Fishery Data Series No. 96-26

Interception of Wild Salmon Lake Coho Salmon by Hatchery Supported Fisheries

by

Artwin E. Schmidt

September 1996

Alaska Department of Fish and Game

Division of Sport Fish

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
metric ton	mt
milliliter	ml
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
ounce	oz
pound	lb
quart	qt
yard	yd

Spell out acre and ton.

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
hour (spell out for 24-hour clock)	h
minute	min
second	s

Spell out year, month, and week.

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.
All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.
and	&
at	@
Compass directions:	
east	E
north	N
south	S
west	W
Copyright	©
Corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
et alii (and other people)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.,
id est (that is)	i.e.,
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
number (before a number)	# (e.g., #10)
pounds (after a number)	# (e.g., 10#)
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)

Mathematics, statistics, fisheries

alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	F, t, χ^2, etc.
confidence interval	C.I.
correlation coefficient	R (multiple)
correlation coefficient	r (simple)
covariance	cov
degree (angular or temperature)	°
degrees of freedom	df
divided by	÷ or / (in equations)
equals	=
expected value	E
fork length	FL
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
mideye-to-fork	MEF
minute (angular)	'
multiplied by	x
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
standard length	SL
total length	TL
variance	Var

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ABSTRACT

A total of 4,692 pre-smolt coho salmon *Oncorhynchus kisutch* were tagged with coded wire tags (CWTs) at Salmon Lake during spring 1994, and interception of these tagged coho was monitored during fisheries conducted in 1995. The marked fraction for the 1994 outmigration (0.2581) was determined by inspecting adults returning to spawn in 1995. Contribution of Salmon Lake coho salmon to sport and commercial fisheries in 1995 was 1740 fish. CWTs were also placed on 4,509 coho smolt at nearby Medvejie Hatchery (marked fraction=1) to allow comparison of recovery pattern for the wild stock coho at Salmon Lake and the hatchery stock released from Medvejie Hatchery. Contribution by both releases of CWT'd fish to the Sitka sport fisheries was similar (65 fish. However, CWT'd Salmon Lake coho contributed 328 fish to the troll fishery while CWT'd Medvejie coho contributed less than half as many (162), indicating that migratory patterns are significantly different and the hatchery stock may not be a good indicator of fate of the wild stock. Fisheries conducted by gillnet and seine in the Deep Inlet Terminal Harvest Area harvested a minimum of 157 wild stock Salmon Lake coho (123 by gillnetters and 34 by seiners). This additional fishing pressure on the wild stock of coho salmon at Salmon Lake further increased exploitation rate, which had more than doubled from 35% in 1985 to 72% in 1989.

Key words: Coho salmon, *Oncorhynchus kisutch*, Salmon Lake, harvest, troll fishery, gillnet fishery, recreational fishery, seine fishery, escapement, migratory timing, timing, production, return, exploitation rate.

INTRODUCTION

Successful marine and freshwater coho salmon sport fisheries in the Sitka area depend on returning wild coho salmon stocks passing through or returning to local fisheries. Investigations of Salmon Lake coho salmon between 1984 and 1989 documented an average smolt production (15,321 smolt), average marine survival (0.0897), and exploitation rates that increased from 35% in 1985 (Schmidt 1986) to 72% in 1989 (Schmidt 1990). The average adult coho production during the study period was 1,375; the average escapement was 732. During the study period, marine survival ranged from about 6% to 13%.

While 1984-1989 escapements appear to have maintained the population, the highest (1989) exploitation rate (72%) may not be sustainable, especially if marine survival is below average. For example, the lowest escapement (210 fish) occurred in 1989, when exploitation was 72% and marine survival was below average (5.6%). Escapements with average production (1,375 adults, marine survival = 0.0897) and 1989 exploitation rate (0.72) would yield an escapement of 385 adult coho (1,375*(1-.72)), about one-half the 1984–1989 average of 732 fish. Escapement to the lake is nearly impossible to estimate as coho salmon enter the lake on high water and then hold in the lake for an extended period prior to spawning. Changes in the river tributary channel and fall floods make operating a weir impractical.

Because of its importance and proximity to special hatchery harvest areas, coho salmon returning to Salmon Lake are of special concern. Developing commercial troll, seine and gillnet fisheries targeting hatchery produced chum and coho salmon returning to Deep Inlet are causing a significant increase in fishing effort at the entrance to Sitka Sound. Sport fishing effort, especially by charter boats, is also increasing. Coho salmon returning to natal waters in Silver Bay pass through these harvest fisheries and are thus experiencing increased fishing pressure and exploitation rate.

The objective of this study was to determine if coho salmon from Salmon Lake are being intercepted in the Deep Inlet terminal harvest area (Figure 1) for hatchery-produced salmon, such that we had a 95% probability of detection if 5% or more of the average historical production were intercepted.

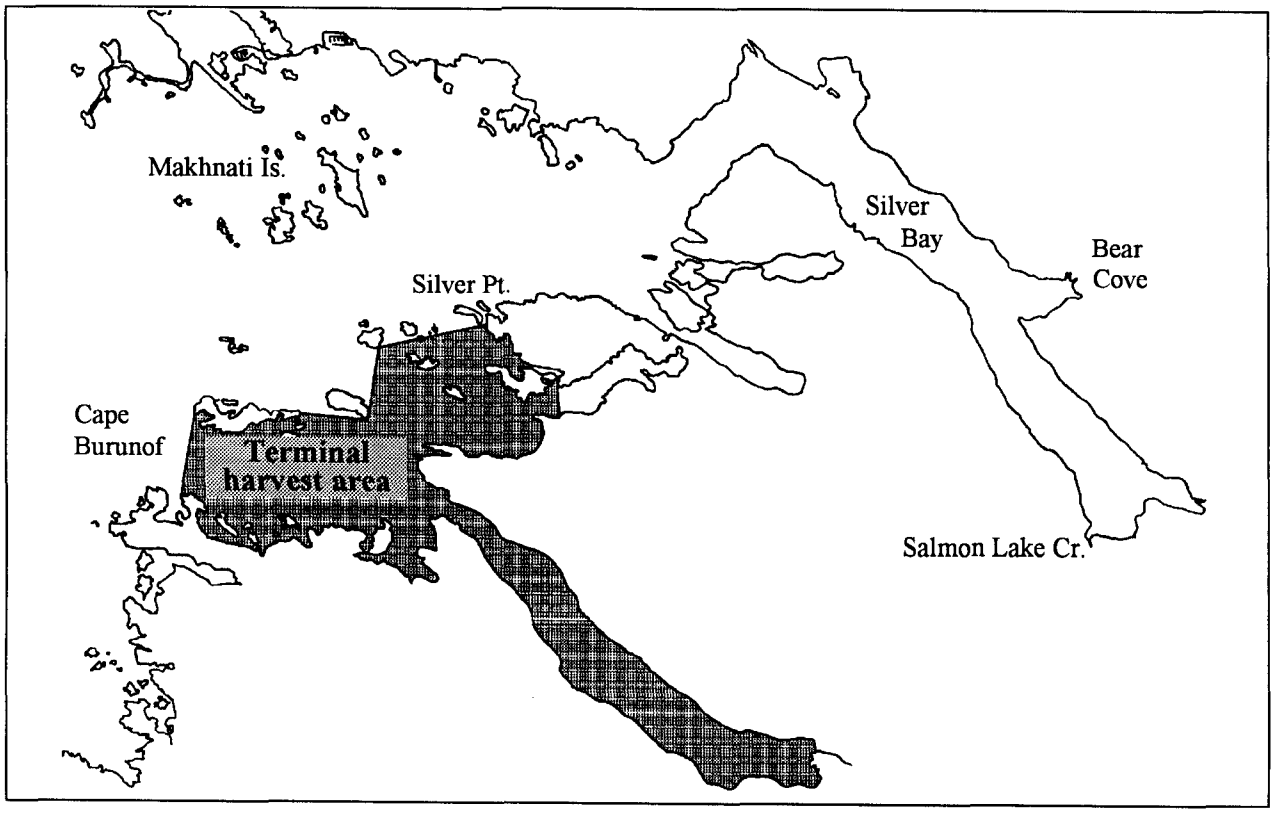

Figure 1.–Map showing location of Deep Inlet terminal harvest area, location of the Medvejie Hatchery (Bear Cove), and location of Salmon Lake near Sitka.

