Fishery Management Report No. 09-39

Kitoi Bay Hatchery Annual Management Plan, 2009

by

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and

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October 2009

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

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

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

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

KITOI BAY HATCHERY ANNUAL MANAGEMENT PLAN
EXECUTIVE SUMMARY, 2009

New Projects for 2009:

1. Construct new storage building to replace demolished "old house".
2. Continue addressing deferred maintenance projects.
3. Modify Little Kitoi Lake fishpass to improve escapement and monitoring of the system and conduct first Saltery stock egg take.
4. Conduct a cost recovery harvest with a goal of 7,000,000 pounds.

Stocking	2009 Projected	2009 Stocking Plan		2009 Egg-Take Goals			Fish Transport Permits			
Location (Broodstock)	Enhanced Run	Releases	Brood Year	2009 Eggs	2010 Stocking	Lifestage	Number	Expiration	Max. Eggs	Max. Juv.
Kitoi Bay pink (BKC)	10,300,000	150,000,000	2008	185,000,000	150,000,000	fry	06A-0073	31-Aug-11	215,000,000	182,000,000
Kitoi Bay chum (BKC)	148,000	22,000,000	2008	28,000,000	22,000,000	fry	06A-0072	31-Aug-11	28,000,000	22,000,000
Kitoi Bay coho (BKC)	154,000	1,040,000	2007	1,300,000	1,000,000	smolt	02A-0007	01-May-12	1,300,000	1,000,000
Jennifer Lake coho (BKC)	4,000	200,000	2008	300,000	200,000	fingerling	02A-0009	01-May-12	300,000	250,000
Ruth Lake coho (BKC)	600	30,000	2008	60,000	30,000	fingerling	02A-0011	01-May-12	60,000	50,000
Crescent Lake coho (BKC)	3,300	165,000	2008	600,000	165,000	fingerling	02A-0008	15-May-12	600,000	500,000
Katmai Lake coho (BKC)	750	28,000	2008	40,000	28,000	presmolt	02A-0010	01-May-12	40,000	30,000
Little Kitoi Lake sockeye (SL)	70,000	415,000	2007	600,000	400,000	presmolt	05A-0078	12-Jun-10	1,200,000	500,000
Little Kitoi Lake sockeye (SL)		100,000	2008		100,000	presmolt	05A-0078	12-Jun-10	1,200,000	500,000

Broodstocks: BKC – Big Kitoi Creek (Kitoi Bay Hatchery); SL – Saltery Lake.

ABSTRACT

The Kitoi Bay Hatchery (KBH) is located on Afognak Island approximately 48 kilometers (30 miles) north of the city of Kodiak. The production at the facility is financed and operated by the Kodiak Regional Aquaculture Association. Currently, KBH incubates and rears a single stock of pink *Oncorhynchus gorbuscha*, chum *O. keta*, coho *O. kisutch*, and sockeye *O. nerka* salmon. The purpose of this management plan is to describe the activities to be undertaken at KBH in 2009.

Approximately 150 million pink salmon fry will be released in 2009. The 2009 adult return from the 2008 fry releases into Kitoi Bay is expected to be approximately 10 million pink salmon. Hatchery personnel will collect 185 million pink salmon eggs in 2009 and plan to release approximately 150 million fry into Kitoi Bay in 2010.

KBH plans to release 22 million chum salmon fry into Kitoi Bay in 2009. The 2009 adult return from prior releases is expected to be about 148 thousand adult chum salmon. Hatchery personnel will collect 28 million eggs in 2009 for a chum salmon release of 22 million fry in 2010.

About 1 million coho salmon smolt will be released into Big Kitoi Bay in 2009. A total of approximately 395 thousand fingerlings will be released into Jennifer, Ruth, and Crescent Lakes and 28 thousand presmolt will be released into Katmai Lake in 2009. The 2009 forecast for returns of coho salmon to the Kitoi Bay area is approximately 154 thousand adults. About 2 million coho salmon eggs will be collected in 2009 for eventual releases of 395 thousand fingerlings and 28 thousand presmolt in 2010 and 1 million coho salmon smolt for release in 2011.

In 2009, approximately 415 thousand sockeye salmon presmolt will be reared in net pens to imprint in Little Kitoi Lake (LKL) for eventual release into Little Kitoi Bay. In addition, approximately 100 thousand sockeye salmon presmolt will be released into LKL in the fall of 2009. About 400 thousand sockeye salmon eggs are currently incubating and will be reared to presmolt at KBH, imprinted in LKL, and released into Little Kitoi Bay in the spring of 2010. Approximately 70 thousand adult sockeye salmon are forecasted to return to Little Kitoi Lake in 2009.

Key words: Kitoi Bay Hatchery, Kodiak Regional Aquaculture Association, sockeye salmon, pink salmon, chum salmon, coho salmon, broodstock, stocking, fry, fingerling, presmolt, smolt, harvest management, cost recovery, management plan, Kodiak management area, annual management plan

INTRODUCTION

Kitoi Bay Hatchery (KBH) is located on Afognak Island (58° 11.04' N lat., 152° 21.04' W long.) on the west side of Izhut Bay approximately 48 km (30 miles) north of the city of Kodiak (Figure 1). The hatchery infrastructure was constructed in 1954 by the United States Department of the Interior, Fish and Wildlife Service (FWS), but was destroyed in the 1964 earthquake and rebuilt by the Alaska Department of Fish and Game (ADF&G) in 1965. The hatchery was initially designed as a sockeye salmon *Oncorhynchus nerka* research facility. By 1976, the hatchery production priorities switched to pink salmon *O. gorbuscha* enhancement. The present goal of the facility is to provide enhanced salmon fishing opportunities for the Kodiak Management Area (KMA) commercial fishermen by increasing the returns of pink, chum *O. keta*, coho *O. kisutch*, and sockeye salmon primarily to the Kitoi Bay area (Figures 2 and 3). KBH was designed to increase salmon production for KMA commercial seine and set gillnet fisheries. Secondary user groups (in terms of the number of salmon harvested) of hatchery production include subsistence and recreational fishermen. KBH has the capacity to produce 178 million juveniles of all life stages (fry, fingerling, presmolt, and smolt). Funding for the hatchery was provided exclusively by ADF&G prior to fiscal year (FY) 1987, and was provided jointly by ADF&G and Kodiak Regional Aquaculture Association (KRAA) from FY 1987 to FY 1991. The hatchery has been fully funded by KRAA since FY 1992.

This annual management plan is the guiding document outlining the activities associated with KBH for 2009. The plan will contain 1) projected releases of juvenile salmon in 2009, 2) egg

take goals in 2009 and projected releases in 2010 and 2011, 3) salmon (enhanced stocks) harvest management in 2009, 4) additional measures for wild stock protection in 2009, and 5) evaluation plans for 2009. Appendix A describes historical juvenile salmon releases from KBH, by species. Inseason assessments and project alterations by the KRAA, ADF&G, or the FWS may result in changes to this management plan in order to reach or maintain program objectives.

