8	163,776	54,742	51	783	783	932	926	161	19
27-Aug - 02-Sep	NE	-	35	8	11,567	4,013	2	48	48	57	57	6	3
03-Sep - 09-Sep	NW	-	36	8	66,952	17,510	30	324	324	382	379	121	19
10-Sep - 16-Sep	NW	-	37	8	67,017	25,722	34	465	463	556	551	94	13
17-Sep - 23-Sep	NW	-	38	8	16,660	11,370	8	173	173	211	206	13	3
Subtotal by statweek					901,740	281,891	168	3,401	3,399	4,223	4,127	550	38
Troll Fishery by Period													
02-Jul - 15-Jul	NE	-	27-28	6	20,020	6,995	1	49	49	67	63	3	3
16 Jul - 19 Aug	NE	-	29-33	7	79,897	26,431	2	191	191	237	231	7	4
16 Jul - 19 Aug	NW	-	29-33	7	499,302	150,899	37	1,426	1,426	1,864	1,796	133	19
20 Aug - 30 Sep	NE	-	34-39	8	26,901	6,460	2	73	73	90	90	9	5
20 Aug - 30 Sep	NW	-	34-39	8	352,195	113,619	126	1,827	1,825	2,176	2,155	414	31
Subtotal by period					978,315	304,404	168	3,566	3,564	4,434	4,335	565	37
Drift Gill Net													
03-Sep - 09-Sep		115	36		16,420	6,388	4	74	74	79	78	11	4
Subtotal					16,420	6,388	4	74	74	79	78	11	4
Purse Seine													
20-Aug - 26-Aug		112	34		4,315	3,855	3	33	33	34	34	4	1
27-Aug - 02-Sep		112	35		2,995	1,109	1	4	4	8	7	3	3
Subtotal					7,310	4,964	4	37	37	42	41	7	3

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Juneau Marine Sport Fishery

Date	Bi- Wk	Sample Stratum	Estimated Harvest)	SE[N]	Harvest Sample	mc Tags	SE[mc]	Detected	Decoded	Ad Clip	Estimated Heads	Harvest	Approximate SE[n1]	Approx. V[n1]
14 Aug-27 Aug	17	MBHLH	3045	387	796	1	0.873571	12	12	14	13	4	4	14
	17	MBLLH	606	206	56	1	0.947113	3	3	5	5	11	11	117
28 Aug-10 Sep	18	MBHLW	1477	277	256	2	1.287392	9	9	9	9	12	8	64
	18	MBHLH	1429	302	361	3	1.492310	24	24	24	26	11	6	37
11 Sep-24 Sep	19	MBHLH	394	74	105	1	0.860517	6	6	6	6	4	3	12
	19	MBHEH	156	145	15	1	0.923672	2	2	2	2	11	11	117
Total Sport			7,107		1,589	9		56	56	60	61	54	43	360 SE = 19

Appendix A2. Estimated harvest of coho salmon bound for Yehring Creek by statistical week and by period in 1989. There were 1,444 adults in the escapement of which 207 had coded wire tags for a tagged/untagged ratio of 0.1434 (SE =0.006). The coded wire tag codes were 42708, 42709, 42836.

Stat. Week	Per.	Date	Area		N	n2	mc	m1	m2	a1	a2	Est.	SE
			Quad.	Dist.	Catch	Sample	Tags	Detected	Decoded	Ad Clip	Heads	Catch	
Troll Fishery													
26	5	25-Jun -	01-Jul	NW	-	1,117	340	1	1	1	2	23	0
27	6	02-Jul -	08-Jul	NE	-	8,344	4,407	1	33	33	44	14	13
27	6	02-Jul -	08-Jul	NW	-	14,921	3,119	1	28	28	33	33	33
28	6	09-Jul -	15-Jul	NW	-	32,650	5,820	2	41	41	53	80	56
28	6	09-Jul -	15-Jul	SE	-	11,220	5,287	1	52	52	63	16	15
29	7	16-Jul -	22-Jul	NW	-	68,932	10,472	2	81	81	112	99	69
30	7	23-Jul -	29-Jul	NW	-	129,960	29,406	10	228	228	304	319	99
30	7	23-Jul -	29-Jul	NE	-	25,363	6,830	2	47	47	61	56	39
31	7	30-Jul -	05-Aug	NW	-	99,460	27,185	6	234	234	316	156	62
32	7	06-Aug -	12-Aug	NW	-	128,228	52,815	29	494	494	637	525	95
32	7	06-Aug -	12-Aug	SW	-	29,709	11,372	1	100	99	130	19	19
33	7	13-Aug -	19-Aug	NW	-	72,822	31,021	22	389	389	495	363	75
34	8	20-Aug -	26-Aug	NW	-	37,790	4,275	5	82	82	95	315	140
35	8	27-Aug -	02-Sep	NW	-	163,776	54,742	33	783	783	932	693	118
35	8	27-Aug -	02-Sep	NE	-	11,567	4,013	2	48	48	57	40	28
36	8	03-Sep -	09-Sep	NW	-	66,952	17,510	10	324	324	382	269	83
37	8	10-Sep -	16-Sep	NW	-	67,017	25,722	17	465	463	556	313	74
37	8	10-Sep -	16-Sep	NE	-	3,456	206	1	6	6	7	117	117
38	8	17-Sep -	23-Sep	NW	-	16,660	11,370	6	173	173	211	63	24
Harvest by Troll Fishery by Stat. Week =					989,944	305,912	152	3,609	3,606	4,490	4,383	3,513	317

