Fishery Data Series No. 06-27

Ninilchik River Chinook Salmon Assessment, 1999 and 2000

by

Robert N. Begich

June 2006

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

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

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

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

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
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
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
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	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
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.
minute (angular)	'
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
variance	
population	Var
sample	var

FISHERY DATA SERIES NO. 06-27

NINILCHIK RIVER CHINOOK SALMON ASSESSMENT, 1999 AND 2000

by

Robert N. Begich
Alaska Department of Fish and Game, Division of Sport Fish, Homer

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska 99518-1565

June 2006

This investigation was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under Projects F-10-15 and F-10-16, Job No. S-2-15.

The Division of Sport Fish Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Since 2004, the Division of Commercial Fisheries has also used the Fishery Data Series. Fishery Data Series reports are intended for fishery and other technical professionals. Fishery Data Series reports are available through the Alaska State Library and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm This publication has undergone editorial and peer review.

Robert N. Begich
Alaska Department of Fish and Game, Division of Sport Fish
3298 Douglas Place, Homer, AK 99603-8027, USA

This document should be cited as:
Begich R. N. 2006. Ninilchik River Chinook salmon assessment, 1999 and 2000. Alaska Department of Fish and Game, Fishery Data Series No. 06-27, Anchorage.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

During 1999 and 2000 naturally- (naturally-produced) and hatchery-produced Chinook salmon *Oncorhynchus tshawytscha* returns to the Ninilchik River were assessed with a weir to determine the age and sex compositions of total escapements and to estimate the contribution of Chinook salmon that stray to the Ninilchik River from three Kachemak Bay Chinook salmon enhancement locations. Additionally during 2000, a random sample of sport harvested Chinook salmon were examined for an adipose finclip to estimate the stock composition of the harvest sampled each weekend in the Ninilchik River below the Sterling Highway.

The escapement of naturally-produced Chinook salmon was 1,576 fish in 1999 and 1,553 fish in 2000. The estimated 2-year average naturally-produced stock contribution to the escapement was 71%. Hatchery-produced escapements were 573 fish and 685 fish during 1999 and 2000, respectively. The average contribution of hatchery fish to the escapements was 29%. Stock composition of the immigrations varied significantly over the duration of the returns to the weir. Median date of weir immigration for naturally-produced fish was July 13, 1999 and July 14, 2000, while the median date of weir immigration for hatchery fish was July 24 for both years.

Two hundred thirty-one coded wire tags were decoded from 237 Chinook salmon that were sacrificed at the weir. No strays from Kachemak Bay Chinook salmon enhancement locations were detected, 230 originated from Ninilchik River hatchery releases, and one originated from the Alaska Department of Fish and Game (ADF&G), Crooked Creek enhancement program, a tributary of the Kasilof River. The contribution of hatchery-produced Chinook salmon to the sport harvest sampled in the lower river was 49% (SE = 4%) and was similar among weekend fishing periods. Continuing the Chinook salmon assessment at Ninilchik River weir is recommended to fully understand run-timing characteristics of and contribution to sport harvest of hatchery returns so that annual stock surpluses of hatchery-produced Chinook salmon can be more fully utilized.

Keywords: Chinook salmon, *Oncorhynchus tshawytscha*, Ninilchik River, naturally-produced, hatchery, return, escapement, weir, contribution, adipose finclip, and coded wire tag.

INTRODUCTION

Ninilchik River, Deep Creek, and Anchor River support road accessible recreational fisheries for Chinook salmon *Oncorhynchus tshawytscha* on the Lower Kenai Peninsula (Figure 1). These Chinook salmon recreational fisheries are open from saltwater to approximately 2 miles upstream during "weekends" (Saturday, Sunday, and Monday) beginning each year with the Memorial Day weekend. The Anchor River is open to fishing 4 weekends while Deep Creek and Ninilchik are open to fishing for 3 weekends. The combined annual Chinook salmon harvest from these streams averaged approximately 4,104 fish from 1977-2000 (Howe et al. 1995, 1996, 2001 a-d; Mills 1979-1980, 1981a-b, 1982-1994; Walker et al. 2003). About 44% (1,737) of the annual Chinook salmon harvest from these streams is supported by the fishery at the Ninilchik River (Howe et al. 1995, 1996, 2001 a-d; Mills 1979-1980, 1981a-b, 1982-1994; Walker et al. 2003; Table 1).

Historical Chinook salmon escapement information obtained from aerial surveys indicated that the Ninilchik River contained a smaller population of spawning Chinook salmon relative to the numbers of spawning fish counted at either the Anchor River or Deep Creek. The annual average return of native Chinook salmon to the Ninilchik River was thought to number approximately 1,500 fish (Nelson 1995). In recognition of the adverse impact increasing harvest could have upon the Ninilchik River Chinook salmon stock, in 1987 the Sport Fish Division began a hatchery supplementation program with installation of a weir to collect Chinook salmon for broodstock so that eggs could be gathered. In addition, due to concerns about overexploitation of native Chinook salmon stocks throughout the Kenai Peninsula, three saltwater locations within Kachemak Bay were stocked with smolt raised from eggs collected at

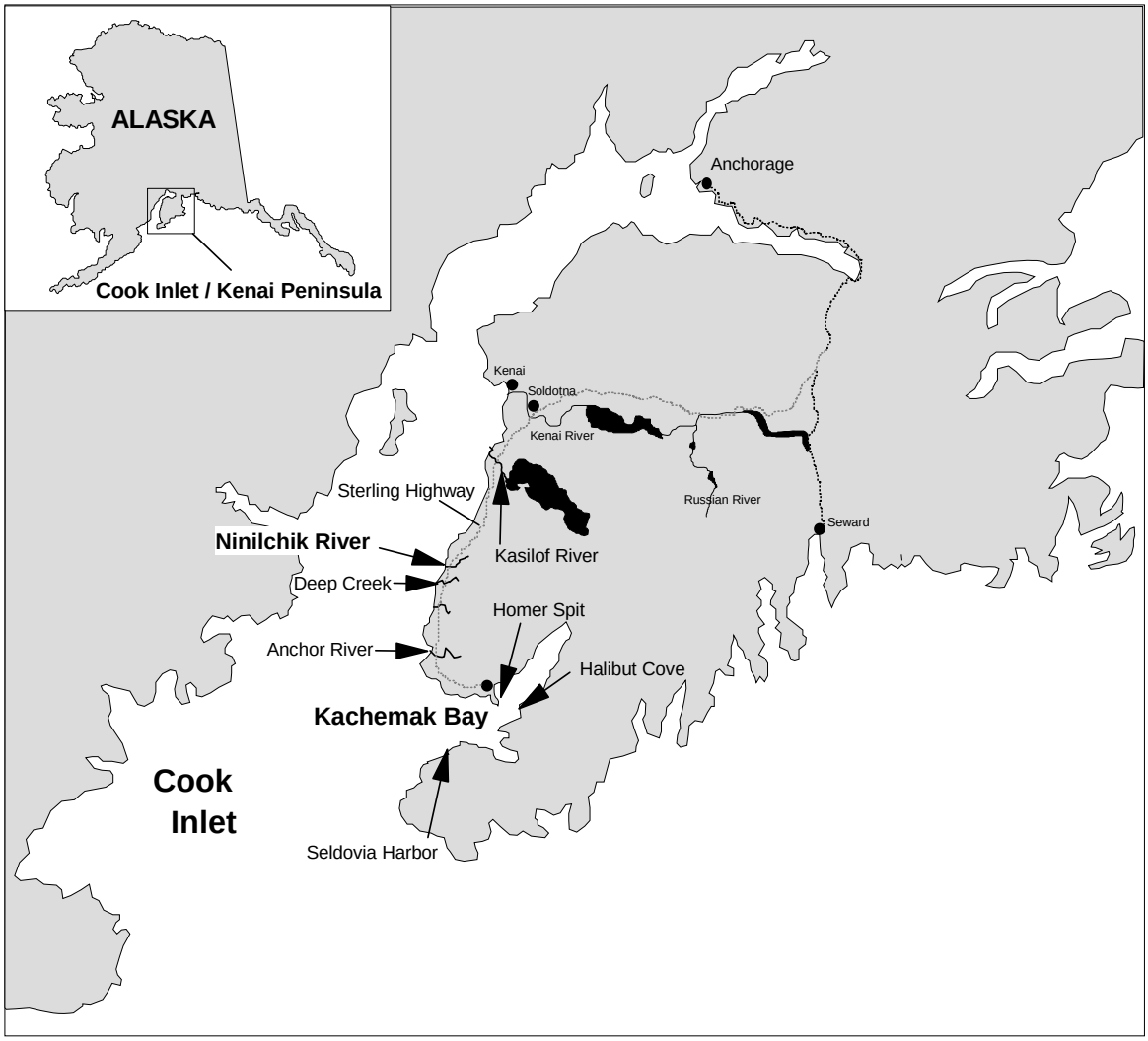


Figure 1.-Kenai Peninsula highway system, Ninilchik River and Kachemak Bay Chinook salmon stocking locations, 1999 and 2000.

the Ninilchik River weir. The Kachemak Bay enhancement sites include the Homer Spit Fishing Lagoon, Halibut Cove Lagoon and Seldovia Harbor (Figure 1). The first smolt releases into Kachemak Bay and at Ninilchik River occurred in 1988 (Table 1). Hatchery-produced Chinook salmon that returned to the Ninilchik spawn with wild Chinook salmon. Their progeny are referred to as "naturally-produced" hereafter.

The purpose of the enhancement program at Ninilchik River was to increase Chinook salmon fishing opportunities on a sustainable basis by supplementing the stream's natural return with hatchery fish without significantly altering historical Chinook salmon age and sex compositions (ADF&G 1999). Thus, the goal of hatchery releases was to supply opportunity for increased harvest of Chinook salmon without increasing the exploitation rate on the naturally-produced Chinook salmon stock.

Table 1.-Estimated angler effort, harvest, escapement, and stocking summary of Chinook salmon, Ninilchik River, 1962 through 2000.

Year	Angler Effort[a]	Harvest[a]	% Hatchery in Harvest[b]	Foot Survey[c]	Aerial Survey[d]	Estimated Escapement[e]	Weir Count[f]	Number Smolt Released[g]	Number Smolt Marked with Finclip and Tag[h]	Percent Smolt Marked
1962				193	179	530				
1963				143	47	450				
1964				347	200	910				
1965				219	224	1,030				
1966				231	No survey	670				
1967				213	100	360				
1968				126	31	450				
1969				191	87	760				
1973				203	No survey					
1976				470	956	1,180				
1977	11,350	1,168		719	1169	1,400				
1978	14,173	1,445		457	724	990				
1979	18,282	1,493		183	854	1,390				
1980	19,706	723			No data	720				
1981	14,184	1,523		232	552	830				
1982	11,806	1,240		568	947	1,430				
1983	9,458	871		313	445	710				
1984	10,122	648		208	346	600				
1985	10,213	983		243	582	650				
1986	9,250	420		277	307	790				
1987	13,329	1,112		239	523	600				
1988	12,533	795		444	569	1,080		247,327	30,809	12%
1989	9,997	744		241	280	400	254	199,831	18,772	9%
1990	8,323	693		414	288	840	315	215,804	40,319	19%
1991	19,640	3,123	77%	362	594	830	338	87,992	21,074	24%
1992	27,816	5,316	57%		No survey		539	132,387	41,335	31%
1993	20,466	4,235	50%		688	2,400		184,585	42,960	23%
1994	21,827	3,108	45%	261	0		539	201,513	45,535	23%
1995	16,160	2,451	50%		No survey		1,150	54,662	54,115	99%

-continued-

Table 1.-Page 2 of 2.

Year	Angler Effort[a]	Harvest[a]	% Hatchery in Harvest[b]	Foot Survey[c]	Aerial Survey[d]	Estimated Escapement[e]	Weir Count[f]	Number Smolt Released[g]	Number Smolt Marked with Finclip and Tag[h]	Percent Smolt Marked
1996	11,445	2,401	50%		0		944	51,688	50,866	98%
1997	11,064	3,263			393		1,096	50,698	50,292	99%
1998	10,994	1,453			316		1,002	48,798	47,480	97%
1999	15,344	1,945			357		2,285	49,853	48,906	98%
2000	12,432	1,782	49%		578		2,487	51,298		
Average 1977 - 2000										
	14,163	1,789	54%		425		2,386	121,264		

[a] Estimates of total number of angler days and harvest (Howe et al. 1995 1996, 2001d-d; Mills 1979-1980, 1981a-b, 1982-1994; Walker et al. 2003).