The total number of pre-smolt coho salmon tagged with coded wire tags (CWTs) at Salmon Lake during spring 1994 was 4,692, and interception of these tagged coho salmon was monitored during fisheries conducted in 1995. Harvest of the Salmon Lake coho salmon could then be computed from the incidence of CWTs in the fisheries.

Because of the close proximity of Salmon Lake to the Medvejie Hatchery, we asked Northern Southeast Aquaculture Association to place coded wire tags in coho salmon smolt released at Medvejie Hatchery in 1994 and to count returns of the tagged fish to the hatchery in 1995. They released 4,509 tagged smolt in spring 1994. Along with harvest sampling programs, this permitted a comparison of recovery pattern for coho salmon returning to Medvejie and Salmon Lake in 1995.

METHODS

SMOLT CAPTURE AND CODED WIRE TAGGING

Pre-smolt coho salmon were captured in baited minnow traps at Salmon Lake between April 7 and April 28, 1994. Pre-smolts >85mm FL were tranquilized with MS 222, tagged with a CWT (Koerner 1977), and had their adipose fins removed. Previous studies showed that nearly all pre-smolts of this size emigrate in the same year as tagged at Salmon Lake (Schmidt 1988). Tagged fish were held overnight to determine short-term mortality rates.

The total number of >85mm FL pre-smolts caught and tagged was 4,735. Post-tagging mortality claimed 39 fish. Tag retention was estimated at 98.9%, yielding a total valid tag release of 4,692

pre-smolt coho at Salmon Lake with tag code 04-42-17. There were also 4,509 coho smolt released from Medvejie Hatchery with tag code 04-41-19.

Estimate of the Fraction of the 1995 Return with CWTs

Sampling to estimate the fraction of the 1995 Salmon Lake coho salmon return carrying CWTs (θ) was conducted at the head of Silver Bay near the outlet of Salmon Lake Creek. Sport fishing gear and a 300-ft beach seine were used to collect adult coho salmon between August 30 and September 6. The incidence of missing adipose fins in the sample was tallied and a sample of fish with missing adipose fins was sacrificed to determine where fish originated. All other adult coho salmon captured were given a caudal clip to prevent double sampling and released. The proportion of the return with CWTs was estimated: θ = n (number of fish with adipose fin clips)/n_e (number of fish sampled), and $V(\theta) = \theta(1-\theta) / n_e - 1$.

Estimate of Harvest

Harvest of coho salmon from Salmon Lake in 1995 was estimated from fish sampled from catches in commercial and recreational fisheries and from the escapement sample taken at the head of Silver Bay. Because several fisheries exploited coho salmon over several months in 1995, the harvest of coho salmon from Salmon Lake was estimated over several strata, each a combination of time, area, and type of fishery. Statistics from the commercial troll fishery were stratified by fishing period and by fishing quadrant. Statistics from drift gillnet fisheries were stratified by week and by fishing district. Statistics from the recreational fishery were stratified by 14-day period. An estimate of the harvest $\hat{n}_l$ was calculated for each stratum h, then summed across strata and across fisheries to obtain an estimate of the total harvest:

$$\hat{N}_c = \sum_{h=1}^{L} \hat{n}_{lh}$$
$$V[\hat{N}_c] = \sum_{h=1}^{L} V[\hat{n}_{lh}] \qquad (1)$$

where L is the number of strata. The variance of the sum of the estimates was calculated as the sum of the variances across strata because sampling was independent across strata and across fisheries. A subset of the catch was counted and inspected to find recaptured fish, those salmon without adipose fins. Heads of all recaptured salmon were retrieved, marked, and sent to Juneau for dissection. Heads that arrived in Juneau were passed through a magnetometer to detect a CWT and were dissected if the presence of metal was indicated. If a CWT was found and the tag was undamaged, its code was read under a microscope. Oliver (1990) and Hubartt et al. (1995) present details of sampling commercial and recreational fisheries, respectively. The fraction of the return to Salmon Lake carrying CWTs was estimated from catches in a beach seine in salt water at the outlet of Salmon Lake Creek.

Information from catch and field sampling programs was expanded to estimate harvest of coho salmon bound for Salmon Lake for each stratum. The harvest in a stratum was calculated as

$$\hat{n}_l = \frac{m_l}{m_2}\frac{a_l}{a_2}\frac{H}{n_2}\frac{m_c}{\hat{\theta}} = H\,\hat{\theta}^{-1}\hat{M} \qquad (2)$$

where $\hat{M}$ is the final statistic obtained through sampling catches (remaining notation is defined in Table 1). All CWTs with codes corresponding to smolts from Salmon Lake were tallied to calculate m_c. The bootstrap of Efron (1982) as modified by Buckland and Garthwaite (1991) was used to estimate M, its variance, and bias. Each fish inspected during a catch sampling program was placed into one of six capture histories depending on its fate in the program (Table 2). A multinomial, empirical density distribution with six cells was created with the data from the catch sampling program. With respect to the capture histories in Table 2, the probabilities of drawing a single sample from this distribution were calculated from the original data as follows:

$$\frac{n_2 - a_l}{n_2}\ \frac{a_l - a_2}{n_2}\ \frac{a_2 - m_l}{n_2}\ \frac{m_l - m_2}{n_2}\ \frac{m_2 - m_c}{n_2}\ \frac{m_c}{n_2} \qquad (3)$$

The bootstrap began with drawing a sample of size n_2 with replacement from the empirical

Table 1.–Notation used to describe the parameters involved in estimators of harvest, escapement, and smolt abundance of coho salmon from Salmon Lake. Coded wire tags are abbreviated as CWTs.

a_1	= Number of adults missing adipose fins in a sample from a 1995 harvest in a stratum
a_2	= Number of heads that arrive at Juneau for dissection (subset of a_1) in a stratum
H	= Number of adults in a harvest in 1995 in a stratum
m_1	= Number of heads with CWTs detected magnetically (subset of a_2) in a stratum
m_2	= Number of CWTs found through dissection and decoded (subset of m_1) in a stratum
m_c	= Number of CWTs with the appropriate code(s) (subset of m_2) in a stratum
n_1	= Number of adults in a harvest from the appropriate stock in 1995 in a stratum
n_2	= Number of adults in a harvest inspected (the sample) in 1995 in a stratum
n_c	= Number of smolt CWT'd in 1994
n_e	= Number of adults sampled in 1995 to estimate θ
n	= Number of adults sampled in 1995 to estimate θ which contain a CWT
N_c	= Number of adults harvested in all strata and all fisheries in 1995
N_s	= Number of smolts emigrating from Salmon Lake in 1994
θ	= Fraction of the stock tagged with CWTs

Table 2.–Possible capture histories for salmon inspected in 1995 during a catch sampling program based on CWTs.