Big Kitoi Lake (BKL) supplies KBH with water through two (2) deep and one (1) shallow 35.6-cm (14 inch) diameter pipelines. The two deep pipelines extend 457 m (500 yards) and 732 m (800 yards) into BKL, drawing water from depths of 15.2 m (50 feet) and 22.9 m (75 feet), respectively. These deep pipelines join downstream of the dam and supply one pipeline extending to the hatchery with water temperatures ranging from 2.0°C to 6.0°C. The shallow pipeline draws water from a depth of 1.5 m, supplying water with temperatures ranging from 0.5°C to 19°C. These pipelines connect to a manifold allowing the hatchery to control water temperatures in any part of the hatchery. Excess lake water drains from BKL through Big Kitoi Creek (BKC; Figure 4). BKC contains a barrier falls approximately 503 m (550 yards) upstream from salt water and 183 m (200 yards) downstream from BKL that prevents adult salmon from entering the lake. A weir is installed at the mouth of the creek and adjacent to the KBH fish ladder to facilitate collection of pink, chum, and coho salmon eggs from returning adults. Coho and chum salmon ascend a fish ladder at the weir and enter two raceways adjacent to the hatchery facility where they are utilized for egg takes. Pink salmon are unable to ascend the fish ladder to the broodstock raceways in sufficient numbers and are collected from the lower section of the ladder during egg takes.

Little Kitoi Lake (LKL) is located approximately 0.40 km (0.25 miles) north of KBH (Figure 4). LKL drains through concrete raceways and a fish pass system located at the lake outlet. All returning adult salmon must pass through this system before entering the lake. The raceways are designed to control movement of both returning adults and outmigrating smolt, enabling the single system to monitor escapement and outmigration simultaneously. While the adult and smolt systems are capable of operating at the same time, smolt can be injured traveling down the fish pass; therefore, the fish pass is shut down during the smolt outmigration. Smolt outmigrate through the smolt compound and into a 20.4 cm (8 inch) pipeline bypass adjacent to the adult fish pass. The fish pass and outmigration pipeline drain directly into Little Kitoi Bay.

The development of a pink salmon brood source began at the hatchery in 1976 using donor stock from BKC (Honnold and Aro 2003-2005). Pink salmon are the only salmon species indigenous to BKC. The program expanded from an egg collection of approximately 5 million eggs in 1976 to 215 million eggs in 1989. Recent increases in green-egg to eyed-egg survival have lowered the pink salmon egg-take requirement to a range of 175 to 185 million eggs. All pink salmon eggs are collected from broodstock returning to BKC and are incubated at KBH. The resultant fry are reared in saltwater net pens adjacent to the hatchery for a period of 3 to 8 weeks prior to release into Big Kitoi Bay.

A chum salmon broodstock program using Sturgeon River (Kodiak Island) stock was initiated in 1980 (Honnold and Aro 2003-2005). The first chum salmon egg take occurred at the hatchery in 1986. Thereafter, runs have been adequate to collect broodstock, but the hatchery production goal of 25 million eggs (a 22-million fry release) was not consistently achieved until recently as run sizes have increased and broodstock collection techniques have improved. In 1991, an infectious hematopoietic necrosis virus (IHNV) outbreak resulted in a complete brood year (BY) failure in 1990. After the IHNV outbreak, ultraviolet (UV) light water disinfecting units were

installed in the hatchery to sterilize all chum incubation water in an effort to prevent further disease outbreaks. The UV water treatment has been successful: no outbreaks of IHNV in chum fry have occurred since the units were installed. In 2008, new UV light sterilization units were installed to improve both the quality of depuration and the energy efficiency of the system. Chum salmon fry produced at the hatchery are reared in saltwater net pens adjacent to the hatchery for a period of 6 to 12 weeks prior to release into Big Kitoi Bay.

A coho salmon stocking project using Buskin Lake and LKL wild stocks was started at KBH in 1982 (Honnold and Aro 2003-2005). Coho salmon fry were released into a number of Kodiak road system lakes and a portion were stocked into Buskin (Buskin Lake broodstock) and Little Kitoi lakes (LKL broodstock; Figure 1). In 1990, coho salmon fingerlings were released into Kitoi Bay (wild LKL stock) to develop a hatchery broodstock returning to BKC and to increase the commercial harvest in the Kitoi Bay area. Since 1993, coho salmon runs have been adequate for hatchery egg takes and have provided enough eggs to reach production goals (about 2.3 million eggs). The majority of juvenile coho salmon are released from the hatchery into Big Kitoi Bay at the smolt life stage; however, some juveniles are released as fingerlings into Jennifer and Ruth Lakes in the Kitoi Bay area (Figure 4). Coho salmon fingerlings are also stocked into Crescent Lake, adjacent to Port Lions (Figure 5) and presmolt are stocked into Katmai Lake (adjacent to Ouzinkie). These projects have contributed coho salmon to the subsistence fisheries for the villages of Port Lions and Ouzinkie. The local school students assist with the Katmai Lake stocking program as part of their school curriculum.

KBH collected eggs from an age-0. component of the late-run Upper Station Lake sockeye salmon stock from 1988 through 1994 to develop a late-run sockeye salmon broodstock that would return to LKL (Figure 1; Hall et al. 1997; Honnold and Aro 2003-2005). The age-0 fish spend only a few weeks rearing in Upper Station Lake (lower Olga Lake) before migrating to the ocean; thus, adults return sooner than those fish that rear for the typical 1 to 2 years in freshwater. The intent of this project was to create a return of sockeye salmon to LKL that could be used as an egg source for Pillar Creek Hatchery (PCH) with resultant fry being stocked into Spiridon Lake (Figure 1). Survivals from the age-0 juvenile releases were poor, which resulted in modifications to the project in 1993 to include the stocking of age-0 presmolt (late fall releases) into LKL and age-1 smolt (late spring releases) into Little Kitoi Bay.

Previously, salmon stocking into LKL had been avoided because the lower depths of the lake contained a high concentration of hydrogen sulfide. This layer was the result of saltwater intrusion during the 1964 earthquake (Schrof et al. 2000). The layer was a "nutrient sink," reducing the ability of the lake to support zooplankton, which are the primary food source for juvenile sockeye salmon. In 1995, a 20.4 cm (8 inch) pipeline was sunk into the lake and most of the hydrogen sulfide-laden water was siphoned off. Although a small amount of hydrogen sulfide remained, the zooplankton levels immediately showed signs of improvement.

The enhancement strategies initially used to develop a LKL sockeye salmon run relied on the late-run Upper Station stock as a brood source. However, research by the ADF&G concluded that the Saltery Lake sockeye salmon stock was preferred for Spiridon Lake and LKL stockings (Clevenger et al. 1997; Honnold 1997). The earlier run timing of Saltery Lake sockeye salmon (about 3 weeks earlier than the late-run Upper Station sockeye stock) was expected to improve returns to Little Kitoi Lake and make broodstock collection easier. Additionally, the earlier run timing was expected to reduce the incidental harvest of Spiridon River pink and chum salmon

stocks during the terminal fishery targeting returns to Spiridon Lake. Therefore, in 1997 Saltery Lake sockeye salmon were used for the LKL broodstock development program.

Several direct release strategies into LKL were implemented in an attempt to maximize the survival and reduce holdover of the Saltery Lake sockeye smolt. In addition, nutrients were added to LKL during 2000-2001 to improve zooplankton productivity (Schrof and Honnold 2003) and although zooplankton production did increase, the resulting smolt emigrations were still inadequate in obtaining returns large enough for an egg take to occur at LKL. Regardless of release method and fertilization, LKL was unable to support the required amount of juveniles to make the broodstock development project successful. Limnological data continues to show that LKL is a marginal environment for successfully rearing sockeye salmon due to its low plankton productivity and high turnover rate. Consequently, releases have been reduced to match the estimated carrying capacity of LKL, which has reduced the number of outmigrating smolt.

