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Ninilchik River Chinook Salmon Stock Assessment and Supplementation, 2007

by

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and

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November 2011

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

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
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)

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

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ABSTRACT

In 2007, the total number of Chinook salmon counted at the Ninilchik River weir was 762, of which 679 were wild and 83 were hatchery-reared. The wild Chinook salmon escapement corresponding to the Sustainable Escapement Goal (SEG) index monitoring period (July 3 through July 31) was 543. The median run timing date during the SEG monitoring period for the wild component was 4 days earlier than hatchery-reared component at the weir site. Overall, ocean age 3 was the dominant age class for both wild and hatchery-reared Chinook salmon. Overall, 14% of the Chinook salmon observed during the weekly beach seine surveys were hatchery-reared. Approximately 565,000 Chinook salmon eggs were collected from 92 females. Egg survival to the eyed stage was 87.9%. Sixteen coded wire tags were decoded from 18 Chinook salmon that were collected during egg takes and all originated from the Ninilchik River. The average travel rate to the weir of floy-tagged Chinook salmon released during the July 5 and 11 beach seine surveys was 0.53 river kilometers per day. The Ninilchik River Chinook salmon supplementation program has provided important sport fishing opportunities on the Ninilchik River and terminal saltwater fisheries. Continuation of the Chinook salmon assessment at Ninilchik River weir is recommended to ensure that adequate escapement of wild Chinook salmon is maintained.

Key words: Chinook salmon, *Oncorhynchus tshawytscha*, Ninilchik River, wild, hatchery-reared, supplementation, enhancement, run, escapement, weir, adipose finclip, coded wire tag.

INTRODUCTION

Ninilchik River is located on the Kenai Peninsula in the Lower Cook Inlet management area (LCIMA) (Figure 1). It is a small (anadromous stream length 81 river kilometers [RKM]), non-glacial, anadromous stream with extensive wetlands (122 km^2), and no large tributary lakes (Table 1). There are only three road accessible streams in the LCIMA that support Chinook salmon *Onchorhynchus tshawytscha* sport fisheries: Ninilchik River, Anchor River, and Deep Creek. Angler effort is focused on Ninilchik River earlier in the season because water conditions are generally less turbid. Sport anglers are capable of harvesting a significant portion of the Ninilchik River Chinook salmon run because of its small stream size. From 1999 through 2006, the average annual harvest estimate of Ninilchik River Chinook salmon has been about 1,400 fish (Table 2).

In the mid 1980s, the Alaska Department of Fish and Game (ADF&G) Division of Sport Fish (SF) recognized that Ninilchik River Chinook salmon stock was vulnerable to overharvest from the growing Kenai Peninsula sport fishery. In 1987, SF initiated a supplementation program for the Ninilchik River as a way to create sustainable fishing opportunities through stocking hatchery-reared Chinook salmon smolt (Table 3). As a result of the supplementation program, two groups of Chinook salmon (wild and hatchery-reared) now return to the Ninilchik River, which has added an additional level of complexity to the management of escapement and harvest of Ninilchik River Chinook salmon.

The following sections summarize the supplementation program and escapement monitoring, the tools used to evaluate the sport harvest of hatchery-reared fish, and management strategies (for a more thorough review see Kerkvliet and Booz 2010).

SUPPLEMENTATION

The annual supplementation of Chinook salmon for Ninilchik River has remained essentially unchanged since 1995 when stocking levels were reduced to 50,000 smolt (from approximately 200,000 smolt) with 100% of the smolt adipose-clipped and coded-wire-tagged (CWT; Appendix A1).

Since 1988, broodstock collection and egg takes were conducted at a broodstock weir located at Brody Road bridge (7.7 RKM) during the month of July and early August (Figure 2). Only the progeny from wild Chinook salmon broodstock are used for Ninilchik River stockings. From 1988 through 2002, Chinook salmon smolt were stocked as age-0 fish. Since 2003, due to limited hatchery rearing facilities, all stocked Chinook salmon have been overwintered in the hatchery as parr and released in the spring as age-1 smolt. Starting in 1994, additional broodstock from the Ninilchik River was collected to support stocking at the terminal saltwater fisheries in Kachemak Bay at Nick Dudiak Fishing Lagoon on Homer Spit (NDFL; Table 4), Halibut Cove Lagoon (Table 5) and Seldovia Bay (Table 6). A combination of both wild and hatchery-reared Chinook salmon are used as broodstock for the terminal saltwater fisheries.

ESCAPEMENT MONITORING

ADF&G has monitored Chinook salmon escapement in Ninilchik River since 1962 (Appendix A2). Starting in 1999, all hatchery-reared Chinook salmon returning to Ninilchik River were adipose-clipped and coded-wire-tagged. Since then, all weir counts of wild and hatchery-reared Chinook salmon have been differentiated by examining all Chinook salmon at the weir for the presence or absence of an adipose fin. Currently, escapement is monitored at the broodstock weir during an index monitoring period and not over the entire run (Table 7). The Chinook salmon escapement is calculated by removing the holding and egg-take mortalities from the Chinook salmon weir count. During the years 1999–2005, an average of 41% of the total wild Chinook salmon weir escapement was counted during the July 8–24 index monitoring period (Table 8). However, the weir escapement during the index monitoring period does not account for spawning below the weir which may consist of approximately 35% of the total spawning escapement based on aerial survey data (Marsh *unpublished*[1]).

ESCAPEMENT GOAL

In 2007, SF established a new wild Chinook salmon sustainable escapement goal (SEG) for the Ninilchik River. The new 2007 SEG is a range of 550–1,300 fish during a new index monitoring period (July 3–31 vs. July 8–24). This SEG was calculated using the percentile method developed in Bue and Hasbrouck *unpublished*[2], and is based on the wild escapement above the weir during the new 2007 SEG period from 1999 through 2007 (Otis and Szarzi 2007). The new 2007 goal replaced the 2001–2006 SEG that was based on weir counts from 1994 through 2000 (Kerkvliet and Booz 2010). The new SEG is a more accurate reflection of escapement, as the 2001–2006 SEG failed to remove mortality (caused by holding and spawning fish for egg takes) from the escapement.

The July 3–31 period was selected for several reasons including 1) the weir was consistently operated through these dates to accomplish supplementation goals, 2) it includes the majority of the total wild Chinook salmon weir run, 3) it increased monitoring by 17 days from the 2001-2006 SEG period (from 12 d to 29 d), and 4) it improved the relationship (from $R^2 = 0.37$ to $R^2 = 0.56$) between counts over the SEG period and the total run.

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[1] L. E. Marsh, 1997 memorandum to B. Clark, ADF&G, on preliminary evaluation of the stocking program at the Ninilchik River. Subsequently referred to as the *Marsh, memorandum.*

[2] Bue, B. G., and J. J. Hasbrouck. Unpublished. Escapement goal review of salmon stocks of Upper Cook Inlet. Alaska Department of Fish and Game, Report to the Alaska Board of Fisheries, November 2001 (and February 2002), Anchorage. Subsequently referred to as *Bue and Hasbrouck, unpublished*.

Although escapement was monitored before the adoption of the new 2007 SEG and period, the results of escapement monitoring are presented in context of the new 2007 SEG and period for several reasons: 1) the new SEG was adopted before this report was written; 2) the 2007 data were used for the analyses to develop the goal; and 3) the new index is more representative of actual escapement.

SPORT HARVEST

Monitoring the Chinook salmon sport harvest at Ninilchik River has become more complicated since the inception of the supplementation program (Appendix A3). Since 1977, ADF&G has conducted an annual mail survey called the Alaska Statewide Harvest Survey (SWHS) to estimate, by area and by fishery, the participation, harvest (fish kept), and catch (fish harvested plus fish released) of sport-caught species (Table 2; Figure 3). Unfortunately, the SWHS only reports total estimates and does not provide the stock composition (wild/hatchery-reared) of the harvest. From 1991 through 2006, periodic assessment of the hatchery-reared contribution to the sport harvest, has been conducted with creel and sport harvest surveys. During high stocking years (1990–1998), these surveys found over 50% of the harvest was hatchery-reared fish (Balland and Begich 2007; Balland et al. 1994; Begich 2006, 2007; Boyle and Alexandersdottir 1992; Boyle et al. 1993; Marsh 1995; Marsh, memorandum). In 2006, the hatchery-reared percentage of the Chinook salmon harvest during the three regulatory 3-day weekend fishery was 39% (Booz and Kerkvliet 2011).

MANAGEMENT

The sport fishery regulations for Ninilchik River Chinook salmon are designed to conservatively manage for the sustainability of the wild stock. The regulations control harvest by limiting the area open to fishing to the lower 3.2 RKM of the river (to protect the Chinook salmon spawning area), and by limiting fishing openings to three consecutive 3-day weekends (Saturday through Monday) beginning on Memorial Day weekend.

Management of Chinook salmon in the Ninilchik River has been refined since the inception of the supplementation program with a more directed focus towards maximizing the harvest of hatchery-reared fish (Appendix A4). From 1991 through 2001, SF has periodically issued Emergency Orders (EOs) to increase the number of fishing days for both wild and hatchery-reared Chinook salmon. Starting in 2002, EOs increased fishing days for hatchery-reared fish only.

In 2004, the Alaska Board of Fisheries (BOF) adopted a regulation that increased the daily bag limit for Ninilchik River Chinook salmon from 1 to 2 of which no more than 1 fish could be a wild Chinook salmon. The intent of this new regulation was to increase the harvest of hatchery-reared Chinook salmon.

This report is part of a continuing series designed to provide information to evaluate the Ninilchik River Chinook salmon supplementation program, and ensure that the wild Chinook salmon escapement at Ninilchik River is managed according to the *Policy for the Management of Sustainable Salmon Fisheries* (5AAC 39.222) and the *Policy for Statewide Salmon Escapement Goals* (5AAC 39.223).

OBJECTIVES

The objectives of this study were:

1. Census the wild and hatchery-reared Chinook salmon escapement into the Ninilchik River from July 2 through August 1, 2007.
2. Census the sex composition and estimate the age composition of each of the wild and hatchery-reared Chinook salmon components of the run into the Ninilchik River from July 2 through August 1, 2007.
3. Estimate the percentage of hatchery-reared fish in the inriver Chinook salmon run below RKM 3.2.

TASKS

1. Collect, hold, and artificially spawn 89 male and 89 female Ninilchik River Chinook salmon (minimum of 60 wild males and 60 wild females to ensure genetic variation) during July to provide fertilized eggs for releases of hatchery-reared smolt into Ninilchik River, Nick Dudiak Fishing Lagoon on Homer Spit (NDFL), Halibut Cove Lagoon, and Seldovia Bay.
2. Release hatchery-reared Ninilchik River Chinook salmon smolt in May and June 2007: approximately 50,000 smolt at Ninilchik River; 210,000 smolt at NDFL; 52,500 smolt at Halibut Cove Lagoon; and 52,500 smolt at Seldovia Bay in June, 2007.
3. Estimate the within reader variability of age estimates from scale readings.
4. Assess accuracy of scale age estimates using samples collected from Chinook salmon of a known age determined through coded wire tag (CWT) analysis.
5. Estimate length at age for the wild and hatchery-reared Ninilchik River Chinook salmon runs.
6. Gather daily stream temperature, discharge, and tide height data from other agencies.
7. Estimate the average travel rate of Chinook salmon tagged in the lower Ninilchik River and recaptured in a beach seine survey and/or at the weir.

METHODS AND ANALYSIS

ESCAPEMENT MONITORING

Weir Counts

A fixed picket weir (Figure 4) was installed approximately 7.7 RKM (Figure 2) from the mouth of the river on July 2 and operated through August 1. The weir was visually inspected on a daily basis for holes to ensure no fish could pass undetected. The gate to the live box was opened daily at approximately 8:00 AM and closed around 11:00 PM. Technicians periodically checked the live box and processed all fish as quickly as possible to avoid impeding the migration.

All captured fish were identified to species and tallied for the daily weir counts. All Chinook salmon that entered the live box were examined for an adipose finclip to identify origin (wild or hatchery-reared). The upper edge of the caudal fin was clipped on all Chinook salmon examined at the weir to prevent double sampling of fish in the event of weir failure. The wild and hatchery-reared Chinook salmon escapements were calculated (e.g., by removing the holding and egg-take

mortalities from the associated Chinook salmon weir count) for the sustainable escapement goal (SEG) index monitoring period and the total weir operating period. The total Chinook salmon escapement was calculated as the sum of the wild and hatchery-reared Chinook salmon escapement.

Sustainable Escapement Goal (SEG)

Although the new SEG was not formally adopted prior to the 2007 weir operation; all results presented in this report pertain to the new 2007 SEG index monitoring period, rather than the 2001–2006 SEG period. Only the wild Chinook salmon escapement count was used to determine if the SEG was met. The contribution of wild Chinook salmon to the escapement during the SEG index monitoring period (June 8–24) was expressed as the percentage of the total Chinook salmon escapement during the SEG index monitoring period. The 2007 escapement counts of hatchery-reared and wild Chinook salmon were compared to their respective averages from 1999 through 2006.

Run Timing

The run timing of wild and hatchery-reared Chinook salmon was plotted as a cumulative percentage of weir counts for the SEG index monitoring period. The median run-timing date (date nearest to the 50% cumulative count) was identified for each component of the run. The 2007 wild and hatchery-reared cumulative plots were compared to each other and to their respective average (1999–2006) cumulative plots to observe any differences in run timing.

The daily weir counts of Chinook salmon (wild and hatchery-reared) were plotted against daily water temperatures, discharge, and tide heights to identify any general patterns. Observed patterns were investigated further and compared to patterns observed in previous years.

Water Temperature, Discharge, and Tide

Cook Inletkeeper (CIK), a citizen-based nonprofit group, collected water temperature in degrees Celsius once every 15 minutes using a temperature logger at their NR-2 site (described in Mauger 2005). The NR-2 site (RKM 13.7) is located ~6.0 RKM (Figure 2) from the Ninilchik River weir site. The reported daily mean, minimum, and maximum temperatures were calculated from all 15-minute temperature readings recorded throughout each day.

The discharge data presented in this report was collected by the National Weather Service, Alaska Pacific River Forecast Center (RFC) at the Beach Access Road bridge (RKM 0.9; Figure 2). RFC contracted a local citizen to collect a daily stage reading (in feet) at approximately the same time each day (~1900 hours) using a wire weight gauge. Collected stage readings were then converted to discharge in cubic feet per second (ft^3/s) using a rating curve of previous discharge and stage measurements from the same Ninilchik River site. The RFC data is not formally published, and should be considered provisional.

The predicted daily high and low tide heights for Ninilchik River were located on the National Oceanic and Atmospheric Administration (NOAA) tides and current website at http://tidesandcurrents.noaa.gov. Predicted high tides heights were corrected from the Seldovia reference station by adding 1.2 ft. No correction factor was used for low tide heights.

Biological Samples

Age and length sample size goals for wild (133) and hatchery-reared (108) Chinook salmon were calculated by combining a finite population correction factor (Cochran 1977) with the sample size determined under the assumption of multinomial sampling (Thompson 1987), assuming an average run size during weir operation dates, and with 15% of the scale samples not readable for age estimates.

To accomplish sampling goals, technicians systematically sampled every 7th wild and every 3rd hatchery-reared Chinook salmon for age and length data. Three scales were taken from the preferred area of the fish (Welander 1940) and lengths were measured from the mid eye to tail fork (METF) length to the nearest 5 mm.

Scale samples were mounted directly to gum cards and later pressed into acetate using a Carver press at 99ºC and 22,500 pounds per square inch (psi) for approximately 2.5 minutes. Scales were read using a microfiche reader and aged with methods described by Welander (1940) and Mosher (1969). Scale age estimates were produced independently of size, sex, and other age estimates. Scale samples were aged twice to estimate within-reader precision. All scale samples that had conflicting ages for the two estimates were re-aged to produce a resolved age which was used for composition and abundance estimates. Original and resolved age estimates were validated using samples of a known age from coded wire tag (CWT) recoveries and expressed as a percent agreement with the known ages. The scale reader had previous experience aging both juvenile and adult salmonid scales and other calcified structures but no experience with Ninilchik River Chinook salmon.

Sex was determined for all Chinook salmon by observing sexual characteristics such as a protruding ovipositor on females and a developing kype on males. The sex ratio of the wild and hatchery-reared components of the Ninilchik River Chinook salmon escapement were both determined.

The proportion of Chinook salmon of age, sex, or length class *j* in group *i* (wild vs. hatchery-reared salmon run to the weir) was estimated as a binomial proportion (Cochran 1977):

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

with variance estimated as

$$\text{var}(\hat{p}_{ij}) = \left[\frac{N_i - n_i}{N_i} \right] \frac{\hat{p}_{ij}(1 - \hat{p}_{ij})}{n_i - 1} \tag{2}$$

where

n_{ij} = the number of fish of age, sex, or length class *j* in the sample from group *i*,

n_i = the number of fish of group *i* sampled, and

N_i = the number of fish of group *i* in the weir count.

The number of Chinook salmon by age of each group was estimated by

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

and its variance estimated by

$$\text{var}(\hat{N}_{ij}) = N_i^2 \, \text{var}(\hat{p}_{ij}) \, . \tag{4}$$

The within-reader variability of scale age estimates was calculated using a coefficient of variation (CV) given as the ratio of the standard deviation over the mean age expressed as a percentage (Campana 2001):

$$CV_j = 100\% \times \frac{\sqrt{\sum_{i=1}^{R} \frac{(X_{ij} - X_j)^2}{R-1}}}{X_j} \tag{5}$$

where X_{ij} = the ith age estimate of the jth fish,

X_j = the mean age estimate of the jth fish,

R = the number of times each fish is aged.

For each sex, age, wild and hatchery-reared group, the CV_js were averaged across all fish (j) in the group to produce a mean CV.

EGG TAKES

During escapement monitoring, an inriver holding area was established using a weir upstream of the escapement weir (Figure 4). Plywood boards (2 ft x 3 ft) were placed on the lower weir during periods of low water to increase the depth of the holding area to provide a rest area for fish. As Chinook salmon were processed at the escapement weir, those fish showing signs of attaining more immediate sexual maturity were placed in the holding area. We began holding fish on July 3. Held fish were checked once weekly to estimate the number of fully matured Chinook salmon. On July 16, during a maturity assessment, the crew found that the majority of held fish had escaped the holding area after a period of high water from a recent rain event. The majority of fish escaped over the top of the upper weir when a crew member failed to adjust or remove the plywood boards from the lower weir as water levels increased. The integrity of the lower weir was not compromised and we assumed no fish escaped undetected above the lower weir during this time.

Egg takes were conducted on July 23 and 30. All Chinook salmon were spawned in a matrix, 4 at a time, with a sex ratio of 2:2 to ensure egg fertilization (Hoffnagle et al. 2003). Held fish were captured with a seine and dipnets. Males and unripe females were sorted into net pens. Ripe females were killed, placed on their back on an angled rack with their heads tilting downward. Females were bled (bled-out) by ripping a gill arch to prevent blood from mixing with the eggs. To collect and fertilize the eggs, each bled-out female was held above a dry plastic bucket then her abdomen was cut open from the vent to the gill plate. Loose eggs were then collected in the bucket. Mature males were randomly selected from the net pens. Immature males were released upstream of the weir and mature males were live spawned before they were released upstream of the weir. To prevent water from the males dripping on the unfertilized eggs, causing them to water harden, each male was live spawned into a dry cup. The milt was then poured into the bucket of eggs. Upon mixing the eggs and milt, a 7 g per liter saline solution was added to increase sperm motility. Fertilized eggs were then rinsed and placed into a plastic bag for water hardening and transport.

Only wild Chinook salmon were used to supplement the Ninilchik River. A combination of wild and hatchery-reared Chinook salmon were used to stock the saltwater terminal release sites. The head, length, and a scale sample were collected from all sacrificed hatchery-reared females for age validation and to detect straying.

STOCKING

Smolt Release and Marking

The Chinook salmon eggs used for stocking were reared to smolt at the Fort Richardson hatchery. All hatchery-reared Chinook salmon smolt released at Ninilchik River were thermal marked, adipose-clipped, and injected with a CWT by hatchery personnel. All smolt released at Halibut Cove Lagoon, Seldovia Bay, and the NDFL were only thermal marked. Hatchery personnel also assessed the average length and weight for all smolt released, and the percentage of acceptable adipose finclips and CWT losses was assessed before they were released at Ninilchik River. The Statewide Stocking Plan (Loopstra 2003) was used to plan and schedule the release of LCIMA smolt.

Straying

Heads were collected from all hatchery-reared females that were sacrificed during egg takes. Collected heads were labeled with a numbered cinch strap, frozen, and sent to the ADF&G Mark, Tag, and Age Laboratory in Juneau for analysis. Results were accessed from the ADF&G tag lab website[4], using parameters specific to the Ninilchik River Chinook salmon project.

INRIVER SAMPLING

Composition of Inriver Chinook Salmon Run

From May 21 through July 11, Homer ADF&G staff conducted beach seine surveys to estimate the hatchery-reared percentage of the inriver Chinook salmon run. Surveys were conducted once a week, for a total of eight surveys in the area open to sport fishing excluding the harbor area near the mouth (From 0.8 to 3.8 RKM; Figure 2). Beach seines were deployed from shore or a small raft to capture Chinook salmon from pools thought to hold fish. Global Positioning System (GPS) coordinates, time of day, and number of each species captured were recorded for each beach seine survey at each location. All captured Chinook salmon were examined for an adipose finclip (identifying wild or hatchery-reared status) and external tags. We attempted to tag every unmarked Chinook salmon but problems encountered with the tagging gun prevented this on most surveys; the exception was the July 11 survey when all unmarked captured Chinook salmon were tagged. Chinook salmon were tagged on the left side, just below the dorsal fin and about four fin rays up from the posterior edge, with a green 30 mm long Floy^{TM} T-bar tag[5]. All tags had a unique six-digit number and an "ADF&G" label. No attempt was made to collect age, sex, or length samples from this survey. Tagging allowed us to 1) identify individual tagged fish that were recaptured on the same day that they were tagged, 2) identify tagged fish from previous beach seine surveys, and 3) estimate the travel rates from tagging location to the weir for individual tagged fish. Signs and media announcements notified the public to voluntarily report

[4] Mark, Tag and Age Laboratory Database [Internet]. Juneau, AK: ADF&G. 2006. [12/10.2007 2:44 PM]. Available from http://tagolabweb.adfg.state.ak.us/CWT/reports/.

[5] Product names used in this publication are included for completeness but do not constitute product endorsement.

the catch or harvest of tagged fish. Volunteer reports collected the tag number, harvest date, and approximate harvest location.

The percentage and its variance of hatchery-reared Chinook salmon in the inriver run from each beach seine survey was estimated in a manner similar to that described for the age composition equation listed above, with subscript *i* representing sampling event and *j* representing hatchery-reared/wild category. No finite correction factor was used because the inriver population size during each event was unknown. Fish with multiple captures on the same survey were counted only once for the hatchery-reared inriver run composition estimates. Accounting for the finite population correction factor, a target sample size of 65 Chinook salmon for each survey was thought to meet the criterion for Objective 3.

A chi-squared test of independence was used to test for composition changes over time (H_o: hatchery-reared composition did not change over the surveys). The change in abundance of Chinook salmon observed during beach seine surveys was compared to weekly Chinook salmon weir abundance.

Travel Rates

The travel rates (RKM/d) of recaptured floy-tagged Chinook salmon were expressed as the distance from the tagging location to the weir divided by the number of days from initial tagging to subsequent recapture. Distances (RKM) were measured using the geographic information system (GIS) program *ARC Map* 9.3 with 1996 digital orthoquads. The time and date from tagging to recapture were used to calculate the number of days (*d*).

Recaptures of tagged fish were limited due to the following factors: 1) fish escaping above the weir site before or after the weir operation dates, 2) tagged fish being harvested during the regulatory and EO fisheries, 3) tagged fish potentially spawning in the area below the weir site, 4) mortality associated with tagging, and sport catch and release (assumed low), and 5) potential tag loss after tagging and before recapture. Travel rate estimates were restricted to the fish tagged on July 5 and 11 and were limited by weir operation dates.

A two-sample *t*-test was used to detect any differences in the average travel rate for each tagging event.