[b] Estimated by creel survey 1991-93; estimated by catch sampling 1994-1996 and 2000.

[c] No raw data for 1970-72, 1974-75, 1980, 1992 and 1993; survey discontinued after 1994.

[d] Aerial survey not conducted in 1970 and 1971, no data available for 1972, 1974, and 1975. Conducted from fixed-wing aircraft 1966-1973, fixed-wing aircraft and helicopter 1974, and helicopter 1975-2000.

[e] Annual expanded estimates of escapement from foot and aerial surveys, not estimated in 1992.

[f] Complete counts began in 1999, 1989-1998 are partial counts from broodstock weir, no data available for 1993, average is for 1999 and 2000 counts only.

[g] Smolt held in Ninilchik Harbor intertidal-saltwater area prior to release there in 1995 and 1996; 1997-2000 smolt held/released in freshwater.

[h] Number with adipose finclip and coded wire tag, accounts for fish which will shed the coded wire tag beginning in 1995.

Spawning escapement of Chinook salmon at Ninilchik River was monitored from 1962 through 1994 using a combination of ground and aerial surveys (Table 1). From 1996-1998 aerial surveys were used to monitor escapement, while foot survey counts of the number of Chinook salmon above the fishery were used as an inseason indicator of run strength (Szarzi 1998). From 1987 through 1998 the broodstock weir was operated from approximately early July until August and only a partial count of the Chinook salmon return was attained because the Chinook salmon immigration begins during late May (Table 2).

Prior to returns from hatchery releases (1977-1989), Chinook salmon harvest at Ninilchik River averaged 990 fish per year (Mills 1979-1980, 1981a-b, 1982-1990; Table 1). From 1991 through 1998 the average Chinook salmon harvest increased to 3,169 fish per year, an increase of 300% above the average harvest experienced prior to stocking (Howe et al. 1995, 1996, 2001a-c, Mills 1992-1994; Table 1). The increased harvest was attributed to the additional fish provided by the enhancement program which was evident from Chinook salmon harvest estimates which increased from 693 fish in 1990 to 3,123 fish in 1991, the first year of returns for 3-ocean fish from stocking (Mills 1991, 1992). Beginning in 1995 the stocking level was reduced from 200,000 smolt of which 20% were marked with an adipose finclip and equipped with a coded wire tag, to 50,000 smolt with nearly 100% marked and tagged (Table 1). In 1997, anglers harvested 3,263 Chinook salmon and in 1998 harvest declined to 1,453 Chinook salmon due to the reduced stocking level (Howe et al. 2001b, 2001c). However, despite the reduction in stocking levels the percentage of hatchery stocked Chinook salmon estimated to return to the broodstock weir increased from approximately 19% in 1994 to 47% in 1998 (Table 2). From 1991-1996 the sport fishery was extended between 9-14 additional days. In 1997 and 1998, additional days of fishing were not granted because foot surveys indicated that adequate escapement was not present upstream of the fishery. The lack of fish observed during foot surveys and changing ratio of naturally-produced to hatchery fish at the weir created concern that the production of naturally-produced Ninilchik River Chinook salmon had declined.

Previous evaluations of the Ninilchik River Chinook salmon fishery were directed at collecting information to estimate: (1) angler effort and harvest; (2) contribution of stocked fish to the sport fishery; and (3) age composition of naturally-produced and hatchery fish in the sport fishery (Balland et al. 1994; Boyle et al. 1993; Boyle and Alexandersdottir 1992; Marsh 1995, *Unpublished*). During 1997 and 1998 no inriver catch sampling of the Chinook salmon harvest was conducted.

Although previous investigations provided estimates of sport fishing parameters and hatchery contribution to harvests, these studies did not provide an assessment of naturally-produced versus hatchery stock production because escapement was not completely enumerated. Furthermore, knowledge of recent harvests greater than pre-stocking harvest levels in combination with an increasing fraction of hatchery fish observed in the return to the broodstock weir created concern that the numbers of naturally-produced Chinook salmon in the return could be declining. Therefore, it was a primary motivation to address uncertainties regarding the number of naturally-produced and hatchery Chinook salmon in the escapement and sport harvest, as well as the sex and age structure of both the naturally-produced and hatchery components of the return. Additionally, there was a need to evaluate the possibility of straying of Chinook salmon stocked at Kachemak Bay enhancement locations to the Ninilchik River. This information is essential to determine the stock status of naturally-produced Chinook salmon and to determine the benefits of the hatchery program at the Ninilchik River.

Table 2.-Summary of counts for Chinook salmon at the Ninilchik River weir, 1989 through 2000.

Year	Run Component	Total Return[a]	Proportion of Return[b]	CWT Recovery[c]	Egg-Take Kill[d]	CWT Non-Ninilchik Origin[e]	Escapement[f]	Proportion of Escapement[g]	Weir Dates[h]
1989		254							7/04 - 7/25
1990		315							7/06 - 7/ 27
1991		338							7/01 - 7/17
1992		539							6/30 - 7/14
1994	Wild	446	0.812						
	Hatchery	103	0.188						
	Total	549			125		411	0.749	7/07 - 7/26
1995	Wild	725	0.630						
	Hatchery	425	0.370						
	Total	1,150			194		792	0.689	7/04 - 8/01
1996	Wild	654	0.693						
	Hatchery	290	0.307						
	Total	944			190		692	0.733	7/02 - 7/24
1997	Wild	579	0.528						
	Hatchery	517	0.472						
	Total	1,096			132		675	0.616	7/01 - 8/11
1998	Wild	536	0.535						
	Hatchery	466	0.465						
	Total	1,002			196		619	0.618	7/03 - 8/01
1999	Wild	1,644	0.719	0	68		1,576	0.733	
	Hatchery	641	0.281	42	26	0	573	0.267	
	Total	2,285		42	94	0	2,149	0.940	5/18 - 8/13
2000	Wild	1,634	0.657	0	81		1,553	0.694	
	Hatchery	853	0.343	109	60	1	684	0.306	
	Total	2,487		109	141	1	2,237	0.899	5/17 - 8/08

[a] Total number of Chinook salmon counted at the weir. No data for 1987, 1988 or 1993, 1999 returns and escapements include 69 fish captured by netting below the weir of which 31 were wild and 38 were hatchery fish.

[b] Estimated proportion of the total number of Chinook salmon in the return that were wild or hatchery fish.

[c] Total number of Chinook salmon sacrificed for coded wire tag recovery information.

[d] Total number of Chinook salmon sacrificed for hatchery broodstock during egg takes at the weir.

[e] Coded wire tagged Chinook salmon of non-Ninilchik River origin.

[f] Escapement is return less those sacrificed for CWT recovery and egg take.

[g] Proportion of the total number of Chinook salmon in the escapement that are wild or hatchery fish.

[h] Inclusive dates for each year that the weir was fully operational.

OBJECTIVES

The objectives of this study were to:

1. Census the natural and hatchery production of Chinook salmon escapement into the Ninilchik River during 1999 and 2000.
2. Estimate the age, sex, and length composition of the natural and hatchery Chinook salmon escapement into Ninilchik River during 1999 and 2000.
3. Estimate the proportion of hatchery-produced Chinook salmon in the inriver sport harvest sampled downstream of the Sterling Highway Bridge each weekend during 2000.
4. Estimate the contribution of hatchery-produced Chinook salmon stocked into the Homer Spit Fishing Lagoon, Halibut Cove Lagoon, and Seldovia to the return of Chinook salmon enumerated at Ninilchik River Weir during 1999 and 2000.

METHODS

BIOLOGICAL SAMPLING AND ESCAPEMENT

From May 18 through August 13, 1999 and May 17 through August 8, 2000 a weir was operated on the Ninilchik River approximately 4.5 km upstream of its mouth. Chinook salmon entered a trap to pass through the weir where they were counted and sampled. All Chinook salmon captured were examined for an adipose finclip. Almost all hatchery-produced Chinook salmon released into the Ninilchik River since 1995 have been marked with an adipose finclip (Starkey et al. 1999; Table 1). Maximum ocean age of hatchery-produced Chinook salmon that return to Ninilchik River is 4 years (Marsh 1995, *Unpublished*). Consequently, examining all Chinook salmon captured at the weir for an adipose finclip allowed for the daily and cumulative count of both the naturally-produced and hatchery components of the Chinook salmon escapement. In addition, during 1999 Chinook salmon were also captured in the lower river below the weir by drifting a 10 m long gillnet through pools so that Chinook salmon which had not migrated upstream prior to weir removal (August 13) could be counted, sampled, and included in the escapement of naturally-produced and hatchery-produced fish.

Age and length compositions of both return components were estimated from fish systematically subsampled at the weir. All those captured during lower river netting were sampled. Sex was recorded for all fish enumerated and was determined based on head shape, and presence of ovipositor, eggs, or milt. During 1999 we attempted to sample every seventh fish, whereas every fourth fish in 2000 was sampled for age and length. Length was measured from mid-eye-to-fork of tail (MEFT). Three scales were collected for aging from the left side of the body, at a point on a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin, two rows above the lateral line (Welander 1940). Later, scales were pressed and age was determined using procedures described by Mosher (1969).

The total escapement of naturally-produced or hatchery Chinook salmon was the total number of unique fish counted through the weir of each return component and sampled in the lower river (for 1999 only) minus those sacrificed for broodstock during the egg take and sacrificed for coded wire tag (CWT) information.

Age, Sex, and Length Composition

Biological data were categorized by return component (naturally-produced or hatchery), sex, and ocean age. Chinook salmon sampled at the weir were used to estimate mean length-at-age and ocean age composition of the escapement. Sex was determined for all Chinook salmon when they were examined for an adipose fin and counted at the weir. Thus, the number in the escapement as well as the number by sex of each return component was known. Because fish were sampled for age and length systematically throughout the immigration the samples collected at the weir were used to estimate age composition for the escapement. Age composition of the naturally-produced and hatchery escapements was estimated after subtracting the count of the number of fish by sex sacrificed from the total number of fish by sex counted at the weir.

Contingency tables and chi-squared tests (Conover 1980) were used to test for temporal differences in the numbers of naturally-produced and hatchery fish counted through the weir, as well as differences in sex and age composition. These tests were used to describe run timing characteristics between Chinook salmon return components and biological characteristics within return components among weeks at the weir. In addition, similar tests were used to test the null hypothesis that there was no difference in sex or age among all Chinook salmon sampled at the weir and those captured during netting.

The proportion of Chinook salmon of sex *i* of age class *k* in the escapement was estimated as a binomial proportion (Cochran 1977) by:

$$\hat{p}_{ik} = \frac{n_{ik}}{n_i}, \tag{1}$$

where:

n_{ik} = number of Chinook salmon of sex *i* sampled that were in age class *k*, and

n_i = number of salmon of sex *i* sampled.

The variance of this proportion was estimated using a finite population correction (fpc) as:

$$Var(\hat{p}_{ik}) = \left[\frac{N_i - n_i}{N_i}\right]\frac{\hat{p}_{ik}(1-\hat{p}_{ik})}{n_i - 1}, \tag{2}$$

where:

N_i = the number of Chinook salmon of sex *i* counted in the escapement.

The denominator used in estimating the proportion was the number counted of each sex during the immigration, not the total number counted during the immigration.

The number of Chinook salmon of sex *i* and age class *k*, was estimated by:

$$\hat{N}_{ik} = N_i \hat{p}_{ik}, \tag{3}$$

and its variance estimated by:

$$Var(\hat{N}_{ik}) = N_i^2 Var(\hat{p}_{ik}). \tag{4}$$

The total number of salmon of sex *i* and age class *k* or sex and age classes combined and their variances, were estimated by summing the respective estimates.

The proportion of salmon of age class *k* in the escapement was estimated by:

$$\hat{p}_k = \frac{\sum_{i=1}^{2} \hat{N}_{ik}}{N_t}, \tag{5}$$

where:

N_t = the total number counted in the escapement for both sexes combined.