In 2003, the broodstock development program was modified in response to the low number of outmigrants and poor zooplankton levels in LKL (Honnold and Aro 2003). A modest number (100 thousand) of presmolt were released (Saltery Lake broodstock) into LKL in the fall, as in the previous years, but a portion of the juveniles were reared at KBH through the winter. These fish (initially 190 thousand) were transferred into net pens in LKL during the second week of May at an average size of about 18 grams. After two and a half weeks of lake rearing, the sockeye salmon smolt were siphoned out of the net pens directly into Little Kitoi Bay. This release coincided with the peak of the resident sockeye salmon smolt outmigration. The experimental strategy was very successful in its first year and a Permit Alteration Request (PAR) was approved to continue the rearing strategy and expand the project in 2006. Additional raceways at KBH were installed in 2005 to accommodate the expansion to the production level of 500 thousand presmolt. Approximately 400 thousand juveniles reared in net pens and 30 thousand LKL resident sockeye smolt are produced annually (assumed 30% smolt survival from 100 thousand fall outstocking), which should provide adequate numbers of returning adults to achieve the broodstock development goal. PCH has released Saltery Lake sockeye juveniles in LKL in the past, but no release is planned for 2009.

This current management plan will remain in effect, after approval by the ADF&G and KRAA, until a new Annual Management Plan (AMP) supersedes the existing plan. The hatchery operator must notify the department in a timely manner of expected or desired departures from the AMP. That notification shall be in the form of a request to amend the AMP. Any amendments must be approved by the department and should be reviewed by the hatchery operator and local ADF&G staff prior to submission to the Private Non Profit (PNP) coordinator. This policy applies to all hatchery operations covered under the AMP.

The ADF&G recognizes that the methods used to estimate eggs, fry and adult numbers are imperfect and it is not unusual to have slight deviations above and below the goals and limits specified in this plan. So long as these deviations are within accepted ranges of the specified numbers, the operator will not be considered out of compliance and no amendment to the management plan will be necessary. As a guideline for accepted deviation, the 5-year average at the respective life stage should be consulted. However, if a consistent pattern of exceeding the approved numbers in the AMP occurs, this will need to be addressed.

RELEASES IN 2009 AND PROJECTED RETURNS

PINK SALMON: BIG KITOI CREEK STOCK

KBH will release approximately 150 million pink salmon fry at 0.6 g in 2009 (Table 1). The fry will be volitionally released from the hatchery into saltwater net pens via pipelines, reared in saltwater for a period of 3 to 8 weeks, and then released in the Inner Kitoi Bay section (Figures 3 and 4).

Approximately 5.6 million adult pink salmon are expected to return to KBH in 2010 from this release based on a stocking-to-adult survival of approximately 3.8% (Tables 1 and 2; average marine survival). The pink salmon run should begin in late July, peak in early August and end in late August (Figure 6).

CHUM SALMON: BIG KITOI CREEK STOCK

Approximately 22 million chum salmon fry at 2.4 g will be released directly into Big Kitoi Bay in 2009 (Table 1; Figures 3 and 4). Most of the BY 08 chum fry (85%) in 2009 will be non-volitionally ponded from Nopad incubators during the first 3 weeks of March. The remaining 15% will volitionally outmigrate from the incubators to the saltwater net pens. This will be the fourth year of the non-volitional release of chum salmon fry that is intended to increase the rearing time in saltwater, thereby resulting in larger fry at release and increasing marine survival. Fry are reared in saltwater net pens from 6 to 12 weeks.

Non-volitional release is a common technique used at Alaska hatcheries, primarily used for chum salmon, but also for pink salmon fry. The technique requires the use of a Nopad incubator, which is a stackable incubator that can be moved around to facilitate the non-volitional release. The fry are sampled prior to release to determine the percent of yolk sac to body weight. When the yolk sac approaches 3 to 5% of the fry's body weight, the fry are ready to enter saltwater. At this point the incubators are lifted with an electric forklift, brought to a tank, submerged and emptied of all fry and incubator substrate. The water upwells over a bar grate and into another fry tank situated below. The fry fall through the grate and flow by gravity to saltwater net pens. The substrate is separated from the fry by the bar grates and is removed for cleaning.

Non-volitional release will allow approximately 85% of the chum salmon fry to enter saltwater between the last week in February and the middle of March, which is approximately 4 weeks earlier than the previous volitional method allowed. This is made possible by recent improvements in the UV water manifold, which allows warmer shallow water to be used for accelerating egg development during chum salmon incubation. Egg development of later egg take lots will be accelerated to equal the earliest lots, so that all fry will be ready to enter saltwater at the same time. The extended rearing period is expected to increase chum salmon fry size by approximately 40% or more. The marine survival of chum salmon fry of this size is expected to range from 2.5 to 5.0% compared to the average survival of 1.2% for KBH releases (Honnold and Aro 2004).

Applying a conservative stocking-to-adult survival estimate of 2.5% results in approximately 551 thousand adults returning from the 2009 release in 2011 and continuing through 2013 (Tables 1 and 2). Approximately 418 thousand chum salmon (3 years ocean residence) are expected to return in 2012. Chum salmon runs into Kitoi Bay usually begin in early June, peak in mid June to early July and end in late August (Figure 6).

COHO SALMON: BIG KITOI CREEK STOCK

Hatchery personnel will release approximately 1 million coho salmon smolt at 18.0 g (BY 2007, BKC broodstock) into Big Kitoi Bay in 2009 (Table 1). Initial imprinting will occur prior to transfer into saltwater, while smolt are still in the hatchery freshwater raceways. The smolt will be transferred from the hatchery via pipelines into saltwater net pens and reared for about 4 weeks to provide additional time for imprinting and adjusting to ocean salinity (osmoregulation). The saltwater net pens will be located in the vicinity of the BKC discharge (KBH water source), which is intended to provide further imprinting to BKC.

Approximately 157 thousand adults (assuming a 15.1 % survival) are projected to return in 2010 as a result of the 2009 coho salmon smolt release (Tables 1 and 2).

Additional coho salmon (BY 2008 BKC broodstock) releases in 2009 in the Kitoi Bay area will include 200 thousand coho salmon fingerlings at 0.7 g into Lower Jennifer Lake and 30 thousand coho salmon fingerlings at 0.7 g into Ruth Lake (Table 3; Figure 4). About 2.0% of these releases, including 4 thousand adults to Jennifer Lake and 600 adults to Ruth Lake, are expected to return in 2011 (Tables 2 and 3). All returning adults to Jennifer and Ruth lakes will be available for harvest, due to stream barriers (waterfalls) near tide water preventing further migrations.

Coho salmon runs into Kitoi Bay usually begin in early August, peak in mid to late August and end in early September (Figure 6).

Remote releases (BY 2008 BKC broodstock) of 165 thousand coho salmon fingerlings at 0.7 g into Crescent Lake (Port Lions; Figure 5) and 28 thousand coho salmon presmolt at 7.5 g into Katmai Lake will occur in 2009 (Ouzinkie; Table 3; Figure 1).

Adult returns from these releases are projected to be 3.3 thousand fish (2.0% survival) to Crescent Lake in 2011 and 1.4 thousand fish (5.0% survival) to Katmai Lake in 2011 (Tables 2 and 3). The residents of each neighboring village primarily harvest these salmon during sport and subsistence fisheries. A portion of the Crescent Lake run may contribute to the commercial harvest in the Northwest Kodiak District (Figure 2) and be available for additional commercial harvest in the Settler Cove Special Harvest Area (SHA; Figure 5; 5 AAC 18.364, 5 AAC 40.085 (5)).

The coho salmon stocking capacities of Ruth, Jennifer, Crescent, and Katmai lakes are based upon the surface area of each lake. Release numbers are adjusted, if needed, in response to zooplankton biomass trends at each lake. All juvenile coho salmon stocked into lakes are transported to each site by floatplane using transfer tanks. The Katmai Lake release requires additional transport by two 4-wheelers equipped with small transfer tanks.