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Stat. Week	Per.	Date	Area		N Catch	n2 Sample	mc Tags	m1 Detected	m2 Decoded	a1 Ad Clip	a2 Heads	Est. Catch	SE
			Quad.	Dist.									
Troll Fishery													
5	25-Jun -	01-Jul	NW	-	1,117	340	1	2	2	2	2	23	22
6	02-JUL -	15-JUL	NE	-	20,020	6,995	1	49	49	67	63	21	21
6	02-JUL -	15-JUL	NW	-	47,571	8,939	3	69	69	86	85	113	64
6	02-JUL -	15-JUL	SE	-	21,047	8,881	1	96	96	120	115	17	17
7	16 Jul -	19 Aug	NE	-	79,897	26,431	2	191	191	237	231	43	30
7	16 Jul -	19 Aug	NW	-	499,302	150,899	69	1,426	1,426	1,864	1,796	1653	195
7	16 Jul -	19 Aug	SW	-	180,826	47,334	1	390	388	512	492	28	27
8	20 Aug -	30 Sep	NE	-	26,901	6,460	3	73	73	90	90	87	49
8	20 Aug -	30 Sep	NW	-	352,195	113,619	71	1,827	1,827	2,176	2,155	1550	180
Harvest by Troll Fishery by Period =					1,228,876	369,898	152	4,123	4,121	5,154	5,029	3,536	282
Drift Gill Net Fishery													
33	- 13-Aug -	19-Aug	-	106	12,707	4,357	1	14	14	21	20	21	21
30	- 23-Jul -	29-Jul	-	111	1,102	378	1	2	2	3	3	20	20
32	- 06-Aug -	12-Aug	-	111	1,507	803	4	6	6	8	8	52	25
33	- 13-Aug -	19-Aug	-	111	3,559	1,005	2	4	4	15	4	185	113
34	- 20-Aug -	26-Aug	-	111	13,308	5,131	20	44	44	53	49	391	84
35	- 27-Aug -	02-Sep	-	111	13,000	3,017	20	46	46	56	55	612	134
36	- 03-Sep -	09-Sep	-	111	5,800	1,923	11	25	25	28	28	231	68
37	- 10-Sep -	16-Sep	-	111	4,400	1,198	5	30	30	35	34	132	58
38	- 17-Sep -	23-Sep	-	111	3,600	338	2	12	12	14	14	149	104
27	- 02-Jul -	08-Jul	-	115	549	348	1	4	4	5	5	11	10
36	- 03-Sep -	09-Sep	-	115	16,420	6,388	5	74	74	79	78	91	39
34	- 20-Aug -	26-Aug	-	212	28,756	9,666	1	100	100	100	100	21	1
Harvest by Drift Gill Net fishery =					104,708	34,552	73	361	361	417	398	1,917	244

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Stat.			Area		N	n2	mc	m1	m2	a1	a2	Est.	
Week	Per.	Date	Quad.	Dist.	Catch	Sample	Tags	Detected	Decoded	Ad Clip	Heads	Catch	SE
Purse Seine fishery													
27	-	02-Jul - 08-Jul	-	221	80	60	1	3	3	3	3	9	9
30	-	23-Jul - 29-Jul	-	110	6,264	1,292	1	10	10	15	13	39	39
30	-	23-Jul - 29-Jul	-	112	2,676	202	1	1	1	1	1	92	1
32	-	06-Aug - 12-Aug	-	112	3,889	185	1	3	3	3	3	147	146
Harvest by Purse Seine fishery =					12,909	1,739	4	17	17	22	20	287	151
Total commercial harvest =					1,346,493	406,189	229	4,501	4,499	5,593	5,447	5,740	403

Sport Harvest

Date	Bi- Wk	Sample Stratum	Estimated Harvest	SE[N]	Harvest Sample	mc Tags	SE[mc]	m1 Detected	m2 Decoded	a1 Ad Clip	a2 Heads	Est. Harvest	Approx. SE[n1]	Approx. V[n1]
17 Jul-30 Jul	15	MBHLH	935	108	205	1	0.982282	3	3	4	4	32	31	977
31 Jul-13 Aug	16	DE	2,176	0	1975	4	1.865163	21	21	24	24	31	14	205
31 Jul-13 Aug	16	MBHLW	860	224	86	1	0.987592	2	2	2	2	70	69	4,754
14 Aug-27 Aug	17	MBHLW	3602	394	664	1	0.986092	5	5	6	6	38	37	1,393
28 Aug-10 Sep	18	MBHLW	1477	277	256	1	0.985902	9	9	9	9	40	40	1,576
Total			9,050		3,186	8		40	40	45	45	210	192	8,906 (SE=94)

Appendix A3.