LOCAL GUIDE HARVEST

During the inriver sport fishery, a volunteer sport fishery guide noted the catch and harvest of wild and hatchery-reared Chinook salmon in the freshwater sport fish guide logbook[6] for each guided trip. The hatchery-reared percentage of Chinook salmon caught and harvested was estimated for each regulatory 3-day weekend opening and for each week of the EO fishery. The percentage of hatchery-reared and wild Chinook salmon in the catch and harvest for each guided trip was estimated as a binomial proportion Cochran 1977:

$$\hat{p}_j = \frac{n_j}{n} \tag{6}$$

[6] 2006 Freshwater Sport Fish Guide Logbook and Vessel Registration. ADF&G, Division of Sport Fish, Anchorage. *Note:* A logbook is required by all sport fish charter and guide services operating in Alaska. It is the responsibility of the business owner to obtain the logbook and assure that all data for fishing activities is submitted to ADF&G.

where the subscript *j* represents wild or hatchery-reared. The variance was estimated as

$$\text{var}(\hat{p}_j) = \frac{\hat{p}_j(1-\hat{p}_j)}{n-1}. \quad (7)$$

No finite correction factor was used because the inriver population size during each guided trip was unknown. Chi-square tests were used to identify differences in the proportions of hatchery-reared fish in the Chinook salmon harvest between the three regulatory 3-day weekend openings and the EO fishery. Data from the roving survey and logbook data were also compared.

RESULTS

ESCAPEMENT MONITORING

Weir Counts

In 2007, the total number of Chinook salmon counted past the Ninilchik River weir from July 2 through August 1 was 762 of which 679 were wild and 83 were hatchery-reared (Table 7; Appendix B1). After subtraction of fish sacrificed during egg takes (92 fish), and mortalities associated with holding fish for egg takes (57 fish), the total escapement was 613 Chinook salmon, of which 90% (550/613) were wild and 10% were hatchery-reared.

In 2007, below average runs of most non-targeted species were observed at the weir (Table 9). All five species of Pacific salmon, Dolly Varden char (*Salvelinus malma*), and steelhead trout (*Oncorhynchus mykiss*) were observed at the weir in 2007. Dolly Varden char were the most common followed by pink salmon (*Oncorhynchus gorbuscha*).

Sustainable Escapement Goal (SEG)

During the SEG index monitoring period (July 3–31), 543 wild Chinook salmon escaped above the weir and comprised 90% (543/606) of the total SEG escapement (Table 8; Figure 5). Wild and hatchery-reared escapement counts were lower than average for previous years (1999–2006) during the SEG period by 433 and 287 fish, respectively.

Run Timing

The wild and hatchery-reared cumulative run timing plots for 2007 showed that both components started out slower than average for the first week of the SEG period but then approached the median earlier than average (Figure 6). After the median, the wild run timing was similar to average while the hatchery-reared run timing continued to be earlier than average. The hatchery-reared run timing was roughly four days later than the wild run timing throughout the SEG period.

Water Temperature, Discharge, and Tides

Average daily temperature and discharge fluctuated during the SEG index monitoring period but no general pattern with daily weir counts emerged (Appendices C1, D1–D2; Figure 7). The 2007 average temperature was one degree below the previous eight-year (1999–2006) average (Table 10) and similar to temperatures observed in 2006 (Booz and Kerkvliet 2011). During the SEG index monitoring period (July 3–31), the average discharge was 73 ft^3/s (range = 58 to 99 ft^3/s; Appendix D1), which was below the previous eight year average (1999–2006) of 77 ft^3/s (Table 10). There was no general pattern with daily weir counts in relation to tide height (Figure 7). From July 3 through July 31, the daily average high tide height ranged from 13.6 to 21.1 ft and

averaged 18.0 ft (Appendix E1). The daily average low tide height ranged from -3.0 to 6.2 ft and averaged 1.8 ft (Appendix E1).

Biological Samples

In 2007, we failed to obtain our age and length sample size goals for both wild and hatchery-reared Chinook salmon by 41 and 84 fish, respectively. Ninety-two wild and 24 hatchery-reared Chinook salmon were sampled for age, of which 28% of the wild and 21% hatchery-reared scale samples were not readable due to regeneration or poor mounting (Table 11). Of the scales collected, 66 wild and 19 hatchery-reared samples were aged. Ocean age 3 was the dominant age class for both wild (54.5%, SE = 5.9%) and hatchery-reared (42.1%, SE = 10.2%) Chinook salmon (Table 11; Figure 8). Ocean age 3 was the dominant age class for both male and female wild Chinook salmon. The hatchery-reared Chinook salmon age composition was dominated by ocean-age-3 females and ocean-age-1 males. Statistically significant differences in age composition were detected between wild and hatchery-reared males (χ^2 = 11.2, df = 3, P = 0.01), females (χ^2 = 7.5, df = 2, P = 0.02), and overall (χ^2 = 9.3, df = 3, P = 0.03) (Table 11). The overall wild (χ^2 = 1.7, df = 3, P = 0.64) and hatchery-reared (χ^2 = 4.9, df = 3, P = 0.18) age compositions were similar to their respective 1999–2006 average age composition (Table 12).

The wild jack Chinook salmon census (24) at the weir was not different from the estimated abundance (41; SE = 19.1) of that age class but the hatchery-reared jack Chinook salmon census (6) fell outside of the estimated abundance confidence interval range (7–35) (Table 11).

The coefficient of variation (CV, Equation 5) of all scale age estimates was 2.4%. The CV of scale age estimates for both wild (CV = 2.8%) and hatchery-reared (CV = 1.6%) Chinook salmon were generally similar to the overall precision. Only ocean-age-4 wild males (CV = 7.1%) differed markedly from the overall precision. We did not conduct statistical tests of these differences.

Age was determined for 16 hatchery-reared Chinook salmon from coded wire tag (CWT) recoveries (a CWT was not detected in 2 of 18 adults recovered; Table 13). Scale regeneration was found in 25% of fish (4/16) recovered for known age sampling; scales from these fish were not aged (Table 13). There was a 100% agreement between the resolved age estimates and known ages. Only one age estimate was not correctly aged for both age estimates with all samples.

Sex was determined for all but six wild Chinook salmon counted at the weir. The sex ratio of males to females was different (χ^2 = 8.9, df = 1, P = 0.003) between the wild (403:270) and hatchery-reared (37:46) components (Table 11). The mean lengths of wild female (796 mm) and male (684 mm) Chinook salmon were larger, but not significantly (χ^2 = 0.1, df = 1, P = 0.72), than the mean length of hatchery-reared female (738 mm) and male (617 mm) Chinook salmon.

EGG TAKES

Chinook salmon eggs were collected from 92 females (Table 14). The average fecundity was 5,975 per female spawned. Seventy-four of the females spawned were wild and 18 were hatchery-reared. The egg take conducted on July 23 sacrificed 24 wild and 6 hatchery-reared females and had a 92.9% egg survival to the eyed stage. The egg take conducted on July 30 sacrificed 50 wild and 12 hatchery-reared females and had an 85.6% egg survival to the eyed stage. The average percent survival to the eyed stage (87.9%) was above the survival average

(84.4%) from 1999–2006. The maximum water temperatures recorded during the egg takes were 11°C (July 23) and 17°C (July 30).

STOCKING

Smolt Release and Marking

Stocking goals[7] were reached at all stocking locations (Tables 3–6). Chinook salmon smolt releases in 2007 were apportioned between the Ninilchik River and three terminal saltwater fisheries as follows: 56,368 smolt were stocked at Ninilchik River, 226,972 smolt were stocked at NDFL, 54,560 smolt were stocked at Halibut Cove Lagoon, and 54,276 smolt were stocked at Seldovia Bay. In 2007, the average length (mm) and weight (g) of Chinook salmon smolt stocked in the Ninilchik River (92 mm, 8.7 g), NDFL (102 mm, 10.3 g), Halibut Cove Lagoon (97 mm, 9.8 g) and Seldovia Bay (99 mm, 10.5 g) were smaller than their respective length and weight averages from recent years (Tables 3–6).

Straying

A total of 18 heads were collected for CWT analysis from female hatchery-reared Chinook salmon sacrificed during egg takes (Table 13; Appendix F1). Coded wire tags were successfully decoded from 16 heads. All of the heads originated from stocking in the Ninilchik River. In 2007, five Ninilchik River hatchery-reared Chinook salmon were detected in the Ninilchik River Tribe's educational fishery (Appendix F2). No other Ninilchik River hatchery-reared Chinook salmon were detected in LCIMA fisheries or escapement projects in 2007.

INRIVER SAMPLING

Composition of Inriver Chinook Salmon Run

Overall, 608 Chinook salmon were captured during the 8 beach seine surveys from 19 different river locations (Appendix G1, G2). Roughly 7% (40/608) of the Chinook salmon captures were excluded from the inriver composition estimates because of individual fish that were captured multiple times in the same survey. We failed to obtain our sampling goal of 65 Chinook salmon for the first four surveys. The hatchery-reared percentage of inriver Chinook salmon run over all beach seine surveys was 14.4% (SE = 1.5%; Table 15) which was higher than the hatchery-reared percentage observed at the weir (10%; Table 7). The weekly hatchery-reared percentage ranged from 0% to 24.1% (SE = 8.1%; Table 15). There were no significant differences (χ^2 = 13.75, df = 7, P = 0.056) detected in the percentage of hatchery-reared fish over the weekly beach seine surveys. The abundance of Chinook salmon during the beach seine surveys peaked on the July 5 survey; which was followed with the peak Chinook salmon abundance observed the next week at the weir (Figure 9). Steelhead trout were the most common non-target species caught during the surveys and were present until after the regulatory 3-day weekend fishery (Table 16; Figure 9).

The harvest of eight tagged fish was voluntarily reported during the regulatory and EO fisheries (Appendix G3). Five of these harvested fish were taken on the first regulatory 3-day weekend. No reports were received after June 16. Hatchery-reared Chinook salmon comprised 37.5% (3/8)

[7] Hatchery-reared Ninilchik River Chinook salmon smolt stocking goals: Ninilchik River (50,000 smolt), NDFL (210,000 smolt), Halibut Cove Lagoon (52,500 smolt), and Seldovia Bay (52,500 smolt).

of the volunteer harvest reports. One report was of an illegal harvest of a wild Chinook salmon after the regulatory fishery on June 16.

Travel Rates

A total of 419 Chinook salmon were floy-tagged, of which 16% (66/419) were recaptured at the weir (Appendix G2, G4). Hatchery-reared Chinook salmon comprised 14.1% (59/419) of the floy-tagged fish and accounted for 11% (7/66) of the weir recaptures. Approximately 49% (32/66) of all weir recaptures were tagged on either July 5 or 11 beach seine surveys. The July 5 tagging event had a low weir recapture rate of 13% (15/110) despite the weir being operational (Figure 10). The July 11 tagging event had a similar number of weir recaptures (n = 17) but a higher weir recapture rate of 29% (17/59). Recaptures from both tagging events were spread out over the weir operation.

Travel distances for individual Chinook salmon floy-tagged on July 5 and 11 and recaptured at the weir ranged from 3.85 to 6.85 RKM. The average travel distance decreased from 4.88 to 4.37 RKM between tagging events (calculated from Appendix G4). Travel days for individual Chinook salmon floy-tagged on July 5 and 11 ranged from 2.3 to 25.1 d. The average travel days also decreased between tagging events from 14.9 to 10.4 d (Figure 10). The travel rates of individual floy-tagged Chinook salmon recaptured at the weir from the July 5 and 11 tagging events ranged from 0.173 to 1.88 RKM/d and the overall average was 0.527 RKM/d (SE = 0.065). Average travel rates increased but not significantly (t = -1.55, df = 21, P = 0.14) between the July 5 and 11 tagging events from 0.411 (SE = 0.059) to 0.636 RKM/d (SE = 0.128).

LOCAL GUIDE HARVEST

The percentage of hatchery-reared Chinook salmon catch and harvest recorded in freshwater sport fish guide logbooks was 22.1% (SE = 2.2%) and 67.1% (SE = 5.3%), respectively (Table 17). There were no significant differences (χ^2 = 14.0, df = 7, P = 0.051) detected in the percentage of hatchery-reared Chinook salmon in the catch over the weeks of the EO fishery. The logbook catch of Chinook salmon per angler peaked at 1.75 fish per angler (77/44) during week five (Jun 23–29, 2007). Few fish were caught after week seven.

The percentage of hatchery-reared Chinook salmon in the logbook catch for the 2007 regulatory 3-day weekend sport fishery (9.1%, SE = 4.4%) was not significantly different (χ^2 = 0.9, df = 1, P = 0.35) than the 2006 percentage. (15.1%, SE = 4.2%;Booz and Kerkvliet 2011). The 2006 (54) and 2007 (53) reported harvest of hatchery-reared Chinook salmon during the EO fishery was similar despite the additional fishing days in 2007.

DISCUSSION

In 2007, the Ninilchik River wild Chinook salmon run failed to meet the sustainable escapement goal (SEG) by 7 fish. Wild and hatchery-reared escapement counts during the SEG index monitoring period indicate the Chinook salmon escapement was below average in 2007. The hatchery-reared proportion of the escapement is the lowest since hatchery-reared fish started returning to the Ninilchik River. The factors that may account for the lower than average weir count of wild Chinook salmon include 1) effects on salmon eggs and parr of the two 100-year floods in the Fall of 2002, 2) increased harvest in the Ninilchik area educational fisheries in 2007, 3) possible prolonged run timing similar to that observed at the Anchor River for Chinook salmon, and 4) effects of catch and release mortality on wild Chinook salmon during the EO fishery.

The 2002 floods may have increased mortality on the eggs in the gravel (2002 brood) and parr rearing in the river (2001 brood; Lisle and Lewis 1992; Arndt et al. 2002). Based on brood table analyses of the Ninilchik River Chinook salmon harvest and escapement data, both the 2001 and 2002 broods produced below average returns (ADF&G, Homer, AK; unpublished data).

In 2007, the Chinook salmon harvest in the educational fisheries increased from an average (1999–2006) of 140 to 365 (Szarzi et al. 2007). Although the educational fishery harvests mixed stocks, all coded wire tag (CWT) recoveries (n = 5) originated from the Ninilchik River, which suggests that at least some of the wild Chinook salmon harvested were Ninilchik River stock.

The Anchor River run timing of Chinook salmon escapement in 2007 took twice as many days to reach cumulative escapement counts within the 25th to 50th percentile than the 2004–2006 average number of days (17 versus 34 days; Kerkvliet et al. *In prep*). If the 2007 Ninilchik River Chinook salmon run was also similarly protracted, a significant proportion of the run could have passed the weir site after the operation.

The 2007 statewide harvest survey (SWHS) Ninilchik River Chinook salmon catch estimate of 4,774 was 46% higher than the 1999–2006 average catch estimate (3,276; Table 2). Furthermore, only 33% of the 2007 Chinook salmon catch estimate was harvested. These estimates suggest that for every Chinook salmon harvested, 2 more were released. Release mortality in a Chinook salmon radio-telemetry tagging study conducted in the Kenai River was 10% (Bendock and Alexandersdottir 1990). However, there are few similarities between the Kenai and Ninilchik River Chinook salmon sport fisheries. The Kenai River is a large glacial river fished primarily from boats and the Ninilchik River is a small stream with comparatively high water temperatures that is fished from shore. Kenai River Chinook salmon are also on average significantly larger than Ninilchik River Chinook salmon. If the catch and release mortality is significantly higher than 10%, it would have correspondingly greater impacts on the escapement.

Monitoring Ninilchik River Chinook salmon escapement at the broodstock weir only during the SEG index monitoring period is not ideal and its utility is especially subject to variations in run timing. To capture the variation in run timing and accurately monitor the total Chinook salmon escapement at the Ninilchik River broodstock weir, the SEG index monitoring period should be further expanded to June 15–August 15. To accurately monitor total escapement and incorporate the escapement below the broodstock weir, an alternative weir site (such as Garrison bridge road) is suggested. If another weir location is selected to monitor escapement in the future, the current broodstock weir operation schedule should continue to pair the new and old weir data series. Extending the SEG index monitoring period and relocating the weir would require additional project funds.

Year to year run timing comparisons are difficult when the weir is not operated over the total run. Since 1999, abundance trends during the SEG index monitoring period do not appear to be associated with run timing differences. The 2008 slow run timing start for both wild and hatchery-reared components suggests that a larger than average percentage of the total run passed the weir during the SEG index monitoring period. In previous years, weir counts were typically higher on days with higher than average high tide height. This general pattern did not occur in 2007 and may have been influenced by the rise in discharge from recent rains that occurred on July 12 and 13. The standardized temperature and discharge measurements from Cook Inlet Keeper and Alaska Pacific River Forecast Center has continued to provide ADF&G the ability to make annual and between year comparisons of general patterns observed with run timing.

Age and length sample size was influenced by the below average runs and a higher rate of unreadable scales. If we had sampled every hatchery-reared Chinook salmon at the weir, the goal would have still been missed by 25 fish. In future escapement monitoring, age and length sampling goals should be conservatively estimated or adjusted in-season to account for smaller runs. Both the accuracy and within reader variability of scale age estimates were at an acceptable level.

The census of wild and hatchery-reared jack Chinook salmon suggests that there is some sampling bias associated with our current methods. Technicians sampled every 7th wild and every 3rd hatchery-reared Chinook salmon as they are captured in the live box at the weir. If there is more than one Chinook salmon in the live box, it is likely that size and behavior of individual fish influence the order in which they are processed (larger fish are thought to be easier to catch). A possible solution to this would be to sample all Chinook salmon present in the box when the sampling target arrives.

The 2007 weir operation was the first year that ADF&G did not sacrifice hatchery-reared Chinook salmon throughout the weir operation to detect strays. On average, roughly 1% of the hatchery-reared Chinook salmon run in the Ninilchik River were strays from other stocking locations (Table 7). Because so few fish were strays, the elimination of this task from the project reduced the workload at the weir and associated expenses. Coded wire tags decoded from hatchery-reared females sacrificed during egg takes in 2007 provided an acceptable number of samples to test the accuracy of scale ages and to detect if strays were used in egg takes.

Egg takes were accomplished in the same period of time despite losing a significant number of Chinook salmon from the holding area on July 12. Cooler than average water temperatures and the improved egg take procedures started in 2006 probably contributed to the higher than average egg survival. Stocking levels in 2007 for Halibut Cove Lagoon and Seldovia Bay were reduced from previous levels due to rearing limitations at the Fort Richardson Hatchery and will remain at the 2007 stocking level until hatchery facilities can increase production. The decrease in stocked smolt size was probably due to colder air and water temperatures in the winter of 2007 at the Fort Richardson Hatchery.

The netting surveys provided reliable estimates of the hatchery-reared composition of the Chinook salmon run in the area open to sport fishing. This method was more effective at catching fish in the section of the river above the Sterling Highway Bridge. The lower section of the Ninilchik River has a slightly higher gradient, fewer pools, and has numerous boulders that prohibit netting. The intertidal area was not sampled due to boat traffic and depth, though it could be effectively sampled with a gill net from a small skiff. Surveys were conducted mid-week and no problems were encountered with anglers fishing during the EO period. Failing to obtain the sample size goal of 65 fish during the first four surveys reduces the confidence in the composition estimates. The increased abundance with time of Chinook salmon captured during the netting surveys suggests that the peak of the Chinook salmon run in the sport fishery area occurred after the regulatory sport fishery. There were a variety factors influencing the observed abundance over the surveys. The first survey was conducted prior to the opening of the regulatory and EO sport fishery and before the majority of the Chinook salmon run was inriver. The next three surveys were conducted after each regulatory 3-day weekend fishery when a large proportion of Chinook salmon run was harvested. To obtain the desired sampling goal for the first four surveys, we would have needed to sample up to three days a week.

Floy tagging enabled identification of multiple captures within each beach seine survey; this information allowed us to remove these fish from our estimates of composition. However, we found that 1) leaving the multiple captures in the sample only marginally changed the inriver run composition estimate, and 2) most of the multiple captures resulted from sampling the same locations repeatedly and could be avoided by only making one net set per location and survey. Therefore, any future surveys could be accomplished without floy tagging.

The recapture of floy-tagged fish at the weir suggests slow travel rates for Chinook salmon in the Ninilchik River although the capture, handling, and tagging may have induced delayed movement (reducing travel rates). This effect has been documented in other tagging studies (Bernard et al. 1999). There was no attempt made to directly assess delayed movement of tagged fish but 20% (6/30) of the beach seine survey recaptures had downstream movement from tagging to recapture and none of these fish were recovered at the weir, suggesting that at least some individual fish movement was influenced by our methods.

The low recapture rate for the July 5 and 11 beach seine surveys is particularly confounding considering that the weir was in operation for both surveys and the short distance from the sport fishery area to the weir (~4 km). The decreased abundance of Chinook salmon observed during the July 5 to the July 11 beach seine surveys and the decreased catch per angler (logbook data) after July 13 suggests that few fish remained in the area open to fishing and that the harvest of floy-tagged fish was low. Given these considerations, the most likely explanation for the low recapture rates from the July 5 and 11 surveys is that a significant number of fish spawned below the weir. The limited number of recaptures from the July 5 and July 11 tagging events also prevented us from comparing the wild and hatchery-reared travel rates. Any future attempts to assess travel rates for Chinook salmon in the Ninilchik River should be conducted when the weir is operated over the total run or with a recapture location just above the sport fishery area.

The 2007 overall harvest recorded in the logbook by the guide suggests that the majority of Chinook salmon being harvested in the Ninilchik River was hatchery-reared. The extended EO fisheries in 2006 and 2007 shifted the majority of the recorded overall harvest from wild (recorded in the regulatory fishery) to hatchery-reared fish. If the recorded harvest from this guide is reflective of all harvest of Chinook salmon in the Ninilchik River, extended fishing opportunities targeting hatchery-reared fish only would be recommended in future years.

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TABLES

Table 1.–Characteristics of the Ninilchik River drainage.

Drainage characteristics	Total
Watershed area	347.9 km²
Wetland area	122.5 km²
Percent wetlands	35.2 %
Stream length	260.7 RKM
Anadromous stream length	81.0 RKM
Percent mapped anadromous	31.1%

Source: S. Baird, Kachemak Bay Research Reserve in Homer, AK, unpublished data, 2006.

Note: RKM = river kilometers.

Table 2.–Statewide Harvest Survey estimates of angler effort and Chinook salmon harvest and catch compared to weir counts with exploitation rates of Ninilchik River Chinook salmon, 1977–2007.

Year	Angler effort-days fished[a]	Chinook salmon Harvest (no. of fish)	Catch[b] (no. of fish)	Percent hatchery harvest[c]	Total weir count[d]	Expanded total weir count[e]	Exploitation rate (%)
1977	11,350	1,168	ND	NA	ND	–	–
1978	14,173	1,445	ND	NA	ND	–	–
1979	18,282	1,493	ND	NA	ND	–	–
1980	19,706	723	ND	NA	ND	–	–
1981	14,184	1,523	ND	NA	ND	–	–
1982	11,806	1,240	ND	NA	ND	–	–
1983	9,458	871	ND	NA	ND	–	–
1984	10,122	648	ND	NA	ND	–	–
1985	10,213	983	ND	NA	ND	–	–
1986	9,250	420	ND	NA	ND	–	–
1987	13,329	1,112	ND	NA	ND	–	–
1988	12,533	795	ND	NA	ND	–	–
1989	9,997	744	ND	ND	254	452	–
1990	8,323	693	1,598	ND	315	567	–
1991	19,640	3,123	5,260	77	338	950	–
1992	27,816	5,316	11,425	57	539	1,785	–
1993	20,466	4,235	9,491	50	NL	–	–
1994	21,827	3,108	5,482	45	549	1,091	–
1995	16,160	2,451	4,313	50	1,150	1,614	–
1996	11,445	2,401	7,481	50	944	1,746	–
1997	11,064	3,263	6,879	ND	1,096	1,374	–
1998	10,994	1,453	3,395	ND	1,002	1,378	–
1999	15,344	1,945	4,153	ND	2,285	–	46.0
2000	12,432	1,782	4,648	49	2,487	–	41.7
2001	10,602	1,399	3,014	51	2,087	–	40.1
2002	9,572	830	2,180	ND	2,075	–	28.6
2003	9,843	1,452	4,205	ND	1,683	–	46.3
2004	10,500	1,240	2,961	ND	2,061	–	37.6
2005	9,003	1,342	2,042	ND	2,703	–	33.2
2006	9,620	1,329	3,004	≥39[f]	1,412	1,862	–
2007	10,211	1,575	4,774	ND	762	1,055	–
Average							
Pre-Stocking (1977–1990)	12,338	990	1,598				
High Stocking (1991–1998)	17,427	3,169	6,716	55		1,420	
Low Stocking (1999–2006)	10,865	1,415	3,276	50	2,197		39.1

Source: Statewide harvest survey estimates for days fished and Chinook salmon harvest and catch gathered from the published reports for each year (Mills 1979-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010).