1)	Adipose fin was present
2)	Adipose fin was missing, but head never reached the lab
3)	Head arrived at lab, but was not dissected
4)	Head was dissected, but no tag was decoded
5)	Tag was decoded, but did not carry the appropriate code
6)	Tag did carry the appropriate code

distribution according to the probabilities based on the original data. Two thousand such samples were drawn, and the results of each (say the b^{th} sample) were tallied to obtain a new set of statistics $\{a_1^*, a_2^*, m_1^*, m_2^*, m_c^*\}_b$ and a value of M_b. The mean of M_b ($\overline{M}$) and its variance $V[\overline{M}]$ were calculated for each stratum as

$$V[\overline{M}] = \frac{\sum_{b=1}^{B}(M_b - \overline{M})^2}{B-1} \qquad (4)$$

$$\text{with} \quad \overline{M} = \frac{\sum_{b=1}^{B} M_b}{B}$$

where B is the number of bootstrap samples drawn (=2000). From Efron (1982), $\hat{M} - \overline{M}$ is a measure of bias in the statistic $\hat{M}$.

For the Salmon Lake wild stock harvested in commercial fisheries where H was known and θ was estimated with error, the variance of the estimated harvest was calculated according to the procedures of Goodman (1960):

$$V[\hat{n}_1] = H^2 \begin{pmatrix} V[\overline{M}]\hat{\theta}^{-2} + V[\hat{\theta}^{-1}]\hat{M}^2 \\ -V[\overline{M}]V[\hat{\theta}^{-1}] \end{pmatrix} \qquad (5)$$

Note that $\hat{M}$ and not $\overline{M}$ was used in equation (5) even though $V[\overline{M}]$ was used as an approximation to $V[\hat{M}]$. For the Salmon Lake stock harvested in sport fisheries where H and θ were both estimated with error, the variance was again calculated according to the procedures of Goodman (1960):

$$\begin{aligned} V[\hat{n}_1] = {} & V[\hat{H}]\,\hat{M}^2\,\hat{\theta}^{-2} + V[\overline{M}]\,\hat{H}^2\,\hat{\theta}^{-2} \\ & + V[\hat{\theta}^{-1}]\hat{H}^2\,\hat{M}^2 - V[\hat{H}]\,V[\overline{M}]\,\hat{\theta}^{-2} \\ & - V[\overline{M}]V[\hat{\theta}^{-1}]\hat{H}^2 - V[\hat{H}]V[\hat{\theta}^{-1}]\,\hat{M}^2 \\ & + V[\hat{H}]\,V[\overline{M}]\,V[\hat{\theta}^{-1}] \end{aligned} \qquad (6)$$

where V[H] was estimated from the angler surveys, $V[\hat{\theta}^{-1}]$ was estimated from a Monte Carlo

simulation, and $V[\overline{M}]$ was estimated using the bootstrap technique (Efron 1982).

The statistic $V[\hat{\theta}^{-1}]$ was estimated from a Monte Carlo simulation (see Geiger 1990) where the binomial probability distribution was employed as the model for recovery of tagged fish. A large set of simulated statistics $\{\theta_1^*, \theta_2^*, \ldots \theta_B^*\}$ was drawn from Binom $(\hat{\theta}, n_e)$ from which

$$\left\{\frac{1}{\theta_1^*}, \frac{1}{\theta_1^*}, \cdots \frac{1}{\theta_B^*}\right\} = \left\{y_1^*, y_2^*, \ldots y_B^*\right\};$$
$$V\left[\theta^{-1}\right] = \frac{\sum_{b=1}^{B}\left(y_b^* - \bar{y}^*\right)^2}{B-1} \quad (7)$$

and each θ was the subset of n_e in the simulation that had no adipose fins (and valid Salmon Lake tags) divided by n_e.

ESTIMATE OF SMOLT ABUNDANCE

At the conclusion of the experiment we were able to estimate the abundance of smolt leaving Salmon Lake in 1994 using mark-recapture theory and Chapman's modified Petersen estimator for a closed population (Seber 1982)

$$\hat{N} = \frac{(n_1+1)(n_2+1)}{(m_2+1)} - 1 \quad (8)$$

where n_1 = number of pre-smolt marked in Salmon Lake, n_2 = number of adults subsequently examined for marks, and m_2 = number of marked fish recaptured among the n_2 fish examined. The variance of the abundance was estimated (Seber 1982)

$$V[\hat{N}] = \frac{(n_1+1)(n_2+1)(n_1-m_2)(n_2-m_2)}{(m_2+1)^2(m_2+2)} \quad (9)$$

Assumptions of the estimator are that (a) the population is closed (recruitment or immigration *and* death or emigration cannot both occur) between sampling events; (b) all fish have the same probability of capture in the first sample *or* in the second sample, *or* that marked and unmarked fish mix completely between the two samples; (c) that marking does not affect the probability of recapture; and (d) fish do not lose marks between sampling events.

RESULTS

CODED WIRE TAG RECOVERY

A total of 103 CWTs with tag code 04-42-17 (Salmon Lake) and 56 CWTs with tag code 04-41-19 (Medvejie Hatchery) were recovered routine sport and commercial port or creel sampling programs in 1995 (Appendix A1 and A2). Due to the unpredictable nature of the gillnet fishery, an additional fishery technician was based in Sitka to sample gillnet landings of coho salmon among pink and chum salmon landed.

There were many difficulties sampling the gillnet-caught coho salmon. Since the majority of the chum salmon caught in the Deep Inlet fishery were not processed in the Sitka area, the sampler had to travel by boat to sample on board packers to which the fishermen sold. There were as many as five packers at a time buying fish. It was a challenge to get fishermen to sort the fish, especially early in the season when pink salmon were abundant and sorting was not financially beneficial for the fishermen. Most tenders, during slow times, would unload a boat into deck bins and let the sampler sort and pitch into the hold. Also, some tenders would buy chum and pink salmon mixed together if the fishermen sorted their coho salmon out for ADF&G.

As the pink catch slowed down, the chum catch increased. During the peak of the chum run, sorting coho salmon was the last thing on the minds of fishermen, but through good communication, a spirit of cooperation, and the sampler assuming the role of deckhand on the packers, good samples were still gathered.

When the catch rate for chum salmon slowed, many gillnetters went to other fisheries and the

remaining gillnet fishermen started to strip eggs from most of the females. Most fishermen who were stripping would save a few females and mix them in with the males. This was done so they could get paid for the males and get ice from the tender. However, as the tenders caught on to this high-grading, they refused to buy from these boats.

As the ratio of females to males dropped, the number of buyers declined and buyers who remained would not buy from boats that were stripping. Some boats, even though not selling to tenders, would give away their male chums so they would be brailed and not have to hand-pitch them overboard.