The variance of this proportion was estimated as:

$$Var(\hat{p}_k) = \frac{\sum_{i=1}^{2} Var(\hat{N}_{ik})}{N_t^2}. \tag{6}$$

SPORT HARVEST

During 2000, the weekend sport fishing periods on May 27-29, June 3-5, and June 10-12, a sample of Chinook salmon harvested in the lower 1-mile section of the Ninilchik River downstream of the Sterling Highway Bridge was examined for the presence of an adipose fin. The number of fish harvested with a missing adipose fin and number with an adipose fin present were enumerated. This sample was used to estimate the stock composition or proportion of hatchery- and naturally- (naturally-produced) produced Chinook salmon harvested. The proportion of hatchery-produced fish in the sampled harvest was estimated for each weekend as shown above (equation 2) except there was no finite population correction (fpc). A chi-square test was used to test the null hypothesis that the proportion of hatchery-produced fish did not change among weekend fishing periods.

STRAYING

To detect straying of fish into the Ninilchik River, Chinook salmon counted at the weir with a missing adipose fin were sampled systematically throughout the immigrations. We attempted to sacrifice every 14th and every 8th fish examined at the weir during 1999 and 2000, respectively, to obtain CWT information. Fish were sampled for age, sex, and length as described above. In addition, we attempted to obtain CWT information from Chinook salmon with missing adipose fins sacrificed for broodstock during egg takes. We also attempted to collect age, sex and length data from these hatchery fish used during the egg takes. Heads of all sacrificed fish were removed, labeled with a numbered cinch strap, frozen, and later sent to the Coded Wire Tag Processing Laboratory (Tag Lab) in Juneau to detect and remove the coded wire tag. Decoding the tag number identified the time and location of release, and the presence of strays from Kachemak Bay enhancement programs.

Final data are archived with the Alaska Department of Fish and Game (Appendix B1).

RESULTS

RETURN AND ESCAPEMENT

The total returns of Chinook salmon enumerated at the Ninilchik River were 2,285 and 2,487 in 1999 and 2000, respectively (Table 2). The total return for 1999 included 69 Chinook salmon captured during netting in the lower river prior to weir removal. After subtraction of those sacrificed during egg takes and for coded wire tag recovery information, the total escapement of naturally-produced and hatchery Chinook salmon combined was 2,149 fish during 1999 and 2,238 fish in 2000 (Table 2). The escapement count of naturally-produced Chinook salmon compared closely between years as the count was 1,576 fish in 1999 and 1,553 fish in 2000. The hatchery escapement count was 573 and 685 Chinook salmon for 1999 and 2000, respectively.

There was a significant difference between the number of naturally-produced versus hatchery Chinook salmon counted among weeks at the weir during 1999 ($\chi^2 = 490.735$, df = 6, $P < 0.001$) and 2000 ($\chi^2 = 413.884$, df = 6, $P < 0.001$; Figure 2). The median dates of weir immigration for the naturally-produced Chinook salmon return to the weir was July 13, 1999 and July 12, 2000, while the median date of weir immigration for the hatchery-produced Chinook salmon return occurred on the same date in each year, July 24 (Figure 2; Appendices A1, A2).

AGE, SEX AND LENGTH COMPOSITIONS

1999 Results

The sex class composition of the return of naturally-produced Chinook salmon to the weir differed significantly among weekly strata ($\chi^2 = 45.128$, df = 6, $P < 0.001$). Further tests indicated that this was largely due to an increase in the number of male relative to female Chinook salmon observed at the weir during weeks 3 through 5. There was no significant difference in the ocean age composition of the naturally-produced return of Chinook salmon sampled among weeks at the weir ($\chi^2 = 16.937$, df = 12, $P = 0.152$) or between the ocean age compositions of all fish sampled at the weir and those captured by netting in the lower river ($\chi^2 = 4.647$, df = 5, $P = 0.460$). Ocean age data from the weir and netting samples were pooled to estimate age composition.

The escapement of naturally-produced Chinook salmon was composed of 38% female and 62% male (Table 3). The majority of female Chinook salmon were estimated to be 3-ocean fish (57%, SE = 5%), while much of the male escapement was 2-ocean fish (50%, SE = 4%). Overall the escapement of naturally-produced Chinook salmon was composed of 47% (SE = 3%) 3-ocean, followed by 36% (SE = 3%) 2-ocean, and 17% (SE = 2%) 4-ocean fish (Table 3).

For the hatchery-produced component of the escapement, ocean age was estimated for 113 of 123 Chinook salmon sampled at the weir. Ocean age composition of hatchery fish was similar over the duration of the immigration ($\chi^2 = 16.356$, df = 15, $P = 0.359$) and there was no significant difference between the ocean age composition of all hatchery fish sampled during the immigration and those captured during netting ($\chi^2 = 4.015$, df = 3, $P = 0.260$). Similar to the immigration of naturally-produced Chinook salmon we detected differences in the sex composition of the hatchery return among weeks at the weir ($\chi^2 = 26.882$, df = 5, $P < 0.001$), which was attributed to an increase in the number of male hatchery Chinook salmon relative to the number of female Chinook salmon counted at the weir during the third and fourth week of the immigration.

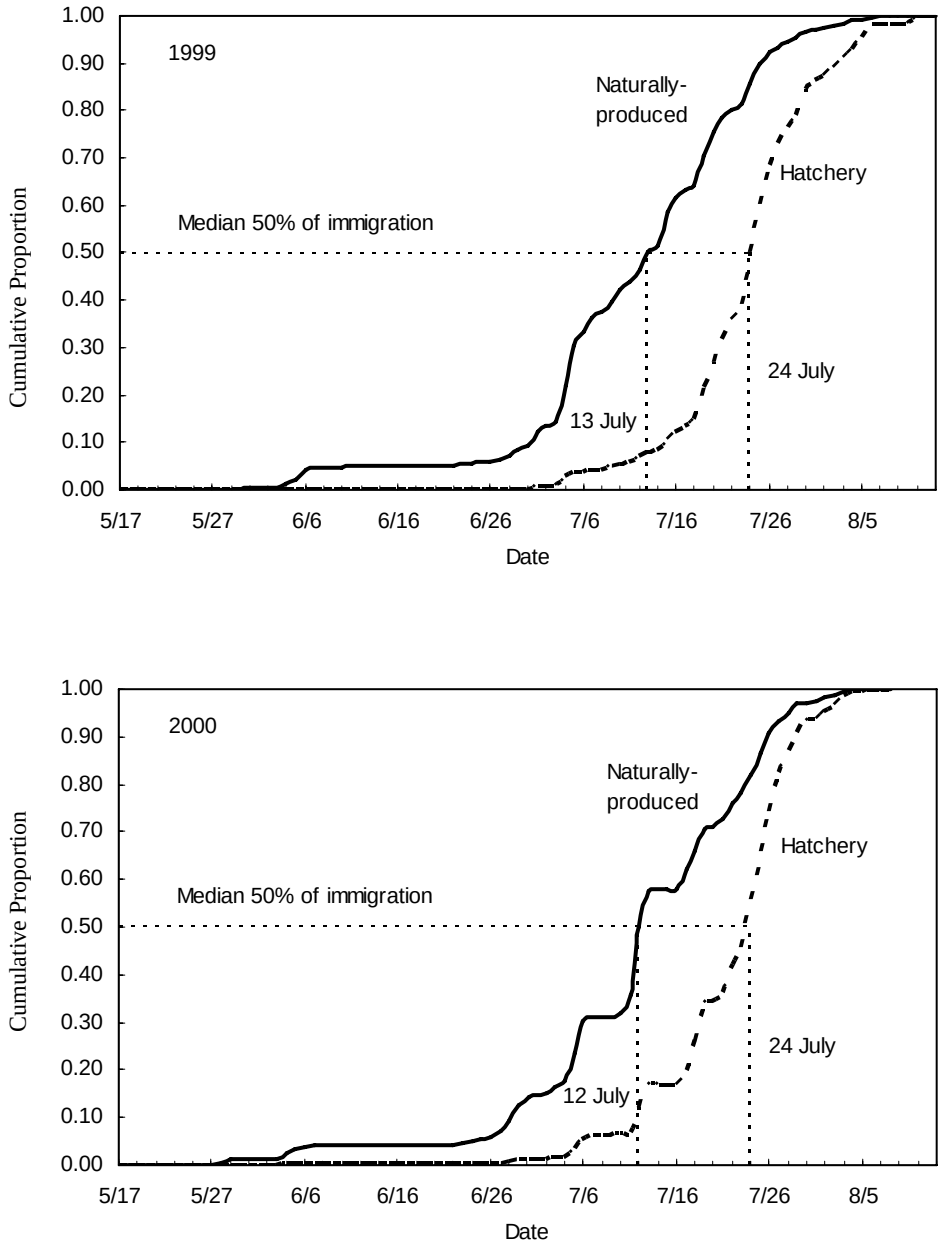


Figure 2.-Time of immigration for naturally-produced and hatchery Chinook salmon, Ninilchik River, 1999 and 2000.

Sixty percent of the hatchery-produced escapement was comprised of males (Table 3). The majority of males was 2-ocean fish (75%, SE = 5%), while the majority of females was 3-ocean fish (57%, SE = 7%). Four-ocean fish accounted for just 3% (SE = 2%) of the male escapement, whereas 21% (SE = 6%) of females were 4-ocean fish. Altogether the age composition of the hatchery escapement was mostly 2-ocean (54%, SE = 4%) and 3-ocean (34%, SE = 4%) fish (Table 3).

Table 3.-Estimated ocean age composition and length-at-ocean age of the naturally-produced and hatchery Chinook salmon escapements, Ninilchik River, 1999.

	Naturally Produced					Hatchery				
	Ocean Age					Ocean Age				
Escapement	1	2	3	4	Total	1	2	3	4	Total
Females										
Number sampled	0	12	48	24	84	0	9	24	9	42
Estimated Proportion	0.000	0.143	0.571	0.286	0.376		0.214	0.571	0.214	0.398
SE Proportion	0.000	0.036	0.050	0.046			0.058	0.070	0.058	
Estimated abundance	0	85	339	169	593	0	49	130	49	228
SE Abundance	0	21	30	27			13	16	13	
Mean Length		634	785	861	785		659	743	790	735
SE Mean Length		27	5	8	9		9	7	12	9
Males										
Number sampled	0	70	57	14	141	3	53	13	2	71
Estimated Proportion	0.000	0.496	0.404	0.099	0.624	0.042	0.746	0.183	0.028	0.602
SE Proportion	0.000	0.039	0.038	0.023		0.024	0.046	0.041	0.018	
Estimated abundance	0	488	397	98	983	15	258	63	10	345
SE Abundance	0	38	38	23		8	16	14	6	
Mean Length		634	787	914	724	409	630	811	843	660
SE Mean Length		6	6	12	9	34	6	11	14	12
All										
Estimated Proportion	0.000	0.363	0.467	0.169	1.000	0.025	0.535	0.338	0.102	1.000
SE Proportion	0.000	0.028	0.031	0.023		0.014	0.036	0.037	0.025	
Estimated abundance	0	573	736	267	1,576	15	306	193	59	573
SE Abundance	0	44	48	36		8	21	21	15	
Mean Length		634	786	881	746	409	634	767	800	688
SE Mean Length		6	4	8	7	34	6	8	12	9

2000 Results

Age was determined for 278 naturally-produced Chinook salmon sampled at the weir (Table 4). Ocean age class composition was similar among weeks at the weir (χ^2 = 22.904, df = 15, P = 0.086). The sex class composition over the duration of the immigration differed (χ^2 = 63.954, df = 5, P < 0.001). Additional testing indicated that this was due to the large number of male Chinook salmon relative to the number of female Chinook salmon counted at the weir during the first 3 weeks compared to the remainder of the immigration.

The escapement of naturally-produced Chinook salmon was 51% male. The ocean age composition among females was 67% (SE = 3%) 3-ocean, 29% (SE = 3%) 4-ocean and 3% (SE = 1%) 2-ocean (Table 4). Similar to females 3-ocean fish comprised the majority of the male escapement (52%, SE = 4%). In total 3-ocean accounted for 59% (SE = 3%) of the escapement of naturally-produced Chinook salmon (Table 4).

Table 4.-Estimated ocean age composition and length-at-ocean age of naturally-produced and hatchery Chinook salmon escapements, Ninilchik River, 2000.