Data used to compute relationship between catch and CPUE of coho salmon in the Juneau recreational fishery and the return of coho salmon to Taku Inlet. The return is the sum of the commercial catch and the estimated escapement above Canyon Island.

Year	Sport Catch	Sport CPUE	Commercial Catch	Escapement ^a above Canyon Is.	Return to Inlet
1987	17,610 ^b	0.392 ^b	23,342	61,977	85,319
1988	12,017 ^c	0.357 ^c	33,095	43,093	76,188
1989	23,819 ^d	0.596 ^d	44,034	73,637	117,671

^a ADF&G (1990)

^b Bingham et al. (1988)

^c Suchanek and Bingham (1989)

^d Suchanek and Bingham (1990)

Appendix A4.

Estimated harvest of coho salmon bound for Vallenar Creek by statistical week and by period in 1989. The tag ratio was from the number of coded wire tags released in the estimated smolt population. There were an estimated 11,994 smolt in the outmigration of which 4,108 had coded wire tags for a tagged/untagged ratio of 0.3425 (SE = 0). The coded wire tag code was 42842.

Stat. Week	Per.	Date	Area		N	n2	mc	m1	m2	a1	a2	Est.	SE
			Quad.	Dist.	Catch	Sample	Tags	Detected	Decoded	Ad Clip	Heads	Catch	
Troll Fishery by Statistical Week													
28	6	09-Jul - 15-Jul	SE	-	11,220	5,287	1	52	52	63	59	7	6
29	7	23-Jul - 29-Jul	SW	-	30,902	4,630	1	33	33	47	45	20	20
30	7	23-Jul - 29-Jul	NW	-	129,960	29,406	3	228	228	304	294	40	22
30	7	23-Jul - 29-Jul	NE	-	25,363	6,830	1	47	47	61	56	12	11
31	7	30-Jul - 05-Aug	NW	-	99,460	27,185	2	234	234	316	311	22	15
31	7	30-Jul - 05-Aug	NE	-	15,090	9,502	1	58	58	71	70	5	4
31	7	30-Jul - 05-Aug	SE	-	16,870	7,575	1	65	65	83	80	7	6
32	7	06-Aug - 12-Aug	NW	-	128,228	52,815	1	494	494	637	596	8	7
32	7	06-Aug - 12-Aug	SW	-	29,709	11,372	1	100	99	130	124	8	8
33	7	13-Aug - 19-Aug	NW	-	72,822	31,021	1	389	389	495	491	7	6
33	7	13-Aug - 19-Aug	SW	-	11,556	5,303	2	49	49	63	61	13	9
35	8	27 Aug - 02 Sep	SW	-	17,176	3,706	1	22	22	28	24	16	15
37	8	10-Sep - 16-Sep	NW	-	67,017	25,722	1	465	463	556	551	8	7
Harvest by Troll Fishery by Stat. Week =					655,373	220,354	17	2,236	2,233	2,854	2,762	171	43
Troll Fishery by Period													
	6	02 Jul - 15 Jul	SE	-	21,047	8,881	1	96	96	120	115	7	7
	7	16 Jul - 19 Aug	NE	-	79,897	26,431	2	191	191	237	231	18	12
	7	16 Jul - 19 Aug	NW	-	499,302	150,899	7	1,426	1,426	1,864	1,796	70	25
	7	16 Jul - 19 Aug	SW	-	180,826	47,334	4	390	388	512	492	47	22
	7	16 Jul - 19 Aug	SE	-	80,901	29,629	1	254	254	336	322	8	8
	8	20 Aug - 30 Sep	NW	-	352,195	113,619	1	1,827	1,825	2,176	2,155	9	9
	8	20 Aug - 30 Sep	SW	-	26,434	5,281	1	45	45	58	54	16	15
Harvest by Troll Fishery by Period =					1,240,602	382,074	17	4,229	4,225	5,303	5,165	175	41