When all remaining gillnetters started stripping eggs, sampling effort was changed since each boat became its own tender. It was thus necessary to sample boats one at a time while they were in the process of fishing. Fishermen acting as processors were allowed to issue fish tickets to themselves. This created a lack of accountability, and on many occasions fish tickets were not filled out. On occasion fish tickets clearly understated the amount of both chum and coho salmon caught. This was evidenced by the low number of chum salmon marked on the tickets versus the large number of eggs on board. Coho salmon during this time became a burden; not only did they take up ice that was needed for the eggs, but there were no buyers for them. On numerous occasions the fish technician observed the fishermen trying to sell their coho salmon, and private citizens trying to buy coho salmon.

It became obvious from sampling and interviewing that the gillnet fishery in the Deep Inlet Terminal Harvest Area was a rather loose operation. A number of the gillnet boats stripped eggs without properly recording and accounting for their actions on fish tickets. Some of the gillnet fishermen were stripping eggs from the coho salmon as well as the chum salmon and not keeping records of the numbers of either species caught. This activity made the fish ticket harvest data from the latter portion of the gillnet fishery inaccurate, and led to underestimation of the calculated contribution of our tagged coho stocks to this fishery.

ESTIMATES OF θ AND SMOLT ABUNDANCE

Sixty-nine (69) coho salmon adults were inspected near the outlet of Salmon Lake between August 30 and September 6, 1995. There were 21 adipose fin clipped coho salmon and 48 unclipped fish in the sample. Seven of the 21 adipose fin clipped coho salmon were killed for tag identification; 5 were from Salmon Lake (04-42-17), one was from Medvejie (04-41-19), and one was from Berners River (04-39-57). The remaining 62 coho adults captured were given a dorsal clip of the caudal fin to prevent double sampling and released. Attempts were made to collect a larger sample of these coho salmon, but a rainstorm and high water moved the coho salmon out of the sampling area, and concentrations were not found during subsequent weekly visits to the sampling area.

Five of the 62 coho salmon given a caudal fin clip and released at the head of Silver Bay were later recovered at the Medvejie Hatchery rack (three adipose fin clipped and two adipose fin unclipped), indicating that Medvejie fish were milling in Silver Bay but returning to the hatchery. Since no other Berners River fish were encountered during all of the sampling which occurred during the sport, seine, troll, and gillnet fisheries in Sitka Sound in 1995, we considered the Berners tag as a very rare occurrence and did not expand for this code when estimating the marked fraction of the Salmon Lake return.

Thus, the marked to unmarked ratio of Salmon Lake coho was calculated assuming all Medvejie Hatchery fish milling in salt water near Salmon Lake outlet returned to the hatchery (or would have in the case of the 1 fish that was killed). The number of adipose clipped Salmon Lake coho in the sample was then 16 (21-2-3), and the number of unclipped fish in the sample returning to Salmon Lake was the (48) total unclipped fish sampled minus the 2 fish which returned to Medvejie. The tagging fraction for Salmon Lake is therefore $\theta = 0.258$. The variance of θ was estimated as 0.00314, thus SE (θ) = 0.056.

The abundance of smolt exiting Salmon Lake in 1994 was estimated as N = 17,391 with SE (N) = 3,496.

Table 3.–Estimated harvest of adult Salmon Lake coho (tag code 04-42-17) in sampled sport and commercial fisheries in 1995. Harvest was assumed to be zero in fishing periods and fishing quadrants for which no CWT was recovered with the appropriate tag code.

TROLL FISHERY											
Quadrant	Dates	Stat .wk	H	n2	mc	m1	m2	a1	a2	n1	SE
SW	7/16-7/22	29	81,722	34,595	2	223	223	313	307	19	14
SW	7/30-8/05	31	93,164	43,751	1	229	229	331	319	9	8
NW	7/02-7/08	27	421,179	106,168	8	1030	1030	1310	1294	125	53
NW	7/09-7/15	28	421,179	106,168	13	1030	1030	1310	1294	202	75
NW	7/16-7/22	29	421,179	106,168	11	1030	1030	1310	1294	171	66
NW	7/23-7/29	30	421,179	106,168	12	1030	1030	1310	1294	187	69
NW	7/30-8/05	31	359,837	106,480	10	1314	1314	1623	1608	132	53
NW	8/06-8/12	32	359,837	106,480	11	1314	1314	1623	1608	145	56
NW	8/13-8/19	33	359,837	106,480	3	1314	1314	1623	1608	40	24
NW	8/20-8/26	34	479,750	101,141	3	1516	1516	1787	1757	56	35
NW	8/27-9/02	35	479,750	101,141	5	1516	1516	1787	1757	93	47
NW	9/03-9/09	36	479,750	101,141	3	1516	1516	1787	1757	56	35
NW	9/17-9/23	38	479,750	101,141	1	1516	1516	1787	1757	19	19
NE	7/30-8/05	31	29,754	10,412	1	91	91	112	110	11	11
SE	8/13-8/19	33	34,039	11,596	1	80	80	111	110	11	11
Subtotal					85					1276	172
GILLNET FISHERY											
District	Dates	Stat .wk	H	n2	mc	m1	m2	a1	a2	n1	SE
113-38	8/13-8/19	33	138	45	2	3	3	4	4	24	17
113-38	8/20-8/26	34	823	135	1	21	21	23	23	24	24
113-38	8/27-9/02	35	785	421	5	70	70	79	77	37	19
113-38	9/03-9/09	36	808	24	0	2	2	2	2	0	
113-38	9/10-9/16	37	466	47	1	1	1	2	2	38	38
Subtotal					9					123	52
SEINE FISHERY											
District	Dates	Stat .wk	H	n2	mc	m1	m2	a1	a2	n1	SE
113-38	7/23-7/29	30	14	5	1	1	1	1	1	11	10
113-38	8/06-8/12	32	19	5	1	2	2	2	2	15	13
113-38	8/20-8/26	34	522	260	1	12	12	13	13	8	8
113-62	8/13-8/19	33	13,181	1,179	1	10	10	11	11	43	43
109-10	8/20-8/26	34	51,448	12,143	1	124	124	156	156	16	17
Subtotal					5					93	50
SPORT FISHERY											
Bi-week	Dates	Stat .wk	H	n2	mc	m1	m2	a1	a2	n1	SE
15	7/17-7/30	30	411	39	1	1	1	1	1	41	41
17	8/14-8/27	34	7,347	538	3	21	21	30	23	207	128
Subtotal					4					248	134
TOTAL					103					1740	230

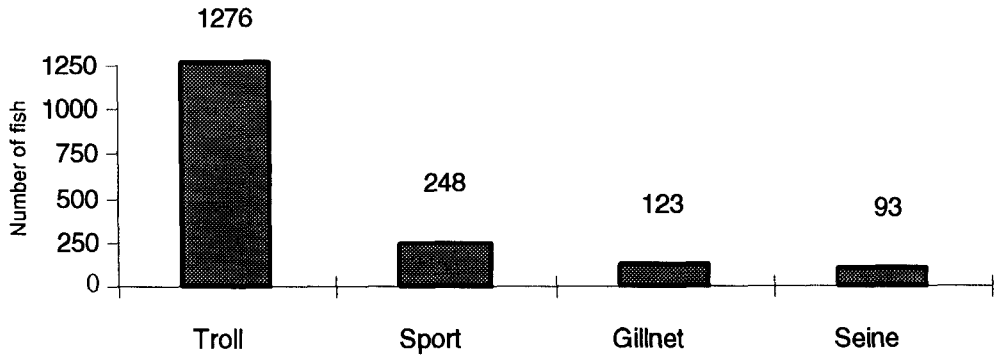

Figure 2.–Estimated contribution of Salmon Lake coho salmon to sampled fisheries in 1995.