Note: NL = no data located; ND = no data; "–" = cannot be computed due to limitations of the data; NA = not applicable.

[a] The estimates for days fished are for the entire season not just for Chinook salmon.

[b] Catch is defined as the number of fish caught-and-released and harvested. Estimates from Gretchen Jennings, project manager, Alaska Statewide Harvest Survey unpublished data, ADF&G, Division of Sport Fish, Anchorage.

[c] Estimated by creel survey 1991–1993; estimated by catch sampling from 1994–1996, 2000, 2001, and 2006.

[d] Complete counts in 1999–2005; 1989–1998 and 2006–2007 are partial counts from broodstock weir, no data available for 1993.

[e] Weir counts were expanded by the average number of fish counted from 1999 through 2005 during the weir operation dates for each year that the weir was not operated over the total run.

[f] The 2006 sport harvest survey percent hatchery harvest estimate should be viewed as a minimum because an unknown number of hatchery fish were harvested in a fishery opened by emergency order after the survey was conducted.

Table 3.–Chinook salmon smolt released at Ninilchik River, 1988–2007.

Release year	Release date	Brood year	Number of smolt[a]	Release location[b]	Hatchery	Mark type[c]	Percent adipose finclip[d]	Percent CWT	CWT tag code	Average length (mm)	Average weight (g)
1988	Jul 6	1987	248,586	Harbor	Fort Richardson	Ad, CWT	ND	12.5	311762	ND	12.5
1989	Jun 1	1988	200,203	Harbor	Fort Richardson	Ad, CWT	ND	9.4	311830	ND	11.8
1990	May 30	1989	215,804	Harbor/Brody	Fort Richardson	Ad, CWT	ND	18.7	311735	ND	12.8
1991	May 22	1990	87,992	Brody	Fort Richardson	Ad, CWT	ND	23.9	311934	100	12.0
1992	May 28	1991	132,387	Brody	Fort Richardson	Ad, CWT	ND	31.2	312104	107	12.5
1993	Jun 8	1992	184,585	Brody	Fort Richardson	Ad, CWT	ND	23.3	312159	107	14.7
1994	May 31	1993	201,513	Brody	Fort Richardson	Ad, CWT	ND	22.6	312318	ND	12.0
1995	May 31	1994	54,662	Harbor	Fort Richardson	Ad, CWT	ND	99.0	312435	ND	14.1
1996	Jun 13	1995	51,688	Harbor	Fort Richardson	Ad, CWT	ND	98.4	312515	ND	12.9
1997	Jun 17	1996	50,292	Brody	Fort Richardson	Ad, CWT, TM	ND	99.2	312608	ND	12.0
1998	Jun 15	1997	48,798	Brody	Fort Richardson	Ad, CWT, TM	ND	97.3	312635	ND	11.4
1999	Jun 15	1998	49,853	Brody	Fort Richardson	Ad, CWT, TM	ND	98.1	310147	104	13.6
2000	Jun 2	1999	51,298	Brody	Fort Richardson	Ad, CWT, TM	ND	97.5	310248	96	10.2
2001	Jun 13	2000	54,770	Brody	Fort Richardson	Ad, CWT, TM	ND	99.4	310260	104	13.6
2002	Jun 14	2001	54,631	Brody	Fort Richardson	Ad, CWT, TM	ND	99.1	310282	101	12.1
2003	Jun 12	2002	47,997	Brody	Fort Richardson	Ad, CWT, TM	ND	92.4	310256	105	12.6
2004	May 12	2002[e]	51,303	Brody	Fort Richardson	Ad, CWT, TM	ND	92.4	310193	105	12.6
2005	May 19	2003[e]	55,229	Brody	Fort Richardson	Ad, CWT, TM	ND	99.9	310318	101	11.9
2006	May 17	2004[e]	57,537	Brody	Fort Richardson	Ad, CWT, TM	99.2	99.4	310341	102	12.5
2007	May 17	2005[e]	56,368	Brody	Fort Richardson	ADCWT; TM	99.5	99.7	310366	92	8.7
Average (1995–2006)			52,338					97.7		102.3	12.5

Note: ND = no data.

[a] Number released includes smolt that shed coded wire tags.

[b] Harbor = Ninilchik River harbor located at the mouth; Brody = Brody Road bridge; Harbor/Brody = 50% released in the Ninilchik River harbor and 50% released at Brody Road bridge.

[c] Ad = adipose finclip; CWT = coded wire tag; TM = thermal mark.

[d] Smolt were checked prior to release for finclip quality starting in 2006.

[e] Smolt were released as freshwater-age-1 fish beginning in 2004.

Table 4.–Chinook salmon smolt released at Nick Dudiak Fishing Lagoon terminal saltwater fishery on Homer Spit, 2000–2007.

Nick Dudiak Fishing Lagoon							
Release year	Release date	Brood year	Number	Hatchery	Mark type[a]	Average length (mm)	Average weight (g)
2000	May 31	1999	102,243	Elmendorf	NM	117	17.8
	Jun 7		117,741	Elmendorf	NM	119	17.8
2001	May 25	2000	101,799	Elmendorf	NM	104	13.9
	Jun 8		106,263	Elmendorf	NM	112	13.9
2002	May 30	2001	122,444	Elmendorf	TM	102	12.1
	Jun 6		67,582	Elmendorf	TM	107	12.1
2003	May 28	2002	126,229	Fort R.	TM	102	12.0
	Jun 6		80,063	Fort Richardson	TM	104	12.0
2004	Jun 7	2002[c]	95,105	Fort Richardson	TM	109	13.9
	Jun 10		47,932	Fort Richardson	TM	109	13.9
	Jun 10	2003	25,706	Elmendorf	TM	112	15.6
2005	Jun 10	2003[c]	111,196	Fort Richardson	TM	107	13.0
	Jun 13		109,626	Fort Richardson	TM	104	13.0
2006	Jun 19	2004[c]	111,089	Fort Richardson	TM	107	13.2
	Jun 22		112,964	Fort Richardson	TM	107	13.2
2007	Jun 11	2005[c]	113,636	Fort Richardson	TM	102	10.3
	Jun 14		113,336	Fort Richardson	TM	102	10.3
Average (2000–2006)			205,426			108.0	13.8

Note: All smolt released at Nick Dudiak Fishing Lagoon were produced from the Ninilchik River egg-take project.

[a] NM = no mark; TM = thermal mark.

[b] Smolt were released as freshwater-age-1 fish beginning in 2004.

Table 5.–Chinook salmon smolt released at Halibut Cove Lagoon terminal saltwater fishery, 1995–2007.

Halibut Cove Lagoon								
Release year	Release date	Brood year	Number[a]	Hatchery	Mark type[b]	CWT tag code	Average length (mm)	Average weight (g)
1995	Jun 13	1994	37,577	Elmendorf	AD, CWT	312430	ND	23.6
1996	Jun 4	1995	97,729	Elmendorf	AD, CWT	312511	ND	18.5
1997	Jun 9	1996	78,133	Elmendorf	AD, CWT	312558	ND	13.4
1998	Jun 12	1997	65,893	Elmendorf	AD, CWT	312632	114	17.0
1999	Jun 1	1998	79,221	Elmendorf	NM		114	16.7
2000	Jun 1	1999	83,277	Elmendorf	NM		114	16.5
2001	Jun 5	2000	106,719	Elmendorf	NM		104	15.7
2002	May 28	2001	106,279	Elmendorf	TM		104	12.7
2003	Jun 17	2002	106,844	Fort Richardson	TM		104	12.5
2004	Jun 4	2002[c]	103,771	Fort Richardson	TM		107	13.6
2005	Jun 15	2003[c]	112,521	Fort Richardson	TM		107	13.0
2006	Jun 14	2004[c]	117,549	Fort Richardson	TM		102	11.7
2007	Jun 13	2005[c]	54,560	Fort Richardson	TM		97	9.8
Average (1995–2006)			91,293				107.8	15.4

Note: All smolt released at Halibut Cove Lagoon were produced from the Ninilchik River egg-take project. ND = no data.

[a] Number released includes smolts that had shed their coded wire tags.

[b] Ad = adipose finclip; CWT = coded wire tag; TM = thermal mark; NM = no mark.

[c] Smolt were released as freshwater-age-1 fish beginning in 2004.

Table 6.–Chinook salmon smolt released at Seldovia Bay terminal saltwater fishery, 1996–2007.

Seldovia Bay								
Release year	Release date	Brood year	Number of smolt[a]	Hatchery	Mark type[b]	CWT tag code	Average length (mm)	Average weight (g)
1996	Jun 12	1995	118,274	Elmendorf	AD, CWT	312510	ND	18.2
1997	Jun 6	1996	103,757	Elmendorf	AD, CWT	312557	ND	13.6
1998	Jun 9	1997	69,461	Elmendorf	AD, CWT	312631	109	13.8
1999	May 28	1998	74,057	Elmendorf	NM		117	17.6
2000	Jun 6	1999	68,114	Elmendorf	NM		119	19.2
2001	Jun 7	2000	102,793	Elmendorf	NM		109	14.2
2002	May 28	2001	83,045	Elmendorf	TM		107	13.4
2003	Jun 11	2002	107,521	Fort Richardson	TM		102	11.4
2004	May 18	2003	88,682	Elmendorf	TM		107	12.9
2005	Jun 7	2003[c]	114,984	Fort Richardson	TM		107	13.2
2006	May 30	2004[c]	113,974	Fort Richardson	TM		102	11.4
2007	Jun 5	2005[c]	54,276	Fort Richardson	TM		99	10.5
Average (1996–2006)			94,969				108.7	14.4

Note: All smolt released at Seldovia Bay were produced from the Ninilchik River egg-take project. ND = no data.

[a] Number released includes smolts that had shed their coded wire tags.

[b] Ad = adipose finclip; CWT = coded wire tag; TM = thermal mark; NM = no mark.

[c] Smolt were released as freshwater-age-1 fish beginning in 2005.

Table 7.–Ninilchik River Chinook salmon weir data, 1989–2007.

		Chinook salmon run			Egg take mortality (no.	Coded wire tagged Chinook salmon		Chinook salmon escapement	
Year	Weir operating dates	Component	No. fish	Percent	Chinook salmon)	No. fish recovered	No. strays detected[a]	No. fish[b]	Percent
1989	July 4– 25	Total[c]	254		ND	ND	ND	ND	
1990	July 6– 27	Total[c]	315		ND	ND	ND	ND	
1991	July 1–17	Total[c]	338		ND	12	ND	ND	
1992	June 30–July 14	Total[c]	539		ND	59	ND	ND	
1993	NL		NL	NL	NL	38	1	NL	NL
1994	July 7–26	Wild	446	81	ND	NA	NA	446	–
		Hatchery-reared	103[d]	19	ND	43	0	60	–
		Total[e]	549	100	125	43	0	381	
1995	July 4 - August 1	Wild	725	63	ND	NA	NA	725	–
		Hatchery-reared	425[d]	37	ND	135	0	290	–
		Total[e]	1,150	100	194	135	0	821	
1996	July 2–24	Wild	654	69	ND	NA	NA	654	–
		Hatchery-reared	290[d]	31	ND	69	0	221	–
		Total[e]	944	100	190	69	0	685	
1997	July 1–August 11	Wild	579	53	ND	NA	NA	579	–
		Hatchery-reared	517[d]	47	ND	181	2	336	–
		Total[e]	1,096	100	132	181	2	783	
1998	July 3–August 1	Wild	536	53	ND	NA	NA	536	53
		Hatchery-reared	466[d]	47	ND	0	0	466	47
		Total	1,002	100	196	0	0	1002	
1999	May 18–August 13	Wild	1,644	72	68	NA	NA	1,576	73
		Hatchery-reared	641	28	26	42	0	573	27
		Total[f]	2,285	100	94	42	0	2,149	
2000	May 17– August 8	Wild	1,634	66	81	NA	NA	1,553	69
		Hatchery-reared	853	34	60	108	1	685	31
		Total	2,487	100	141	108	1	2,238	
2001	May 30–August 5	Wild	1,414	68	175	NA	NA	1,239	70
		Hatchery-reared	673	32	0	130	0	543	30
		Total	2,087	100	175	130	0	1,782	

-continued-

Table 7.–Page 2 of 2.

Year	Weir operating dates	Chinook salmon run			Egg take mortality (no. Chinook salmon)	Coded wire tagged Chinook salmon		Chinook salmon escapement	
		Component	No. fish	Percent		No. fish recovered	No. strays detected[a]	No. fish[b]	Percent
2002	May 23 –August 11	Wild	1,516	73	176	NA	NA	1,340	77
		Hatchery-reared	559	27	55	109	0	395	23
		Total	2,075	100	231	109	0	1,735	
2003	May 16–August 5	Wild	1,258	75	131	NA	NA	1,127	77
		Hatchery-reared	425	25	52	37	5	336	23
		Total	1,683	100	183	37	5	1,463	
2004	May 18–August 5	Wild	1,525	74	132	NA	NA	1,393	75
		Hatchery-reared	536	26	0	67	1	469	25
		Total	2,061	100	132	67	1	1,862	
2005	May 6–August 4	Wild	2,241	83	165	NA	NA	2,076	84
		Hatchery-reared	462	17	0	53	0	409	16
		Total	2,703	100	165	53	0	2,485	
2006	June 30–August 1	Wild	1,139	81	101	NA	NA	1,038	84
		Hatchery-reared	273	19	35	34	1	204	16
		Total	1,412	100	136	34	1	1,242	
2007	July 2–August 1	Wild	679	89	129	0	NA	550	90
		Hatchery-reared	83	11	20	0	0	63	10
		Total	762	100	149	0	0	613	
Average (1999–2006)		Wild	1,546	74	129	NA	NA	1,418	76
		Hatchery-reared	553	26	28	73	1	452	24
		Total	2,099	100	157	73	1	1,870	

Note: NL = no data located; ND = no data; "-" = value cannot be computed due to limitations of the data; NA = not applicable.

[a] Number of Chinook salmon strays from other drainages that were recovered in Ninilchik River. Note: the number of strays are included in the coded wire tag (CWT) recovered total.

[b] Escapement = [total run - (egg take mortality + CWT recovered)].

[c] Number of wild and hatchery-reared Chinook salmon used in egg take unavailable; therefore total escapement does not account for mortality.

[d] Number of hatchery-reared Chinook salmon in the weir counts were expanded by the percent of CWT fish.

[e] Number of wild and hatchery-reared Chinook salmon used in egg take unavailable.

[f] Run includes the 31 wild and 38 hatchery-reared Chinook salmon that were captured in nets below the weir.

Table 8.–Number and escapement of wild and hatchery-reared Chinook salmon counted at the Ninilchik River weir during SEG index monitoring periods, 1994–2007.

	Wild Chinook salmon						Hatchery-reared Chinook salmon					
	Weir counts[a]			Escapement counts[b]			Weir counts[a]			Escapement counts[b]		
Year	Total run	July 8 - 24	Percentage of run	Total run	July 3 - 31	Percentage of run	Total run	July 8 - 24	Percentage of run	Total run	July 3 - 31	Percentage of run
1994	ND	423	–	–	–	–	ND	40	–	–	–	–
1995	ND	503	–	–	–	–	ND	342	–	–	–	–
1996	ND	591	–	–	–	–	ND	264	–	–	–	–
1997	ND	235	–	–	–	–	ND	358	–	–	–	–
1998	ND	422	–	–	–	–	ND	268	–	–	–	–
1999	1,644	799	48.6	1,576	1,283	81.4	641	277	43.2	573	447	78.0
2000	1,634	834	51.0	1,553	1,265	81.5	853	426	49.9	685	618	90.2
2001	1,414	716	50.6	1,239	897	72.4	673	363	53.9	543	471	86.7
2002	1,516	655	43.2	1,340	897	66.9	559	169	30.2	394	238	60.4
2003	1,258	393	31.2	1,127	517	45.9	425	150	35.3	336	204	60.7
2004	1,525	416	27.3	1,393	679	48.7	536	158	29.5	469	342	72.9
2005	2,241	814	36.3	2,076	1,259	60.6	462	129	27.9	409	286	69.9
2006	ND	764	–	–	1,013	–	ND	123	–	–	191	–
2007	ND	530	–	–	543	–	ND	58	–	–	63	–
Average (1999–2006)	1,605	674	41.2	1,472	976	65.4	593	224	38.6	487	350	74.1
		SEG[c] (2001) 400–850			SEG[d] (2007) 550–1,300							

Note: ND = no data, "-" = value cannot be calculated due to limitations of the data.

[a] Weir counts are the number of Chinook salmon that arrive to the weir during the SEG period.

[b] Escapement counts are [weir counts - (scarified for egg take + CWT recovered)].

[c] SEG=Sustainable Escapement Goal established in 2001 based on weir counts July 8–July 24, 1994–2000.

[d] SEG=Sustainable Escapement Goal established in 2007 based on escapement counts July 3–July 31, 1999–2007.

Table 9.–Summary of non-targeted species captured at the Ninilchik River weir, 1999–2007.

	Species					
Year	Dolly Varden	Pink salmon	Chum salmon	Sockeye salmon	Coho salmon	Steelhead
1999	0	0	0	300	0	0
2000	134	31	0	0	0	0
2001	309	369	0	707	20	0
2002	723	21	12	150	18	0
2003	175	101	2	19	15	0
2004	181	27	9	16	0	2
2005	429	275	4	45	14	1
2006	435	68	12	9	9	2
2007	201	35	14	1	3	1
Average (1999–2006)	298	112	5	156	10	1

Table 10.–Average, maximum, and minimum water temperature, discharge, and stage height for Ninilchik River during the SEG index monitoring period, July 3–31, 1999–2007.

	Ninilchik River								
	River temperature (°C)			Discharge (ft^3/s)			Stage height (ft)		
Year	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum
1999	ND	ND	ND	63	101	52	ND	ND	ND
2000	12	19	9	97	199	59	ND	ND	ND
2001	13	17	10	101	197	58	ND	ND	ND
2002	14	18	11	64	115	46	ND	ND	ND
2003	15	20	11	66	129	54	ND	ND	ND
2004	14	19	10	71	106	54	3.17	3.45	3.00
2005	14	19	11	72	99	60	3.18	3.40	3.07
2006	12	16	9	84	113	73	3.30	3.50	3.20
2007	12	17	9	73	99	58	3.19	3.40	3.05
(1999–2006)									
Average	13	18	10	77	132	57	3.22	3.45	3.09
Minimum	12	16	9	63	99	46	3.17	3.40	3.00
Maximum	15	20	11	101	199	73	3.30	3.50	3.20

Source: Temperature data collected at the NR-2 site by Sue Mauger of Cook Inletkeeper; provisional discharge data collected by the National Weather Service Alaska Pacific Weather Forecast Center.

Note: ND = No Data.

Table 11.–Estimated ocean age composition and length-at-ocean age of wild and hatchery-reared Chinook salmon run at Ninilchik River weir, 2007.

	Wild Chinook salmon							Hatchery-reared Chinook salmon						
		Ocean age					Sex		Ocean age					Sex
	UR[a]	1	2	3	4	Total	composition[b]	UR[a]	1	2	3	4	Total	composition[b]
Females														
Number sampled[c]	13	0	1	17	8	39	270	2	0	3	7	0	12	46
Estimated percent		0.0	1.5	25.8	12.1		40.1		0.0	15.8	36.8	0.0		55.4
SE percent		0.0	1.4	5.2	3.9		0.2		0.0	7.6	10.0	0.0		0.0
Estimated abundance[d]		0	10	175	82	267			0	13	31	0	44	
SE abundance		0.0	9.8	35.0	26.1	1.2			0.0	6.3	8.3	0.0	0	
Mean length (mm)		–	560	784	865	796			–	670	771	–	738	
SE length (mm)		–	–	11.5	13.2	10.3			–	15.3	15.3	–	14.1	
Males														
Number sampled[c]	13	4	15	19	2	53	403	3	5	3	1	0	12	37
Estimated percent		6.1	22.7	28.8	3.0		59.9		26.3	15.8	5.3	0.0		44.6
SE percent		2.8	4.9	5.3	2.0		0.2		9.1	7.6	4.6	0.0		0.0
Estimated abundance[d]		41	154	196	21	412			22	13	4	0	39	
SE abundance		19.1	33.5	36.2	13.7	1.2			7.6	6.3	3.8	0.0	0.0	
Mean length (mm)		468	629	772	828	684			521	652	695	–	617	
SE length (mm)		20.9	9.7	14.9	37.5	14.1			46.8	27.3	–	–	26.2	
Total														
Number sampled[c]	26	4	16	36	10	92	673	5	5	6	8	0	24	83
Estimated percent		6.1	24.2	54.5	15.2				26.3	31.6	42.1	0.0		
SE percent		2.8	5.1	5.9	4.2				9.1	9.6	10.2	0.0		
Estimated abundance[d]		41	165	370	103	679			22	26	35	0	83	
SE abundance		19.1	34.3	39.8	28.7				7.6	8.0	8.5	0.0		
Jacks counted		24							6					
Mean length (mm)		468	624	778	858				521	661	761	–		
SE length (mm)		20.9	10.0	9.5	12.9				46.8	14.6	6.3	–		

[a] UR= unreadable scale samples.

[b] All fish were examined to indentify sex but was not determined for 6 wild fish.

[c] Numbered sampled for age and length data.

[d] Estimated abundances were calculated using the rounded estimated percent presented in this table.

Table 12.–Estimated annual age composition (percent of total) for wild and hatchery-reared Chinook salmon from the Ninilchik River, 1997–2007.

	Wild				Hatchery-reared			
	Ocean age				Ocean age			
Year	1	2	3	4	1	2	3	4
1997	0.9	9.1	85.5	4.5	12.2	34.5	45.0	8.3
1998	1.5	33.5	36.1	28.9	7.8	29.8	53.9	8.5
1999	0.0	36.4	46.7	16.9	2.5	53.5	33.8	10.2
2000	2.3	10.5	59.3	27.9	4.6	26.7	60.8	7.9
2001	0.9	40.6	41.5	17.0	8.1	41.4	37.9	12.6
2002	3.0	39.1	52.3	5.6	19.4	33.0	46.6	1.0
2003	1.1	26.9	60.0	12.0	9.7	41.7	47.2	1.4
2004	0.0	21.0	50.3	28.7	1.8	31.9	62.8	3.5
2005	6.2	18.2	68.2	7.4	13.0	12.2	67.5	7.3
2006	9.3	30.0	40.0	20.7	32.8	32.8	22.3	11.9
2007	6.1	24.2	54.5	15.2	26.3	31.6	42.1	0.0
Average (1999–2006)	2.9	27.8	52.3	17.0	11.5	34.2	47.4	7.0

Table 13.–Coded wire tag (CWT) data from hatchery-reared Chinook salmon recovered at Ninilchik River weir, 2007.

CWT code	Brood year	Release		Number of samples	Ocean age										
					CWT-age[a]		Scale-1st age estimate			Scale-2nd age estimate			Scale- resolved age estimate		
		Date	Site		Fresh	Ocean	Corr[b]	Incorr[c]	Unaged[d]	Corr[b]	Incorr[c]	Unaged[d]	Corr[b]	Incorr[c]	Unaged[d]
310318	2002	May 12, 2004	Ninilchik R.	13	1	3	12	0	1	11	1	1	12	0	1
310341	2003	May 19, 2005	Ninilchik R.	3	1	2	0	0	3	0	0	3	0	0	3
No tag[e]				2	–	–	–	–	–	–	–	–	–	–	–
Total				18			12	0	4	11	1	4	12	0	4

Note: "-" = value not applicable.

[a] Fresh and ocean ages were determined by comparing brood year, release year, and recovery year.

[b] Number of scale samples where age matched CWT age.

[c] Number of scale samples where age did not matched CWT age.

[d] Number of scale samples that were not aged due to un-readable scales.

[e] CWT was not detected from Chinook salmon samples missing adipose fins.

Table 14.–Ninilchik River Chinook salmon egg take dates, number of females spawned, fecundity and percent survival to the eyed stage, 1999–2007.