SOCKEYE SALMON: SALTERY LAKE STOCK

KBH will release 415 thousand sockeye salmon presmolt at 22.0 g (BY 2007) into net pens at LKL in 2009 (Table 4). The BY 2007 juveniles will be transported to LKL in a tank, pumped from the tank into net pens to short term rear for approximately 2 weeks to imprint on the waters of LKL. Presmolt will be siphoned out of the nets and travel through a pipe that feeds into the LKL estuary. The non-volitional release will occur during the peak outmigration of the resident sockeye salmon smolt, which usually occurs around the last week in May or first week in June.

In addition, about 100 thousand BY 2008 presmolt will be released directly into LKL in October 2009.

The 2009 releases are expected to produce approximately 70 thousand adults returning to LKL from 2011 through 2015 (Table 4). The majority of the returns should occur in 2012 through 2013. The run timing is expected to be typical for Saltery stock, beginning in late June, peaking in mid to late July and ending in mid August (Figure 7; Honnold 1997).

EGG TAKES IN 2009 AND RELEASES IN 2010 AND 2011

PINK SALMON: BIG KITOI CREEK STOCK

About 350 thousand adult pink salmon returning to KBH will be needed for broodstock in 2009 (Tables 5 and 6). Approximately 185 million pink salmon eggs will be collected in 2009 to provide for the release of 150 million pink salmon fry at 0.8 g into Big Kitoi Bay (BKB) in 2010. The actual number of eggs collected may be more depending on how many chum salmon eggs are collected and their eyed egg survival. If the maximum chum salmon egg take occurs (28 million green-eggs), incubation space will not be available for an increased number of pink salmon eggs. KBH is permitted to collect up to 215 million pink salmon eggs, if additional incubation becomes available.

The 2010 release is expected to result in approximately 7.3 million (assuming a 5.9% survival) adult pink salmon returning to KBH in 2011 (Tables 2 and 6).

CHUM SALMON: BIG KITOI CREEK STOCK

Approximately 30 thousand chum salmon adults returning to KBH in 2009 will be needed for broodstock to achieve an egg-take goal of 28 million eggs (Tables 5 and 6). Approximately 22 million chum salmon fry at 2.8 g will be released into BKB in 2010 using a non-volitional release technique for 95% of the chum salmon fry. In 2010, the majority of juvenile chum salmon in Kitoi box incubators will also be non-volitionally moved in a manner similar to the Nopad incubators. The remaining 5% of the fry will be moved volitionally to the saltwater net pens.

Applying an average of 2.5% stocking-to-adult return survival to the 2010 release, about 550 thousand adult chum salmon are expected to return from 2012 through 2014 (Tables 2 and 6). The majority of the chum salmon return (418 thousand) are expected in 2013 (age 0.3 chum salmon).

COHO SALMON: BIG KITOI CREEK STOCK

Approximately 6 thousand of the 154 thousand adult coho salmon returning to KBH in 2009 will be used for broodstock (Table 5). About 1 million BY 2008 juvenile coho salmon are being raised at KBH and will be released as 20.0 g smolt into BKB in 2010 (Tables 1 and 6). The 2010 smolt release should result in approximately 151 thousand adults returning in 2011. A total of 2.3 million coho salmon eggs will be collected from Big Kitoi Creek in 2009 for future releases into BKB, and Jennifer, Ruth, Crescent, and Katmai lakes (Tables 6 and 7). Approximately 1.3 million green eggs will provide for 1 million coho salmon smolt to be released at 20.0 g into BKB in 2011 (Table 6). This release is expected to produce 151 thousand (assuming a 15.1% survival) adults returning in 2012. Approximately 360 thousand eggs will be collected for future juvenile releases at Jennifer (200 thousand fingerlings) and Ruth (30 thousand fingerlings) Lakes

in 2010 (Table 7; Figure 4). These releases are expected to produce 4.6 thousand adults (assuming a 2.0% survival) returning in 2012 (Tables 2 and 7). The remaining 640 thousand coho salmon eggs collected are planned for future releases into Crescent (165 thousand fingerlings) and Katmai Lakes (28 thousand presmolt) in 2010 (Table 7; Figures 1 and 5). Approximately 3.3 thousand adults (assuming a 2.0% survival) should return to Settlers Cove in 2012 as a result of these releases and 1.4 thousand (assuming a 5.0% survival) adults should return to Ouzinkie in 2012 as a result of the Katmai Lake releases (Tables 2 and 7).

SOCKEYE SALMON: SALTERY LAKE STOCK

In 2009, sockeye salmon eggs (375 broodstock; 550 thousand eggs) will be collected from LKL for the eventual release of 100 thousand presmolt at 9.0 g in October 2010 and a release of 400 thousand sockeye salmon smolt (23.0 g) into LKL for June 2011 (Table 8). Saltery Lake sockeye salmon will be a secondary (back-up) brood source for an egg take, if there are not an adequate number of adults that returned to LKL for an egg take to occur. Approximately 68 thousand adult sockeye salmon are expected to return from 2011 through 2015 from these two releases (assuming a 7.5% survival for fall presmolt and 15% survival for spring smolt; Tables 2 and 8).

KBH will short term rear and release approximately 400 thousand sockeye salmon presmolt (BY 2008) at 23.0 g into LKL in 2010, which should result in approximately 60 thousand adults returning from 2011 through 2013 (Table 8).

The broodstock development program initiated at LKL was intended to provide sockeye salmon juveniles for annual stockings into Spiridon Lake. Sockeye salmon eggs have been collected at Saltery Lake to develop the program. The 2009 forecast of approximately 70 thousand sockeye salmon returning to LKL should provide an adequate number of adults for an egg take to occur (Table 5). KRAA estimates that 6,200 sockeye salmon are necessary in order to yield a minimum of 3,000 adults for an egg take. If hatchery personnel are unable to pass 6,250 adult sockeye salmon into LKL, the egg take will take place at Saltery Lake. The decision to collect broodstock at LKL will be made by the middle of August as determined by escapement levels. There will be several changes in 2009 to the LKL fish pass to improve escapement and monitoring of adults entering the lake. A weir will be installed in the LKL estuary to help direct adults to the fish pass entrance and to prevent them from straying to the base of the cement compound. A camera will also be installed at the lake entrance to enumerate escapement and allow the fish pass to remain open at all times. PCH personnel will collect the broodstock and conduct an egg take at LKL or Saltery Lake in 2009 (Table 5).

SALMON HARVEST MANAGEMENT

ADULT SALMON FORECASTS FOR 2009

Approximately 10.4 million pink salmon, 148 thousand chum salmon, 154 thousand coho salmon, and 70 thousand sockeye salmon are expected to be harvested as they return to Kitoi Bay in 2009, based on previous releases of juvenile salmon from KBH (Table 5). Once broodstock and escapement (in parentheses) needs are met, we anticipate approximately 10 million pink salmon (350 thousand for brood stock), 116 thousand chum salmon (30 thousand for brood stock), 148 thousand coho salmon (6 thousand for brood stock), and 64 thousand sockeye salmon (6 thousand for brood stock) will be available for harvest in the Kitoi, Izhut and Duck Bay sections in 2009. The majority of these returning fish will be available to the common

property fishery. KBH, under the direction of the KRAA Board of Directors, plans to harvest approximately 1.9 million pink salmon (7 million pounds) for cost recovery.