ESTIMATES OF HARVEST, ESCAPEMENT, AND EXPLOITATION IN 1995

The estimated harvest of Salmon Lake coho salmon (tag code 04-42-17) in sampled sport and commercial fisheries in 1995 was 1,740 fish (SE = 230), most of which occurred in troll fisheries (73% or 1,276 fish) (Table 3; Figure 2).

Total contribution to the sport fishery by Salmon Lake coho was estimated at 248 fish (Table 3; Figure 2). Contribution of Salmon Lake coho to the gillnet fishery was estimated at 123 fish, but was probably higher since sampling effectiveness was limited by conduct of the fishermen during September. All gillnet catch came from the Deep Inlet terminal harvest area (District 113-38) (Table 3; Figure 2). The seine fishery harvested an estimated 93 Salmon Lake coho salmon, 35 of which came from the Deep Inlet terminal harvest area (Table 3; Figure 2).

The estimated harvest of CWT'd coho salmon released at the Medvejie hatchery (tag code 04-41-19) in sampled sport and commercial fisheries in 1995 was 265 fish (SE = 41, Table 4). A similar high proportion of the harvest from 1995 Medvejie Hatchery CWT release occurred in troll fisheries (61% or 162 fish).

Random recoveries of CWT'd coho salmon marked at Salmon Lake (103, or 9.67% of 4,644 pre-smolt) were about twice as large as recoveries from smolt released at Medvejie Hatchery (56, or 5.88% of 4,509 smolt). The higher recovery rate for Salmon Lake tags was due to the much higher harvest rate of Salmon Lake fish, relative to Medvejie Hatchery releases, in NW quadrant troll fisheries during statistical weeks 27–31; however, interception rates of the two releases were very similar after the first week in August (Figure 3, Table 5).

The sport fishery intercepted an estimated 65 tags from each of the Salmon Lake and Medvejie tag groups (Figure 4). The gillnet fishery also intercepted nearly identical numbers of Salmon Lake CWTs (32) and of Medvejie CWTs (33). The seine fishery intercepted smaller numbers of these CWTs with 24 from Salmon Lake and 5 from Medvejie.

Numbers of coho salmon escaping the fisheries and returning to Salmon Lake are unknown, since it was not possible to count or estimate escapement of coho salmon to this system. Observations made at the head of Silver Bay showed concentration of coho salmon only prior to September 7. Within the period August 30 to September 6, sampling yielded a total of 62 Salmon Lake coho salmon. This milling area near the outlet of Salmon Lake stream was observed weekly until mid-October, but no more coho salmon were observed. There were 195 tagged Medvejie coho salmon which returned to the hatchery from the appropriate tag release.

Table 4.–Estimated harvest of adult Medvejie Hatchery released coho salmon (tag code 04-41-19) in 1995 sport and commercial fisheries in 1995. Harvest was assumed to be zero in fishing periods and fishing quadrants for which no CWT was recovered with the appropriate tag code.

TROLL FISHERY											
Quadrant	Dates	Stat .wk	H	n2	mc	m1	m2	a1	a2	n1	SE
NW	7/02-7/08	27	421,179	106,168	1	1030	1030	1310	1294	4	3
NW	7/16-7/22	29	421,179	106,168	2	1030	1030	1310	1294	8	5
NW	7/23-7/29	30	421,179	106,168	2	1030	1030	1310	1294	8	5
NW	7/30-8/05	31	359,837	106,480	2	1314	1314	1623	1608	7	4
NW	7/31-8/13	32	359,837	106,480	11	1314	1314	1623	1608	38	9
NW	8/13-8/19	33	359,837	106,480	5	1314	1314	1623	1608	17	6
NW	8/20-8/26	34	479,750	101,141	4	1516	1516	1787	1757	19	9
NW	8/27-9/02	35	479,750	101,141	5	1516	1516	1787	1757	24	10
NW	9/03-9/09	36	479,750	101,141	3	1516	1516	1787	1757	14	7
NW	9/10-9/16	37	479,750	101,141	2	1516	1516	1787	1757	10	6
NW	9/17-9/23	38	479,750	101,141	1	1516	1516	1787	1757	5	4
NE	7/31-8/13	32	29,754	10,412	1	91	91	112	110	3	2
NE	8/27-9/02	35	51,228	18,002	1	202	201	271	270	3	2
Dist. 113-38	8/20-8/26	34	34	18	1	2	2	2	2	2	1
Subtotal					41					162	22
GILLNET FISHERY											
District	Dates	Stat.wk	H	n2	mc	m1	m2	a1	a2	n1	SE
113-38	8/20-8/26	34	823	135	4	21	21	23	23	24	11
113-38	8/27-9/02	35	877	421	4	70	70	79	77	9	3
Subtotal					8					33	11
SEINE FISHERY											
District	Dates	Stat.wk	H	n2	mc	m1	m2	a1	a2	n1	SE
113-38	8/20-8/26	34	522	260	2	12	12	13	13	4	2
113-38	8/20-8/26	34	3,465	2,676	1	6	6	11	11	1	0
Subtotal					3					5	2
SPORT FISHERY											
Bi-week	Dates	Stat.wk	H	n2	mc	m1	m2	a1	a2	n1	SE
16	7/31-8/13	32	1,243	61	1	1	1	1	1	20	20
17	8/14-8/27	34	7,347	538	2	21	21	30	23	36	25
18	8/28-9/10	35	1,018	108	1	8	8	9	9	9	9
Subtotal					4					65	33
TOTAL					56					265	41

Table 5.–Comparison of the recovery of CWTs and contribution to fisheries by Salmon Lake coho and Medvejie released coho, 1995.

TROLL FISHERY						
			SALMON LAKE COHO		MEDVEJIE COHO	
Quadrant	Week	Dates	Tags sampled	Expanded Tags	Tags sampled	Expanded Tags
SW	29	7/16-7/22	2	5		
SW	31	7/30-8/05	1	2		
NW	27	7/02-7/08	8	32	1	4
NW	28	7/09-7/15	13	52	0	
NW	29	7/16-7/22	11	44	2	8
NW	30	7/23-7/29	12	48	2	8
NW	31	7/30-8/05	10	34	2	7
NW	32	8/06-8/12	11	38	11	38
NW	33	8/13-8/19	3	10	5	17
NW	34	8/20-8/26	3	14	4	19
NW	35	8/27-9/02	5	24	5	24
NW	36	9/03-9/09	3	14	3	14
NW	37	9/10-9/16	0		2	10
NW	38	9/17-9/23	1	5	1	5
NE	31	7/30-8/05	1	3		
NE	32	8/06-8/12			1	3
NE	35	8/27-9/02			1	3
SE	33	8/13-8/19	1	3		
113-38	34	8/20-8/26			1	2
		Subtotal	85	328	41	162
GILLNET FISHERY						
			SALMON LAKE COHO		MEDVEJIE COHO	
District	Week		Tags sampled	Expanded tags	Tags sampled	Expanded tags
113-38	33	8/13-8/19	2	6		
113-38	34	8/20-8/26	1	6	4	24
113-38	35	8/27-9/02	5	10	4	9
113-38	36	9/03-9/09				
113-38	37	9/10-9/16	1	10		
		Subtotal	9	32	8	33
SEINE FISHERY						
113-38	30	7/23-7/29	1	3		
113-38	32	8/06-8/12	1	4		
113-38	34	8/20-8/26	1	2	2	4
113-62	33	8/13-8/19	1	11		
109-10	34	8/20-8/26	1	4		
113-	34	8/20-8/26			1	1
		Subtotal	5	24	3	5
SPORT FISHERY						
113-41	30	7/23-7/29	1	11		
113-41	32	8/06-8/12			1	20
113-41	34	8/20-8/26	3	54	2	36
	34	8/20-8/26			1	9
		Subtotal	4	65	4	65