	Naturally Produced					Hatchery				
	Ocean Age					Ocean Age				
Escapement	1	2	3	4	Total	1	2	3	4	Total
Females										
Number sampled	1	4	101	44	150	4	2	68	13	87
Estimated Proportion	0.007	0.027	0.673	0.293	0.488	0.046	0.023	0.782	0.149	0.47 0
SE Proportion	0.006	0.012	0.034	0.033		0.019	0.014	0.038	0.033	
Estimated abundance	5	20	510	222	758	15	7	252	48	322
SE Abundance	5	9	26	25		6	4	12	11	
Mean Length	521	710	773	829	787	368	732	763	776	746
SE Mean Length		70	5	7	5	12	32	4	15	10
Males										
Number sampled	5	23	66	34	128	3	31	29	1	64
Estimated Proportion	0.039	0.180	0.516	0.266	0.512	0.047	0.484	0.453	0.016	0.53 0
SE Proportion	0.016	0.031	0.041	0.036		0.027	0.057	0.057	0.014	
Estimated abundance	31	143	410	211	795	17	176	164	6	363
SE Abundance	13	25	32	29		10	21	21	5	
Mean Length	518	625	775	864	761	399	628	763	780	680
SE Mean Length	18	17	7	9	10	13	8	13		14
All										
Estimated Proportion	0.023	0.105	0.593	0.279	1.000	0.046	0.267	0.608	0.079	1.00 0
SE Proportion	0.009	0.017	0.027	0.025		0.017	0.031	0.035	0.017	
Estimated abundance	36	163	920	434	1,553	32	183	416	54	685
SE Abundance	13	26	42	38		11	21	24	12	
Mean Length	518	638	774	844	775	381	634	763	776	719
SE Mean Length	15	18	4	6	5	10	9	5	14	8

For the immigration of the hatchery-produced return chi-square testing results detected differences in the sex (χ^2 = 19.4308, df = 5, P = 0.002) and ocean age class compositions (χ^2 = 27.3629, df = 15, P = 0.026) over the duration of the immigration. Subsequent testing indicated that this was due to the passage of approximately 48% of the hatchery return (410 fish) over a 1-week period, July 21 through July 28 (Figure 2; Appendix A2).

The hatchery-produced Chinook salmon escapement was estimated to be composed of 53% male Chinook salmon (Table 4). Among males 2-ocean fish comprised 48% (SE = 6%), whereas 2-ocean fish comprised just 2% (SE = 1%) of the female hatchery escapement. The majority of the female hatchery escapement was composed of 3-ocean fish, 78% (SE = 4%) and 3-ocean fish accounted for 61% (SE = 4%) of the hatchery-produced escapement (Table 4).

SPORT HARVEST

During the weekend sport fishing periods in 2000, a total of 283 Chinook salmon harvested in the lower river were sampled for the presence of an adipose fin. One hundred thirty-eight (49%, SE = 4%) were of hatchery origin (Table 5). The proportion of hatchery-produced fish in the sampled harvest ranged from 45% (SE = 8%) to 53% (SE = 8%). Lastly, the fraction of the sampled harvest composed of hatchery fish relative to the harvest fraction composed of naturally-produced fish was not significantly different among weekend fishing periods (χ^2 = 1.183, df =2, P = 0.554).

STRAYING

During 1999, 68 Chinook salmon missing the adipose fin were collected at Ninilchik River and were used to detect strays from Kachemak Bay enhancement locations. Forty-two Chinook salmon were sacrificed during the immigration at the weir. An additional 26 heads were collected from adipose finclipped fish that were sacrificed for broodstock (Table 2; Appendix A3). Coded wire tags were successfully decoded from all 68 samples. All were of Ninilchik River origin (Table 6; AppendixA3).

One hundred sixty-nine Chinook salmon were sacrificed during sampling of the immigration at the weir (109) and the egg takes (60) during 2000 (Table 2; Appendix A4). Six fish had no tag, 162 were of Ninilchik River origin, and 1 fish was from the stocking program at Crooked Creek, a tributary of the Kasilof River (Table 6; Figure 1; Appendix A4). No tags were from the Homer Spit Fishing Lagoon, Halibut Cove Lagoon, or Seldovia Harbor stocking locations (Table 6).

A summary of the age and length composition by sex of Chinook salmon sampled during egg takes and for CWT information appears in Appendix A5.

DISCUSSION

Historically the Ninilchik River weir was operated primarily in July not during May or June; however, during 1999 and 2000 it was operated from mid May through early August. Consequently, this study succeeded in identifying the number of naturally-produced fish in the Chinook salmon escapement to Ninilchik River. Because this study provided the first complete enumerations at the Ninilchik River, there are no historical data for comparison. However, if the average numbers of naturally-produced Chinook salmon counted at the broodstock weir during July 8 through July 24, 1994-1998 are compared with the average counts over the same dates during this study, it seems that the 1999 and 2000 escapement counts of naturally-produced fish are nearly double those counts of the past (1994-1998 $\bar{x}$ = 435 fish; 1999-2000 $\bar{x}$ = 817; Table 7). Furthermore, the aerial escapement count of 578 Chinook salmon counted during 2000 was the highest count recorded since 1993 (Table 1). Since the 1999 and 2000 counts of Chinook salmon in July were record high counts, and we assume the 1999 and 2000 returns of naturally-produced fish exhibited similar run-timing of naturally produced fish of past years, it appears that the escapement of naturally-produced Chinook salmon has increased since the mid-1990s. In addition, the number of Chinook salmon counted in 1999 and 2000 were stable. It is recommended that the numbers of Chinook salmon in the escapement continue to be completely enumerated so that escapement levels and contribution of naturally-produced fish to escapements can be identified.

Table 5.-Stock composition estimates of the Chinook salmon sport harvest by weekend sampled in the lower Ninilchik River below the Sterling Highway bridge, 2000.

Weekend	Number Wild Sampled	Proportion	SE	Number Hatchery Sampled	Proportion	SE	Total Number Sampled
5/27-5/29	37	0.468	0.083	42	0.532	0.078	79
6/03-6/05	53	0.510	0.069	51	0.490	0.071	104
6/10-6/12	55	0.550	0.068	45	0.450	0.075	100
Total	145	0.512	0.042	138	0.488	0.043	283

Table 6.-Coded wire tag recovery information by tag code, brood year and release location for Chinook salmon sacrificed at the Ninilchik River, 1999 and 2000.

Tag Code[a]	Brood Year	Rearing Code and Location[b]	Release Date	Release Site	Actual Age[c] Fresh	Actual Age[c] Ocean	Female	Male	Sample Total
1999									
312635	1997	(H)Fort Richardson	06-15-98	Ninilchik R 244-20	0	1	1	1	2
312608	1996	(H)Fort Richardson	06-17-97	Ninilchik R 244-20	0	2	2	27	29
312515	1995	(H)Fort Richardson	06-13-96	Ninilchik R 244-20	0	3	26	5	31
312435	1994	(H)Fort Richardson	05-31-95	Ninilchik R 244-20	0	4	6	0	6
						Total	35	33	68
2000									
310147	1998	(H)Fort Richardson	06-15-99	Ninilchik R 244-20	0	1	2	2	4
312635	1997	(H)Fort Richardson	06-15-98	Ninilchik R 244-20	0	2	4	25	29
312608	1996	(H)Fort Richardson	06-17-97	Ninilchik R 244-20	0	3	106	21	127
312515	1995	(H)Fort Richardson	06-13-96	Ninilchik R 244-20	0	4	2	0	2
312629	1997	(H)Elmendorf	06-04-98	Crooked Cr 244-30	0	2	0	1	1
No Tag							4	2	6
						Total	118	51	169

[a] No tag is a Chinook with an adipose finclip but no tag.

[b] Rearing code H is for hatchery facility.

[c] Actual age fresh and ocean was determined by comparing brood year, release year, and recovery year.

Table 7.-Number of naturally-produced and hatchery Chinook salmon counted at the Ninilchik River weir, July 8 through July 24, 1994 through 2000.

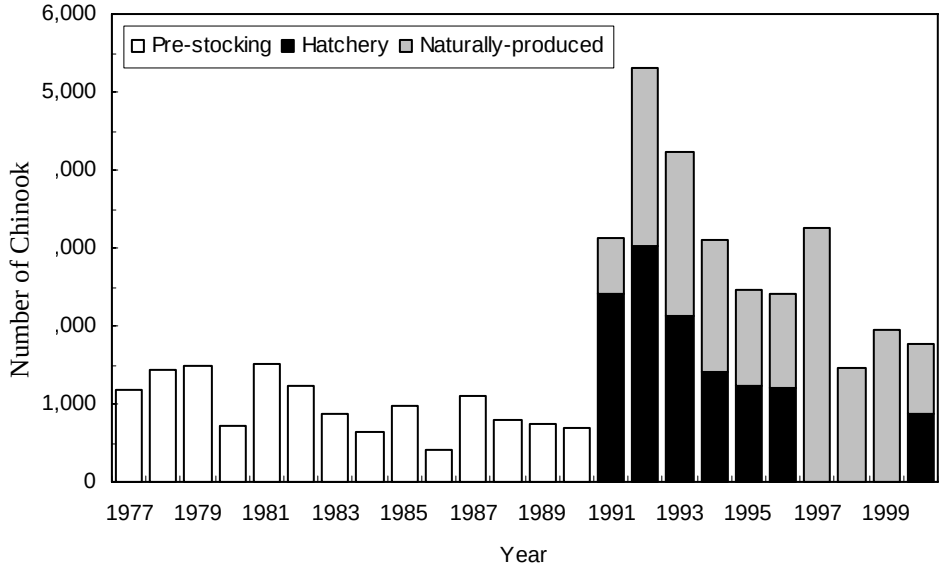
Year	Naturally Produced Chinook	Hatchery Chinook	Total
1994	423	40	463
1995	503	342	845
1996	591	264	855
1997	235	358	593
1998	422	268	690
1999	799	277	1,076
2000	834	426	1,260
Average	544	282	826
Avg 1994-1998	435	254	689
Avg 1999-2000	817	352	1,168

During 1999 the number of naturally-produced fish in the escapement greatly outnumbered hatchery fish in the escapement and the median date of weir immigration for naturally-produced fish occurred 11 days (July 13) before the median date for hatchery fish (July 24; Figure 2). The predominance of naturally-produced fish in the escapement created concern that the hatchery contribution to the inriver harvest was low as it had been assumed that the ratio of naturally-produced to hatchery fish in the return was mirrored in the harvest. Based on those results from 1999 it was thought that naturally-produced fish comprised the majority of the harvest. In addition, managers also questioned whether hatchery fish were present in adequate numbers to avoid excessive naturally-produced stock harvest in the lower river fishery since hatchery fish arrived later than naturally-produced fish. Together these two findings suggest that naturally-produced stock exploitation may be substantial, which would conflict with the goal of the Ninilchik River enhancement program.

Results of harvest sampling in 2000 alleviated concerns about overexploitation of naturally-produced fish because almost 50% of the harvest was hatchery fish (Table 5; Figure 3). In addition, the 2000 results suggested that the immigration of hatchery fish through the fishery to upstream spawning areas was protracted (Figure 4).

If hatchery fish tend to linger in the lower river while wild fish move upstream, an opportunity arises for hatchery surpluses to be better utilized, increasing benefits of the enhancement program to sport anglers without risk of overexploiting naturally-produced Chinook. Utilizing surplus hatchery fish could be accomplished by additional fishery openings that selectively target hatchery (adipose finclipped) fish in the lower river. Therefore, evaluation of run timing and harvest of the naturally-produced and hatchery components should continue. Fish should be enumerated at the weir throughout the emigration, and stock composition of harvests from the lower river should be estimated. We can then determine if protracted upstream immigration is

an enduring characteristic of the hatchery-produced stock. In addition, we recommend that hatchery-selective fisheries be executed while escapement is being monitored so that risks to the naturally-produced component can be evaluated.



Note: harvest was not apportioned by hatchery/naturally-produced in 1997-1999.

Figure 3.-Chinook salmon harvest, Ninilchik River, 1977-2000.

During this 2-year study 237 Chinook salmon were sacrificed for coded wire tag recovery information. No Chinook salmon from which coded wire tags were decoded were identified as originating from the Homer Spit Fishing Lagoon, Halibut Cove Lagoon, or Seldovia Harbor Chinook salmon enhancement locations, although one fish from a Crooked Creek release was recovered (Table 6). Consequently, the Kachemak Bay Chinook salmon enhancement program poses a low risk of interogression to the naturally-produced Chinook salmon stock at Ninilchik River.