Year	Hatchery	Egg take date	Number of females spawned[a]	Maximum water temp (°C)	Fecundity[b]		Green egg estimates at		Eyed eggs	
					Assumed	Actual	Egg take	Eyed stage	Total	% survival
1999	Fort Richardson	7-Jul	6	ND	6,000	6,399	36,000	38,396	34,707	90.4
1999	Fort Richardson	14-Jul	23	ND	6,000	6,380	138,000	146,734	124,751	85.0
1999	Fort Richardson	21-Jul	41	ND	6,000	6,179	246,000	253,329	217,827	86.0
1999	Fort Richardson	27-Jul	19	ND	6,000	5,630	114,000	106,970	98,492	92.1
Average			22	ND	6,000	6,147	133,500	136,357	118,944	
Total			89				534,000	545,429	475,777	87.2
2000	Fort Richardson	7-Jul	8	14	5,591	5,533	44,726	44,267	35,496	80.2
2000	Fort Richardson	17-Jul	10	14	5,381	5,660	53,815	56,598	49,257	87.0
2000	Fort Richardson	24-Jul	36	12	5,421	5,663	195,174	203,876	161,326	79.1
2000	Fort Richardson	28-Jul	24	14	5,400	5,900	129,600	141,606	127,624	90.1
2000	Fort Richardson	28-Jul	41	14	5,400	5,794	221,400	237,536	214,659	90.4
Average			24	14	5,439	5,710	128,943	136,777	117,672	
Total			119				644,715	683,883	588,362	86.0
2001	Fort Richardson	10-Jul	7	14	5,793	5,680	40,551	39,757	26,050	65.5
2001	Fort Richardson	17-Jul	56	16	5,793	5,843	324,408	327,181	241,786	73.9
2001	Fort Richardson	25-Jul	42	15	5,793	6,365	243,306	267,331	237,211	88.7
Average			35	15	5,793	5,962	202,755	211,423	168,349	
Total			105				608,265	634,269	505,047	79.6
2002	Fort Richardson	12-Jul	6	18	6,000	5,852	36,000	35,109	21,112	60.1
2002	Fort Richardson	16-Jul	11	15	6,000	5,331	66,000	58,644	45,700	77.9
2002	Fort Richardson	23-Jul	12	14	6,000	5,937	72,000	71,241	60,738	85.3
2002	Fort Richardson	26-Jul	36	13	6,000	5,576	216,000	200,753	164,910	82.1
2002	Fort Richardson	30-Jul	32	18	6,000	5,771	192,000	184,672	162,332	87.9
2002	Fort Richardson	2-Aug	17	18	6,000	5,884	102,000	100,032	84,357	84.3
2002	Elmendorf	19-Jul	16	14	5,888	6,160	94,200	98,557	30,150	30.6
2002	Elmendorf	23-Jul	12	14	5,269	5,863	63,232	70,350	28,140	40.0
2002	Elmendorf	26-Jul	35	13	4,900	4,767	171,520	166,830	123,280	73.9
2002	Elmendorf	30-Jul	32	18	4,950	5,825	158,388	186,394	138,288	74.2
2002	Elmendorf	2-Aug	17	18	4,035	4,997	68,608	84,956	41,540	48.9
Average			21	16	5,549	5,633	112,723	114,322	81,868	
Total			226				1,239,948	1,257,538	900,547	71.6
2003	Fort Richardson	22-Jul	27	18	5,800	6,323	156,600	170,723	147,530	86.4
2003	Fort Richardson	29-Jul	55	13	5,800	6,240	319,000	343,177	293,695	85.6
2003	Fort Richardson	1-Aug	41	17	5,800	6,703	237,800	274,834	249,242	90.7
2003	Elmendorf	17-Jul	27	15	7,128	7,251	182,764	195,774	153,162	78.2
Average			38	16	6,132	6,629	224,041	246,127	210,907	
Total			150				896,164	984,508	843,629	85.7
2004	Fort Richardson	15-Jul	3	16	6,000	5,005	18,000	15,016	7,186	47.9
2004	Fort Richardson	20-Jul	26	14	6,000	5,941	156,000	154,461	110,634	71.6
2004	Fort Richardson	26-Jul	57	12	6,000	6,139	343,000	349,937	319,414	91.3
2004	Fort Richardson	30-Jul	40	13	6,000	5,396	240,000	215,859	195,000	90.3
Average			32	14	6,000	5,620	189,250	183,818	158,059	
Total			126				757,000	735,273	632,234	86.0
2005	Fort Richardson	20-Jul	14	16	5,811	4,968	81,354	69,550	56,165	80.8
2005	Fort Richardson	26-Jul	60	14	5,972	5,375	358,320	322,470	284,845	88.3
2005	Fort Richardson	2-Aug	31	12	5,972	5,365	185,132	166,324	154,087	92.6
Average			35	14	5,918	5,236	208,269	186,115	165,032	
Total			105				624,806	558,344	495,097	88.7

-continued-

Table 14.–Page 2 of 2.

Year	Hatchery	Egg take date	Number of females spawned[a]	Maximum water temp (°C)	Fecundity[b]		Green egg estimates at		Eyed eggs	
					Assumed	Actual	Egg take	Eyed stage	Total	% survival
2006	Fort Richardson	19-Jul	44	11	5,858	6,359	279,796	267,527	229,151	86.0
2006	Fort Richardson	26-Jul	47	11	5,858	5,142	241,674	277,003	259,843	94.0
2006	Fort Richardson	1-Aug	11	12	5,858	4,295	47,245	51,845	49,200	95.0
Average			34	11	5,858	5,265	189,572	198,792	179,398	
Total			102				568,715	596,375	538,194	90.2
2007	Fort Richardson	23-Jul	30	11	6,630	5,934	192,270	172,096	159,808	92.9
2007	Fort Richardson	30-Jul	62	17	6,219	6,015	372,924	372,924	319,194	85.6
Average			46	14	6,425	5,975	282,597	272,510	239,501	
Total			92				565,194	545,020	479,002	87.9
Average (1999-2006)			118	14	5,836	5,775	734,202	749,452	622,361	84.4

Note: ND = no data collected.

[a] Only ripe females were counted, and this number does not necessarily match the number of fish sacrificed during the egg take.

[b] Number of green eggs per female.

Table 15.–Ninilchik River Chinook salmon run composition observed in the area open to sport fishing for each beach seine survey, 2007.

	Wild		Hatchery-reared		
Date	Number	Percent	Number	Percent	SE[a]
May 24	22	75.9	7	24.1	8.1
May 30	23	100.0	0	0.0	0.0
Jun 6	45	88.2	6	11.8	4.6
Jun 13	36	85.7	6	14.3	5.5
Jun 20	77	84.6	14	15.4	3.8
Jun 27	99	82.5	21	17.5	3.5
Jul 5	119	91.5	11	8.5	2.5
Jul 11	65	79.3	17	20.7	4.5
Total	486	85.6	82	14.4	1.5

[a] Binomial proportion; the calculated standard error applies for both wild and hatchery-reared percentages.

Table 16.–Summary of non-targeted species captured during beach seine surveys conducted in the area open to sport fishing in the Ninilchik River, 2007.

	Species		
Date	Steelhead trout	Pink salmon	Dolly Varden
May 24	18	0	0
May 30	7	0	0
Jun 6	13	0	0
Jun 13	14	0	0
Jun 20	2	0	0
Jun 27	0	1	0
Jul 5	0	23	0
Jul 11	0	15	4
Total	54	39	4

Table 17.–Ninilchik River wild and hatchery-reared Chinook salmon (jacks included) inriver harvest and catch reported in freshwater sport fish guide logbooks for regulatory and emergency order fisheries openings, 2007.

				Chinook salmon									
				Harvest					Catch				
				Wild		Hatchery-reared			Wild		Hatchery-reared		
Fishery opened by:	Period	Dates	Anglers	Number	Percent	Number	Percent	SE[a]	Number	Percent	Number	Percent	SE[a]
Regulation	Weekend 1	May 26-28	12	5	83.3	1	16.7	16.7	6	85.7	1	14.3	14.3
	Weekend 2	Jun 2-4	35	11	91.7	1	8.3	8.3	15	93.8	1	6.2	6.3
	Weekend 3	Jun 9-11	29	10	90.9	1	9.1	9.1	19	90.5	2	9.5	6.6
	Subtotal		76	26	89.7	3	10.3	5.8	40	90.9	4	9.1	4.4
Emergency Order[b]	Week 1	May 26-Jun 1	23	5	41.7	7	58.3	14.9	18	69.2	8	30.8	9.2
	Week 2	Jun 2-8	53	11	57.9	8	42.1	11.6	60	84.5	11	15.5	4.3
	Week 3	Jun 9-15	41	10	76.9	3	23.1	12.2	35	89.7	4	10.3	4.9
	Week 4	Jun 16-22	42	0	0.0	11	100.0	0.0	52	74.3	18	25.7	5.3
	Week 5	Jun 23-29	44	0	0.0	13	100.0	0.0	63	81.8	14	18.2	4.4
	Week 6	Jun 30-Jul 6	38	0	0.0	7	100.0	0.0	27	64.3	15	35.7	7.5
	Week 7	Jul 7-13	24	0	0.0	4	100.0	0.0	22	68.8	10	31.2	8.3
	Week 8	Jul 14-20	20	0	0.0	0	0.0	0.0	8	88.9	1	11.1	11.1
	Total		285	26	32.9	53	67.1	5.3	285	77.9	81	22.1	2.2

[a] Binomial proportion; the calculated standard error applies for both wild and hatchery-reared percentages.

[b] Closed to the harvest of wild Chinook salmon except during the regulatory fishery on the weekends of the first three weeks.

FIGURES

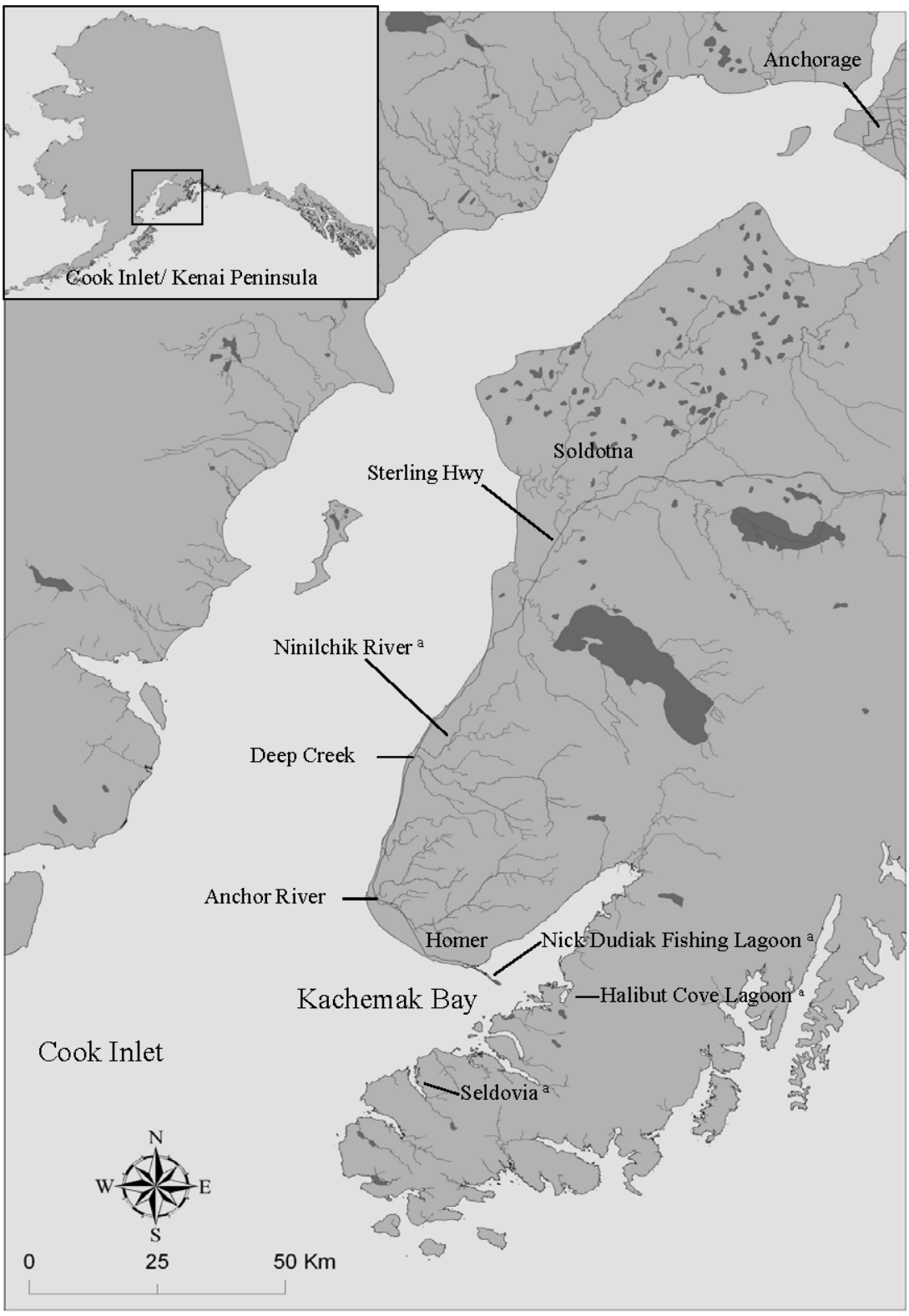

Figure 1.–Map of Kenai Peninsula highway system, Ninilchik River, and Kachemak Bay Chinook salmon smolt stocking locations, 1999–2007.

[a] Stocking locations for hatchery-reared Ninilchik River Chinook salmon smolt.

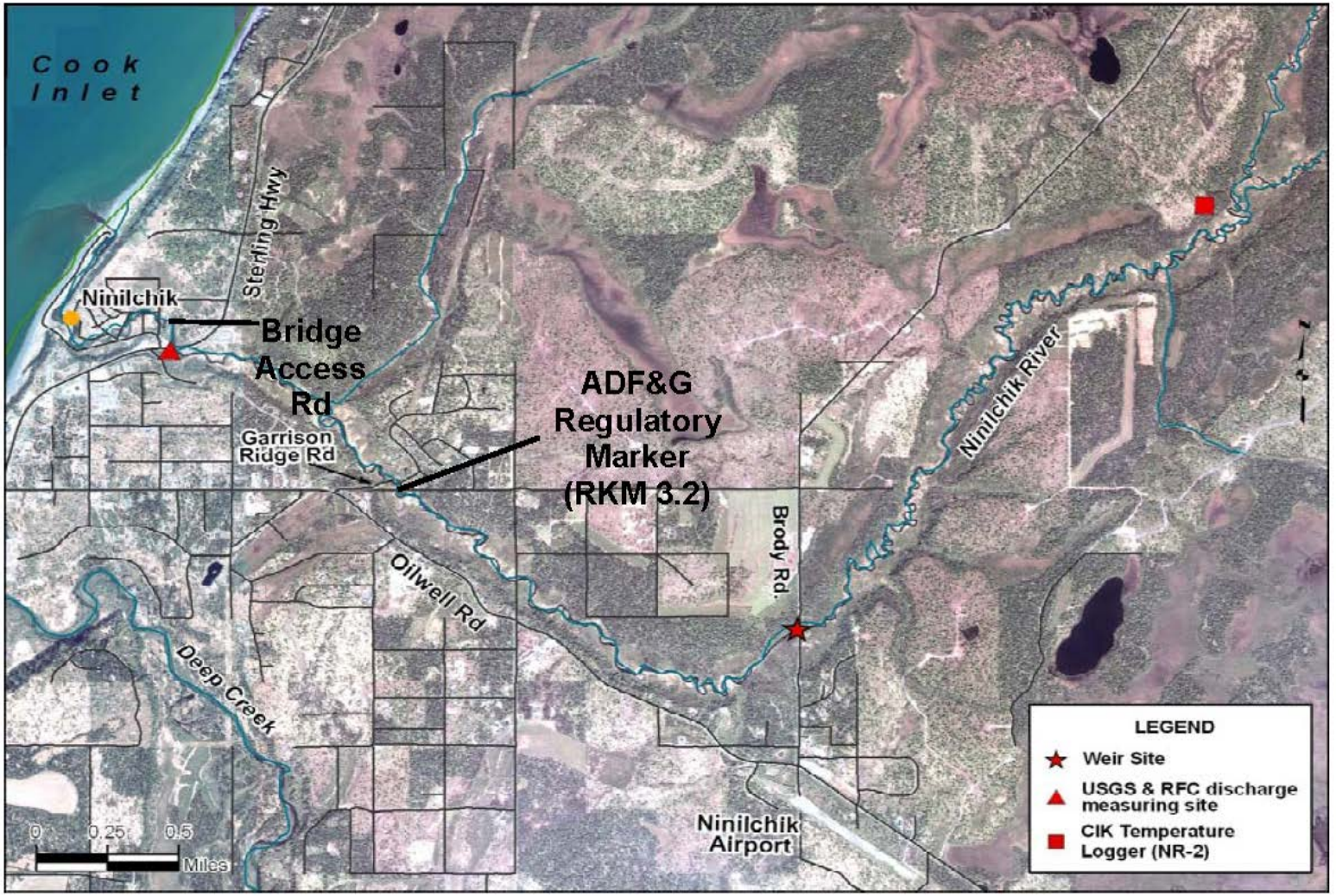

Figure 2.–Map of Ninilchik River weir sampling locations, 2007.

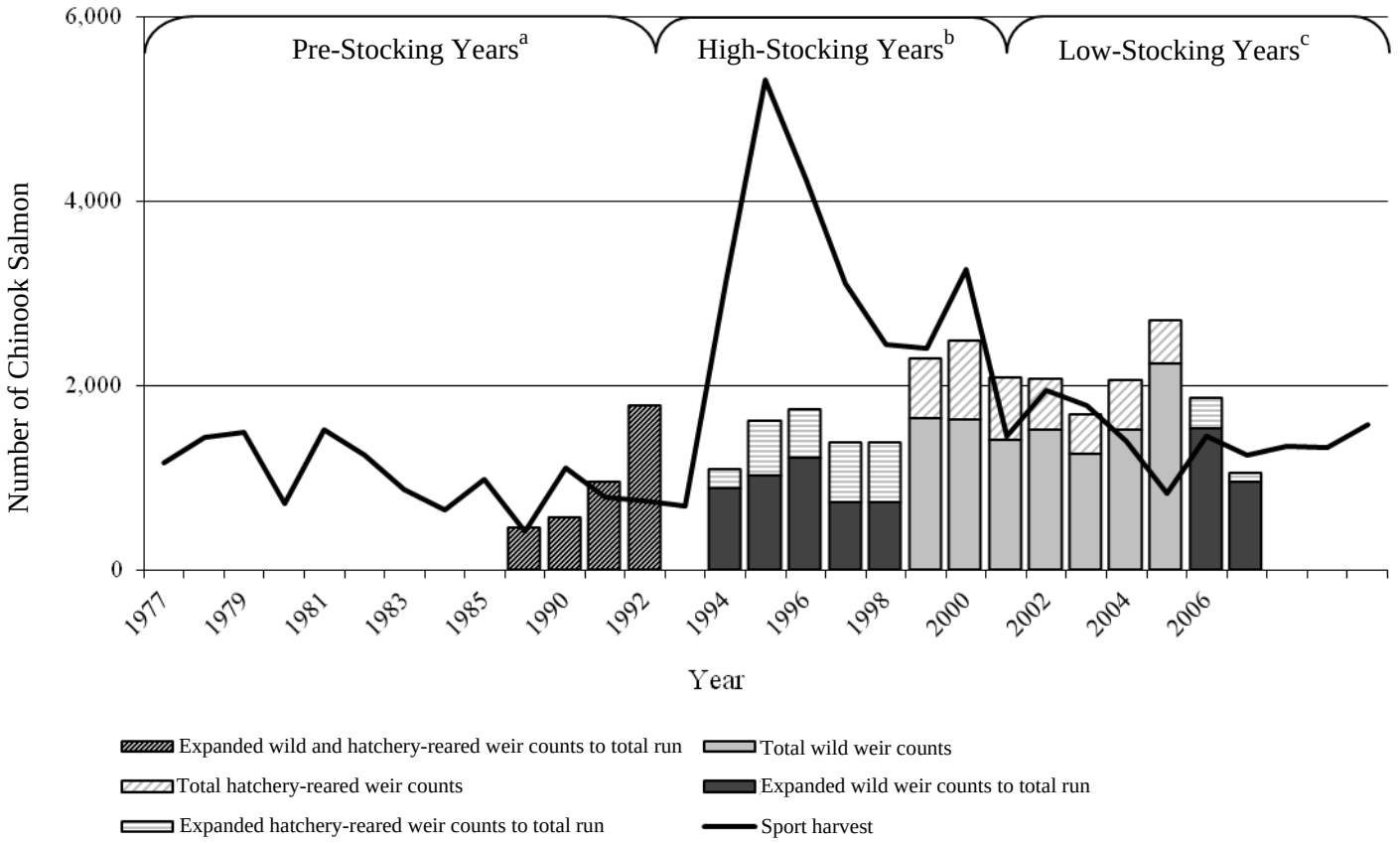

Figure 3.–Comparison of Ninilchik River Chinook salmon sport harvest and weir counts and how each responded to higher and lower levels of stocking with hatchery-reared Chinook salmon smolt, 1977–2007.

[a] Years before the stocking program and the effect of stocking was realized from the adult Chinook salmon return.

[b] Years when adult Chinook salmon returned from the release of approximately 200,000 smolt.

[c] Years when the adult Chinook salmon returned from the reduced stocking level of approximately 50,000 smolt.

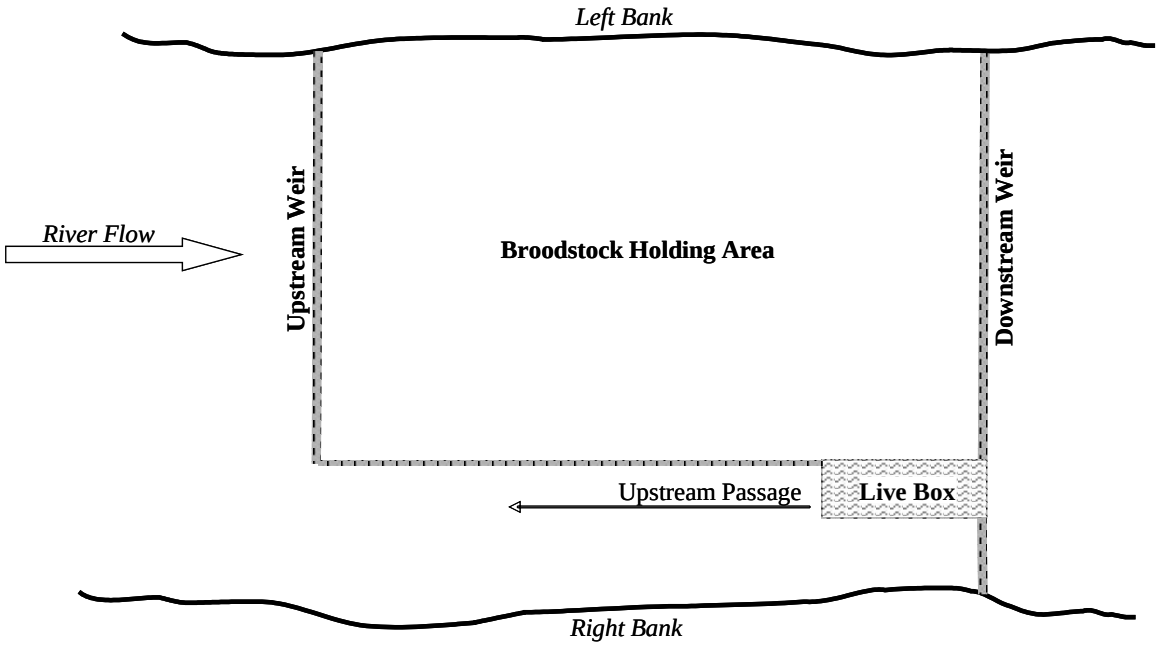

Figure 4.–The configuration of the Ninilchik River weirs and location of the broodstock holding area, 2007.