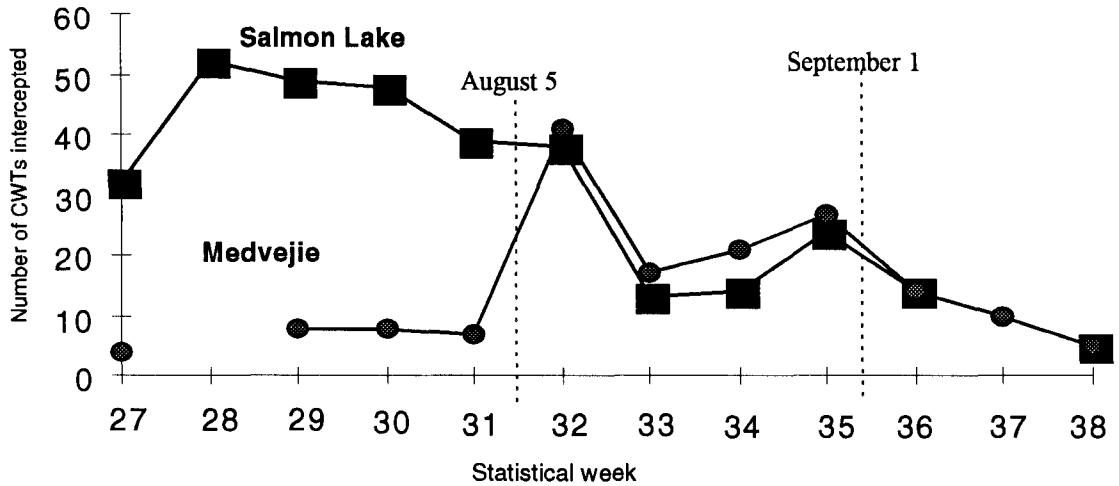

Figure 3.–Interception of CWTs from Salmon Lake and Medvejie coho salmon in the troll fishery in 1995, by statistical week.

DISCUSSION

Salmon Lake contributed many more CWT'd coho salmon to the troll fishery than did the Medvejie tag group, especially early in the season. The seine fishery also intercepted more Salmon Lake CWTs than Medvejie CWTs, and intercepted some of the Salmon Lake coho salmon in areas distant from Silver Bay (districts 109-10 and 113-62). Medvejie coho salmon were not encountered in these distant areas.

This increased interception of Salmon Lake coho salmon early in the season, and in areas distant from Sitka, suggests a significant difference in migration patterns between the two stocks of coho salmon. The sport and gillnet fisheries encountered nearly identical numbers of CWTs from the two tag groups, as did the troll fishery after the first week in August.

Although the number of coho salmon escaping to Salmon Lake is unknown, we can make a rough estimate by assuming that survival of the two tag groups was the same. If this were true, then there would have been 25 CWT'd coho salmon (10.2% times 4,644 CWTs released minus 449 CWTs intercepted in fisheries) surviving to escapement at Salmon Lake (Table 6). This number of CWTs could then be expanded for tagging fraction of .2581 to estimate escapement of Salmon Lake coho salmon at 97 adults. Although we do not know if survival of the two CWT groups was the same, we do know that concentrations of coho salmon were not observed at the head of Silver Bay after early September as has been experienced during years with good escapements. Also, given past escapements and exploitation rates to Salmon Lake (Table 7), we doubt such small escapements could sustain the population at historical levels if continued for any length of time.

RECOMMENDATIONS

Management of Sitka area fisheries for coho salmon should be conducted so that exploitation does not prevent an adequate escapement to Salmon

Table 6.–Fate of CWT'd coho salmon released from Salmon Lake and Medvejie Hatchery in spring 1994, and intercepted in 1995.

	Salmon Lake wild coho salmon	Medvejie Hatchery coho salmon
CWTs released	4,644	4,509
Troll fishery	328	162
Sport fishery	65	65
Gillnet fishery	32	33
Seine fishery	24	5
Escapement	NA[a]	195
Total estimated recovery	NA	460
CWTs recovered %	NA	10.20%

[a] Data not available.

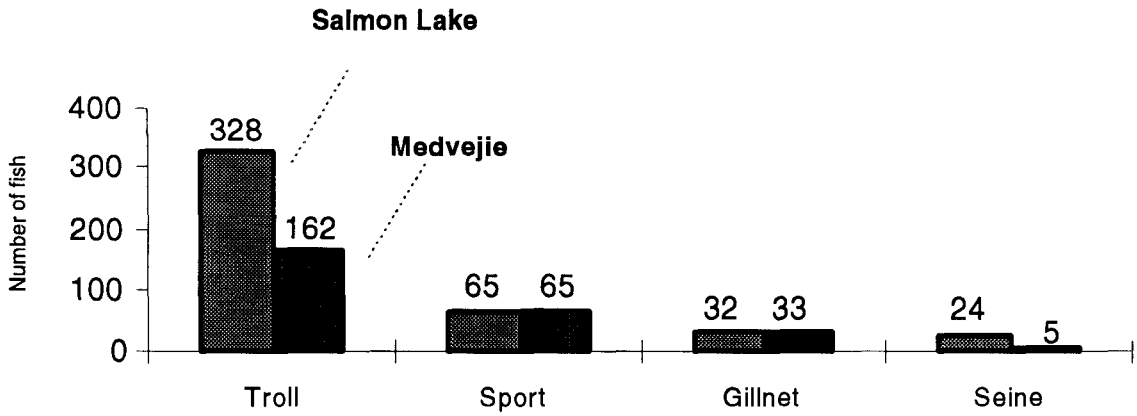

Figure 4.–Number of Salmon Lake and Medvejie CWTs intercepted by sampled fisheries in 1995.

Lake. Since the troll, sport, and gillnet fisheries intercept the larger proportions of the harvest, harvest by these fisheries should be reduced. A suggested change for the troll fishery is to require non-retention of coho salmon in the Silver Bay area after early August, as the troll fishery has already intercepted the majority of the Salmon Lake stock in the general troll fishery prior to this time. The sport bag and possession limit could be reduced in the Silver Bay area concurrent with the troll closure since sport fishing effort in the area at this time also intercepts Salmon Lake coho salmon. Fishing effort by intercepting fisheries in the Deep Inlet terminal harvest needs to be reduced when Salmon Lake coho salmon are transiting the area after mid-August. This would affect primarily the gillnet fleet, especially during the month of September.