ACKNOWLEDGMENTS

The author would like thank the Homer Division of Sport Fish Staff, especially field crew leader Tom Balland, Area Management Biologist Nicky Szarzi, and those who counted and sampled most of the fish for this study, Amber Glenzel and John Stryker. Thanks also go to Jody Nemchek, Mel Matthews and Nicky Szarzi who helped to sample the inriver sport harvest and to Jim Hasbrouck and Allen Bingham for planning and biometric support.

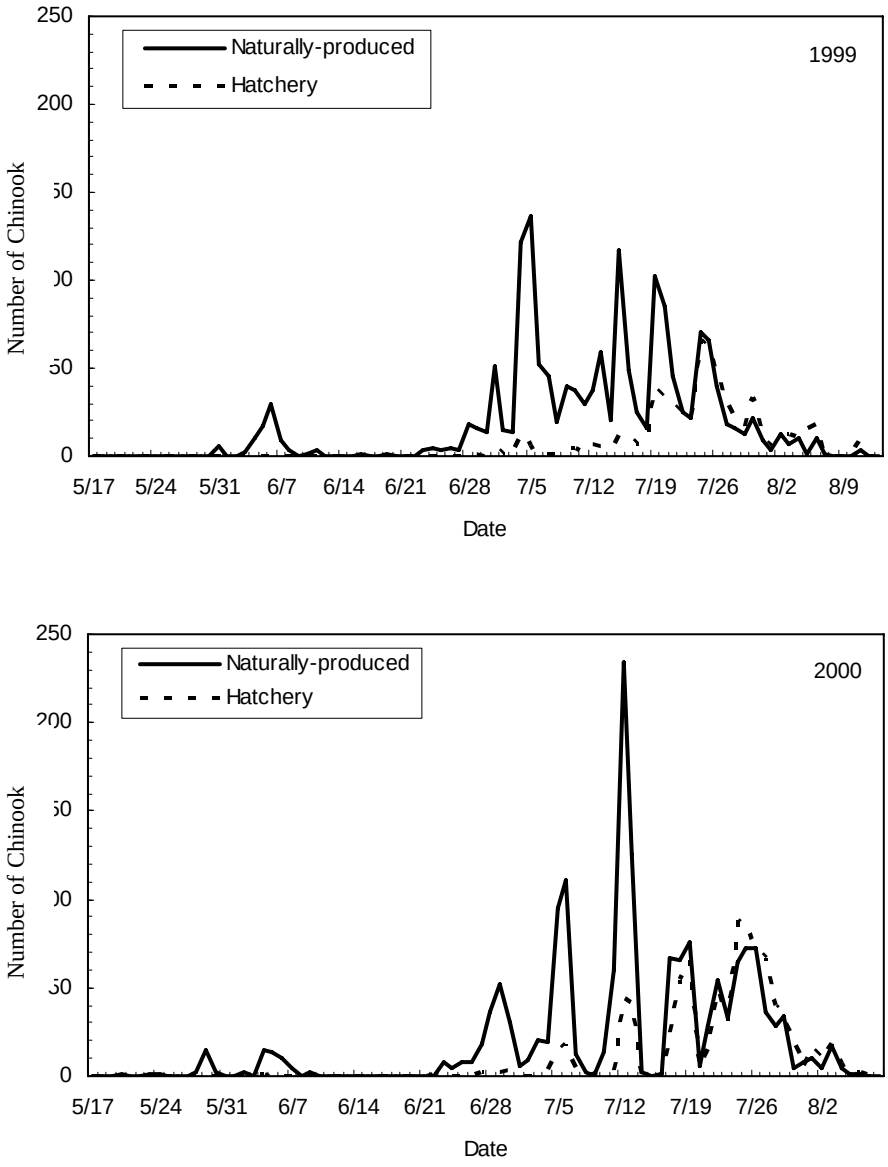


Figure 4.-Daily counts of naturally-produced and hatchery Chinook salmon, Ninilchik River, 1999 and 2000.

REFERENCES CITED

ADF&G (Alaska Department of Fish and Game). 1999. Statewide stocking plan for recreational fisheries 2000-2004 (Draft). Alaska Department of Fish and Game, Anchorage.

Balland, D. T., S. Sonnichsen, and S. L. Timmons. 1994. Contribution of stocked Chinook salmon to the Ninilchik River sport fishery, 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-25, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds94-25.pdf

Boyle, L., and M. Alexandersdottir. 1992. Contribution of stocked Chinook salmon to the Ninilchik River sport fishery, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-30, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds92-30.pdf

Boyle, L., S. Sonnichsen, and T. D. Balland. 1993. Contribution of stocked Chinook salmon to the Ninilchik River sport fishery, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-21, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds93-21.pdf

Cochran, W. G. 1977. Sampling techniques. Third Edition. John Wiley & Sons, New York.

Conover, W. J. 1980. Practical nonparametric statistics. Second Edition. John Wiley and Sons, New York.

Howe, A. L., G. Fidler, A. E. Bingham, and M. J. Mills. 1996. Harvest, catch, and participation in Alaska sport fisheries during 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-32, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds96-32.pdf

Howe, A. L., G. Fidler, and M. J. Mills. 1995. Harvest, catch, and participation in Alaska sport fisheries during 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-24, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds95-24.pdf

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001a. Revised Edition. Harvest, catch, and participation in Alaska sport fisheries during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-29 (revised), Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds97-29(revised).pdf

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001b. Revised Edition. Harvest, catch, and participation in Alaska sport fisheries during 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-25 (revised), Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds98-25(revised).pdf

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001c. Revised Edition. Participation, catch, and harvest in Alaska sport fisheries during 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-41 (revised), Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds99-41(revised).pdf

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001d. Participation, catch, and harvest in Alaska sport fisheries during 1999. Alaska Department of Fish and Game, Fishery Data Series No. 01-8, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds01-08.pdf

Marsh, L. E. 1995. Harvest of stocked Chinook salmon in the Ninilchik River sport fishery, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-33, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds95-33.pdf

Marsh, L. E. *Unpublished*. Preliminary evaluation of the stocking program at the Ninilchik River. Alaska Department of Fish and Game, Memorandum, Soldotna.

Mills, M. J. 1979. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report 1978-1979, Project F-9-11, 20 (SW-I-A), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/f-9-11(20)SW-I-A.pdf

Mills, M. J. 1980. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21 (SW-I-A), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/f-9-12(21)SW-I-A.pdf

REFERENCES CITED (Continued)

Mills, M. J. 1981a. Alaska statewide sport fish harvest studies - 1979 data. Alaska Department of Fish and Game, Federal Aid in Fish Restoration and Anadromous Fish Studies, Annual Performance Report 1980-1981, Project F-9-13, 22 (SW-I-A), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/f-9-13(22a)SW-I-A.pdf

Mills, M. J. 1981b. Alaska statewide sport fish harvest studies - 1980 data. Alaska Department of Fish and Game, Federal Aid in Fish Restoration and Anadromous Fish Studies, Annual Performance Report 1980-1981, Project F-9-13, 22 (SW-I-A), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/f-9-13(22b)SW-I-A.pdf

Mills, M. J. 1982. Alaska statewide sport fish harvest studies - 1981 data. Alaska Department of Fish and Game, Federal Aid in Fish Restoration and Anadromous Fish Studies, Annual Performance Report 1981-1982, Project F-9-14, 23 (SW-I-A), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/f-9-14(23)SW-I-A.pdf

Mills, M. J. 1983. Alaska statewide sport fish harvest studies - 1982 data. Alaska Department of Fish and Game, Federal Aid in Fish Restoration and Anadromous Fish Studies, Annual Performance Report 1982-1983, Project F-9-15, 24 (SW-I-A), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/f-9-15(24)SW-I-A.pdf

Mills, M. J. 1984. Alaska statewide sport fish harvest studies - 1983 data. Alaska Department of Fish and Game, Federal Aid in Fish Restoration and Anadromous Fish Studies, Annual Performance Report 1983-1984, Project F-9-16, 25 (SW-I-A), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/f-9-16(25)SW-I-A.pdf

Mills, M. J. 1985. Alaska statewide sport fish harvest studies - 1984 data. Alaska Department of Fish and Game, Federal Aid in Fish Restoration and Anadromous Fish Studies, Annual Performance Report 1984-1985, Project F-9-17, 26 (SW-I-A), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/f-9-17(26)SW-I-A.pdf

Mills, M. J. 1986. Alaska statewide sport fish harvest studies - 1985 data. Alaska Department of Fish and Game, Federal Aid in Fish Restoration and Anadromous Fish Studies, Annual Performance Report 1985-1986, Project F-10-1, 27 (RT-2), Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/f-10-1(27)RT-2.pdf

Mills, M. J. 1987. Alaska statewide sport fisheries harvest report, 1986. Alaska Department of Fish and Game, Fishery Data Series No. 2, Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds-002.pdf

Mills, M. J. 1988. Alaska statewide sport fisheries harvest report, 1987. Alaska Department of Fish and Game, Fishery Data Series No. 52, Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds-052.pdf

Mills, M. J. 1989. Alaska statewide sport fisheries harvest report, 1988. Alaska Department of Fish and Game, Fishery Data Series No. 122, Juneau. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds-122.pdf

Mills, M. J. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-44, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds90-44.pdf

Mills, M. J. 1991. Harvest, catch, and participation in Alaska sport fisheries during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-58, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds91-58.pdf

Mills, M. J. 1992. Harvest, catch, and participation in Alaska sport fisheries during 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-40, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds92-40.pdf

Mills, M. J. 1993. Harvest, catch, and participation in Alaska sport fisheries during 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-42, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds93-42.pdf

Mills, M. J. 1994. Harvest, catch, and participation in Alaska sport fisheries during 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-28, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds94-28.pdf

Mosher, K. H. 1969. Identification of Pacific salmon and steelhead trout by scale characteristics. U. S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Circular 317.

REFERENCES CITED (Continued)

Nelson, D. C. 1995. Area management report for the recreational fisheries of the Kenai Peninsula, 1994. Alaska Department of Fish and Game, Fishery Management Report No. 95-4, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fmr95-04.pdf

Starkey, D., C. Olito, and P. Hansen. 1999. Marking, enumeration, and size estimation for coho and Chinook salmon smolt releases into upper Cook Inlet and Resurrection Bay, Alaska in 1997. Alaska Department of Fish and Game, Fishery Data Series No. 99-1, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds99-01.pdf

Szarzi, N. 1998. Report on selected recreational salmon fisheries in the lower Cook Inlet Management Area, 1995-1997. A report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage.

Walker, R. J., C. Olnes, K. Sundet, A. L. Howe, and A. E. Bingham. 2003. Participation, catch, and harvest in Alaska sport fisheries during 2000. Alaska Department of Fish and Game, Fishery Data Series No. 03-05, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds03-05.pdf

Welander, A. D. 1940. A study of the development of the scale of Chinook salmon *Oncorhynchus tshawytscha*. Masters Thesis. University of Washington, Seattle.

APPENDIX A. SUMMARY OF NINILCHIK RIVER CHINOOK SALMON ASSESSMENT STATISTICS FOR 1999 AND 2000.

Appendix A1.-Daily and cumulative (Cum.) naturally-produced and hatchery Chinook salmon weir counts, 1999.