KITOI BAY

The Kitoi Bay harvest strategy, as described in the Eastside Afognak Management Plan (5 AAC 18.365), is designed to increase fishing opportunities for the commercial salmon net fishery in the Duck, Izhut, and Kitoi Bays sections (Figure 3) while providing for adequate broodstock returns to KBH. Inseason management of KBH salmon runs is complicated because of overlapping run timing between species and the broodstock priorities (Figure 6). Therefore, inseason adjustments to fishing periods in any or all management units may be necessary. These adjustments may occur more frequently in the Kitoi Bay sections (Kitoi Bay SHA) and less frequently in the Duck and Izhut Bay sections. During the broodstock collection periods, every effort will be made by the Kodiak Salmon Area Management Biologist and the Kitoi Bay Hatchery Manager to secure the required number of fish to achieve the egg take goals while maintaining a high quality product for harvests on hatchery bound returns. However, the area management biologist has the authority to open and close the salmon fisheries.

In 2003, the KRAA Board of Directors approved the implementation of a cost recovery fishery to fund hatchery operations and supplement the declining revenues in the Kitoi Fund. The fund, which was established in 1989, has been a revenue source to KRAA in sustaining operations at KBH. In 1993, KBH operations were transferred from ADF&G to KRAA. In 2009, KRAA will derive funds from the cost recovery fisheries to supplement hatchery operations in a similar fashion as in previous years. Cost recovery fisheries previously occurred in the Kitoi Bay Section from 1987 to 1989 and from 2003 to 2008. The harvest goal for 2009 cost recovery will be approximately 7 million pounds of pink salmon. Vessels will again be contracted to catch and deliver the fish to processors having bids approved by the KRAA Board of Directors. Contract vessels may use atypical purse seine gear in the Kitoi Bay SHA upon approval of ADF&G. Kitoi Bay SHA has been established (5 AAC 40.085(1)) as the Inner and Outer Kitoi Bay sections or all waters of Kitoi Bay west of a line from 58° 09.50′ N. lat., 152° 18.70 W. long. to 58° 10.58 N. lat., 152° 17.56 W. long. (Wadle and Dinnocenzo 2009; Figure 4).

Pink Salmon

Pink salmon produced at KBH are harvested in commercial purse seine fisheries in the Duck, Izhut, and Kitoi Bay sections (Figures 3 and 4). The pink salmon return begins in mid July, peaks in early to mid August, and ends in late August to early September (Figure 6). The initial fishery opening for pink salmon is expected in late July and is designed to harvest excess males, which arrive during the early portion of the run (Wadle and Dinnocenzo 2009). Broodstock will be collected throughout the run, once it is composed of at least 60% female fish. Spawning pairs will be randomly selected during the egg takes to maximize genetic variability.

In order to harvest pink salmon in excess of the hatchery broodstock needs (350 thousand adults; Table 5), additional openings may occur. Depending on run strength and timing, the Inner and Outer Kitoi, Izhut, and Duck Bay sections may close to commercial salmon fishing from July 20 through September 25 to allow for pink salmon broodstock collection and cost recovery fisheries (Wadle and Dinnocenzo 2009; Figure 3). The cost recovery operations will most likely occur between August 1 and August 20, however due to the run strength expected in 2009, they may begin sooner if the strong than average return warrants it. The common property fishery will remain open during the beginning of the pink return to assess run timing and strength before the

cost recovery fishery is opened. This is intended to maximize common property fishing opportunities at the beginning and end of the run and result in a condensed and efficient cost recovery fishery. The pink salmon broodstock collection typically begins in mid-August and continues through the third week. Once the pink salmon broodstock is collected and contained behind the barrier net enclosure, additional commercial fishing time may be allowed inside Kitoi Bay SHA depending on the progress of the cost recovery fishery (Figure 4). Fishing periods are coordinated between the Kitoi Bay Hatchery Manager and the Kodiak Area Management Biologist to ensure adequate broodstock, while maintaining an orderly cost recovery and commercial fishery. Escapement goals have not been formally established for Big Kitoi Creek; however, pink salmon escapement is monitored by KBH staff and the annual escapement objective is 15 thousand pink salmon (Table 5).

Chum Salmon

Chum salmon produced at KBH are taken in commercial purse seine fisheries in the Izhut, Duck, and Kitoi Bay sections (Figure 3). The chum salmon run begins in early June, peaks in late June to early July, and ends in early August (Figure 6). The initial chum salmon commercial opening in the Kitoi, Izhut and Duck Bays will occur on June 9, 2009 (Wadle and Dinnocenzo 2009). In order to harvest adults in excess of hatchery broodstock needs, additional openings in these sections may occur as run strength is determined. Most of the chum salmon needed for broodstock (30 thousand adults; Table 5) are expected to be in the Inner Kitoi Bay Section by mid July (Figures 3 and 4). Broodstock are retained by a barrier net enclosure in Big Kitoi Bay (Figure 4). Once all chum salmon broodstock are contained behind the barrier net, additional commercial fishing time may occur in the Kitoi Bay SHA. The chum salmon egg take is expected to occur from the middle of July through early August.

The Hatchery Manager and the Kodiak Area Management Biologist will coordinate openings in the Duck, Izhut, and Kitoi Bay sections to minimize the harvest of chum salmon during the late July pink salmon fisheries. Escapement goals have not been formally established for Big Kitoi Creek; however, chum salmon escapement is monitored by KBH staff and the escapement objective is 2,000 chum salmon annually (Table 5).

Coho Salmon

Coho salmon produced at KBH are harvested in commercial purse and beach seine fisheries in the Duck, Izhut, and Kitoi Bay sections (Figure 3). The coho salmon run is expected to start in late July, peak in late August, and continue through the beginning of September (Figure 6). The majority of the coho salmon will be harvested incidental to the pink salmon fishery in the Kitoi Bay area as well as in directed coho fisheries in late August and early September. Hatchery broodstock (6,000 adults; Table 5) will be collected throughout the coho salmon run. In the past, a specific commercial fishing closure has not been necessary to ensure adequate broodstock. The run strength in 2009 is estimated to be substantially larger than broodstock requirements; therefore, specific commercial fishing closures are not expected to occur (Wadle and Dinnocenzo 2009). Coho salmon broodstock are incidentally collected during the pink broodstock collection and after the commercial fisheries are generally over and do not require the use of the barrier net.

There are 3 distinct areas where fishing is either prohibited year-round or restricted between August 15 and September 30 (Figures 3 and 4; 5 AAC 18.350(a); 5 AAC 64.022(b)). These closed waters areas are intended to improve broodstock collection efforts near the hatchery and

are used as a precautionary measure to resolve potential conflicts between hatchery broodstock needs and subsistence and recreational fisheries.

Coho salmon returning to Jennifer and Ruth lakes will also be harvested during commercial fisheries in Duck, Izhut, and Outer Kitoi Bay sections (Figure 3). All of the coho salmon bound for these lakes will be available for harvest. Fish that are not harvested at Jennifer and Ruth Lakes have access to the lower portion of the outlet streams, so they are not expected to stray.

Coho salmon are allowed to enter LKL beginning the first week of September to provide escapement (approximately 500 salmon; Table 5) and to prevent straying. Although the coho salmon peak run timing is later than the pink salmon run peak, most of the coho will be harvested during fisheries targeting pink salmon.

Sockeye Salmon

The sockeye salmon run should begin in late June and continue through mid August with the peak occurring during the first 2 weeks of July (Figure 7). The 2009 run (Saltery Lake stock) is forecast to be stronger than in past years with the primary components of the return coming from releases of predominantly net pen reared fish (in LKL). Based on the forecasted run of 70,000 sockeye salmon, the run should provide enough returning adults to LKL to begin broodstock collection for the Spiridon Lake enhancement program. However, an inseason assessment will be conducted and commercial fishery closures inside the Kitoi Bay SHA will occur to allow LKL bound sockeye salmon access to the lake (Wadle and Dinnocenzo 2009).