Because it is unlikely that a weir can now be operated successfully at Salmon Lake to count adult coho salmon (due to channel changes in the drainage), coho smolt production from Salmon Lake may be evaluated to determine if escapement has been adequate to maintain production in the range observed during the 1983 to 1990 period (Table 7). The smolt production evaluation would be conducted by CWTing about 5,000 pre-smolt in Salmon Lake when we expect the age-2 smolt from this years escapement to emigrate. Adults would then be collected near the outlet of Salmon Lake to obtain marked fraction and estimate smolt production. Future management of intercepting fisheries would consider the results of this smolt production evaluation, using historical average as a target level.

Table 7.–Summary data from Salmon Lake coho salmon investigations conducted during 1983 to 1990 (Schmidt 1984–1990, Elliott et al. 1989).

Year	Total adult coho	No. adults harvested	Troll harvest	Adult escapement	Harvest rate	Smolt emigration	Marine survival
1983				403		28,380	8.36%
1984	2,372	857	857	1,514	36.13%	17,254	12.43%
1985	2,145	757	755	1,388	35.29%	17,083	11.28%
1986	1,927	1,090	1,052	837	56.56%	15,250	9.00%
1987	1,373	757	702	616	55.13%	20,601	6.40%
1988	1,319	618	593	680	46.85%	13,304	5.62%
1989	748	538	536	210	71.93%	9,490	8.22%
1990	780	574	531	204	73.59%	16,267	
1991		1,243	1,158				

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APPENDIX A

Appendix A1.–Random and select recoveries of coded wire tags from Salmon Lake coho salmon (tag code 04-42-17) during 1995.

Head. number	Length	Date	Stat. week	Quadrant	District	Gear
Random recoveries[a]						
26206	620	7/3/95	27	NW	113-91	TROLL
30488	664	7/4/95	27	NW	113-	TROLL
30559	618	7/8/95	27	NW	113-41	TROLL
30655	615	7/4/95	27	NW	113-45	TROLL
30710	560	7/3/95	27	NW	113-41	TROLL
30876	628	7/6/95	27	NW	-	TROLL
99292	540	7/6/95	27	NW	113-91	TROLL
99294	545	7/6/95	27	NW	-	TROLL
9903	670	7/10/95	28	NW	113-91	TROLL
26351	685	7/10/95	28	NW	113-91	TROLL
31038	675	7/12/95	28	NW	113-31	TROLL
31118	663	7/10/95	28	NW	113-31	TROLL
31223	656	7/10/95	28	NW	113-	TROLL
31234	614	7/10/95	28	NW	113-31	TROLL
31236	675	7/10/95	28	NW	113-31	TROLL
31257	635	7/11/95	28	NW	113-	TROLL
31270	606	7/11/95	28	NW	113-91	TROLL
31350	568	7/11/95	28	NW	156-	TROLL
31429	686	7/11/95	28	NW	-	TROLL
31706	620	7/11/95	28	NW	113-91	TROLL
31708	642	7/11/95	28	NW	113-91	TROLL
20122	653	7/18/95	29	SW	104-40	TROLL
20137	680	7/19/95	29	SW	104-40	TROLL
31365	658	7/16/95	29	NW	113-45	TROLL
31391	634	7/19/95	29	NW	113-	TROLL
31559	632	7/22/95	29	NW	113-31	TROLL
31619	698	7/20/95	29	NW	-	TROLL
31625	644	7/20/95	29	NW	113-22	TROLL
31636	634	7/21/95	29	NW	113-	TROLL
31639	630	7/22/95	29	NW	116-11	TROLL
31658	648	7/22/95	29	NW	113-	TROLL
31748	612	7/18/95	29	NW	-	TROLL
31814	657	7/21/95	29	NW	154-	TROLL
82133	678	7/20/95	29	NW	113-94	TROLL
4164	669	7/26/95	30	NW	113-38	SEINE
9931	625	7/24/95	30	NW	113-91	TROLL
14254	629	7/24/95	30	NW	-	TROLL
14258	615	7/24/95	30	NW	-	TROLL
20224	615	7/27/95	30		-	TROLL
31600	656	7/27/95	30	NW	113-21	TROLL
31679	654	7/24/95	30	NW	154-	TROLL
31910	643	7/26/95	30	NW	-	TROLL
31942	648	7/29/95	30	NW	154-	TROLL
32016	584	7/27/95	30	NW	154-	TROLL
32222	528	7/26/95	30	NW	113-62	TROLL

-continued-

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Head. number	Length	Date	Stat. week	Quadrant	District	Gear
Random recoveries (continued)						
32324	678	7/28/95	30	NW	113-41	TROLL
32335	695	7/29/95	30	NW	154-	TROLL
20482	670	8/4/95	31	SW	104-40	TROLL
32160	698	8/2/95	31	NW	113-91	TROLL
32178	696	8/3/95	31	NW	113-31	TROLL
32179	732	8/3/95	31	NW	113-31	TROLL
32611	732	8/2/95	31	NW	154-	TROLL
32633	640	8/3/95	31	NW	113-41	TROLL
32680	654	8/5/95	31	NW	116-11	TROLL
79036	672	7/31/95	31	NW	-	TROLL
79037	664	7/31/95	31	NW	-	TROLL
79108	670	7/31/95	31	NW	-	TROLL
79110	455	7/31/95	31	NW	-	TROLL
79133	671	8/3/95	31	NE	109-	TROLL
20595	647	8/12/95	32	NW	113-45	TROLL
25145	678	8/6/95	32	NW	-	TROLL
25160	727	8/12/95	32	NW	-	TROLL
32746	660	8/8/95	32	NW	-	TROLL
32793	629	8/12/95	32	NW	154-	TROLL
32964	701	8/6/95	32	NW	-	TROLL
32999	590	8/9/95	32	NW	113-38	SEINE
33031	670	8/11/95	32	NW	154-	TROLL
33320	657	8/11/95	32	NW	113-62	TROLL
33336	672	8/12/95	32	NW	113-	TROLL
33342	671	8/12/95	32	NW	113-	TROLL
79328	645	8/11/95	32	NW	-	TROLL
33402	750	8/15/95	33	NW	113-38	GILLNET
33403	687	8/15/95	33	NW	113-38	GILLNET
33532	678	8/14/95	33	NW	113-41	TROLL
33676	632	8/14/95	33	NW	-	TROLL
33709	676	8/13/95	33	NW	113-21	TROLL
33743	678	8/15/95	33	NW	113-62	SEINE
45773	568	8/14/95	33	SE	101-21	TROLL
4183	700	8/24/95	34	NW	113-38	GILLNET
33904	696	8/23/95	34	NW	113-38	SEINE
34014	726	8/26/95	34	NW	113-45	TROLL
34051	687	8/24/95	34	NW	113-31	TROLL
34098	762	8/26/95	34	NW	113-41	TROLL
42398	696	8/24/95	34	NE	109-10	SEINE
33438	670	8/29/95	35	NW	113-38	GILLNET
33447	681	8/29/95	35	NW	113-38	GILLNET
33463	727	9/1/95	35	NW	113-38	GILLNET
33478	645	9/1/95	35	NW	113-38	GILLNET
33483	618	9/1/95	35	NW	113-38	GILLNET
34021	665	8/27/95	35	NW	113-31	TROLL
34342	696	8/28/95	35	NW	113-41	TROLL

-continued-

Appendix A1.–Page 3 of 3.