	Wild			Hatchery			Total		
Date	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion
5/17	0	0	0.000	0	0	0.000	0	0	0.000
5/18	0	0	0.000	0	0	0.000	0	0	0.000
5/19	0	0	0.000	0	0	0.000	0	0	0.000
5/20	0	0	0.000	0	0	0.000	0	0	0.000
5/21	0	0	0.000	0	0	0.000	0	0	0.000
5/22	0	0	0.000	0	0	0.000	0	0	0.000
5/23	0	0	0.000	0	0	0.000	0	0	0.000
5/24	0	0	0.000	0	0	0.000	0	0	0.000
5/25	0	0	0.000	0	0	0.000	0	0	0.000
5/26	0	0	0.000	0	0	0.000	0	0	0.000
5/27	0	0	0.000	0	0	0.000	0	0	0.000
5/28	0	0	0.000	0	0	0.000	0	0	0.000
5/29	0	0	0.000	0	0	0.000	0	0	0.000
5/30	0	0	0.000	0	0	0.000	0	0	0.000
5/31	6	6	0.004	0	0	0.000	6	6	0.003
6/01	0	6	0.004	0	0	0.000	0	6	0.003
6/02	0	6	0.004	0	0	0.000	0	6	0.003
6/03	2	8	0.005	0	0	0.000	2	8	0.004
6/04	10	18	0.011	0	0	0.000	10	18	0.008
6/05	17	35	0.022	0	0	0.000	17	35	0.016
6/06	30	65	0.040	0	0	0.000	30	65	0.029
6/07	9	74	0.046	0	0	0.000	9	74	0.033
6/08	3	77	0.048	0	0	0.000	3	77	0.035
6/09	0	77	0.048	0	0	0.000	0	77	0.035
6/10	1	78	0.048	0	0	0.000	1	78	0.035
6/11	3	81	0.050	0	0	0.000	3	81	0.037
6/12	0	81	0.050	0	0	0.000	0	81	0.037
6/13	0	81	0.050	0	0	0.000	0	81	0.037
6/14	0	81	0.050	0	0	0.000	0	81	0.037
6/15	0	81	0.050	0	0	0.000	0	81	0.037
6/16	1	82	0.051	0	0	0.000	1	82	0.037
6/17	0	82	0.051	0	0	0.000	0	82	0.037
6/18	0	82	0.051	0	0	0.000	0	82	0.037
6/19	1	83	0.051	0	0	0.000	1	83	0.037
6/20	0	83	0.051	0	0	0.000	0	83	0.037
6/21	0	83	0.051	0	0	0.000	0	83	0.037
6/22	0	83	0.051	0	0	0.000	0	83	0.037
6/23	3	86	0.053	0	0	0.000	3	86	0.039
6/24	5	91	0.056	0	0	0.000	5	91	0.041
6/25	3	94	0.058	0	0	0.000	3	94	0.042
6/26	4	98	0.061	0	0	0.000	4	98	0.044
6/27	3	101	0.063	0	0	0.000	3	101	0.046
6/28	18	119	0.074	0	0	0.000	18	119	0.054

-continued-

Appendix A1.-Page 2 of 3.

Date	Wild			Hatchery			Total		
	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion
6-29	16	135	0.084	1	1	0.002	17	136	0.061
6-30	14	149	0.092	0	1	0.002	14	150	0.068
7-01	51	200	0.124	4	5	0.008	55	205	0.093
7-02	15	215	0.133	1	6	0.010	16	221	0.100
7-03	14	229	0.142	0	6	0.010	14	235	0.106
7-04	122	351	0.218	12	18	0.030	134	369	0.167
7-05	136	487	0.302	6	24	0.040	142	511	0.231
7-06	52	539	0.334	0	24	0.040	52	563	0.254
7-07	45	584	0.362	1	25	0.041	46	609	0.275
7-08	19	603	0.374	1	26	0.043	20	629	0.284
7-09	40	643	0.399	4	30	0.050	44	673	0.304
7-10	37	680	0.422	4	34	0.056	41	714	0.322
7-11	30	710	0.440	2	36	0.060	32	746	0.337
7-12	38	748	0.464	7	43	0.071	45	791	0.357
7-13	59	807	0.500	6	49	0.081	65	856	0.386
7-14	20	827	0.513	3	52	0.086	23	879	0.397
7-15	117	944	0.585	12	64	0.106	129	1,008	0.455
7-16	49	993	0.616	10	74	0.123	59	1,067	0.481
7-17	25	1,018	0.631	7	81	0.134	32	1,099	0.496
7-18	16	1,034	0.641	9	90	0.149	25	1,124	0.507
7-19	102	1,136	0.704	39	129	0.214	141	1,265	0.571
7-20	85	1,221	0.757	33	162	0.269	118	1,383	0.624
7-21	45	1,266	0.785	29	191	0.317	74	1,457	0.657
7-22	25	1,291	0.800	24	215	0.357	49	1,506	0.680
7-23	22	1,313	0.814	21	236	0.391	43	1,549	0.699
7-24	70	1,383	0.857	66	302	0.501	136	1,685	0.760
7-25	66	1,449	0.898	61	363	0.602	127	1,812	0.818
7-26	40	1,489	0.923	48	411	0.682	88	1,900	0.857
7-27	18	1,507	0.934	29	440	0.730	47	1,947	0.879
7-28	16	1,523	0.944	20	460	0.763	36	1,983	0.895
7-29	12	1,535	0.952	17	477	0.791	29	2,012	0.908
7-30	22	1,557	0.965	33	510	0.846	55	2,067	0.933
7-31	9	1,566	0.971	11	521	0.864	20	2,087	0.942
8-01	3	1,569	0.973	6	527	0.874	9	2,096	0.946
8-02	12	1,581	0.980	10	537	0.891	22	2,118	0.956
8-03	7	1,588	0.985	12	549	0.910	19	2,137	0.964
8-04	10	1,598	0.991	11	560	0.929	21	2,158	0.974
8-05	1	1,599	0.991	15	575	0.954	16	2,174	0.981
8-06	10	1,609	0.998	18	593	0.983	28	2,202	0.994
8-07	1	1,610	0.998	1	594	0.985	2	2,204	0.995
8-08	0	1,610	0.998	0	594	0.985	0	2,204	0.995
8-09	0	1,610	0.998	0	594	0.985	0	2,204	0.995
8-10	0	1,610	0.998	0	594	0.985	0	2,204	0.995

-continued-

Appendix A1.-Page 3 of 3.

	Wild			Hatchery			Total		
Date	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion
8/11	3	1,613	1.000	9	603	1.000	12	2,216	1.000
8/12	0	1,613	1.000	0	603	1.000	0	2,216	1.000
8/13	0	1,613	1.000	0	603	1.000	0	2,216	1.000
Total	1,613			603			2,216		

Note: The weir was removed 8/13/99.

Appendix A2.-Daily and cumulative (Cum.) naturally-produced and hatchery Chinook salmon weir counts, 2000.

	Wild			Hatchery			Total		
Date	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion
5-17	0	0	0.000	0	0	0.000	0	0	0.000
5-18	0	0	0.000	0	0	0.000	0	0	0.000
5-19	0	0	0.000	0	0	0.000	0	0	0.000
5-20	1	1	0.001	0	0	0.000	1	1	0.000
5-21	0	1	0.001	0	0	0.000	0	1	0.000
5-22	0	1	0.001	0	0	0.000	0	1	0.000
5-23	1	2	0.001	0	0	0.000	1	2	0.001
5-24	1	3	0.002	0	0	0.000	1	3	0.001
5-25	0	3	0.002	0	0	0.000	0	3	0.001
5-26	0	3	0.002	0	0	0.000	0	3	0.001
5-27	0	3	0.002	0	0	0.000	0	3	0.001
5-28	2	5	0.003	0	0	0.000	2	5	0.002
5-29	15	20	0.012	0	0	0.000	15	20	0.008
5-30	2	22	0.013	0	0	0.000	2	22	0.009
5-31	0	22	0.013	1	1	0.001	1	23	0.009
6-01	0	22	0.013	0	1	0.001	0	23	0.009
6-02	2	24	0.015	0	1	0.001	2	25	0.010
6-03	0	24	0.015	0	1	0.001	0	25	0.010
6-04	15	39	0.024	1	2	0.002	16	41	0.016
6-05	14	53	0.032	0	2	0.002	14	55	0.022
6-06	10	63	0.039	0	2	0.002	10	65	0.026
6-07	5	68	0.042	0	2	0.002	5	70	0.028
6-08	0	68	0.042	0	2	0.002	0	70	0.028
6-09	2	70	0.043	0	2	0.002	2	72	0.029
6-10	0	70	0.043	0	2	0.002	0	72	0.029
6-11	0	70	0.043	0	2	0.002	0	72	0.029
6-12	0	70	0.043	0	2	0.002	0	72	0.029
6-13	0	70	0.043	0	2	0.002	0	72	0.029
6-14	0	70	0.043	0	2	0.002	0	72	0.029
6-15	0	70	0.043	0	2	0.002	0	72	0.029
6-16	0	70	0.043	0	2	0.002	0	72	0.029
6-17	0	70	0.043	0	2	0.002	0	72	0.029
6-18	0	70	0.043	0	2	0.002	0	72	0.029
6-19	0	70	0.043	0	2	0.002	0	72	0.029
6-20	0	70	0.043	0	2	0.002	0	72	0.029
6-21	0	70	0.043	0	2	0.002	0	72	0.029
6-22	0	70	0.043	1	3	0.004	1	73	0.029
6-23	8	78	0.048	0	3	0.004	8	81	0.033
6-24	4	82	0.050	0	3	0.004	4	85	0.034
6-25	8	90	0.055	0	3	0.004	8	93	0.037
6-26	8	98	0.060	0	3	0.004	8	101	0.041
6-27	18	116	0.071	2	5	0.006	20	121	0.049
6-28	36	152	0.093	2	7	0.008	38	159	0.064

-continued

Appendix A2.-Page 2 of 2.

	Wild			Hatchery			Total		
Date	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion	Daily Count	Cum. Count	Cum. Proportion
6-29	52	204	0.125	2	9	0.011	54	213	0.086
6-30	30	234	0.143	3	12	0.014	33	246	0.099
7-01	6	240	0.147	0	12	0.014	6	252	0.101
7-02	9	249	0.152	0	12	0.014	9	261	0.105
7-03	20	269	0.165	1	13	0.015	21	282	0.113
7-04	19	288	0.176	3	16	0.019	22	304	0.122
7-05	95	383	0.234	14	30	0.035	109	413	0.166
7-06	111	494	0.302	18	48	0.056	129	542	0.218
7-07	13	507	0.310	4	52	0.061	17	559	0.225
7-08	2	509	0.312	0	52	0.061	2	561	0.226
7-09	0	509	0.312	1	53	0.062	1	562	0.226
7-10	14	523	0.320	3	56	0.066	17	579	0.233
7-11	60	583	0.357	3	59	0.069	63	642	0.258
7-12	234	817	0.500	44	103	0.121	278	920	0.370
7-13	126	943	0.577	41	144	0.169	167	1,087	0.437
7-14	2	945	0.578	0	144	0.169	2	1,089	0.438
7-15	0	945	0.578	0	144	0.169	0	1,089	0.438
7-16	1	946	0.579	1	145	0.170	2	1,091	0.439
7-17	67	1,013	0.620	24	169	0.198	91	1,182	0.475
7-18	66	1,079	0.660	54	223	0.261	120	1,302	0.524
7-19	76	1,155	0.707	66	289	0.339	142	1,444	0.581
7-20	6	1,161	0.711	4	293	0.343	10	1,454	0.585
7-21	28	1,189	0.728	16	309	0.362	44	1,498	0.602
7-22	54	1,243	0.761	49	358	0.420	103	1,601	0.644
7-23	33	1,276	0.781	32	390	0.457	65	1,666	0.670
7-24	65	1,341	0.821	88	478	0.560	153	1,819	0.731
7-25	72	1,413	0.865	86	564	0.661	158	1,977	0.795
7-26	72	1,485	0.909	72	636	0.746	144	2,121	0.853
7-27	36	1,521	0.931	67	703	0.824	103	2,224	0.894
7-28	28	1,549	0.948	40	743	0.871	68	2,292	0.922
7-29	34	1,583	0.969	31	774	0.907	65	2,357	0.948
7-30	4	1,587	0.971	20	794	0.931	24	2,381	0.957
7-31	8	1,595	0.976	4	798	0.936	12	2,393	0.962
8-01	10	1,605	0.982	17	815	0.955	27	2,420	0.973
8-02	5	1,610	0.985	9	824	0.966	14	2,434	0.979
8-03	17	1,627	0.996	18	842	0.987	35	2,469	0.993
8-04	5	1,632	0.999	7	849	0.995	12	2,481	0.998
8-05	1	1,633	0.999	1	850	0.996	2	2,483	0.998
8-06	1	1,634	1.000	2	852	0.999	3	2,486	1.000
8-07	0	1,634	1.000	0	852	0.999	0	2,486	1.000
8-08	0	1,634	1.000	1	853	1.000	1	2,487	1.000
Total	1634			853			2487		

Note: The weir was removed 8/8/00.

Appendix A3.-Summary of Chinook salmon coded wire tag recoveries, 1999.