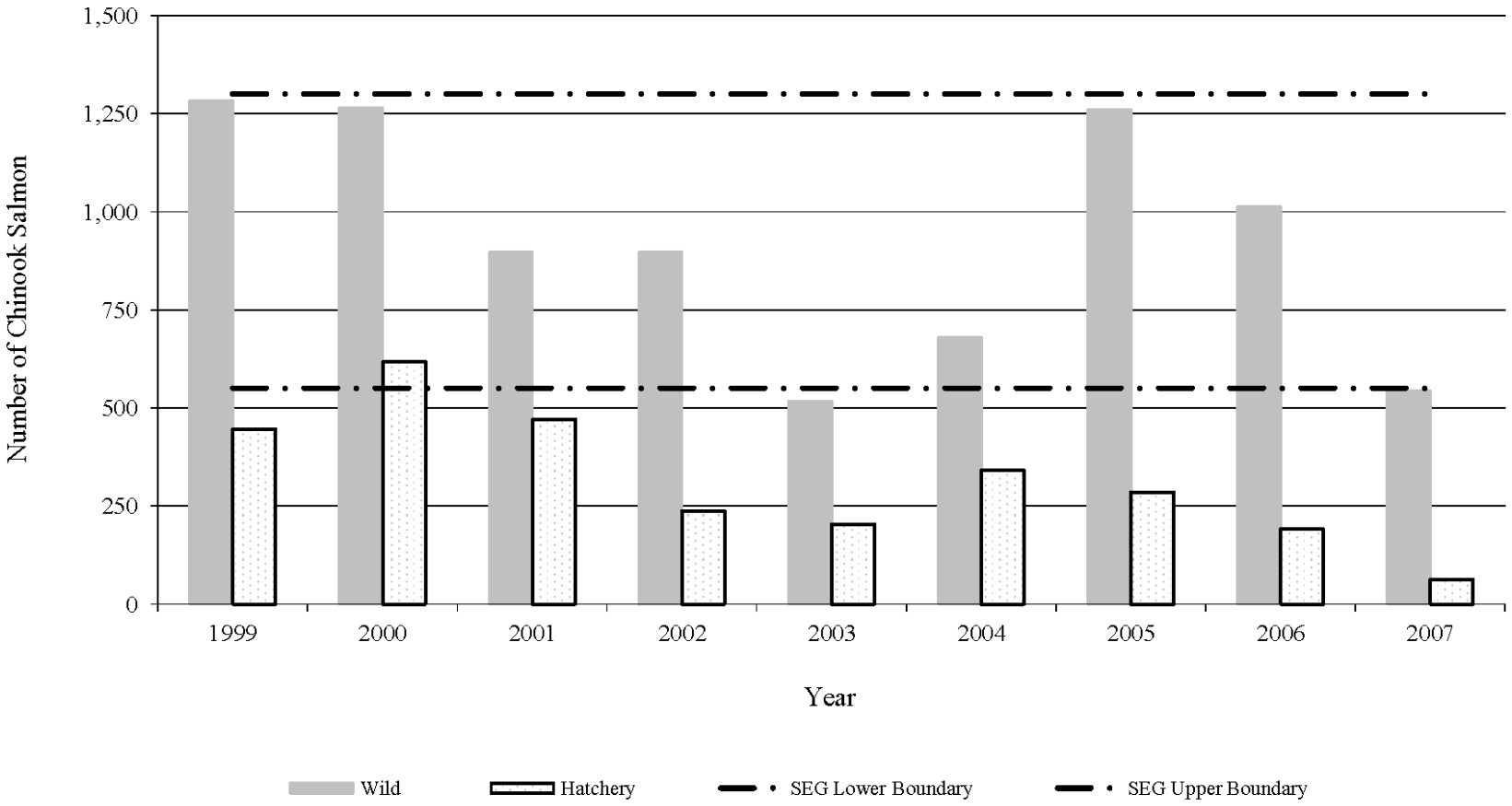

Figure 5.–Comparison of Ninilchik River Chinook salmon weir counts during the sustainable escapement goal (SEG) index monitoring period (July 3–31) with the upper and lower boundaries of the SEG range, 1999–2007.

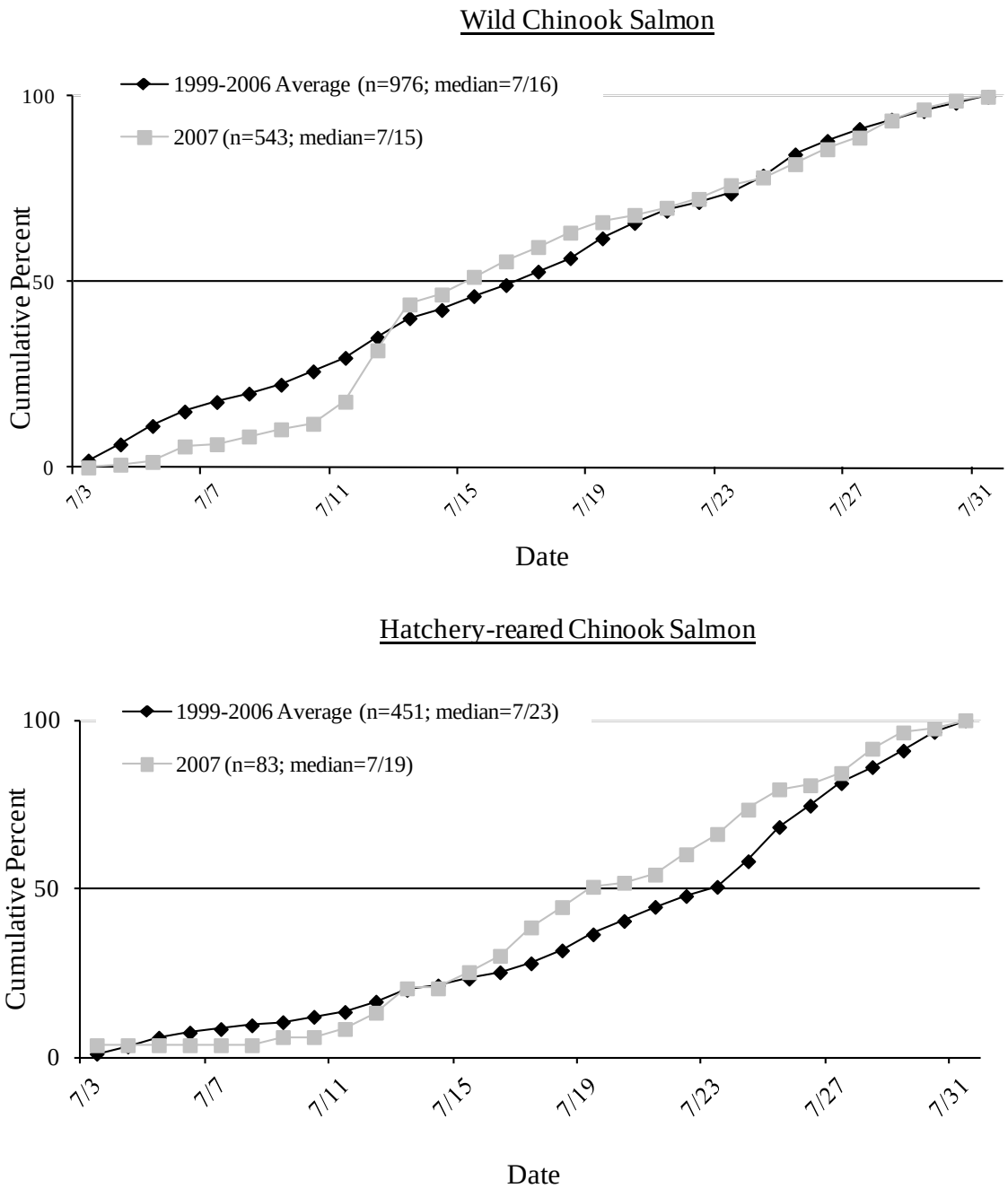

Figure 6.– Run timing cumulative percent of wild and hatchery-reared components of Ninilchik River Chinook salmon weir counts during SEG index monitoring period, 1999–2007.

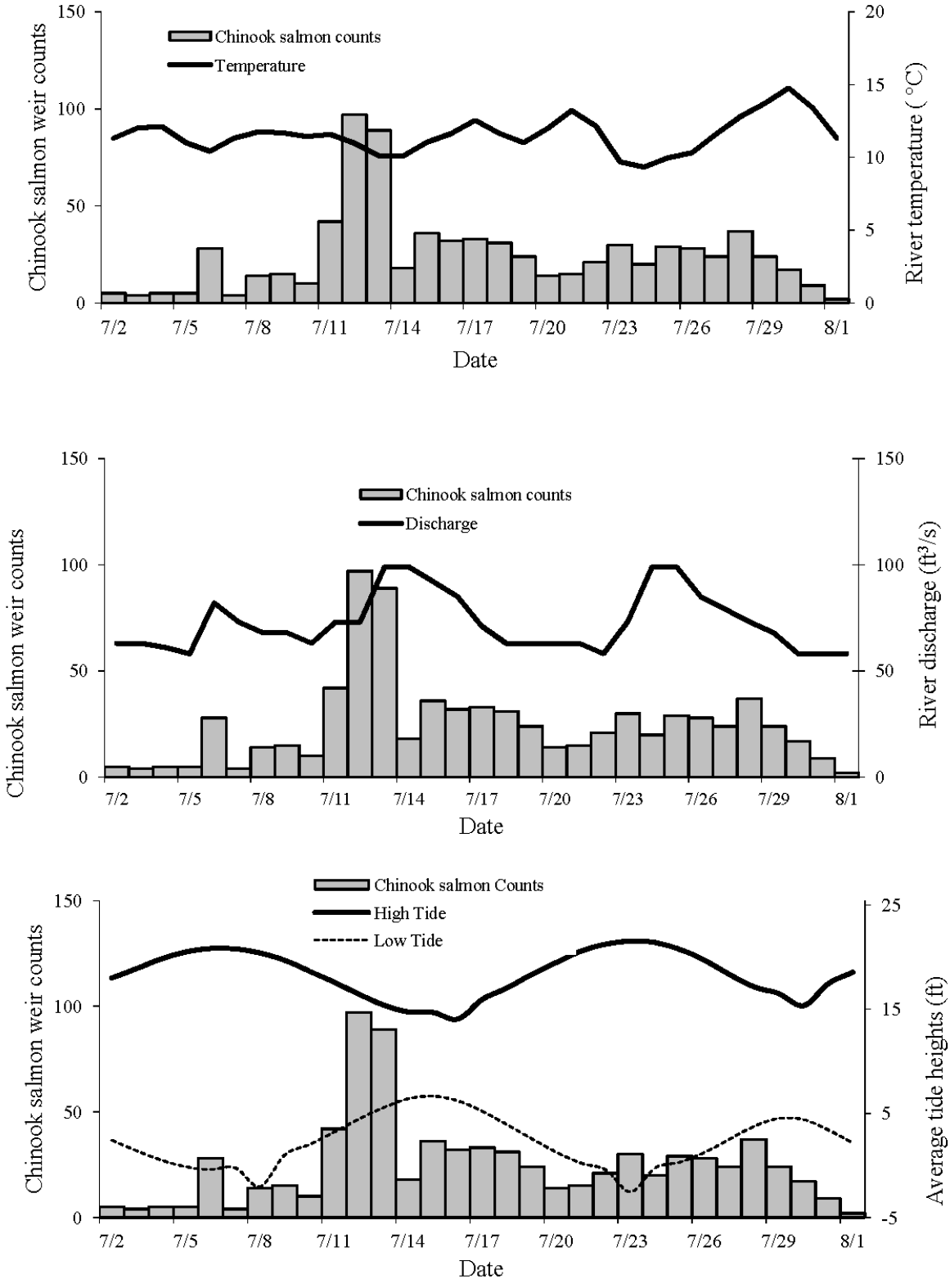

Figure 7.– Daily comparison of Ninilchik River Chinook salmon weir counts with average water temperature, discharge, and tide height, July 2 through August 1, 2007.

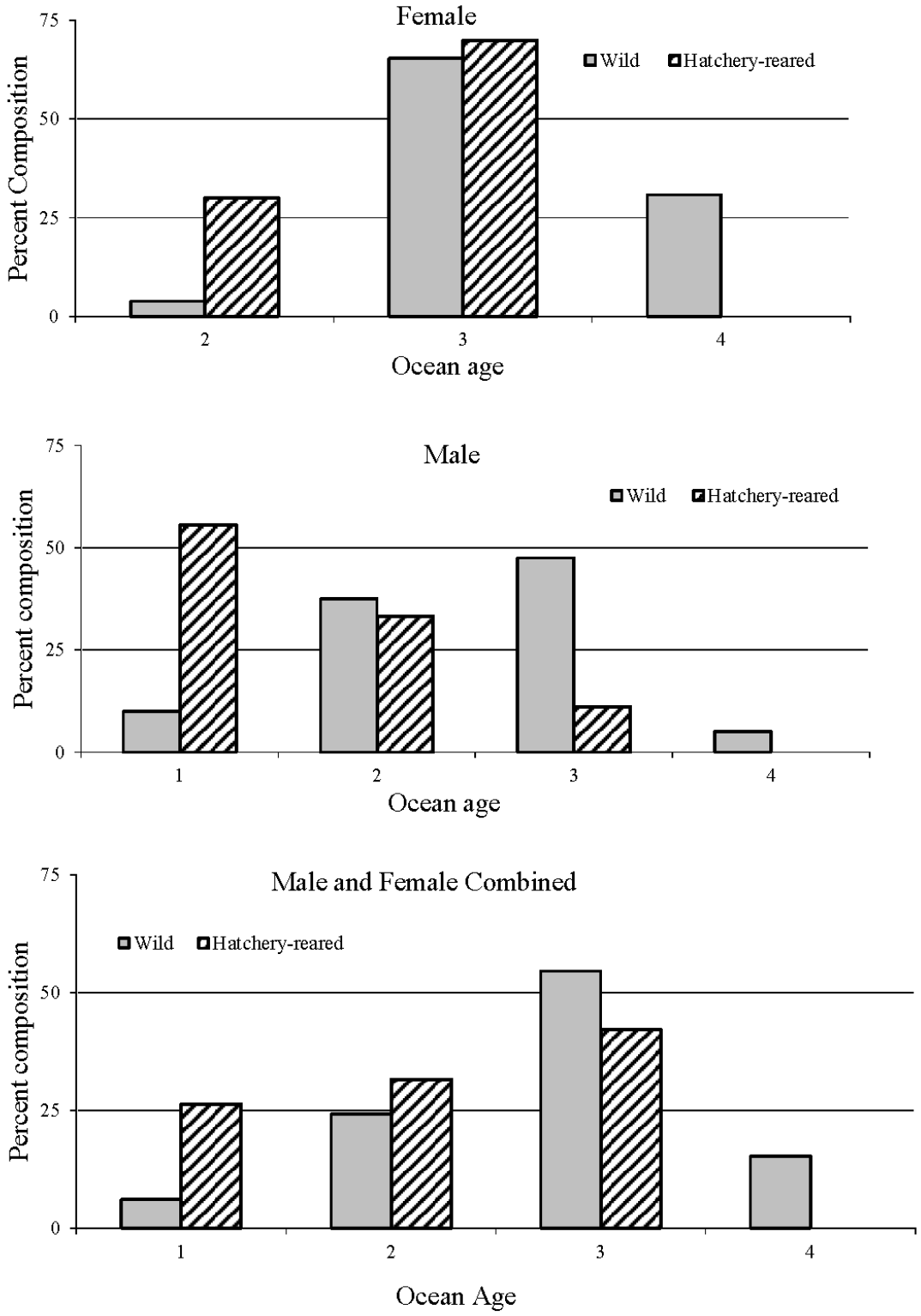

Figure 8.–Ninilchik River wild and hatchery-reared Chinook salmon estimated ocean age composition, 2007.

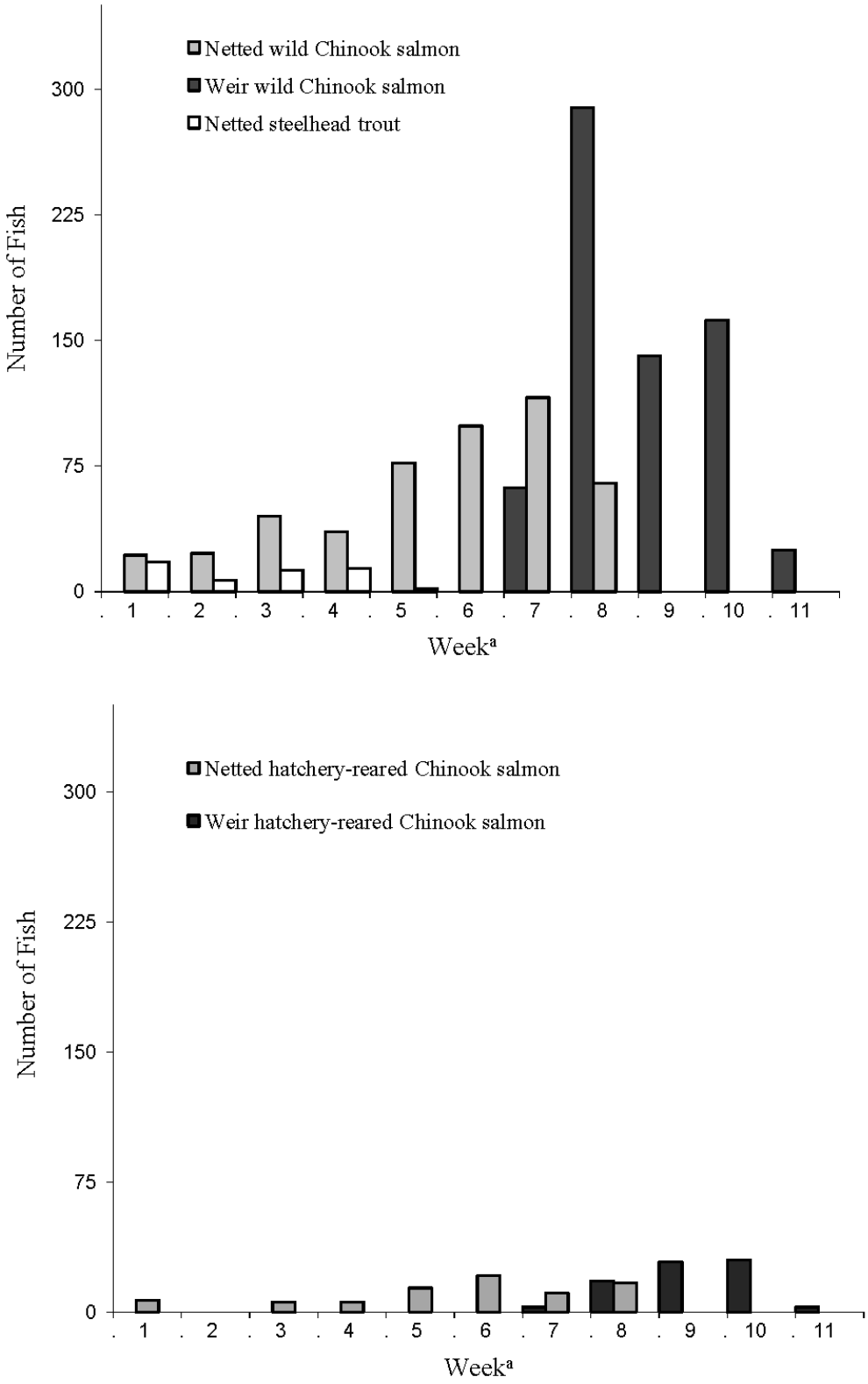

Figure 9.–Weekly comparison of the wild and hatchery-reared Chinook salmon and steelhead trout captured during beach seine surveys and at the weir, 2007.

[a] Weeks are 7-day periods from May 21 through August 5 except week 11 only contains the last three weir days of weir operation.

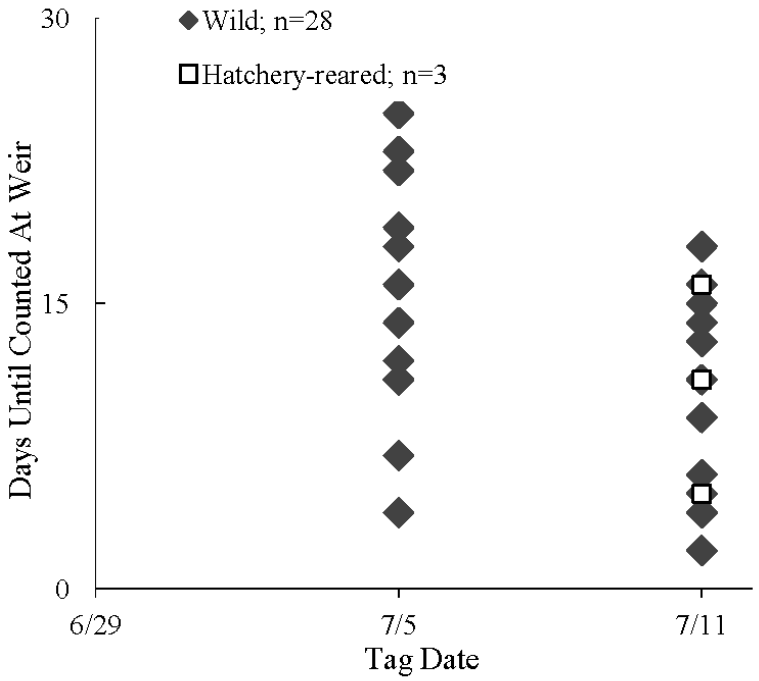

Figure 10.–Number of travel days for tagged wild and hatchery-reared Chinook salmon to arrive at the Ninilchik River weir after being tagged within the river reach open to sport fishing on July 5 and July 11, 2007.

APPENDIX A. TIMELINES FOR NINILCHIK RIVER CHINOOK SALMON SUPPLEMENTATION AND MONITORING PROGRAM

Appendix A1.–Ninilchik River Chinook salmon supplementation program timeline.

Year(s)	**Supplementation**
1987	Supplementation program initiated with Ninilchik River Chinook salmon. Site selected at 7.7 river kilometers (RKM) (Brody Road bridge) upstream from the mouth of Ninilchik River for first egg take. The site was selected because of the availability of spawning Chinook salmon and it was accessible by road. Nets used to capture Chinook salmon for egg takes. Fertilized eggs transported to hatchery and reared to smolt.
1988	Egg take conducted in similar fashion to 1987. First year smolt were stocked into the Ninilchik River (~20% were adipose-clipped and coded-wire-tagged). All smolt were released in the harbor.
1989	Broodstock weir began operating only in July at Garrison Road bridge (~3 RKM) to capture Chinook salmon for egg takes; a seine was used to force fish into the trap because they refused to move upstream. A containment area was also created to hold fish so they could ripen. Fertilized eggs transported to hatchery and reared to smolt. Smolt released and quantity split equally between Brody Road bridge and Sterling Highway bridge.
1990–1992	Broodstock weir was moved upstream to Brody Road bridge (RKM 7.7) and operated only in July. A containment area was also created to hold fish so they could ripen. All smolt released at Brody Road bridge.
1993–1994	Genetic policy enacted to require that 60 wild pairs be spawned for Ninilchik River stocking. Separated wild from hatchery-reared fish for egg take. Broodstock weir, egg takes, and stocking conducted similar to 1990. All smolt released at Brody Road bridge.
1995–1998	Beginning in 1995, Ninilchik River stocking rate was reduced to ~ 50,000 smolt and coded wire tag (CWT) rate increased to 100%. In 1995 and 1996 smolt released in harbor, thereafter all Ninilchik River smolt released at Brody Road bridge. Program expanded to use smolt from Ninilchik River to support terminal saltwater fisheries in Kachemak Bay. Broodstock weir and egg takes were conducted similar to 1990.
1999–2007	100% of adult hatchery-reared Chinook salmon observed at the broodstock weir were visually indentified by an adipose finclip. Broodstock weir operated throughout the entire run with a holding area only established in July. Egg takes used hatchery-reared fish for saltwater stocking locations. Stocking was conducted similar to 1995. All Ninilchik River smolt released at Brody Road bridge.

Appendix A2.–Ninilchik River Chinook salmon escapement monitoring timeline.