Head. number	Length	Date	Stat. week	Quadrant	District	Gear
Random recoveries (continued)						
34343	706	8/28/95	35	NW	113-41	TROLL
34354	705	8/28/95	35	NW	113-41	TROLL
34370	670	8/28/95	35	NW	113-	TROLL
34627	688	9/3/95	36	NW	181-	TROLL
34717	728	9/6/95	36	NW	113-21	TROLL
35336	678	9/8/95	36	NW	181-	TROLL
33500	689	9/16/95	37	NW	113-38	GILLNET
33130	726	9/19/95	38	NW	113-41	TROLL
12927		7/24/95	30	NW	113-41	SPORT
12743		8/26/95	34	NW	113-41	SPORT
12744		8/26/95	34	NW	113-41	SPORT
12936	640	8/20/95	34	NW	113-41	SPORT
Select recoveries[b]						
32280		7/6/95	27		-	TROLL
32249		7/12/95	28		-	TROLL
32314		7/9/95	28	1	-	TROLL
32446		7/10/95	28		-	TROLL
14303		7/22/95	29	NW	-	TROLL
32889		7/29/95	30		-	TROLL
33247		7/28/95	30	1	-	TROLL
33255		7/28/95	30		-	TROLL
14349		8/5/95	31	NW	-	TROLL
32464		8/4/95	31		-	TROLL
33231		8/9/95	32		-	TROLL
33761		8/16/95	33		-	TROLL
34570		9/11/95	37		-	TROLL
12729		7/7/95	27	NW	113-61	SPORT
12733		7/28/95	30	NW	113-41	SPORT
12751		7/29/95	30	NW	113-41	SPORT
12887		7/27/95	30	NW	113-41	SPORT
12888		7/27/95	30	NW	113-41	SPORT
12897		8/31/95	35	NW	113-41	SPORT
12899		9/1/95	35	NW	113-41	SPORT
33492	710	9/6/95	36	NW	113-41	SPORT
33493	630	9/6/95	36	NW	113-41	SPORT
33495	681	9/6/95	36	NW	113-41	SPORT

[a] Random recoveries are those collected during routine sampling programs and are used in data expansion calculations.

[b] Select recoveries are those collected outside of routine sampling programs and therefore are not used to estimate harvest raates.

Appendix A2.–Random and select recoveries of coded wire tags from Medvejie Hatchery released coho salmon (tag code 04-41-19) during 1995.

Head. number	Length	Date	Stat. week	Quadrant	District	Gear
Random recoveries[a]						
30842	584	7/6/95	27	NW	-	TROLL
31743	605	7/18/95	29	NW	-	TROLL
82143	548	7/21/95	29	NW	113-91	TROLL
31924	590	7/28/95	30	NW	154-	TROLL
82146	630	7/26/95	30	NW	113-94	TROLL
32191	621	8/3/95	31	NW	-	TROLL
32693	528	8/5/95	31	NW	113-21	TROLL
09757	680	8/12/95	32	NW	116-	TROLL
26589	628	8/11/95	32	NW	116-11	TROLL
26592	677	8/11/95	32	NW	116-11	TROLL
26611	652	8/12/95	32	NW	116-11	TROLL
26617	601	8/12/95	32	NW	113-91	TROLL
32774	668	8/12/95	32	NW	154-	TROLL
32794	612	8/12/95	32	NW	154-	TROLL
32938	665	8/6/95	32	NW	-	TROLL
33044	656	8/11/95	32	NW	154-	TROLL
33354	637	8/12/95	32	NW	113-45	TROLL
33366	640	8/12/95	32	NW	113-	TROLL
42151	603	8/6/95	32	NE	109-10	TROLL
33100	588	8/14/95	33	NW	-	TROLL
33504	586	8/13/95	33	NW	116-	TROLL
33590	615	8/14/95	33	NW	-	TROLL
33661	635	8/14/95	33	NW	-	TROLL
33664	645	8/14/95	33	NW	-	TROLL
33806	682	8/19/95	33	NW	113-38	GILLNET
04182	663	8/24/95	34	NW	113-38	GILLNET
33404	576	8/21/95	34	NW	113-38	GILLNET
33412	654	8/22/95	34	NW	113-38	GILLNET
33413	691	8/23/95	34	NW	113-38	SEINE
33748	617	8/23/95	34	NW	113-	SEINE
33804	625	8/20/95	34	NW	113-38	SEINE
33820	640	8/26/95	34	NW	113-41	TROLL
34052	672	8/24/95	34	NW	113-31	TROLL
34070	658	8/25/95	34	NW	113-45	TROLL
34095	598	8/26/95	34	NW	113-41	TROLL
29129	656	9/2/95	35	NE	109-10	TROLL
33462	591	9/1/95	35	NW	113-38	GILLNET
33464	597	9/1/95	35	NW	113-38	GILLNET
33468	658	9/1/95	35	NW	113-38	GILLNET
33472	638	9/1/95	35	NW	113-38	GILLNET
34023	688	8/27/95	35	NW	113-61	TROLL
34043	646	8/27/95	35	NW	113-	TROLL
34355	720	8/28/95	35	NW	113-41	TROLL
34365	632	8/28/95	35	NW	113-	TROLL
34488	616	8/31/95	35	NW	-	TROLL

-continued-

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Head. number	Length	Date	Stat. week	Quadrant	District	Gear
Random recoveries (continued)						
34690	690	9/5/95	36	NW	113-21	TROLL
35221	662	9/6/95	36	NW	113-32	TROLL
35385	632	9/13/95	37	NW	113-45	TROLL
82627	670	9/11/95	37	NW	189-	TROLL
35919	647	9/20/95	38	NW	113-45	TROLL
12674	660	8/9/95	32	NW	113-41	SPORT
12681		8/26/95	34	NW	113-41	SPORT
12746		8/26/95	34	NW	113-41	SPORT
12945		9/2/95	35	NW	113-41	SPORT
Select recoveries[b]						
14099	535	7/7/95	27	NW	-	TROLL
32886		7/29/95	30		-	TROLL
33252		7/28/95	30		-	TROLL
32846		8/6/95	32		-	TROLL
35665		9/6/95	36	NW	113-45	TROLL
35705		9/7/95	36		-	TROLL
12933		8/11/95	32	NW	113-41	SPORT
12689		8/29/95	35	NW	113-41	SPORT
12690		8/28/95	35	NW	113-41	SPORT
12756		8/29/95	35	NW	113-41	SPORT
12898		9/1/95	35	NW	113-41	SPORT

[a] Random recoveries are those collected during routine sampling programs and are used in data expansion calculations.

[b] Select recoveries are those collected outside of routine sampling programs and therefore are not used to estimate harvest raates.

Appendix A3.–The following data files used to prepare this report are archived at Research and Technical Services, Anchorage, Alaska.

appmdxa1.doc	Salmon Lake CWT recovery data
appndxa2	Medvejie CWT recovery data
Theta.xls	Spreadsheet of Salmon Lake Theta calculation
cwt4.exe	estimator used to calculate cwt data and variance
*.txt	input files for cwt4.exe (comvar for commercial and sportvar for sport caught CWTs)
*.out	output files from cwt4.exe (comvar for commercial and sportvar for sport caught CWTs)
*.err	output analysis files from cwt4.exe analysis (comvar for commercial and sportvar for sport caught CWTs)