Sample #	Date Recovered	Head Number	Tag Code	Brood Year	Actual Age[a] Fresh	Actual Age[a] Ocean	Scale Age[b] Fresh	Scale Age[b] Ocean	Sex	Length	Rearing Code and Location	Release Date	Release Site
Return sampled at weir													
99DE2049	7-04	83888	312608	1996	0	2	R	2	F	666	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2049	7-04	83889	312608	1996	0	2	0	2	M	603	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2050	7-05	83890	312608	1996	0	2	R	2	M	613	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2058	7-13	83892	312608	1996	0	2	R		M	668	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2060	7-15	83893	312515	1995	0	3	0	3	M	812	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2062	7-17	83894	312608	1996	0	2	0	2	M	604	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2064	7-19	83895	312515	1995	0	3	0	3	M	751	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2064	7-19	83896	312608	1996	0	2	0	2	M	619	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2064	7-19	83897	312608	1996	0	2	0	2	M	633	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2065	7-20	83898	312608	1996	0	2	0	2	M	605	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2065	7-20	83899	312608	1996	0	2	0	2	M	643	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2065	7-20	83900	312608	1996	0	2	0	2	M	584	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2066	7-21	83918	312608	1996	0	2	0	2	M	580	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2067	7-22	83919	312608	1996	0	2	R	2	M	709	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2067	7-22	83920	312608	1996	0	2	0	2	M	600	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2068	7-23	83921	312608	1996	0	2	0	2	M	646	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2069	7-24	83922	312608	1996	0	2	0	2	M	623	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2069	7-24	83923	312608	1996	0	2	0	2	M	604	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2069	7-24	83924	312608	1996	0	2	0	2	M	693	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2069	7-24	83925	312608	1996	0	2	0	2	M	596	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2069	7-24	83926	312635	1997	0	1	0	1	M	359	Fort Richardson	6-15-98	Ninilchik R 244-20
99DE2070	7-25	83927	312608	1996	0	2	0	2	M	699	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2070	7-25	83928	312515	1995	0	3	R		M	732	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2070	7-25	83929	312515	1995	0	3	1	3	F	747	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2070	7-25	83930	312515	1995	0	3	0	3	M	798	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2071	7-26	83931	312608	1996	0	2	0	2	M	683	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2071	7-26	83932	312515	1995	0	3	R	3	F	751	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2071	7-26	83933	312608	1996	0	2	0	2	M	623	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2072	7-27	83944	312435	1994	0	4	R	4	F	834	Fort Richardson	5-31-95	Ninilchik R 244-20

-continued-

Appendix A3.-Page 2 of 3.

Sample #	Date Recovered	Head Number	Tag Code	Brood Year	Actual Age[a] Fresh	Actual Age[a] Ocean	Scale Age[b] Fresh	Scale Age[b] Ocean	Sex	Length	Rearing Code and Location	Release Date	Release Site
99DE2072	7-27	83945	312435	1994	0	4	R	4	F	819	Fort Richardson	5-31-95	Ninilchik R 244-20
99DE2074	7-28	83946	312608	1996	0	2	1	3	M	790	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2074	7-28	83947	312608	1996	0	2	0	2	M	670	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2075	7-29	83948	312515	1995	0	3	0	3	F	755	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2076	7-30	83949	312515	1995	0	3	R		M	730	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2076	7-30	83950	312608	1996	0	2	0	2	M	580	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2077	7-31	85365	312515	1995	0	3	R		F	739	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2078	8-01	85366	312608	1996	0	2	0	2	M	627	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2080	8-03	85367	312515	1995	0	3	0	3	F	701	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2081	8-04	85368	312608	1996	0	2	0	2	M	610	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2082	8-05	85369	312608	1996	0	2	0	2	M	613	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2083	8-06	85370	312635	1997	0	1	0	2	F	474	Fort Richardson	6-15-98	Ninilchik R 244-20
99DE2088	8-11	85371	312515	1995	0	3	0	3	F	726	Fort Richardson	6-13-96	Ninilchik R 244-20
Egg-take samples													
99DE2090	7-21	83902	312515	1995	0	3	0	3	F	774	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83903	312515	1995	0	3	0	3	F	764	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83904	312515	1995	0	3	0	3	F	780	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83905	312515	1995	0	3	0	3	F	780	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83906	312515	1995	0	3	1	3	F	822	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83907	312435	1994	0	4	0	4	F	885	Fort Richardson	5-31-95	Ninilchik R 244-20
99DE2090	7-21	83908	312435	1994	0	4	0	4	F	880	Fort Richardson	5-31-95	Ninilchik R 244-20
99DE2090	7-21	83909	312515	1995	0	3	0	3	F	782	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83910	312515	1995	0	3	0	3	F	787	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83911	312515	1995	0	3	0	3	F	760	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83912	312515	1995	0	3	0	3	F	788	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83913	312608	1996	0	2	0	3	M	550	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2090	7-21	83914	312515	1995	0	3	0	3	F	771	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83915	312515	1995	0	3	0	3	F	695	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2090	7-21	83916	312515	1995	0	3	0	3	F	747	Fort Richardson	6-13-96	Ninilchik R 244-20

-continued-

Appendix A3.-Page 3 of 3.

Sample #	Date Recovered	Head Number	Tag Code	Brood Year	Actual Age[a] Fresh	Actual Age[a] Ocean	Scale Age[b] Fresh	Scale Age[b] Ocean	Sex	Length	Rearing Code and Location	Release Date	Release Site
99DE2090	7-21	83917	312515	1995	0	3	0	3	F	800	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2073	7-27	83934	312515	1995	0	3	1	3	F	790	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2073	7-27	83935	312435	1994	0	4	0	3	F	790	Fort Richardson	5-31-95	Ninilchik R 244-20
99DE2073	7-27	83936	312515	1995	0	3	0	3	F	798	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2073	7-27	83937	312435	1994	0	4	0	3	F	808	Fort Richardson	5-31-95	Ninilchik R 244-20
99DE2073	7-27	83938	312515	1995	0	3	0	3	F	757	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2073	7-27	83939	312515	1995	0	3	0	3	F	731	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2073	7-27	83940	312608	1996	0	2	0	3	F	680	Fort Richardson	6-17-97	Ninilchik R 244-20
99DE2073	7-27	83941	312515	1995	0	3	0	2	F	731	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2073	7-27	83942	312515	1995	0	3	R		F	813	Fort Richardson	6-13-96	Ninilchik R 244-20
99DE2073	7-27	83943	312515	1995	0	3	0	3	F	756	Fort Richardson	6-13-96	Ninilchik R 244-20

[a] Actual fresh and ocean age was determined by comparing brood year, year of release, and year of recovery.

[b] Scale age is the estimated fresh and ocean age determined from scale samples. R = regenerated, denotes fish that could not be aged. Not all fish were sampled for age.

Appendix A4.-Summary of Chinook salmon coded wire tag recoveries, 2000.

Sample #	Date Recovered	Head Number	Tag Code	Brood Year	Actual Age[a] Fresh	Actual Age[a] Ocean	Scale Age[b] Fresh	Scale Age[b] Ocean	Sex	Length	Rearing Code and Location	Release Date	Release Site
Return sampled at weir													
00DE2044	6-29	75428	312608	1996	0	3	1	4	F	674	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2049	7-04	75429	312608	1996	0	3	1	3	M	767	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2050	7-05	75430	312608	1996	0	3	R	3	M	840	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2051	7-06	75431	312635	1997	0	2	0	2	M	690	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2051	7-06	75432	312635	1997	0	2	R		M	607	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2051	7-06	75433	312608	1996	0	3	0	3	F	723	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2055	7-10	75434	312608	1996	0	3	0	3	F	720	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2057	7-12	75435	312635	1997	0	2	1	2	M	835	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2057	7-12	75436	312608	1996	0	3	1	3	F	766	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2057	7-12	75437	312629	1997	0	2	R		M	614	Elmendorf	6-04-98	Crooked Cr 244-30
00DE2057	7-12	75439	NO TAG				R	2	M	587			
00DE2057	7-12	75440	312608	1996	0	3	R	3	F	796	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2057	7-12	75441	312608	1996	0	3	0	3	M	780	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2057	7-12	75442	312635	1997	0	2	0	2	M	610	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2058	7-13	75472	312635	1997	0	2	1	2	M	668	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2058	7-13	75473	312608	1996	0	3	1	3	F	735	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2058	7-13	75474	312608	1996	0	3	0	3	F	777	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2058	7-13	75475	312635	1997	0	2	R		M	674	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2058	7-13	75476	312608	1996	0	3	R		F	661	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2062	7-17	75477	310147	1998	0	1			F	324	Fort Richardson	6-15-99	Ninilchik R 244-20
00DE2062	7-17	75478	310147	1998	0	1	R	1	F	335	Fort Richardson	6-15-99	Ninilchik R 244-20
00DE2062	7-17	75479	312608	1996	0	3	0	3	M	764	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2063	7-18	75480	312635	1997	0	2	R		M	737	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2063	7-18	75481	312608	1996	0	3	R	3	F	815	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2063	7-18	75482	312608	1996	0	3	1	3	M	820	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2063	7-18	75483	NO TAG				0	3	M	771			
00DE2063	7-18	75484	312608	1996	0	3	R	3	F	794	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2063	7-18	75485	312608	1996	0	3	R		F	754	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2063	7-18	75486	312608	1996	0	3	R		M	726	Fort Richardson	6-17-97	Ninilchik R 244-20

-continued-

Appendix A4.-Page 2 of 6.

Sample #	Date Recovered	Head Number	Tag Code	Brood Year	Actual Age[a] Fresh	Actual Age[a] Ocean	Scale Age[b] Fresh	Scale Age[b] Ocean	Sex	Length	Rearing Code and Location	Release Date	Release Site
00DE2064	7-14	75487	312608	1996	0	3	1	3	F	790	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2064	7-14	75488	312608	1996	0	3	1	3	F	861	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2064	7-14	75489	312608	1996	0	3	1	3	F	760	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2064	7-14	75490	312608	1996	0	3	1	3	M	754	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2064	7-14	75491	312635	1997	0	2	1	3	M	620	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2064	7-14	75492	312635	1997	0	2	R		M	637	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2064	7-14	75493	312608	1996	0	3	1	3	F	756	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2064	7-14	75494	312635	1997	0	2	1	2	M	628	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2066	7-21	75495	312608	1996	0	3	1	4	F	780	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2066	7-21	75496	312608	1996	0	3	1	4	F	800	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2067	7-22	75497	312608	1996	0	3	1	3	F	750	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2067	7-22	75498	312608	1996	0	3	1	3	F	690	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2067	7-22	75499	312608	1996	0	3	0	3	F	740	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2067	7-22	75500	312635	1997	0	2	1	2	M	800	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2065	7-20	77052	312608	1996	0	3	0	3	F	775	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2067	7-22	77053	312608	1996	0	3	0	3	F	720	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2067	7-22	77054	312635	1997	0	2	0	2	M	600	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2068	7-23	77055	312635	1997	0	2	0	2	M	530	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2068	7-23	77056	312515	1995	0	4	R		F	800	Fort Richardson	6-13-96	Ninilchik R 244-20
00DE2068	7-23	77057	312608	1996	0	3	0	4	M	780	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2068	7-23	77058	312635	1997	0	2	R		M	580	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2069	7-24	77059	312608	1996	0	3	0	3	M	790	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2069	7-24	77060	312608	1996	0	3	R	4	F	770	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2069	7-24	77061	312635	1997	0	2	R	2	M	740	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2069	7-24	77062	312608	1996	0	3	R		F	720	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2069	7-24	77063	312608	1996	0	3	R		M	794	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2069	7-24	77064	312608	1996	0	3			F	785	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2069	7-24	77065	312635	1997	0	2			M	618	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2069	7-24	77066	312608	1996	0	3			M	747	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2069	7-24	77067	312608	1996	0	3	0	3	F	752	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2069	7-24	77068	312608	1996	0	3	0	3	F	780	Fort Richardson	6-17-97	Ninilchik R 244-20

-continued-

Appendix A4.-Page 3 of 6.