Year (s)	Escapement Monitoring
1962–1973	Annual Chinook salmon escapement estimated with a combination aerial and ground index survey. Survey conducted once annually over a standard length of river. Aerial surveys were done from a fixed wing aircraft (super cub). Foot surveys were conducted in only a subsection from the Sterling Highway bridge upstream approximately 9 RKM (upstream of Brody road). If the foot survey counts were greater than the aerial counts in the subsection, the total aerial count was expanded by the difference. No surveys were conducted for several years due to poor viewing conditions.
1974	Aerial survey conducted with both fixed and rotary wing aircraft. Escapement estimate produced in similar fashion to 1962–1973.
1976–1988	Subsection for ground survey reduced to 7.7 RKM above mouth at Brody Road Bridge. Escapement estimate produced in similar fashion to 1962–1973.
1975	Rotary wing aircraft replaces fixed wing aircraft as the viewing platform for all aerial surveys. Escapement estimate produced in similar fashion to 1962–1973.
1989	In addition to the aerial and foot survey, escapement data were opportunistically collected from broodstock weir located at Garrison Road Bridge (approximately 3 RKM). Weir was not operated over the entire run.
1990–1993	In addition to the aerial and foot survey, escapement data were opportunistically collected from broodstock weir located at Brody Road Bridge. No attempt was made to identify and enumerate hatchery-reared fish. Weir was not operated over the entire run.
1994	In addition to the aerial and foot survey, escapement counts at broodstock weir were used to estimate the number of wild and hatchery-reared Chinook salmon. The annual estimate of hatchery-reared Chinook salmon was based on the percent of adipose-clipped fish counted at the weir, the percent of each brood year detected at the weir through CWT recoveries, and the percentage that each brood year was adipose-clipped. Wild counts equaled the difference between the total number of Chinook salmon counted at the broodstock weir and the hatchery-reared estimate. Weir was not operated over the entire run.
1995–1998	Foot survey discontinued because counts didn't appear to have a relationship to escapement—likely due to poor visibility. Escapement was monitored at the broodstock weir similar to 1994..
1999–2000	In addition to the aerial survey, broodstock weir operated over the entire Chinook salmon run. First year where 100% of hatchery-reared fish identified by adipose finclip. Escapement counts of both wild and hatchery-reared fish enumerated by subtracting fish sacrificed for egg takes and CWT analysis.
2001–2005	Aerial survey discontinued in 2001 because counts didn't appear to have a relationship to escapement—likely due to poor visibility. Escapement was monitored at broodstock weir similar to 1999.
2006–Present	Weir operated only during the month of July and early August, not over the total run.

Appendix A3.–Ninilchik River Chinook salmon sport harvest monitoring and escapement goal timelines.

Year (s)	Sport Harvest
1977–present	Alaska Statewide Harvest Survey conducted, which produced estimates of total catch and harvest for Chinook salmon in the Ninilchik River.
1991–1993	Creel surveys of freshwater harvest were conducted to estimate the hatchery-reared harvest.
1994–1996 & 2000–2003	Inriver harvest sampling was conducted to estimate the percentage of hatchery-reared fish in the harvest.
2006	Inriver harvest sampling was conducted throughout the area open for sport fishing to estimate the percentage of hatchery-reared fish in the harvest.
2007	Beach seine surveys and floy tagging conducted throughout the area open for sport fishing to estimate the percentage of hatchery-reared fish in the inriver Chinook salmon run below RKM 3.2.

Year (s)	Escapement Goals
1993–1997	First escapement goal adopted (Biological Escapement Goal [BEG] = 830 wild Chinook salmon, which was based on average annual aerial and foot survey average counts and expanded estimates from 1966 to 1969 and 1977 to 1991).
1998	BEG range of 500 to 900 wild Chinook salmon was adopted, which was based on historic aerial survey counts and their relationship to the sport harvest.
2001–2006	Escapement goal policy adopted, and BEG was replaced with a Sustainable Escapement Goal (SEG) range of 400 to 850 wild Chinook salmon calculated from 7 years (1994 to 2000) of weir counts collected from July 8 through July 24.
2007	SEG with a range of 550 to 1,300 wild fish and a new index monitoring period (July 3–31) was adopted. The SEG was calculated using the percentile method (Bue and Hasbrouck *Unpublished*) and is based on the wild escapement above the weir during the index monitoring period from 1999 through 2007. The SEG period increased the number of monitoring days by 12 at no additional costs.

Appendix A4.–Ninilchik River Chinook salmon freshwater fishing regulations and emergency orders timelines.

Year	Chinook salmon fishing regulations Assume the regulations are carried forward unless otherwise stated. Chinook salmon may be referred to as "king salmon" or "kings."
1977	Harvest Recording Requirement. Open period: 4 two-day weekend openings beginning in the last week of May. Open area: mouth upstream 2 miles Season limit: 5 kings from fresh and salt water combined. Bag and size limit: 1 king salmon 20 in or larger; 10 kings under 20 in.
1978	Open period changed to 3 three-day weekend openings beginning in the last week of May.
1985	Bag and size limit: 1 king salmon 16 in or larger; 10 kings under 16 in.
2001	Bag and size limit: 1 king salmon 20 in or larger; 10 kings under 20 in.
2005	Bag and size limit: 2 king salmon 20 in or larger, of which only 1 can be wild; 10 kings under 20 in. A person may not fillet, mutilate, or otherwise disfigure a king salmon in a manner that prevents determination whether the fish is a wild or hatchery fish until the person has stopped fishing in the Ninilchik River drainage for the day and has moved more than 100 yards away from the Ninilchik River.
2007	Extended open season for hatchery fish from July 1 through December 31.

Year	Emergency Orders (EOs)
1991	EO: added a fourth 3-day weekend (June 15, 16, 17). EO: extended the fishery to from June 17 to June 24.
1992	EO: extended fishery by 10 days.
1993	EO: opened the fishery continuously from June 15 through June 28.
1994	EO: opened the fishery continuously from June 14 through June 27.
1995	EO: extended fishery by 14 days.
1996	EO 2-KS-1-20-96 extended the king salmon fishery on the Ninilchik River on a continual basis effective June 15, 12:01 AM through Monday June 24, 1996, 11:59PM.
2001	EO 2-KS-7-05-02 opened the Ninilchik River downstream of the regulatory marker for an additional 3-day weekend, June 16, 2001, 12:01AM to June 18, 2001, 11:59 PM.
2002	EO 2-KS-7-08-02 opened the Ninilchik River from its mouth to the downstream edge of the Sterling Highway Bridge, from Saturday, June 15, 12:01 AM to Monday, June 17, 11:59 PM, to sport fishing for hatchery king salmon only. The daily bag and possession limit was 1 fish 20 inches or greater in length or 10 fish under 20 inches. Only unbaited artificial lures were permitted.
2003	EO 2-KS-7-03-03 opened the Ninilchik River from its mouth to the downstream edge of the Sterling Highway Bridge, from Saturday, June 14, 2003, 12:01 AM, to Monday, June 30, 2003, 11:59 PM to sport fishing for hatchery Chinook salmon only. The daily bag and possession limit was 1 fish 20 inches or greater in length and 10 fish under 20 inches. Use of only one single hook was allowed.

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Year	Emergency Orders (EOs)
2004	EO 2-KS-7-03-04 opened the Ninilchik River from its mouth upstream to the regulatory marker located approximately 2 miles upstream, to fishing for hatchery king salmon 7 days per week. Bait was allowed. Only one, single hook could be used. A person could not possess a king salmon that had been filleted, headed, mutilated, or otherwise disfigured in a manner that prevented identification of hatchery or wild origin until permanently transported away from the fishing site if the fish was taken from the riverbank. "Fishing site" meant the riverbank where the fish was hooked and removed from the water. The emergency order was effective 12:01 AM, Saturday, May 29, 2004 until 11:59 PM. December 31, 2004.
2006	EO 2-KS-7-12-06 opened the Ninilchik River from its mouth upstream to the regulatory markers located approximately 2 miles upstream, from Wednesday, June 14, 12:01 AM to Friday, July 14, 11:59 PM, to fishing for hatchery king salmon. Hatchery king salmon can be recognized by the healed adipose finclip scar. Anglers were prohibited from removing king salmon with an adipose fin from the water and were required to release them immediately. The daily bag and possession limit was 2 hatchery king salmon 20 inches or greater in length and 10 hatchery king salmon under 20 inches. Fish 20 inches or greater in length must be recorded on the back of the fishing license or harvest record card. Bait was allowed. Use of only one single hook was allowed.
2007	EO 2-KS-7-06-07 opened the Ninilchik River from its mouth upstream to the regulatory markers located approximately 2 miles upstream, from Saturday, May 26, 12:01 AM to Sunday, July 15, 11:59 PM, to fishing for hatchery king salmon. The daily bag and possession limit was 2 hatchery king salmon 20 inches or greater in length and 10 hatchery king salmon under 20 inches. Fish 20 inches or greater in length must be recorded on the back of the fishing license or harvest record card. Bait was allowed. Use of only one single hook was allowed.

APPENDIX B. NINILCHIK RIVER CHINOOK SALMON WEIR COUNTS, 2007

Appendix B1.–Daily and cumulative counts of wild and hatchery-reared Chinook salmon at Ninilchik River weir, 2007.

		Weir count (number of fish)								
		Wild Chinook salmon			Hatchery-reared Chinook salmon			Total Chinook salmon		
			Cumulative			Cumulative			Cumulative	
Date		Daily	Number	Percent	Daily	Number	Percent	Daily	Number	Percent
Jul 2		5	5	1	0	0	0	5	5	1
Jul 3	[a]	1	6	1	3	3	4	4	9	1
Jul 4	[a]	5	11	2	0	3	4	5	14	2
Jul 5	[a]	5	16	2	0	3	4	5	19	2
Jul 6	[a]	28	44	6	0	3	4	28	47	6
Jul 7	[a]	4	48	7	0	3	4	4	51	7
Jul 8	[a]	14	62	9	0	3	4	14	65	9
Jul 9	[a]	13	75	11	2	5	6	15	80	10
Jul 10	[a]	10	85	13	0	5	6	10	90	12
Jul 11	[a]	40	125	18	2	7	8	42	132	17
Jul 12	[a]	93	218	32	4	11	13	97	229	30
Jul 13	[a]	83	301	44	6	17	20	89	318	42
Jul 14	[a]	18	319	47	0	17	20	18	336	44
Jul 15	[a,b]	32	351	52	4	21	25	36	372	49
Jul 16	[a]	28	379	56	4	25	30	32	404	53
Jul 17	[a]	26	405	60	7	32	39	33	437	57
Jul 18	[a]	26	431	63	5	37	45	31	468	61
Jul 19	[a, c]	19	450	66	5	42	51	24	492	65
Jul 20	[a]	13	463	68	1	43	52	14	506	66
Jul 21	[a]	13	476	70	2	45	54	15	521	68
Jul 22	[a]	16	492	72	5	50	60	21	542	71
Jul 23	[a]	25	517	76	5	55	66	30	572	75
Jul 24	[a]	14	531	78	6	61	73	20	592	78
Jul 25	[a]	24	555	82	5	66	80	29	621	81
Jul 26	[a]	27	582	86	1	67	81	28	649	85
Jul 27	[a]	21	603	89	3	70	84	24	673	88
Jul 28	[a]	31	634	93	6	76	92	37	710	93
Jul 29	[a]	20	654	96	4	80	96	24	734	96
Jul 30	[a]	16	670	99	1	81	98	17	751	99
Jul 31	[a]	7	677	100	2	83	100	9	760	100
Aug 1		2	679	100	0	83	100	2	762	100

[a] Sustainable escapement goal (SEG) counting period.

[b] Median run timing date during the SEG counting period for wild Chinook salmon.

[c] Median run timing date during the SEG counting period for hatchery-reared Chinook salmon.

APPENDIX C. NINILCHIK RIVER TEMPERATURE DATA, 2007

Appendix C1.–Ninilchik River daily mean, minimum, and maximum water temperatures, June 1 through October 4, 2007.

	Water temperatures (°C)														
	June			July			August			September			October		
Date	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
1	6.6	7.2	7.2	11.1	10.1	13.9	11.3	10.7	12.4	9.6	8.4	10.7	5.6	4.9	6.1
2	6.3	7.8	7.8	11.3	9.0	14.1	10.7	9.8	11.3	9.2	8.4	10.4	4.3	3.5	5.2
3	7.5	9.5	9.5	12.0	10.4	13.6	10.6	9.8	11.5	8.9	8.1	9.5	3.4	2.6	4.3
4	8.7	11.0	11.0	12.1	11.0	13.3	10.5	9.8	11.0	9.0	7.8	10.4	2.4	2.3	2.9
5	8.6	9.2	9.2	11.0	10.4	12.1	11.0	9.8	13.0	8.9	7.5	10.4			
6	8.6	11.0	11.0	10.4	8.7	11.8	12.4	10.7	14.7	9.4	7.8	11.0			
7	8.6	9.5	9.5	11.3	9.2	13.3	12.2	10.1	14.4	9.1	8.4	9.8			
8	7.3	8.1	8.1	11.7	11.0	12.7	12.3	9.8	14.7	8.7	8.4	9.2			
9	7.4	9.2	9.2	11.7	10.1	13.6	12.5	10.1	15.0	8.8	8.4	9.2			
10	9.4	12.7	12.7	11.4	10.7	12.4	12.3	9.8	14.7	8.9	8.4	9.5			
11	11.2	13.6	13.6	11.6	10.1	13.6	12.1	9.5	14.4	8.2	7.5	9.0			
12	10.3	11.8	11.8	11.0	10.4	11.8	13.5	11.3	16.2	8.2	7.8	8.7			
13	9.7	12.1	12.1	10.1	9.2	11.0	13.9	11.3	16.5	7.5	7.2	7.8			
14	10.4	13.3	13.3	10.1	9.0	11.5	13.6	12.7	14.7	7.8	7.2	9.0			
15	11.4	14.4	14.4	11.0	9.5	13.3	12.1	11.0	13.3	7.2	6.4	8.1			
16	12.5	15.3	15.3	11.6	9.2	14.1	11.6	10.7	12.4	6.6	5.8	7.8			
17	12.6	14.1	14.1	12.5	10.4	14.7	10.7	10.1	11.5	5.9	4.9	7.2			
18	11.2	12.4	12.4	11.7	11.0	13.0	10.0	9.2	10.7	6.1	5.8	6.4			
19	11.9	15.0	15.0	11.0	9.8	12.4	10.3	9.0	11.3	7.0	6.4	7.8			
20	13.8	16.8	16.8	12.0	9.8	14.7	10.6	9.8	11.3	7.7	7.2	8.4			
21	14.6	17.1	17.1	13.2	10.7	15.9	10.3	9.8	10.7	7.1	6.4	7.8			
22	13.4	14.7	14.7	12.1	10.7	14.1	9.8	9.5	10.1	5.8	4.9	6.6			
23	11.5	13.0	13.0	9.7	9.2	10.7	9.6	9.0	10.1	6.4	5.8	7.5			
24	9.8	10.4	10.4	9.3	8.7	10.1	10.0	8.7	11.8	6.9	6.4	7.5			
25	9.2	9.8	9.8	10.0	9.2	10.7	10.2	8.7	12.1	6.9	6.4	7.5			
26	10.0	12.4	12.4	10.3	9.8	11.0	10.3	9.0	11.8	6.5	5.8	7.2			
27	10.8	13.0	13.0	11.6	9.8	13.9	9.8	8.4	11.3	5.4	4.6	6.1			
28	10.9	12.7	12.7	12.8	10.7	15.0	10.7	9.5	12.7	5.4	5.2	5.8			
29	11.3	14.1	14.1	13.7	11.5	16.2	10.2	8.1	12.1	5.4	4.6	6.4			
30	13.2	15.9	15.9	14.8	13.3	16.8	9.9	7.8	12.1	5.7	5.2	6.6			
31				13.4	12.4	14.7	10.0	7.8	12.1						

Source: Temperature data collected at the NR-2 site by Sue Mauger of Cook Inlet Keeper.

APPENDIX D. NINILCHIK RIVER DISCHARGE AND STAGE HEIGHT DATA, 2007

Appendix D1.–Daily discharge measurements taken approximately 0.9 river kilometers upstream from Ninilchik River mouth, 2007.

	Discharge (ft^3/s)							
Date	April	May	June	July	August	September	October	November
1	–	222	99	61	58	54	–	99
2	–	166	99	63	58	–	–	99
3	–	177	99	63	63	54	–	99
4	–	166	99	61	–	58	–	85
5	–	147	106	58	73	54	–	73
6	–	113	92	82	68	54	–	47
7	–	136	92	73	63	54	–	73
8	–	129	92	68	54	58	–	73
9	916	121	82	68	54	177	–	–
10	916	147	81	63	54	147	–	156
11	883	129	83	73	54	113	–	121
12	1660	137	79	73	47	121	73	79
13	852	121	79	99	26	166	85	85
14	883	129	71	99	51	129	99	85
15	883	147	71	92	44	113	99	85
16	1020	166	68	85	54	99	99	73
17	852	177	67	71	54	79	92	99
18	761	156	68	63	54	79	99	99
19	761	129	68	63	54	147	–	99
20	445	113	68	63	54	166	99	68
21	353	113	63	63	63	129	79	552
22	353	106	63	58	79	99	68	507
23	305	106	63	73	92	–	68	507
24	465	121	82	99	99	113	63	–
25	406	129	92	99	79	129	79	600
26	336	121	79	85	68	129	85	445
27	305	113	73	79	63	106	99	336
28	261	113	63	73	58	99	85	234
29	247	99	63	68	54	85	73	156
30	234	113	63	58	54	–	85	129
31		106		58	–		–	

Source: Provisional data collected by the National Weather Service Alaska Pacific Weather Forecast Center.

Note: "-" = value can't be calculated due to limitations of the data.

Appendix D2.–Stage height measurements taken approximately 0.9 river kilometers upstream from the mouth of the Ninilchik River, 2007.

Date	Stage height (ft)							
	April	May	June	July	August	September	October	November
1	5.65	4.05	3.40	3.08	3.05	3.00	–	3.40
2	5.65	3.80	3.40	3.10	3.05	-	–	3.40
3	5.60	3.85	3.40	3.10	3.10	3.00	–	3.40
4	6.55	3.80	3.40	3.07	–	3.05	–	3.30
5	5.55	3.70	3.45	3.05	3.20	3.00	–	3.20
6	5.60	3.50	3.35	3.27	3.15	3.00	–	2.90
7	5.60	3.63	3.35	3.20	3.10	3.00	–	3.20
8	5.80	3.60	3.35	3.15	3.00	3.05	–	3.20
9	5.55	3.55	3.28	3.15	3.00	3.85	–	-
10	5.40	3.70	3.27	3.10	3.00	3.70	–	3.75
11	5.40	3.60	3.28	3.20	3.00	3.50	–	3.55
12	4.75	3.65	3.25	3.20	2.90	3.55	3.20	3.25
13	4.50	3.55	3.25	3.40	2.50	3.80	3.30	3.30
14	4.50	3.60	3.18	3.40	2.95	3.60	3.40	3.30
15	4.35	3.70	3.18	3.35	2.85	3.50	3.40	3.30
16	4.80	3.80	3.15	3.30	3.00	3.40	3.40	3.20
17	4.65	3.85	3.15	3.18	3.00	3.25	3.35	3.40
18	4.45	3.75	3.15	3.10	3.00	3.25	3.40	3.40
19	4.35	3.60	3.15	3.10	3.00	3.70	–	3.40
20	4.20	3.50	3.15	3.10	3.00	3.80	3.40	3.15
21	4.15	3.50	3.10	3.10	3.10	3.60	3.25	5.00
22	4.10	3.45	3.10	3.05	3.25	3.40	3.15	4.90
23	5.65	3.45	3.10	3.20	3.35	–	3.15	4.90
24	5.65	3.55	3.28	3.40	3.40	3.50	3.10	–
25	5.60	3.60	3.35	3.40	3.25	3.60	3.25	5.10
26	6.55	3.55	3.25	3.30	3.15	3.60	3.30	4.75
27	5.55	3.50	3.20	3.25	3.10	3.45	3.40	4.45
28	5.60	3.50	3.10	3.20	3.05	3.40	3.30	4.10
29	5.60	3.40	3.10	3.15	3.00	3.30	3.20	3.75
30	5.80	3.50	3.10	3.05	3.00	–	3.30	3.60
31		3.45		3.05	–		–	

Source: Provisional data collected by the National Weather Service Alaska Pacific Weather Forecast Center.
Note: "-" = value can't be calculated due to limitations of the data.

APPENDIX E. NINILCHIK PREDICTED DAILY AVERAGE HIGH AND LOW TIDE HEIGHTS DATA, 2007

Appendix E1.–Deep Creek predicted daily high and low tides heights, May 1 through August 31, 2007.

	Daily tide height (ft)											
	May						June					
	High			Low			High			Low		
Date	AM	PM	Average	AM	PM	Average	AM	PM	Average	AM	PM	Average
1	14.9	15.5	15.2	6.6	2.4	4.5	15.2	18.8	17.0	1.9	3.2	2.6
2	15.0	16.8	15.9	5.4	2.3	3.9	16.1		–	0.0	3.4	1.7
3	15.9		–	3.3	1.9	2.6	19.8	17.1	18.5	-1.9	3.3	0.7
4	18.4	17.2	17.8	0.8	1.5	1.2	20.7	18.2	19.5	-3.4	3.0	-0.2
5	20.0	18.6	19.3	-1.7	1.2	-0.3	21.3	19.0	20.2	-4.4	2.6	-0.9
6	21.4	19.7	20.6	-3.7	1.0	-1.4	21.7	19.4	20.6	-4.9	2.5	-1.2
7	22.4	20.3	21.4	-5.1	1.1	-2.0	21.6	19.4	20.5	-4.7	2.5	-1.1
8	22.8	20.3	21.6	-5.6	1.4	-2.1	21.0	19.1	20.1	-4.0		-4.0
9	22.5	19.9	21.2	-5.3	2.0	-1.7	20.0	18.6	19.3	2.8	-2.9	-0.1
10	21.6	19.0	20.3	-4.3		–	18.7	18.0	18.4	3.2	-1.4	0.9
11	20.2	17.9	19.1	2.9	-2.9	0.0	17.2	17.3	17.3	3.8	0.2	2.0
12	18.5	16.9	17.7	3.9	-1.1	1.4	15.6	16.7	16.2	4.3	1.9	3.1
13	16.7	16.1	16.4	4.9	0.6	2.8	14.3	16.3	15.3	4.6	3.6	4.1
14	15.2	15.7	15.5	5.5	2.1	3.8	13.4	16.1	14.8	4.6	5.0	4.8
15	14.1	15.8	15.0	5.5	3.2	4.4	13.2	16.2	14.7	4.1	6.0	5.1
16	13.8		–	4.9	3.9	4.4	13.6		–	3.3	6.5	4.9
17	16.2	14.1	15.2	3.8	4.4	4.1	16.5	14.4	15.5	2.2	6.5	4.4
18	16.7	14.8	15.8	2.5	4.5	3.5	17.1	15.3	16.2	1.1	6.1	3.6
19	17.4	15.7	16.6	1.3	4.6	3.0	17.8	16.2	17.0	0.0	5.6	2.8
20	18.1	16.5	17.3	0.2	4.5	2.4	18.5	17.0	17.8	-1.0	5.0	2.0
21	18.7	17.1	17.9	-0.7	4.3	1.8	19.3	17.7	18.5	-1.8	4.3	1.3
22	19.2	17.5	18.4	-1.4	4.3	1.5	19.8	18.2	19.0	-2.5	3.8	0.7
23	19.5	17.7	18.6	-1.8	4.3	1.3	20.0	18.5	19.3	-2.7	3.4	0.4
24	19.5	17.5	18.5	-2.0	4.4	1.2	19.9	18.7	19.3	-2.6		–
25	19.3	17.3	18.3	-1.9		–	19.4	18.8	19.1	3.1	-2.0	0.6
26	18.9	16.9	17.9	4.6	-1.5	1.6	18.5	18.8	18.7	2.9	-1.0	1.0
27	18.2	16.6	17.4	4.8	-1.0	1.9	17.3	18.7	18.0	2.6	0.5	1.6
28	17.3	16.5	16.9	5.0	-0.2	2.4	16.0	18.6	17.3	2.4	2.1	2.3
29	16.3	16.7	16.5	5.0	0.8	2.9	15.0	18.5	16.8	2.0	3.7	2.9
30	15.4	17.2	16.3	4.5	1.8	3.2	14.7	18.6	16.7	1.3	4.8	3.1
31	15.0	17.9	16.5	3.4	2.6	3.0						