CRESCENT LAKE

Coho Salmon

The purpose of the Crescent Lake coho salmon stocking project is to provide enhanced coho salmon for harvest (as directed in 5 AAC 18.364) as they return to Crescent Lake (Figure 5). Most of the 2009 coho salmon run will be harvested in the local sport and subsistence fishery; however, a portion of the run should be available for commercial harvest. The commercial harvest of Crescent Lake coho salmon is expected to occur during normal fishing periods targeting coho salmon in the Northwest Kodiak District (Figure 2). Special openings are not expected to occur within the Settler Cove SHA (Figure 5; 5 AAC 40.085). Natural barriers prevent salmon access to Crescent Lake, so all returning coho salmon will be available for harvest. Some fish may escape into the lower portion of the outlet stream, but will be utilized by villagers from Port Lions for subsistence purposes. Harvest information will be obtained from the ADF&G subsistence permit and commercial fish ticket programs to provide harvest information from the stocking project.

KATMAI LAKE

Coho Salmon

The purpose of the Katmai Lake coho salmon stocking project is to provide adult returns for harvest by sport and subsistence fishermen in the vicinity of Ouzinkie (Figure 1). This project is also intended to provide students in Ouzinkie with a community and educational project assisting in the release of the presmolt. Most coho salmon returning to Katmai Lake will be harvested in the local sport and subsistence fishery. Some may also be harvested in commercial fisheries in the Northwest Kodiak District (Figure 2). Natural barriers prevent salmon access to Katmai Lake, so all returning coho salmon will be available for harvest (Table 5). Fish that congregate in the

outlet stream are prevented from straying since the villagers of Ouzinkie utilize the entire escapement for subsistence purposes. Harvest information will be obtained from the ADF&G subsistence permit and commercial fish ticket programs to estimate contributions from the stocking project.

ADDITIONAL MEASURES FOR WILDSTOCK PROTECTION

GENETICS POLICY

The ADF&G Genetics policy is designed to ensure that stocking projects do not negatively impact the genetic integrity of wild stocks (McGee 1995). The policy addresses three primary areas: 1) stock transport, 2) protection of wild stocks, and 3) maintenance of genetic variability. This policy, as described in the 2001 KBH annual management plan (McCullough and Aro 2001), will be followed in 2009 for all projects.

To protect wild stocks and maintain genetic variability, adults produced from hatchery stocking projects must be prevented from straying into stream and lake systems supporting wild stocks. A management strategy targeting enhanced production is required by the ADF&G to ensure compliance with state regulations for PNP salmon hatcheries (5 AAC 40.005 (f)). This strategy must address the ADF&G PNP permitting requirements for salmon straying concerns and include detailed actions required when harvest of enhanced production is delayed or abandoned.

These actions were detailed in an unplanned cost recovery operational plan (UCROP) as part of the PCH annual management plan in 2003 and included cost recovery fisheries in the Terminal Harvest Areas (THAs currently SHAs; Honnold and Clevenger 2003). If commercial fishing does not occur for some reason in 2009, salmon returning to the Kitoi Bay SHA will be harvested using the guidelines described in the UCROP.

POLICIES AND GUIDELINES FOR HEALTH AND DISEASE CONTROL

The State of Alaska Pathology Review Committee has developed a long range goal to prevent dissemination of infectious finfish (and shellfish) disease within or outside the borders of Alaska (McGee 1995). This goal is intended to protect stocks without constraining aquaculture or stock renewal programs. The policy and guidelines do not advocate transplanting wild finfish stocks between geographic zones in attempt to minimize risk of transporting disease from one zone to another. In addition, this policy includes hatchery stocks in order to be consistent with the Genetics policy. Some exceptions may be made on a case by case basis. The policy and guidelines for health and disease control, as described in the 2001 Kitoi Bay Hatchery Annual Management Plan (McCullough and Aro 2001) will be followed in 2009 for all projects.

EVALUATION

In FY 2003, the responsibilities of an evaluation program were transferred from ADF&G to KRAA personnel at KBH. The primary responsibilities were the biological sampling and sockeye salmon monitoring operations at LKL. In an effort to maintain the objectives of the evaluation program, KRAA staff will continue to 1) determine the age structure of chum salmon returning to the hatchery, 2) collect baseline age and growth data from juvenile sockeye salmon pen reared at LKL, 3) estimate the number of sockeye salmon smolt outmigrating from LKL, 4) estimate the survival of the sockeye salmon presmolt stocked into LKL, 5) estimate the average age, weight, and length

(AWL) composition of the sockeye salmon smolt outmigrating from LKL, and 6) determine zooplankton density and biomass in Little Kitoi, Upper and Lower Jennifer, and Ruth lakes.

CHUM AND COHO SALMON

Size, sex, and age (scales) data will be collected throughout the chum salmon run to maintain a representative sample of the chum salmon age classes returning to KBH. Age, length, and sex data will be collected from broodstock entering hatchery raceways (600 adults) and from the Kitoi Bay area commercial harvest (600 adults; McCullough and Aro 2002). These data will be used to assign ages to the adult chum salmon run and estimate overall survival by release year. Prior to saltwater rearing, coho salmon smolt will be sampled for weight and evaluated for their ability to osmoregulate (ability to maintain proper water and electrolyte balance in saltwater). The latter assessment will include holding small numbers of juveniles in the net pens used for rearing in saltwater and recording mortality. This will be repeated until mortality is minimal (<1%). Once this occurs, the remaining smolt will be transferred to the net pens for saltwater rearing.

SOCKEYE SALMON

The sockeye salmon evaluation program will continue to focus on assessing production from LKL presmolt releases. In 2009, we will rear 415 thousand presmolt (BY 2007) in net pens to allow them to imprint in LKL and the release will coincide with the peak outmigration of the resident sockeye salmon smolt (Table 4). We will also collect 90 random scale samples (15 per pen) prior to non-volitional release from net pens into Little Kitoi Bay. These presmolt should average about 22.0 g and should have significantly different scale patterns than the presmolt released into LKL in the fall. In 2009, 100 thousand fall presmolt (BY 2008) will also be released into LKL at the beginning of October (Table 4). In 2009, a reduced percentage of the sockeye salmon released (5% instead of 10%) will be marked prior to release by fin clipping to determine survival and age composition of future emigrations from LKL.

All sockeye salmon caught in the LKL fish pass, cost recovery or sport fishery or the hatchery raceways will be examined for marks and scales, and fish lengths will be taken. Scales taken from adults without marks will be aged and the scale patterns will be compared to LKL sockeye scale patterns. The scale data will be used to reconstruct age components of the yearly returns.

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REFERENCES CITED

Clevenger C., S. G. Honnold, and J. N. McCullough. 1997. Pillar Creek Hatchery annual management plan, 1997. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K97-31, Kodiak.

Hall A., S. G. Honnold, and J. N. McCullough. 1997. Kitoi Bay Hatchery annual management plan, 1996. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K97-36, Kodiak.

REFERENCES CITED (Continued)

Honnold, S. G. 1997. The results of sockeye salmon (*Oncorhynchus nerka*) stocking into Spiridon Lake in the Kodiak National Wildlife Refuge: juvenile and adult production, commercial harvest, and ecosystem effects, 1987-1996. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 4K97-47, Kodiak.

Honnold, S. G., and A. W. Aro. 2003. Kitoi Bay Hatchery annual management plan, 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K03-39, Kodiak.

Honnold, S. G., and A. W. Aro. 2004. Kitoi Bay Hatchery annual management plan, 2004. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K04-29, Kodiak.