Sample #	Date Recovered	Head Number	Tag Code	Brood Year	Actual Age[a] Fresh	Actual Age[a] Ocean	Scale Age[b] Fresh	Scale Age[b] Ocean	Sex	Length	Rearing Code and Location	Release Date	Release Site
00DE2069	7-24	77069	312635	1997	0	2			M	620	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2069	7-24	77070	312635	1997	0	2			M	580	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2070	7-25	77071	312608	1996	0	3	1	3	F	764	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2070	7-25	77072	312608	1996	0	3	R	3	M	850	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2070	7-25	77073	312608	1996	0	3	1	4	F	819	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2070	7-25	77074	312635	1997	0	2	0	2	M	574	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2070	7-25	77075	312608	1996	0	3	R	3	F	771	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2070	7-25	77076	312608	1996	0	3	0	3	F	734	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2070	7-25	77077	312608	1996	0	3	1	3	F	724	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2070	7-25	77078	312608	1996	0	3	R		M	764	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2070	7-25	77079	312608	1996	0	3	1	3	M	750	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2070	7-25	77080	312608	1996	0	3			F	750	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2070	7-25	77081	312608	1996	0	3	R	3	F	760	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2071	7-26	77082	312608	1996	0	3	R		M	778	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2071	7-26	77083	310147	1998	0	1	0	1	M	409	Fort Richardson	6-15-99	Ninilchik R 244-20
00DE2071	7-26	77084	312608	1996	0	3	R	3	F	725	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2071	7-26	77085	312608	1996	0	3	R		M	768	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2071	7-26	77086	312608	1996	0	3	R	3	M	775	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2071	7-26	77087	312635	1997	0	2	R		M	693	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2071	7-26	77088	312608	1996	0	3	R		F	771	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2071	7-26	77089	312608	1996	0	3	0	3	F	729	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2072	7-27	77090	312608	1996	0	3	1	3	F	721	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2072	7-27	77091	312608	1996	0	3	R		F	810	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2072	7-27	77092	312608	1996	0	3	0	3	F	786	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2072	7-27	77093	312608	1996	0	3	R		F	754	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2072	7-27	77094	312608	1996	0	3	R	3	F	760	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2072	7-27	77095	312635	1997	0	2	0	2	M	640	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2072	7-27	77096	312608	1996	0	3	0	3	F	767	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2072	7-27	77097	312608	1996	0	3	1	3	F	777	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2074	7-28	77249	312608	1996	0	3	R		M	815	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2074	7-28	77250	312608	1996	0	3	1	3	M	792	Fort Richardson	6-17-97	Ninilchik R 244-20

-continued-

Appendix A4.-Page 4 of 6.

Sample #	Date Recovered	Head Number	Tag Code	Brood Year	Actual Age[a] Fresh	Actual Age[a] Ocean	Scale Age[b] Fresh	Scale Age[b] Ocean	Sex	Length	Rearing Code and Location	Release Date	Release Site
00DE2074	7-28	77793	312608	1996	0	3	1	3	F	802	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2074	7-28	77794	312608	1996	0	3	R		M	827	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2074	7-28	77795	312608	1996	0	3	0	3	F	807	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2075	7-29	77796	312608	1996	0	3	R		F	730	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2075	7-29	77797	312608	1996	0	3	1	4	F	831	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2075	7-29	77798	312608	1996	0	3	1	3	F	766	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2075	7-29	77799	312608	1996	0	3			F	812	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2076	7-30	77800	312608	1996	0	3	1	3	F	780	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2071	7-26	78202	312608	1996	0	3	1	4	F	820	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2076	7-30	85768	312608	1996	0	3	R		F	810	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2077	7-31	85769	312608	1996	0	3	1	3	F	835	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2078	8-01	85770	312635	1997	0	2	0	2	M	638	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2078	8-01	85771	312635	1997	0	2	0	2	M	642	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2079	8-02	85772	312635	1997	0	2				764	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2080	8-03	85773	312608	1996	0	3	R	3	F	766	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2080	8-03	85774	312608	1996	0	3	0	3	M	822	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2081	8-04	85775	310147	1998	0	1	0	1	M	374	Fort Richardson	6-15-99	Ninilchik R 244-20
00DE2081	8-04	85776	312635	1997	0	2	R	2	M	602	Fort Richardson	6-15-98	Ninilchik R 244-20
Egg-take samples													
00DE2073	7-28	78247	312515	1995	0	4			F	835	Fort Richardson	6-13-96	Ninilchik R 244-20
00DE2073	7-28	78250	312608	1996	0	3			F	682	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78203	312608	1996	0	3			F	708	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78225	312608	1996	0	3			F	714	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78236	312608	1996	0	3			F	716	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78211	312608	1996	0	3			F	720	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78234	312608	1996	0	3			F	722	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78204	312608	1996	0	3			F	732	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78209	312608	1996	0	3			F	744	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78249	312608	1996	0	3			F	745	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77784	312608	1996	0	3			F	746	Fort Richardson	6-17-97	Ninilchik R 244-20

-continued-

Appendix A4.-Page 5 of 6.

Sample #	Date Recovered	Head Number	Tag Code	Brood Year	Actual Age[a] Fresh	Actual Age[a] Ocean	Scale Age[b] Fresh	Scale Age[b] Ocean	Sex	Length	Rearing Code and Location	Release Date	Release Site
00DE2073	7-28	78235	312608	1996	0	3			F	746	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78242	312608	1996	0	3			F	748	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78238	312608	1996	0	3			F	749	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77788	312608	1996	0	3			F	752	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78218	312608	1996	0	3			F	753	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78230	312608	1996	0	3			F	755	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78229	312608	1996	0	3			F	762	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78233	312608	1996	0	3			F	764	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77786	312608	1996	0	3			F	765	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78227	312608	1996	0	3			F	767	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78214	312608	1996	0	3			F	770	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78220	312608	1996	0	3			F	770	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77785	312608	1996	0	3			F	772	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77098	312608	1996	0	3			F	776	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78215	312608	1996	0	3			F	778	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78208	312608	1996	0	3			F	779	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77791	312608	1996	0	3			F	780	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78222	312608	1996	0	3			F	780	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78205	312608	1996	0	3			F	784	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78223	312608	1996	0	3			F	786	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78232	312608	1996	0	3			F	789	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78212	312608	1996	0	3			F	790	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78231	312608	1996	0	3			F	790	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78219	312608	1996	0	3			F	795	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78240	312608	1996	0	3			F	799	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78226	312608	1996	0	3			F	801	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77100	312608	1996	0	3			F	804	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78207	312608	1996	0	3			F	806	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78241	312608	1996	0	3			F	806	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78243	312608	1996	0	3			F	806	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78246	312608	1996	0	3			F	807	Fort Richardson	6-17-97	Ninilchik R 244-20

-continued-

Appendix A4.-Page 6 of 6.

Sample #	Date Recovered	Head Number	Tag Code	Brood Year	Actual Age[a] Fresh	Actual Age[a] Ocean	Scale Age[b] Fresh	Scale Age[b] Ocean	Sex	Length	Rearing Code and Location	Release Date	Release Site
00DE2073	7-28	78216	312608	1996	0	3			F	808	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78237	312608	1996	0	3			F	830	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77783	312608	1996	0	3			F	839	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77789	312608	1996	0	3			F	839	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77790	312608	1996	0	3			F	840	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78206	312608	1996	0	3			F	846	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78239	312608	1996	0	3			F	846	Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	77099	312608	1996	0	3			F		Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78210	312608	1996	0	3			F		Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78228	312608	1996	0	3			F		Fort Richardson	6-17-97	Ninilchik R 244-20
00DE2073	7-28	78221	312635	1997	0	2			F	544	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2073	7-28	78245	312635	1997	0	2			F	618	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2073	7-28	77792	312635	1997	0	2			F	621	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2073	7-28	78248	312635	1997	0	2			F	671	Fort Richardson	6-15-98	Ninilchik R 244-20
00DE2073	7-28	78244	NO TAG						F	601			
00DE2073	7-28	77787	NO TAG						F	724			
00DE2073	7-28	78224	NO TAG						F	787			
00DE2073	7-28	78217	NO TAG						F	842			

[a] Actual fresh and ocean age was determined by comparing brood year, year of release, and year of recovery.

[b] Scale age is the estimated fresh and ocean age determined from scale samples. R = regenerated, denotes fish that could not be aged. Not all fish were sampled for age.

Appendix A5.-Summary of samples from Chinook salmon sacrificed at Ninilchik River, 1999 and 2000.

	Wild Fish Ocean Age					Hatchery Fish Ocean Age				
	1	2	3	4	Total	1	2	3	4	Total
1999										
Females										
Number sampled	0	1	35	20	56	0	3	23	6	32
Mean Length		681	805	847	818		689	763	855	767
SE Mean Length			9	8	8		21	7	17	9
Males										
Number sampled	0	1	2	2	5	1	25	7	0	33
Mean Length		562	870	900	801	358	626	788		639
SE Mean Length			6		80		8	13		16
All										
Number sampled	0	2	37	22	61	1	28	30	6	65
Mean Length		622	809	850	816	358	633	766	855	708
SE Mean Length		60	9	8	9		8	6	17	12
2000										
Females										
Number sampled	0	0	47	25	72	1	4	88	9	102
Mean Length			774	831	792	335	689	763	855	676
SE Mean Length			5	8	5		21	7	17	9
Males										
Number sampled	0	0	0	0	0	2	15	14	1	32
Mean Length						358	626	788	835	639
SE Mean Length						4	8	13		16
All										
Number sampled	0	0	47	25	72	3	19	102	10	134
Mean Length			774	831	792	358	633	766	855	708
SE Mean Length			5	8	5		8	6	17	12

APPENDIX B. DATA FILES

Appendix B1.-Computer data files and analysis programs developed for the 1999 and 2000 Ninilchik River Chinook salmon assessment project.

File	Description	Location
1999		
P001600B011999.DTA	Weir data ASCII (DTA) file format. Mark sense form AWL version 1.1. Wild unmarked fish.	RTS Anchorage
P001600B021999.DTA	Weir data ASCII (DTA) file format. Mark sense form AWL version 1.1. Marked hatchery fish.	RTS Anchorage
P001600B031999.DTA	Weir data ASCII (DTA) file format. Mark sense form AWL version 1.1. Egg-take wild fish.	RTS Anchorage
P001600B041999.DTA	Weir data ASCII (DTA) file format. Mark sense form AWL version 1.1. Egg-take hatchery fish.	RTS Anchorage
P001600B051999.DTA	Weir data ASCII (DTA) file format. Mark sense form AWL version 1.1. Mark-Recapture hatchery fish.	RTS Anchorage
P001600B061999.DTA	Weir data ASCII (DTA) file format. Mark sense form AWL version 1.1. Mark-Recapture wild fish.	RTS Anchorage
NinilchikRB1999.Zip	Zip File containing the five files listed below for 1999.	Homer Office of the Alaska Department of Fish and Game.
Ninweir99.prn	Text file containing all of the above listed ASCII files.	
Ninkng.SAS	SAS program created to analyze Ninweir99.prn all AWL ASCII (DTA) files.	
Ninwkngcomp.XLS	Excel spreadsheet created to calculate age composition of wild and hatchery Chinook salmon escapements at the Ninilchik River 1999.	
NRWAFC1999.XLS	Excel spreadsheet created from tag-lab query to produce listing report of coded wire tagged Chinook salmon sacrificed at Ninilchik River, 1999.	
Ninweircount.XLS	Excel spreadsheet created to produce daily count summary of Chinook salmon passage at Ninilchik River weir, 1999.	
2000		
P0000600B012000.DTA	Weir data ASCII (DTA) file format. Mark sense form AWL version 1.1. All Chinook salmon sampled at the Ninilchik River weir, 2000.	RTS Anchorage
P0000600B052000.DTA	Sport harvest data ASCII (DTA) file format. Mark sense form AWL version 1.1. All Chinook salmon sampled for the presence of an adipose fin during the 2000 Ninilchik River Chinook salmon fishery.	RTS Anchorage
NinilchikRB2000.Zip	Zip File containing the five files listed below for 2000.	Homer Office of the Alaska Department of Fish and Game
Ninkng00.SAS	SAS program to analyze P0000600B012000.DTA,	
Nrkgsf00.SAS	SAS program to analyze P0000600B052000.DTA, 2000	
Ninwkngcomp00	Excel spreadsheet created to calculate age composition of wild and hatchery Chinook salmon escapements at the Ninilchik River 2000.	
NRWAFC2000.XLS	Excel spreadsheet created from tag-lab query to produce listing report of coded wire tagged Chinook salmon sacrificed at Ninilchik River, 2000.	
Ninweircount.XLS	Excel spreadsheet created to produce daily count summary of Chinook salmon passage at Ninilchik River weir, 2000.	