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	Daily tide height (ft)											
	July						August					
	High			Low			High			Low		
Date	AM	PM	Average	AM	PM	Average	AM	PM	Average	AM	PM	Average
1	15.1		15.1	0.2	5.3	2.8	18.6	17.6	18.1	-1.1	4.5	1.7
2	18.9	16.2	17.6	-1.1	5.0	2.0	19.6	18.9	19.3	-2.0	3.1	0.6
3	19.5	17.4	18.5	-2.3	4.2	1.0	20.5	19.8	20.2	-2.6	2.0	-0.3
4	20.3	18.5	19.4	-3.3	3.4	0.1	21.0	20.5	20.8	-2.7	1.3	-0.7
5	20.8	19.3	20.1	-3.8	2.6	-0.6	21.1	20.7	20.9	-2.3	0.9	-0.7
6	21.1	19.7	20.4	-3.8	2.1	-0.9	20.7	20.7	20.7	-1.4		–
7	20.9	19.8	20.4	-3.4	2.0	-0.7	19.9	20.3	20.1	1.0	-0.1	0.5
8	20.3	19.6	20.0	-2.5		–	18.7	19.6	19.2	1.4	1.4	1.4
9	19.3	19.2	19.3	2.2	-1.1	0.6	17.3	18.7	18.0	2.0	3.2	2.6
10	17.9	18.5	18.2	2.6	0.5	1.6	15.7	17.6	16.7	2.9	5.0	4.0
11	16.5	17.8	17.2	3.2	2.3	2.8	14.1	16.5	15.3	3.9	6.7	5.3
12	15.0	17.0	16.0	3.8	4.2	4.0	12.9	15.6	14.3	4.9	8.3	6.6
13	13.6	16.3	15.0	4.3	5.9	5.1	12.6	15.0	13.8	5.3	9.2	7.3
14	12.8	15.8	14.3	4.6	7.3	6.0	13.6	15.5	14.6	4.6	8.8	6.7
15	12.8	15.7	14.3	4.4	8.0	6.2	15.0		15.0	3.1	7.5	5.3
16	13.6		–	3.5	8.0	5.8	16.8	16.6	16.7	1.4	5.8	3.6
17	16.2	14.8	15.5	2.3	7.2	4.8	18.5	18.3	18.4	-0.2	3.8	1.8
18	17.1	16.1	16.6	0.8	6.1	3.5	20.2	19.9	20.1	-1.6	1.9	0.2
19	18.4	17.4	17.9	-0.6	4.8	2.1	21.6	21.3	21.5	-2.5	0.2	-1.2
20	19.6	18.5	19.1	-1.9	3.5	0.8	22.4	22.3	22.4	-2.8	-1.1	-2.0
21	20.7	19.6	20.2	-2.8	2.3	-0.3	22.5	22.8	22.7	-2.3	-1.9	-2.1
22	21.3	20.3	20.8	-3.2	1.4	-0.9	21.9	22.8	22.4	-1.2		–
23	21.4	20.8	21.1	-3.0		–	20.6	22.1	21.4	-1.9	0.5	-0.7
24	20.9	21.0	21.0	0.7	-2.1	-0.7	18.8	20.9	19.9	-1.3	2.5	0.6
25	19.8	20.8	20.3	0.4	-0.7	-0.2	16.8	19.3	18.1	-0.1	4.7	2.3
26	18.3	20.2	19.3	0.4	1.2	0.8	15.1	17.7	16.4	1.4	6.6	4.0
27	16.5	19.3	17.9	0.8	3.3	2.1	14.6	16.7	15.7	2.3	7.6	5.0
28	15.0	18.4	16.7	1.4	5.2	3.3	15.5		15.5	2.1	7.1	4.6
29	14.4	17.7	16.1	1.6	6.5	4.1	17.0	16.9	17.0	1.1	5.5	3.3
30	14.9		–	1.2	6.7	4.0	18.1	18.3	18.2	0.1	3.8	2.0
31	17.8	16.2	17.0	0.1	5.8	3.0	19.3	19.5	19.4	-0.7	2.3	0.8

Source: NOAA tides and currents website [Internet], 2007. Available from : http://tidesandcurrents.noaa.gov.

Note: "-" = value can't be calculated due to limitations of the data.

APPENDIX F. NINILCHIK RIVER CHINOOK SALMON CODED WIRE TAG RETURNS, 2007

Appendix F1.–Coded wire tag recoveries of hatchery-reared Chinook salmon at Ninilchik River weir, 2007.

Number		Brood			Date		Actual[b]	Scale ocean age estimate[c]				Length
CWT	Head[a]	year	Rearing hatchery	Release site	Released	Recovered	age	First	Second	Resolved	Sex	(mm)[d]
310318	297701	2002	Fort Richardson	Ninilchik	May 12, 2004	July 23, 2007	3	3	3	3	F	810
310318	297702	2002	Fort Richardson	Ninilchik	May 12, 2004	July 23, 2007	3	3	3	3	F	845
310318	297703	2002	Fort Richardson	Ninilchik	May 12, 2004	July 23, 2007	3	3	3	3	F	765
310318	297704	2002	Fort Richardson	Ninilchik	May 12, 2004	July 23, 2007	3	3	3	3	F	775
310318	297705	2002	Fort Richardson	Ninilchik	May 12, 2004	July 23, 2007	3	3	3	3	F	730
310318	297706	2002	Fort Richardson	Ninilchik	May 12, 2004	July 23, 2007	3	3	3	3	F	785
310318	297707	2002	Fort Richardson	Ninilchik	May 12, 2004	July 30, 2007	3	3	4	3	F	–
310318	297708	2002	Fort Richardson	Ninilchik	May 12, 2004	July 30, 2007	3	3	3	3	F	–
310318	297710	2002	Fort Richardson	Ninilchik	May 12, 2004	July 30, 2007	3	3	3	3	F	–
310318	297711	2002	Fort Richardson	Ninilchik	May 12, 2004	July 30, 2007	3	3	3	3	F	–
310318	297712	2002	Fort Richardson	Ninilchik	May 12, 2004	July 30, 2007	3	NR	NR	NR	F	750
310318	297713	2002	Fort Richardson	Ninilchik	May 12, 2004	July 30, 2007	3	3	3	3	F	715
310318	297714	2002	Fort Richardson	Ninilchik	May 12, 2004	July 30, 2007	3	3	3	3	F	745
310341	297715	2003	Fort Richardson	Ninilchik	May 19, 2005	July 30, 2007	2	NR	NR	NR	F	680
310341	297716	2003	Fort Richardson	Ninilchik	May 19, 2005	July 30, 2007	2	NR	NR	NR	F	635
310341	297718	2003	Fort Richardson	Ninilchik	May 19, 2005	July 30, 2007	2	3	3	3	F	630

Note: "-" = value can't be calculated due to limitations of the data.

[a] Head cinch strap number.

[b] Ocean ages were determined by comparing brood year, release year, and recovery year.

[c] NR = Not readable scale sample due to regeneration or poor mounting.

[d] Length measurements were recorded from mid-eye to tail fork (METF).

Appendix F2.–Ninilchik River hatchery-reared Chinook salmon coded wire tag recoveries outside of Ninilchik River, 2007.

Number		Brood								Actual age[d]	
CWT	Head[a]	year	Rearing hatchery	Release site	Release date	Recovery site[b]	Recovery method[c]	Water type	Recovery date	Fresh	Ocean
310341	144322	2003	Fort Richardson	Ninilchik	May 19, 2005	Cook Inlet	Subsistence	Saltwater	June 23, 2007	1	2
310256	144318	2002	Fort Richardson	Ninilchik	June 12, 2003	Cook Inlet	Subsistence	Saltwater	May 21, 2007	0	4
310318	144319	2002	Fort Richardson	Ninilchik	May 12, 2004	Cook Inlet	Subsistence	Saltwater	May 21, 2007	1	3
310318	144320	2002	Fort Richardson	Ninilchik	May 12, 2004	Cook Inlet	Subsistence	Saltwater	June 1, 2007	1	3
310318	144321	2002	Fort Richardson	Ninilchik	May 12, 2004	Cook Inlet	Subsistence	Saltwater	June 23, 2007	1	3

[a] Head cinch strap number.

[b] Cook Inlet recovering site was in the approximately one mile north and ¼ mile offshore from the mouth of the Ninilchik River.

[c] Subsistence recovery method was from the Ninilchik educational fishery.

[d] Ocean ages were determined by comparing brood year, release year, and recovery year.

APPENDIX G. SUMMARY OF NINILCHIK RIVER CHINOOK SALMON BEACH SEINE SURVEYS, 2007

Appendix G1.–Description of beach seine sampling locations for Ninilchik River, 2007.

Location number	Latitude[a]	Longitude[a]	RKM[b]
1	60.0402	-151.63586	3.85
2	60.04056	-151.63769	3.73
3	60.04273	-151.64135	3.35
4	60.04363	-151.64176	3.26
5	60.04378	-151.64258	3.2
6	60.04413	-151.64314	3.13
7	60.04467	-151.6436	3.06
8	60.04533	-151.64654	2.86
9	60.046	-151.64761	2.77
10	60.0465	-151.64821	2.67
11	60.04664	-151.64951	2.59
12	60.04667	-151.65043	2.55
13	60.04709	-151.65222	2.44
14	60.04728	-151.65259	2.43
15	60.04688	-151.65383	2.29
16	60.04766	-151.65851	1.95
17	60.49125	-151.65987	1.73
18	60.04841	-151.66502	1.32
19	60.0492	-151.66839	0.89

[a] Coordinates collected in WGS84 datum.

[b] River kilometer measured in ARCGIS.

Appendix G2.–Summary of Chinook salmon captured during beach seine surveys conducted in the area of the Ninilchik River open to sport fishing, 2007.

Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
24-May	1	1	Wild	1	123024
24-May	3	1	Hatchery-reared	1	123021
24-May	3	1	Wild	1	No tag
24-May	3	5	Wild	1	No tag
24-May	5	1	Wild	1	123014
24-May	6	1	Wild	1	123011
24-May	6	1	Wild	1	123012
24-May	6	1	Wild	1	123013
24-May	7	1	Wild	1	123010
24-May	8	1	Wild	1	123009
24-May	9	1	Wild	1	123008
24-May	12	1	Wild	1	123007
24-May	16	1	Wild	1	123001
24-May	16	1	Hatchery-reared	1	123002
24-May	16	1	Hatchery-reared	1	123003
24-May	16	1	Wild	1	123004
24-May	16	1	Wild	1	123005
24-May	16	1	Wild	1	123006
24-May	16	1	Hatchery-reared	1	123039
24-May	16	1	Wild	1	123041
24-May	16	1	Wild	1	123046
24-May	16	1	Wild	1	123047
24-May	16	1	Hatchery-reared	1	123048
24-May	16	1	Hatchery-reared	1	123050
24-May	16	2	Wild	3	No tag
24-May	16	2	Wild	3	No tag
24-May	18	1	Hatchery-reared	1	123051
30-May	5	1	Wild	1	123028
30-May	9	1	Wild	1	123030
30-May	9	1	Wild	1	123031
30-May	9	1	Wild	1	123033
30-May	14	1	Wild	1	123034
30-May	14	1	Wild	1	123054
30-May	15	1	Wild	1	123055
30-May	15	1	Wild	1	123056
30-May	15	1	Wild	1	123057
30-May	15	1	Wild	1	123060
30-May	15	1	Wild	1	123061
30-May	15	1	Wild	1	123062
30-May	16	1	Wild	1	123064
30-May	16	1	Wild	1	123065
30-May	16	1	Wild	1	123066
30-May	16	1	Wild	1	123067
30-May	16	1	Wild	1	123068
30-May	16	1	Wild	1	123069
30-May	16	1	Wild	3	123069
30-May	16	1	Wild	1	123070
30-May	16	1	Wild	1	123072
30-May	16	1	Wild	1	123076
30-May	16	1	Wild	1	No tag
30-May	19	1	Wild	1	123078
6-Jun	1	1	Wild	1	123079
6-Jun	1	1	Wild	1	123080
6-Jun	1	1	Wild	1	123081
6-Jun	1	1	Wild	1	123083
6-Jun	1	1	Wild	1	123084
6-Jun	1	1	Wild	1	123085
6-Jun	3	1	Wild	1	123086

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
6-Jun	3	1	Wild	1	123088
6-Jun	3	1	Wild	1	123089
6-Jun	3	1	Hatchery-reared	1	123091
6-Jun	3	1	Wild	1	123092
6-Jun	3	1	Wild	1	123093
6-Jun	3	1	Wild	1	123094
6-Jun	3	1	Wild	1	123095
6-Jun	3	1	Wild	1	123096
6-Jun	3	1	Wild	1	123097
6-Jun	3	1	Wild	1	No tag
6-Jun	3	1	Hatchery-reared	1	No tag
6-Jun	3	1	Wild	1	No tag
6-Jun	3	1	Wild	1	No tag
6-Jun	3	1	Wild	1	No tag
6-Jun	4	1	Wild	3	123093
6-Jun	4	1	Wild	1	123107
6-Jun	4	1	Wild	1	123108
6-Jun	5	1	Wild	1	123109
6-Jun	5	1	Wild	1	123110
6-Jun	7	1	Wild	1	123115
6-Jun	9	1	Wild	1	123119
6-Jun	9	1	Hatchery-reared	1	123120
6-Jun	13	1	Wild	1	123122
6-Jun	14	1	Wild	1	123123
6-Jun	14	1	Wild	1	No tag
6-Jun	15	1	Hatchery-reared	1	123124
6-Jun	15	1	Wild	1	123125
6-Jun	15	1	Wild	1	123127
6-Jun	16	1	Hatchery-reared	1	123128
6-Jun	16	1	Wild	1	123129
6-Jun	16	1	Wild	1	123130
6-Jun	16	1	Wild	1	123131
6-Jun	16	1	Wild	1	123133
6-Jun	16	1	Wild	1	123134
6-Jun	16	1	Wild	1	123135
6-Jun	16	1	Hatchery-reared	1	123136
6-Jun	16	1	Wild	1	123137
6-Jun	16	1	Wild	1	123141
6-Jun	16	1	Wild	1	123143
6-Jun	16	1	Wild	1	123144
6-Jun	16	1	Wild	1	123145
6-Jun	16	1	Wild	1	123146
6-Jun	16	1	Wild	1	123147
6-Jun	17	1	Wild	1	123148
6-Jun	18	1	Wild	1	123149
13-Jun	1	1	Wild	2	123079
13-Jun	1	1	Wild	1	123150
13-Jun	1	1	Wild	1	123151
13-Jun	1	1	Wild	1	123152
13-Jun	3	1	Wild	1	123153
13-Jun	3	1	Wild	1	123154
13-Jun	3	1	Hatchery-reared	1	123156
13-Jun	3	1	Hatchery-reared	3	123156
13-Jun	3	1	Hatchery-reared	1	123157
13-Jun	3	1	Wild	1	123158
13-Jun	3	1	Wild	1	123160
13-Jun	3	1	Wild	1	123161
13-Jun	3	1	Wild	1	123163
13-Jun	3	1	Wild	1	123164

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
13-Jun	3	1	Wild	1	123165
13-Jun	3	1	Wild	1	123166
13-Jun	3	1	Hatchery-reared	1	123167
13-Jun	3	1	Wild	1	123168
13-Jun	3	1	Wild	1	123170
13-Jun	3	1	Wild	1	123173
13-Jun	5	1	Wild	1	123174
13-Jun	9	1	Wild	1	123179
13-Jun	9	1	Hatchery-reared	1	123181
13-Jun	9	1	Wild	1	123185
13-Jun	9	1	Wild	1	123191
13-Jun	9	1	Wild	1	123192
13-Jun	9	1	Wild	1	No tag
13-Jun	12	1	Wild	1	123194
13-Jun	12	1	Wild	1	123195
13-Jun	13	1	Wild	1	123197
13-Jun	13	1	Wild	1	123199
13-Jun	13	1	Hatchery-reared	1	123502
13-Jun	14	1	Wild	1	123203
13-Jun	15	1	Wild	2	123095
13-Jun	15	1	Wild	1	123211
13-Jun	16	1	Wild	1	123212
13-Jun	16	1	Wild	1	123214
13-Jun	16	1	Wild	1	123215
13-Jun	16	1	Wild	3	123215
13-Jun	16	1	Wild	1	123216
13-Jun	16	1	Wild	1	123217
13-Jun	16	1	Wild	1	No tag
13-Jun	17	1	Hatchery-reared	1	123220
13-Jun	18	1	Wild	1	123223
20-Jun	1	1	Wild	2	123079
20-Jun	1	1	Wild	1	123251
20-Jun	1	1	Wild	1	123252
20-Jun	2	1	Wild	1	123253
20-Jun	3	1	Wild	2	123062
20-Jun	3	1	Wild	2	123174
20-Jun	3	1	Wild	1	123254
20-Jun	3	1	Hatchery-reared	1	123256
20-Jun	3	1	Wild	1	123258
20-Jun	3	1	Hatchery-reared	1	123259
20-Jun	3	1	Wild	1	123260
20-Jun	3	1	Wild	3	123260
20-Jun	3	1	Hatchery-reared	1	123261
20-Jun	3	1	Wild	1	123262
20-Jun	3	1	Wild	1	123263
20-Jun	3	1	Wild	1	123264
20-Jun	3	1	Wild	1	123266
20-Jun	3	1	Wild	1	123267
20-Jun	3	1	Wild	1	123268
20-Jun	3	1	Wild	1	123269
20-Jun	3	1	Wild	1	123270
20-Jun	3	1	Wild	1	123271
20-Jun	3	1	Wild	1	123272
20-Jun	3	1	Wild	1	123273
20-Jun	3	1	Wild	1	123274
20-Jun	3	1	Wild	1	123275
20-Jun	3	1	Wild	1	123276
20-Jun	3	1	Wild	1	123277
20-Jun	3	1	Hatchery-reared	1	123278

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
20-Jun	3	1	Wild	1	No tag
20-Jun	4	1	Wild	1	123279
20-Jun	4	1	Hatchery-reared	1	123280
20-Jun	4	1	Wild	1	123282
20-Jun	5	1	Hatchery-reared	1	123283
20-Jun	5	1	Hatchery-reared	1	123284
20-Jun	5	1	Wild	1	123285
20-Jun	5	1	Wild	1	123286
20-Jun	6	1	Wild	1	123287
20-Jun	6	1	Wild	1	123288
20-Jun	6	1	Wild	1	123290
20-Jun	7	1	Wild	1	123291
20-Jun	8	1	Wild	2	123211
20-Jun	8	1	Wild	1	123292
20-Jun	8	1	Wild	1	123293
20-Jun	9	1	Wild	3	123291
20-Jun	9	1	Wild	1	123294
20-Jun	9	1	Wild	1	123295
20-Jun	9	1	Wild	1	123296
20-Jun	9	1	Wild	1	123297
20-Jun	9	1	Wild	1	123298
20-Jun	9	1	Wild	1	123299
20-Jun	9	1	Wild	1	123301
20-Jun	9	1	Wild	1	123302
20-Jun	9	1	Wild	1	123303
20-Jun	9	1	Hatchery-reared	1	123305
20-Jun	9	1	Hatchery-reared	1	123306
20-Jun	9	1	Hatchery-reared	3	123306
20-Jun	9	1	Wild	1	123307
20-Jun	9	1	Hatchery-reared	1	123308
20-Jun	9	1	Wild	1	123309
20-Jun	9	1	Wild	1	123310
20-Jun	9	1	Hatchery-reared	1	123311
20-Jun	9	1	Wild	1	123312
20-Jun	9	1	Wild	1	123313
20-Jun	9	1	Wild	1	123314
20-Jun	9	1	Wild	1	123315
20-Jun	9	1	Hatchery-reared	1	123316
20-Jun	9	1	Wild	1	123317
20-Jun	9	1	Wild	1	123318
20-Jun	9	1	Wild	1	123319
20-Jun	9	1	Wild	1	123320
20-Jun	9	1	Hatchery-reared	1	123321
20-Jun	9	1	Wild	1	123322
20-Jun	11	1	Wild	1	123323
20-Jun	11	1	Wild	1	123324
20-Jun	11	1	Wild	1	123325
20-Jun	13	1	Wild	3	123291
20-Jun	13	1	Wild	3	123294
20-Jun	13	1	Wild	1	123326
20-Jun	13	1	Wild	1	123327
20-Jun	13	1	Wild	1	123328
20-Jun	13	1	Hatchery-reared	1	123329
20-Jun	13	1	Wild	1	123330
20-Jun	14	1	Wild	1	No tag
20-Jun	14	1	Wild	1	No tag
20-Jun	16	1	Wild	1	123331
20-Jun	16	1	Wild	1	123332
20-Jun	16	1	Wild	1	123333

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
20-Jun	16	1	Wild	1	123334
20-Jun	16	1	Wild	3	123334
20-Jun	16	1	Wild	1	123335
20-Jun	16	1	Wild	1	123336
20-Jun	16	1	Wild	3	123336
20-Jun	16	1	Wild	1	123337
20-Jun	16	1	Wild	3	123337
20-Jun	16	1	Wild	1	123340
20-Jun	16	1	Wild	1	123342
20-Jun	16	1	Wild	1	123343
20-Jun	18	1	Wild	1	123344
27-Jun	1	1	Wild	2	0123303
27-Jun	1	1	Wild	2	0123323
27-Jun	1	1	Wild	1	0123345
27-Jun	1	1	Wild	1	0123346
27-Jun	1	1	Wild	1	0123347
27-Jun	1	1	Wild	1	0123348
27-Jun	1	1	Wild	1	0123349
27-Jun	1	1	Wild	1	0123350
27-Jun	1	1	Wild	1	0123376
27-Jun	1	1	Wild	1	0123377
27-Jun	2	1	Wild	2	0123253
27-Jun	2	1	Wild	1	0123378
27-Jun	2	1	Wild	1	0123379
27-Jun	2	1	Wild	1	0123380
27-Jun	3	1	Wild	2	0123174
27-Jun	3	1	Wild	1	0123382
27-Jun	3	1	Wild	1	0123383
27-Jun	3	1	Wild	1	0123384
27-Jun	3	1	Wild	1	0123386
27-Jun	3	1	Wild	1	0123388
27-Jun	3	1	Wild	1	0123389
27-Jun	3	1	Wild	1	0123393
27-Jun	3	1	Wild	1	0123398
27-Jun	3	1	Wild	1	0123399
27-Jun	3	1	Wild	1	0123400
27-Jun	3	1	Wild	1	0123401
27-Jun	3	1	Wild	1	0123402
27-Jun	3	1	Wild	1	0123403
27-Jun	3	1	Wild	1	0123404
27-Jun	3	1	Wild	1	0123405
27-Jun	3	1	Wild	1	0123406
27-Jun	3	1	Wild	1	0123407
27-Jun	3	1	Wild	1	0123410
27-Jun	3	1	Wild	1	0123413
27-Jun	3	1	Wild	1	0123414
27-Jun	3	1	Wild	1	0123419
27-Jun	3	1	Hatchery-reared	1	0123420
27-Jun	3	1	Hatchery-reared	1	0123421
27-Jun	3	1	Wild	1	0123422
27-Jun	3	1	Wild	1	0123424
27-Jun	3	1	Wild	1	0123425
27-Jun	3	1	Wild	1	0123428
27-Jun	3	1	Hatchery-reared	1	No tag
27-Jun	3	1	Wild	1	No tag
27-Jun	3	1	Hatchery-reared	1	No tag
27-Jun	3	1	Wild	1	No tag
27-Jun	3	1	Wild	1	No tag
27-Jun	3	1	Wild	1	No tag