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Stat. Week	Per.	Date	Area Quad. Dist.	N Catch	n2 Sample	mc Tags	m1 Detected	m2 Decoded	a1 Ad Clip	a2 Heads	Est. Catch	SE
Drift Gill Net Fishery												
36	8	03-Sep - 09-Sep	- 101	6,660	2,506	2	46	46	66	49	21	14
37	8	10-Sep - 16-Sep	- 101	8,245	2,947	1	84	84	100	91	9	8
37	8	10-Sep - 16 Sep	- 106	11,657	3,889	1	39	39	46	46	9	8
38	8	17-Sep - 23-Sep	- 101	11,335	6,219	1	137	137	156	156	5	5
Harvest by Drift Gill Net fishery =				37,897	15,561	5	306	306	368	342	44	19
Purse Seine fishery =												
28	6	09-Jul - 15-Jul	104	14,154	3,738	1	23	23	32	32	11	11
30	7	23-Jul - 29-Jul	- 102	7,808	782	1	6	6	8	8	29	29
32	7	06-Aug - 12-Aug	- 102	7,869	411	1	2	2	2	2	56	55
33	7	13-Aug - 19-Aug	104	22,829	1,103	1	7	7	10	9	67	67
34	8	20 Aug - 26 Aug	101	4,400	1,120	1	7	7	9	8	13	12
Harvest by Purse Seine fishery =				57,060	7,154	5	45	45	61	59	176	93
Total commercial harvest =				1,335,559	404,789	27	4,580	4,576	5,732	5,566	395	103

Canadian Harvest^a

Area	Number Recovered	Sampling Fraction	Tagging Fraction	Estimated Catch
Northern troll	4	4.33	2.919669	51
Northern net	2	3.66	2.919669	21
Total	6			72*

^a Canadian harvest (based on tag recovery and sampling data from the Canadian Department of Fisheries and Oceans).

Appendix A5. Indices of spawning coho salmon abundance from foot, aerial, and float surveys in southeast Alaska in 1989.

Stream Number	Stream Name	Spawner Index
101-15-019	Tombstone River	950
101-15-085	Fish Creek	311
101-29-006	Vallenar Creek	73
101-30-075	Hugh Smith Lake	424
101-30-083	Humpback Creek	350
101-45-078	Carrol River	18
101-47-015	Ward Creek (hatch.)	28
101-71-004	Indian River	925
101-71-028	Walker Creek	10
101-75-005	Herman Creek	75
101-75-015	Eulachon River	290
102-60-072	Twelvemile Creek	178
102-60-082	Harris River	28
102-60-084	Maybeso Creek	93
103-60-059	St. Nicholas Creek	9
103-60-077	Tracadero B R Head	76
106-22-016	Navy Creek	96
106-30-080	108 Creek	113
107-30-070	Snake Creek	194
107-40-049	Harding River	17
107-40-052	N. Bradfield River	460
108-40-010	North Arm Creek	40
108-40-013	Shakes Slough	55
108-40-014	Ketili Creek	205
108-40-016	Kikahe Creek	120
108-40-018	Shuktusa Creek	75
108-40-020	Andrews Creek	570
111-32-038	Sockeye Creek	370
111-32-056	Fish Creek	780
111-32-066	Yehring Creek	505
111-32-068	Johnson Creek	118
111-32-203	Wilms Creek	1,465
111-32-270	Nahlin River	315
111-32-280	Dudidontu River	115
111-40-007	Switzer Creek	76
111-50-010	Peterson Creek (25 mi)	227
111-50-042	Auke Creek (Weir)	502
111-50-052	Montana/McGinnis Creek	565
111-50-056	Steep Creek	213
111-50-062	Jordan Creek	131
112-67-035	Hasselborg River	600
112-80-028	Chaik Bay Creek	409
113-41-015	Starrigavan Creek	101
113-41-032	Salmon Lake Weir	210

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Stream Number	Stream Name	Spawner Index
113-43-002	Nakwasina River	129
113-62-005	Eagle River	131
113-62-008	Sinitzin Creek	76
113-66-006	St. Johns Creek	89
113-73-003	Ford Arm Lake weir	2,160
113-81-011	Black River	181
115-20-010	Berners River	7,509
115-32-025	Chilkat River (20-22 MI)	770
115-32-027	Clear Creek	134
115-32-030	Takhin River	970
115-32-032	Chilkat Lake weir	1,258
115-32-040	Spring Creek	48
115-32-057	31 Mile Creek	56
115-32-064	Kelsall River	182
115-32-068	Tahini River	987
115-33-020	Chilkoot Lake weir	3,830
182-40-010	Akwe River	40
182-50-010	Italio River	1,200
182-70-010	Situk River	3,900
182-70-015	Old Situk River	48
182-80-010	Lost River	700
182-80-030	Tawah Creek	1,300
185-10-010	Yahtse River	800
192-41-010	Kaliakh River	1,000
192-42-020	Tsiu River	2,600