Honnold, S. G., and A. W. Aro. 2005. Kitoi Bay Hatchery annual management plan, 2005. Alaska Department of Fish and Game, Division of Commercial Fisheries, Fishery Management Report No. 05-42, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/fmr05-42.pdf

Honnold, S. G., and C. Clevenger. 2003. Pillar Creek Hatchery annual management plan, 2003. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K03-38, Kodiak.

McCullough, J. N., and A. W. Aro. 2001. Kitoi Bay Hatchery annual management plan, 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K01-42, Kodiak.

McCullough, J. N., and A. W. Aro. 2002. Kitoi Bay Hatchery annual management plan, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K02-41, Kodiak.

McGee, S. G. 1995. The hatchery program and protection of wild salmon in Alaska: policies and regulations. Alaska Department of Fish and Game, Division of Commercial Fisheries, Draft Report (compilation), Juneau.

Schrof, S. T., and S. G Honnold. 2003. A summary of salmon enhancement, rehabilitation, evaluation, and monitoring efforts conducted in the Kodiak Management Area through 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K03-41, Kodiak.

Schrof, S. T., S. G. Honnold, C. Hicks, and J. Wadle. 2000. A summary of salmon enhancement, rehabilitation, evaluation, and monitoring efforts conducted in the Kodiak Management Area through 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K00-57, Kodiak.

Wadle, J. and J. Dinnocenzo. 2009. Kodiak management area harvest strategy for the 2009 commercial salmon fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Fishery Management Report No. 09-19, Anchorage. http://www.sf.adfg.state.ak.us/FedAidpdfs/fmr09-19.pdf

TABLES AND FIGURES

Table 1.–Kitoi Bay Hatchery pink, chum, and coho salmon egg takes in 2007 and 2008, juvenile releases planned for Big Kitoi Bay in 2009 and 2010, projected adult production and FTP.

Fish Species	Pink Salmon	Chum Salmon	Coho Salmon	Coho Salmon
Brood Year	2008	2008	2007	2008
Broodstock	Big Kitoi Creek	Big Kitoi Creek	Big Kitoi Creek	Big Kitoi Creek
Egg take				
eggs	190,486,032	27,078,083	1,200,000	1,200,000
adults	364,286	34,877	3,120	3,120
Releases				
location	Big Kitoi Bay	Big Kitoi Bay	Big Kitoi Bay	Big Kitoi Bay
number	150,000,000	22,000,000	1,040,000	1,000,000
size (g)	0.6	2.4	18.0	20.0
lifestage	fed fry	fed fry	smolt	smolt
date	27-May-09	27-May-09	04-Jun-09	04-Jun-10
Projected Returns [a]				
2010	5,640,000	0	157,040	0
2011	0	66,000	0	151,000
2012	0	418,000	0	0
2013	0	66,000	0	0
2014	0	550	0	0
total	5,640,000	550,550	157,040	151,000
Fish Transport Permit				
number	06A-0073	06A-0072	02A-0007	02A-0007
expires	31-Aug-11	31-Aug-11	01-May-12	01-May-12
max. no.	215,000,000	28,000,000	1,300,000	1,300,000
lifestage	G.Eggs	G.Eggs	G. Eggs	G. Eggs
number	06A-0073	06A-0072	02A-0007	02A-0007
expires	31-Aug-11	31-Aug-11	01-May-12	01-May-12
max. no.	182,000,000	22,000,000	1,000,000	1,000,000
lifestage	Fry	Fry	Smolt	Smolt

[a] Projected returns are calculated from Table 2 survival and age assumptions.
G. eggs = green eggs

Table 2.–Salmon survival and age assumptions used to estimate returns for Kitoi Bay Hatchery.

	Stocking			Survival	Age-at-return Proportions (%) [a]										
Species	Year	Life Stage [a]	Size (g)	Stocking-to-adult return	0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	0.5	2.3
Pink	even	F	0.7	3.8%	1.00										
	odd	F	0.7	5.9%											
Chum	all	F	2.8	2.5%		0.12		0.76			0.12			0.00	
Coho	all	FG	0.7	2.0%						1.00					
Coho	all	FPS	7.5	5.0%			1.00								
Coho	all	S	20	15.1%			1.00								
Sockeye	all	FPS	9	7.5%			0.01		0.31	0.01		0.39	0.24		0.05
Sockeye	all	SPS	20	15.0%			0.02		0.55			0.44			

[a] F = fry, FG = fingerling, FPS = fall presmolt, S = smolt, and SPS = spring presmolt.

Table 3.–Kitoi Bay Hatchery coho salmon egg takes in 2008, juvenile releases planned for Jennifer, Ruth, Crescent, and Katmai lakes in 2009, projected adult production, and FTP.

Fish Species	Coho Salmon	Coho Salmon	Coho Salmon	Coho Salmon	Totals
Brood Year	2008	2008	2008	2008	
Broodstock	Big Kitoi Creek	Big Kitoi Creek	Big Kitoi Creek	Big Kitoi Creek	
Egg take					
eggs	275,500	55,100	553,100	36,000	919,700
adults	1,600	300	3,200	200	5,300
Stocking					
location	Jennifer Lake	Ruth Lake	Crescent Lake	Katmai Lake	
number	200,000	30,000	165,000	28,000	423,000
size (g)	0.7	0.7	0.7	7.5	
lifestage	fingerling	fingerling	fingerling	presmolt	
date	07-Jul-09	07-Jul-09	07-Jul-09	05-Oct-09	
Projected Returns [a]					
2010	0	0	0	0	0
2011	4,000	600	3,300	1,400	9,300
2012	0	0	0	0	0
total	4,000	600	3,300	1,400	9,300
Fish Transport Permit					
number	02A-0009	02A-0011	02A-0008	02A-0010	
expires	01-May-12	01-May-12	15-May-12	01-May-12	
max. no.	300,000	60,000	600,000	40,000	
lifestage	G. Eggs	G. Eggs	G. Eggs	G. Eggs	
number	02A-0009	02A-0011	02A-0008	02A-0010	
expires	01-May-12	01-May-12	15-May-12	01-May-12	
max. no.	250,000	50,000	500,000	30,000	
lifestage	Fingerlings	Fingerlings	Fingerlings	Presmolt	

[a] Projected returns are calculated from Table 2 survival and age assumptions.
G. eggs = green eggs

Table 4.–Pillar Creek Hatchery sockeye salmon egg takes and egg transfer to Kitoi Bay Hatchery in 2007 and 2008, juvenile releases planned for Little Kitoi Lake in 2009 and 2010, projected adult production, and FTP.

Fish Species	Sockeye Salmon	Sockeye Salmon	Sockeye Salmon	Totals
Brood Year	2007	2008	2008	
Broodstock	Saltery Lake	Saltery Lake	Saltery Lake	
Egg take				
eggs	605,883	123,055	492,219	1,221,157
adults	360	72	288	720
Stocking				
location	Little Kitoi Lake	Little Kitoi Lake	Little Kitoi Lake	
number	415,000	100,000	400,000	915,000
size (g)	22.0	8.0	23.0	
lifestage	presmolt	presmolt	presmolt	
date	03-Jun-09	01-Oct-09	03-Jun-10	
Projected Returns [a]				
2011	996	0	0	996
2012	33,926	38	960	34,924
2013	27,328	2,385	32,700	62,413
2014	0	4,665	26,340	31,005
2015	0	405	0	405
total	62,250	7,493	60,000	129,743
Fish Transport Permit				
number	97A-0068	97A-0068	97A-0068	
expires	31-Dec-08	31-Dec-08	31-Dec-08	
max. no.	1,200,000	1,200,000	1,200,000	
lifestage	G.Eggs	G.Eggs	G.Eggs	
number	05A-0078	05A-0078	05A-0078	
expires	12-Jun-10	12-Jun-10	12-Jun-10	
max. no.	500,000	500,000	500,000	
lifestage	Presmolt	Presmolt	Presmolt	

[a] Projected returns are calculated from Table 2 survival and age assumptions.