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
27-Jun	3	1	Wild	1	No tag
27-Jun	3	1	Hatchery-reared	1	No tag
27-Jun	3	1	Wild	1	No tag
27-Jun	3	1	Wild	1	No tag
27-Jun	3	1	Hatchery-reared	1	No tag
27-Jun	3	1	Wild	1	No tag
27-Jun	3	1	Wild	1	No tag
27-Jun	4	1	Wild	1	No tag
27-Jun	4	1	Wild	1	No tag
27-Jun	4	2	Wild	1	No tag
27-Jun	5	1	Wild	1	No tag
27-Jun	5	1	Wild	1	No tag
27-Jun	5	1	Wild	1	No tag
27-Jun	5	1	Wild	1	No tag
27-Jun	5	1	Hatchery-reared	1	No tag
27-Jun	6	1	Wild	1	No tag
27-Jun	6	1	Wild	1	No tag
27-Jun	6	1	Wild	1	No tag
27-Jun	6	1	Hatchery-reared	1	No tag
27-Jun	6	1	Wild	1	No tag
27-Jun	7	1	Wild	1	No tag
27-Jun	7	1	Hatchery-reared	1	No tag
27-Jun	9	1	Wild	2	0123313
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Hatchery-reared	1	No tag
27-Jun	9	1	Hatchery-reared	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Hatchery-reared	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	9	1	Wild	1	No tag
27-Jun	10	1	Wild	1	No tag
27-Jun	10	1	Wild	1	No tag
27-Jun	10	1	Hatchery-reared	1	No tag
27-Jun	10	1	Wild	1	No tag
27-Jun	13	1	Wild	1	No tag
27-Jun	13	1	Wild	1	No tag
27-Jun	14	1	Hatchery-reared	1	No tag
27-Jun	14	1	Wild	1	No tag
27-Jun	14	1	Wild	1	No tag
27-Jun	15	1	Wild	2	0123298
27-Jun	15	1	Hatchery-reared	1	No tag
27-Jun	16	1	Wild	1	No tag
27-Jun	16	1	Wild	1	No tag
27-Jun	16	1	Wild	1	No tag
27-Jun	16	1	Wild	1	No tag
27-Jun	16	1	Hatchery-reared	1	No tag
27-Jun	16	1	Wild	1	No tag
27-Jun	16	1	Wild	1	No tag

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
27-Jun	16	1	Hatchery-reared	1	No tag
27-Jun	16	1	Hatchery-reared	1	No tag
27-Jun	16	1	Wild	1	No tag
27-Jun	16	1	Wild	1	No tag
27-Jun	16	1	Wild	1	No tag
27-Jun	16	1	Hatchery-reared	1	No tag
27-Jun	16	1	Hatchery-reared	1	No tag
27-Jun	16	1	Hatchery-reared	1	No tag
27-Jun	17	1	Wild	1	No tag
27-Jun	17	1	Wild	1	No tag
27-Jun	17	1	Wild	1	No tag
27-Jun	18	1	Wild	1	No tag
5-Jul	3	1	Wild	2	123174
5-Jul	3	1	Wild	3	123174
5-Jul	3	1	Wild	2	123212
5-Jul	3	1	Wild	1	123229
5-Jul	3	1	Hatchery-reared	1	123230
5-Jul	3	1	Wild	1	123231
5-Jul	3	1	Wild	1	123232
5-Jul	3	1	Wild	3	123232
5-Jul	3	1	Wild	1	123233
5-Jul	3	1	Wild	1	123234
5-Jul	3	1	Wild	1	123235
5-Jul	3	1	Wild	1	123237
5-Jul	3	1	Hatchery-reared	1	123238
5-Jul	3	1	Wild	1	123239
5-Jul	3	1	Wild	1	123240
5-Jul	3	1	Wild	3	123240
5-Jul	3	1	Wild	1	123241
5-Jul	3	1	Wild	1	123242
5-Jul	3	1	Wild	1	123248
5-Jul	3	1	Wild	3	123248
5-Jul	3	1	Wild	1	123250
5-Jul	3	1	Wild	2	123260
5-Jul	3	1	Wild	2	123325
5-Jul	3	1	Wild	1	123356
5-Jul	3	1	Wild	3	123356
5-Jul	3	1	Wild	1	123357
5-Jul	3	1	Wild	3	123357
5-Jul	3	1	Wild	1	123358
5-Jul	3	1	Wild	3	123358
5-Jul	3	1	Wild	1	123360
5-Jul	3	1	Wild	1	123363
5-Jul	3	1	Wild	1	123364
5-Jul	3	1	Wild	1	123366
5-Jul	3	1	Wild	3	123366
5-Jul	3	1	Wild	1	123367
5-Jul	3	1	Wild	1	123368
5-Jul	3	1	Wild	1	123369
5-Jul	3	1	Wild	3	123369
5-Jul	3	1	Wild	1	123371
5-Jul	3	1	Wild	3	123371
5-Jul	3	1	Wild	1	123372
5-Jul	3	1	Wild	1	123375
5-Jul	3	1	Wild	2	123384
5-Jul	3	1	Wild	2	123414
5-Jul	3	1	Wild	2	123428
5-Jul	3	1	Wild	1	123503
5-Jul	3	1	Wild	1	123504

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
5-Jul	3	1	Wild	1	123505
5-Jul	3	1	Wild	1	123506
5-Jul	3	1	Wild	1	123507
5-Jul	3	1	Wild	1	123508
5-Jul	3	1	Wild	1	123509
5-Jul	3	1	Wild	1	123510
5-Jul	3	1	Wild	1	123511
5-Jul	3	1	Wild	1	123512
5-Jul	3	1	Wild	1	123514
5-Jul	3	1	Wild	1	123516
5-Jul	3	1	Wild	1	123517
5-Jul	3	1	Wild	1	123518
5-Jul	3	1	Wild	1	123519
5-Jul	3	1	Wild	1	123520
5-Jul	3	1	Wild	1	123522
5-Jul	3	1	Wild	1	123523
5-Jul	5	1	Wild	1	123201
5-Jul	5	1	Wild	1	123202
5-Jul	5	1	Wild	1	123527
5-Jul	5	1	Wild	1	123530
5-Jul	5	1	Wild	1	123534
5-Jul	5	1	Wild	1	123535
5-Jul	5	1	Wild	1	123541
5-Jul	5	1	Wild	1	No tag
5-Jul	6	1	Wild	1	123544
5-Jul	6	1	Wild	1	123547
5-Jul	7	1	Wild	2	123279
5-Jul	7	1	Wild	3	123544
5-Jul	7	1	Wild	1	123548
5-Jul	7	1	Wild	1	123549
5-Jul	8	1	Wild	2	123293
5-Jul	8	1	Wild	1	123550
5-Jul	8	1	Wild	1	123577
5-Jul	8	1	Wild	1	123578
5-Jul	8	1	Wild	1	123581
5-Jul	8	1	Wild	1	123586
5-Jul	8	1	Wild	1	No tag
5-Jul	8	1	Wild	1	No tag
5-Jul	9	1	Wild	2	123317
5-Jul	9	1	Wild	2	123319
5-Jul	9	1	Wild	2	123319
5-Jul	9	1	Wild	1	123551
5-Jul	9	1	Hatchery-reared	1	123555
5-Jul	9	1	Wild	1	123556
5-Jul	9	1	Wild	1	123557
5-Jul	9	1	Wild	1	123558
5-Jul	9	1	Wild	1	123561
5-Jul	9	1	Wild	1	123562
5-Jul	9	1	Wild	1	123563
5-Jul	9	1	Wild	1	123566
5-Jul	9	1	Wild	1	123591
5-Jul	9	1	Hatchery-reared	1	123598
5-Jul	9	1	Wild	1	No tag
5-Jul	9	1	Wild	1	No tag
5-Jul	9	1	Wild	1	No tag
5-Jul	12	1	Wild	3	123517
5-Jul	13	1	Wild	1	123567
5-Jul	13	1	Hatchery-reared	1	123570
5-Jul	13	1	Wild	1	123574

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
5-Jul	15	1	Wild	1	123575
5-Jul	15	1	Wild	1	123602
5-Jul	15	1	Wild	1	123603
5-Jul	16	1	Wild	1	123604
5-Jul	16	1	Wild	1	123605
5-Jul	16	1	Hatchery-reared	1	123606
5-Jul	16	1	Hatchery-reared	1	123609
5-Jul	16	1	Wild	1	123611
5-Jul	16	1	Hatchery-reared	1	123612
5-Jul	16	1	Wild	1	123613
5-Jul	16	1	Wild	1	123614
5-Jul	16	1	Wild	1	123616
5-Jul	16	1	Wild	1	123617
5-Jul	16	1	Wild	1	123618
5-Jul	16	1	Hatchery-reared	1	123619
5-Jul	16	1	Wild	1	123620
5-Jul	16	1	Wild	1	123622
5-Jul	16	1	Wild	1	123623
5-Jul	16	1	Wild	1	123625
5-Jul	16	1	Wild	1	123628
5-Jul	16	1	Wild	1	123631
5-Jul	16	1	Wild	1	123633
5-Jul	16	1	Wild	1	123638
5-Jul	16	1	Wild	1	123639
5-Jul	16	1	Wild	1	123640
5-Jul	16	1	Wild	1	123641
5-Jul	16	1	Hatchery-reared	1	123642
5-Jul	16	1	Wild	1	123644
5-Jul	16	1	Wild	1	No tag
5-Jul	16	1	Wild	1	No tag
5-Jul	17	1	Wild	1	123645
5-Jul	17	1	Hatchery-reared	1	123647
5-Jul	18	1	Wild	1	123653
5-Jul	19	1	Wild	1	123648
5-Jul	ND	1	Wild	1	123525
5-Jul	ND	1	Wild	1	123636
7-Jul	1	1	Wild	2	123287
7-Jul	1	1	Wild	1	123463
7-Jul	1	1	Wild	1	123465
7-Jul	1	1	Wild	1	123466
7-Jul	2	1	Wild	3	123465
7-Jul	2	1	Wild	1	123467
7-Jul	2	1	Wild	1	123468
7-Jul	3	1	Hatchery-reared	2	123021
7-Jul	3	1	Wild	2	123119
7-Jul	3	1	Wild	2	123235
7-Jul	3	1	Hatchery-reared	2	123259
7-Jul	3	1	Wild	2	123314
7-Jul	3	1	Wild	2	123317
7-Jul	3	1	Wild	2	123318
7-Jul	3	1	Wild	2	123384
7-Jul	3	1	Wild	3	123384
7-Jul	3	1	Wild	2	123428
7-Jul	3	1	Wild	2	123525
7-Jul	3	1	Wild	2	123605
7-Jul	3	1	Wild	3	123605
7-Jul	3	1	Wild	2	123611
7-Jul	3	1	Wild	1	123941
7-Jul	3	1	Wild	1	123942

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
7-Jul	3	1	Hatchery-reared	1	123944
7-Jul	3	1	Wild	1	123945
7-Jul	3	1	Wild	1	123946
7-Jul	3	1	Wild	1	123947
7-Jul	3	1	Hatchery-reared	1	123977
7-Jul	3	1	Hatchery-reared	1	123978
7-Jul	3	1	Wild	1	123979
7-Jul	3	1	Wild	1	123981
7-Jul	3	1	Wild	1	123982
7-Jul	3	1	Wild	1	123983
7-Jul	3	1	Wild	1	123984
7-Jul	3	1	Hatchery-reared	1	123985
7-Jul	3	1	Wild	1	123986
7-Jul	3	1	Wild	1	123987
7-Jul	3	1	Hatchery-reared	1	123988
7-Jul	3	1	Wild	1	123989
7-Jul	3	1	Wild	3	123989
7-Jul	3	1	Wild	1	123990
7-Jul	3	1	Hatchery-reared	1	123991
7-Jul	3	1	Wild	1	123992
7-Jul	3	1	Wild	3	123992
7-Jul	3	1	Hatchery-reared	1	123993
7-Jul	3	1	Wild	1	123994
7-Jul	3	1	Wild	1	123995
7-Jul	3	1	Hatchery-reared	1	123998
7-Jul	3	1	Hatchery-reared	3	123998
7-Jul	3	1	Wild	1	123999
7-Jul	3	1	Wild	3	123999
7-Jul	3	1	Hatchery-reared	1	124000
7-Jul	4	1	Wild	1	123937
7-Jul	4	1	Wild	1	123938
7-Jul	4	1	Wild	1	123940
7-Jul	5	1	Wild	1	123936
7-Jul	7	1	Wild	1	123934
7-Jul	7	1	Hatchery-reared	1	123935
7-Jul	8	1	Hatchery-reared	2	123329
7-Jul	8	1	Wild	3	123465
7-Jul	8	1	Wild	1	123930
7-Jul	8	1	Wild	1	123931
7-Jul	8	1	Hatchery-reared	1	123932
7-Jul	8	1	Wild	1	123933
7-Jul	9	1	Wild	2	123561
7-Jul	9	1	Wild	2	123581
7-Jul	9	1	Wild	2	123591
7-Jul	9	1	Wild	1	123927
7-Jul	9	1	Wild	3	123931
7-Jul	9	1	Wild	1	123965
7-Jul	9	1	Wild	1	123966
7-Jul	9	1	Wild	1	123967
7-Jul	9	1	Wild	1	123969
7-Jul	9	1	Wild	1	123970
7-Jul	9	1	Hatchery-reared	1	123971
7-Jul	9	1	Wild	1	123972
7-Jul	9	1	Wild	1	123973
7-Jul	9	1	Wild	1	123974
7-Jul	9	1	Wild	1	123975
7-Jul	10	1	Wild	2	123285
7-Jul	10	1	Wild	2	123293
7-Jul	10	1	Wild	1	123963

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Date	Location number[a]	Number of fish	Adipose fin	Capture event[b]	Floy tag number
7-Jul	10	1	Wild	1	123964
7-Jul	13	1	Hatchery-reared	1	123962
7-Jul	14	1	Wild	2	123123
7-Jul	15	1	Wild	2	123602
7-Jul	15	1	Wild	3	123602
7-Jul	15	1	Wild	2	123617
7-Jul	15	1	Wild	2	123636
7-Jul	15	1	Wild	1	123958
7-Jul	15	1	Hatchery-reared	1	123959
7-Jul	15	1	Wild	1	123961
5-Jul	9	1	Wild	3	123319
5-Jul	16	1	Wild	3	123614

[a] See appendix G1 for description of location number.

[b] Capture event codes: 1 = new fish and initial tagging, 2 = recaptured fish during a later survey, 3 = recaptured on the same day as initial tagging.

Appendix G3.–Summary of volunteer harvest reports of floy tagged Chinook salmon in the Ninilchik River, 2007.

Floy tag number	Adipose fin	Tagging		Harvest		Days from tagging
		Date	Location[a]	Date	Location	
123001	Wild	24-May	16	26-May	Unknown	2
123002	Hatchery-reared	24-May	16	26-May	Unknown	2
123008	Wild	24-May	9	26-May	~1mile above Sterling Hwy bridge	2
123039	Hatchery-reared	24-May	16	26-May	Sterling Hwy bridge	2
123048	Hatchery-reared	24-May	16	28-May	Unknown	4
123130	Wild	6-Jun	16	9-Jun	~3/4 mile above Sterling Hwy bridge	3
123146	wild	6-Jun	16	9-Jun	Unknown	3
123166	Wild	13-Jun	3	16-Jun	Sterling Hwy bridge	3

[a] See Appendix G1 for description of location number.

Appendix G4.–Summary of recaptured floy-tagged Chinook salmon in the Ninilchik River during beach seine surveys and at the weir, 2007.

			Tagging		Recapture		Distance to	Travel	Travel rate
Recapture	Floy No	AdFin	Date	Location	Date	Location	recapture (km)	time (d)	(km/d)
Beach Seine	123021	Hatchery	24-May	3	11-Jul	3	0.00	48.00	0.000
	123062	Hatchery	30-May	15	20-Jun	3	1.04	20.95	0.050
	123095	Wild	6-Jun	3	13-Jun	15	-1.04	6.95	-0.150
	123123	Wild	6-Jun	14	11-Jul	14	0.00	35.02	0.000
	123235	Wild	5-Jul	3	11-Jul	3	0.00	5.98	0.000
	123253	Wild	20-Jun	2	27-Jun	2	0.00	7.03	0.000
	123259	Wild	20-Jun	3	11-Jul	3	0.00	21.15	0.000
	123260	Wild	20-Jun	3	5-Jul	3	0.00	15.01	0.000
	123279	Wild	20-Jun	4	5-Jul	7	-0.21	15.04	-0.014
	123285	Wild	20-Jun	ND	11-Jul	10	-0.62	20.97	-0.030
	123287	Wild	20-Jun	6	11-Jul	1	0.71	20.98	0.034
	123298	Wild	20-Jun	9	27-Jun	15	-0.47	6.92	-0.068
	123303	Wild	20-Jun	9	27-Jun	1	1.07	6.95	0.154
	123313	Wild	20-Jun	9	27-Jun	9	0.00	6.92	0.000
	123314	Wild	20-Jun	9	11-Jul	3	0.58	20.95	0.028
	123318	Wild	20-Jun	9	11-Jul	3	0.58	21.03	0.028
	123323	Wild	20-Jun	11	27-Jun	1	1.23	6.87	0.179
	123325	Wild	20-Jun	11	5-Jul	3	0.72	15.01	0.048
	123414	Wild	27-Jun	3	5-Jul	3	0.00	8.11	0.000
	123525	Wild	27-Jun	ND	11-Jul	3		6.08	
	123561	Wild	5-Jul	9	11-Jul	9	0.00	5.93	0.000
	123581	Wild	5-Jul	8	11-Jul	9	-0.12	5.96	-0.020
	123591	Wild	5-Jul	9	11-Jul	9	0.00	5.96	0.000
	123602	Wild	5-Jul	15	11-Jul	15	0.00	5.93	0.000
	123605	Wild	5-Jul	16	11-Jul	3	1.40	5.84	0.240
	123611	Wild	5-Jul	16	11-Jul	3	1.40	5.87	0.238
	123617	Wild	5-Jul	16	11-Jul	15	0.32	5.93	0.054
	123636	Wild	5-Jul	ND	11-Jul	15		5.87	
Weir	123011	Wild	24-May	6	13-Jul	weir	4.57	50.14	0.091
	123028	Wild	30-May	5	13-Jul	weir	4.50	44.28	0.102
	123056	Wild	30-May	15	11-Jul	weir	5.41	42.37	0.128
	123066	Wild	30-May	16	8-Jul	weir	5.75	39.11	0.147
	123081	Wild	6-Jun	1	13-Jul	weir	3.85	36.11	0.107
	123086	Wild	6-Jun	3	6-Jul	weir	4.35	30.20	0.144
	123088	Wild	6-Jun	3	16-Jul	weir	4.35	40.21	0.108
	123092	Wild	6-Jun	3	16-Jul	weir	4.35	40.12	0.108
	123115	Wild	6-Jun	7	17-Jul	weir	4.64	40.10	0.116
	123122	Wild	6-Jun	13	13-Jul	weir	5.26	37.20	0.141
	123129	Wild	6-Jun	16	16-Jul	weir	5.75	40.29	0.143
	123141	Wild	6-Jun	16	22-Jul	weir	5.75	46.21	0.124
	123145	Wild	6-Jun	16	28-Jul	weir	5.75	52.07	0.110
	123150	Wild	13-Jun	1	6-Jul	weir	3.85	23.44	0.164
	123151	Wild	13-Jun	1	23-Jul	weir	3.85	40.40	0.095
	123152	Wild	13-Jun	1	16-Jul	weir	3.85	33.43	0.115
	123163	Wild	13-Jun	3	25-Jul	weir	4.35	42.20	0.103
	123173	Wild	13-Jun	3	25-Jul	weir	4.35	42.03	0.103
	123194	Wild	13-Jun	12	13-Jul	weir	5.15	30.14	0.171
	123233	Wild	5-Jul	3	17-Jul	weir	4.35	12.43	0.350
	123239	Wild	5-Jul	3	24-Jul	weir	4.35	19.04	0.228
	123242	Wild	5-Jul	3	17-Jul	weir	4.35	11.12	0.391
	123252	Wild	20-Jun	1	12-Jul	weir	3.85	22.42	0.172
	123266	Wild	20-Jun	3	11-Jul	weir	4.35	20.01	0.217
	123288	Wild	20-Jun	6	20-Jul	weir	4.57	30.27	0.151
	123299	Wild	20-Jun	9	16-Jul	weir	4.93	26.35	0.187
	123316	Hatchery	20-Jun	9	15-Jul	weir	4.93	25.26	0.195
	123346	Wild	27-Jun	1	16-Jul	weir	3.85	19.16	0.201
	123349	Wild	27-Jun	1	19-Jul	weir	3.85	22.29	0.173
	123368	Wild	5-Jul	3	30-Jul	weir	4.35	25.15	0.173

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Recapture	FloyNo	AdFin	Tagging		Recapture		Distance to recapture (km)	Travel time (d)	Travel rate (km/d)
			Date	location	Date	Location			
	123407	Wild	27-Jun	3	22-Jul	weir	4.35	25.18	0.173
	123419	Wild	27-Jun	3	24-Jul	weir	4.35	27.26	0.160
	123421	Hatchery	27-Jun	3	28-Jul	weir	4.35	31.11	0.140
	123463	Wild	11-Jul	1	20-Jul	weir	3.85	9.31	0.413
	123467	Wild	11-Jul	2	15-Jul	weir	3.97	4.08	0.972
	123506	Wild	5-Jul	3	23-Jul	weir	4.35	18.27	0.238
	123510	Wild	5-Jul	3	9-Jul	weir	4.35	4.41	0.986
	123523	Wild	5-Jul	3	21-Jul	weir	4.35	16.18	0.269
	123527	Wild	5-Jul	5	16-Jul	weir	4.50	11.28	0.399
	123566	Wild	5-Jul	9	12-Jul	weir	4.93	6.15	0.802
	123574	Wild	5-Jul	13	27-Jul	weir	5.26	22.30	0.236
	123577	Wild	5-Jul	8	12-Jul	weir	4.84	7.23	0.670
	123586	Wild	5-Jul	8	19-Jul	weir	4.84	14.44	0.335
	123618	Wild	5-Jul	16	28-Jul	weir	5.75	23.18	0.248
	123640	Wild	5-Jul	16	16-Jul	weir	5.75	11.24	0.511
	123653	Wild	5-Jul	18	27-Jul	weir	6.85	21.07	0.325
	123937	Wild	11-Jul	4	26-Jul	weir	4.44	15.35	0.289
	123947	Wild	11-Jul	3	24-Jul	weir	4.35	13.46	0.323
	123953	Hatchery	11-Jul	ND	27-Jul	weir			
	123967	Wild	11-Jul	9	24-Jul	weir	4.93	13.24	0.372
	123972	Wild	11-Jul	9	17-Jul	weir	4.93	6.25	0.789
	123977	Hatchery	11-Jul	3	22-Jul	weir	4.35	11.31	0.385
	123978	Hatchery	11-Jul	3	27-Jul	weir	4.35	16.48	0.264
	123979	Wild	11-Jul	3	25-Jul	weir	4.35	14.28	0.305
	123982	Wild	11-Jul	3	13-Jul	weir	4.35	2.31	1.880
	123983	Wild	11-Jul	3	29-Jul	weir	4.35	18.38	0.237
	123984	Wild	11-Jul	3	13-Jul	weir	4.35	2.37	1.839
	123985	Hatchery	11-Jul	3	16-Jul	weir	4.35	5.39	0.807
	123986	Wild	11-Jul	3	17-Jul	weir	4.35	6.21	0.700
	123994	Wild	11-Jul	3	26-Jul	weir	4.35	15.18	0.287
	123995	Wild	11-Jul	3	24-Jul	weir	4.35	13.47	0.323
Multiple	123079	Wild	6-Jun	1	13-Jun	1	0.00	7.00	0.000
					20-Jun	1	0.00	14.02	0.000
	123119	Wild	6-Jun	9	11-Jul	3	0.58	35.08	0.017
					17-Jul	weir	4.93	40.12	0.123
Multiple	123174	Wild	13-Jun	5	20-Jun	3	0.15	6.18	0.024
					27-Jun	3	0.15	13.42	0.011
					5-Jul	3	0.15	21.98	0.007
	123211	Wild	13-Jun	15	20-Jun	8	0.57	6.89	0.083
					11-Jul	weir	5.41	28.08	0.193
	123212	Wild	13-Jun	16	5-Jul	3	1.40	21.92	0.064
					11-Jul	weir	5.75	28.18	0.204
	123293	Wild	20-Jun	8	5-Jul	8	0.00	15.01	0.000
					11-Jul	10	0.19	15.02	0.013
	123317	Wild	20-Jun	9	5-Jul	9	0.00	14.96	0.000
					11-Jul	3	0.58	20.98	0.028
	123319	Wild	20-Jun	9	5-Jul	9	0.00	15.06	0.000
					19-Jul	weir	4.93	28.04	0.176
	123329	Hatchery	20-Jun	13	11-Jul	8	0.42	21.03	0.020
					18-Jul	weir	5.26	28.02	0.188
	123384	Wild	27-Jun	3	5-Jul	3	0.00	7.98	0.000
					11-Jul	3	0.00	14.00	0.000
	123428	Wild	27-Jun	3	5-Jul	3	0.00	7.98	0.000
					11-Jul	3	0.00	14.01	0.000

Note: ND=no data.