G. eggs = green eggs

Table 5.–Forecasted returns, brood stock requirements, minimum escapements, and potential harvest of salmon returning to systems in 2009 as a result of prior Kitoi Bay Hatchery stockings.

		Forecasted Return			Broodstock	Minimum	Potential
Return Location	Species	Point	Low	High	Required	Escapement [a]	Harvest [b]
Kitoi Bay Hatchery (Big Kitoi Creek)	Pink	10,321,711	8,193,622	13,223,982	350,000	15,000	9,956,711
	Chum	148,000	110,000	185,000	30,000	2,000	116,000
	Coho	154,000	133,000	204,000	6,000	0	148,000
Little Kitoi Lake [c]	Sockeye	69,689	46,460	92,919	6,000	0	63,689
	Coho	1,000			0	500	500
Crescent Lake	Coho	2,860	2,145	3,575	0	0	2,860
Katmai Creek	Coho	680	510	850	0	0	680
Saltery Lake[d]	Sockeye				1,960	6,250	

[a] Minimum escapement for BKC refers to the number of adults remaining in the creek after KBH has completed the egg takes. These fish are allowed to escape into the creek to spawn to perpetuate the run in case of a catastrophic event at the hatchery.

[b] Projected harvest is the run minus broodstock and escapement needs.

[c] An egg take may occur in 2009, if enough adults are counted through the fish pass into the lake. Returns of sockeye salmon (Saltery Lake broodstock) are not targeted for harvest. Eggs may be transferred to Pillar Creek Hatchery for stocking of Spiridon Lake in 2010. Broodstock numbers include 5,000 adults for Pillar Creek Hatchery (Spiridon Lake stocking) and 600 adults for KBH for continued broodstock development at LKL. The assumption is that only 50% of LKL escapement may be available for an egg take.

[d] Saltery Lake egg take will occur, if there are insufficient adults available for a Little Kitoi egg take.

Table 6.–Proposed 2009 Kitoi Bay Hatchery pink, chum, and coho salmon egg takes and juvenile releases for Big Kitoi Bay in 2010 and 2011.

Fish Species	Pink Salmon	Chum Salmon	Coho Salmon	Coho Salmon
Brood Year	2009	2009	2008	2009
Broodstock	Big Kitoi Creek	Big Kitoi Creek	Big Kitoi Creek	Big Kitoi Creek
Egg take				
eggs	185,000,000	28,000,000	1,300,000	1,300,000
adults	350,000	30,000	3,360	3,360
Releases				
location	Big Kitoi Bay	Big Kitoi Bay	Big Kitoi Bay	Big Kitoi Bay
number	150,000,000	22,000,000	1,000,000	1,000,000
size (g)	0.8	2.8	20.0	20.0
lifestage	fed fry	fed fry	smolt	smolt
date	27-May-10	27-May-10	03-Jun-10	03-Jun-11
Projected Returns [a]				
2011	7,320,000	0	151,000	0
2012	0	66,000	0	151,000
2013	0	418,000	0	0
2014	0	66,000	0	0
2015	0	0	0	0
total	7,320,000	550,000	151,000	151,000
Fish Transport Permit				
number	06A-0073	06A-0072	02A-0007	02A-0007
expires	31-Aug-11	31-Aug-11	01-May-12	01-May-12
max. no.	215,000,000	28,000,000	1,300,000	1,300,000
lifestage	G.Eggs	G.Eggs	G. Eggs	G. Eggs
number	06A-0073	06A-0072	02A-0007	02A-0007
expires	31-Aug-11	31-Aug-11	01-May-12	01-May-12
max. no.	182,000,000	22,000,000	1,000,000	1,000,000
lifestage	Fry	Fry	Smolt	Smolt

[a] Projected returns are calculated from Table 2 survival and age assumptions.

G. eggs = green eggs

Table 7.–Proposed 2009 Kitoi Bay Hatchery coho salmon egg takes, juvenile releases planned for Jennifer, Ruth, Crescent, and Katmai lakes in 2010, projected adult production, and FTP.

Fish Species	Coho Salmon	Coho Salmon	Coho Salmon	Coho Salmon	Totals
Brood Year	2009	2009	2009	2009	
Broodstock	Big Kitoi Creek	Big Kitoi Creek	Big Kitoi Creek	Big Kitoi Creek	
Egg take					
eggs	300,000	60,000	600,000	40,000	1,000,000
adults	780	180	1,560	120	2,640
Stocking					
location	Jennifer Lake	Ruth Lake	Crescent Lake	Katmai Lake	
number	200,000	30,000	165,000	28,000	423,000
size (g)	0.7	0.7	0.7	7.5	
lifestage	fingerling	fingerling	fingerling	presmolt	
date	20-Jun-10	20-Jun-10	20-Jun-10	03-Oct-10	
Projected Returns [a]					
2011	0	0	0	0	0
2012	4,000	600	3,300	1,400	9,300
2013	0	0	0	0	0
total	4,000	600	3,300	1,400	9,300
Fish Transport Permit					
number	02A-0009	02A-0011	02A-0008	02A-0010	
expires	01-May-12	01-May-12	15-May-12	01-May-12	
max. no.	300,000	60,000	600,000	40,000	1,000,000
lifestage	G. Eggs	G. Eggs	G. Eggs	G. Eggs	
number	02A-0009	02A-0011	02A-0008	02A-0010	
expires	01-May-12	01-May-12	15-May-12	01-May-12	
max. no.	250,000	50,000	500,000	30,000	830,000
lifestage	Fingerlings	Fingerlings	Fingerlings	Presmolt	

[a] Projected returns are calculated from Table 2 survival and age assumptions.
G. eggs = green eggs

Table 8.–Proposed Pillar Creek Hatchery sockeye salmon egg takes and egg transfer to Kitoi Bay Hatchery in 2008 and 2009, juvenile releases planned for Little Kitoi Lake in 2010 and 2011, projected adult production, and FTP.

Fish Species	Sockeye Salmon	Sockeye Salmon	Sockeye Salmon	Total
Brood Year	2008	2009	2009	
Broodstock	Saltery Lake	Saltery Lake	Saltery Lake	
Egg take				
eggs	529,335	110,000	440,000	1,079,335
adults	360	75	300	735
Stocking				
location	Little Kitoi Lake	Little Kitoi Lake	Little Kitoi Lake	
number	400,000	100,000	400,000	900,000
size (g)	23.0	9.0	23.0	
lifestage	presmolt	presmolt	presmolt	
date	03-Jun-10	11-Oct-10	03-Jun-11	
Projected Returns [a]				
2011	960	0	0	960
2012	32,700	38	960	33,698
2013	26,340	2,385	32,700	61,425
2014	0	4,665	26,340	31,005
2015	0	405	0	405
total	60,000	7,493	60,000	127,493
Fish Transport Permit [b]				
number	97A-0068	97A-0068	97A-0068	
expires	31-Dec-08	31-Dec-08	31-Dec-08	
max. no.	1,200,000	1,200,000	1,200,000	3,600,000
lifestage	G. Eggs	G. Eggs	G. Eggs	
number	05A-0078	05A-0078	05A-0078	
expires	12-Jun-10	12-Jun-10	12-Jun-10	
max. no.	400,000	100,000	400,000	900,000
lifestage	Presmolt	Presmolt	Presmolt	

[a] Projected returns are calculated from Table 2 survival and age assumptions.

[b] FTP 02A-0060 is in the process of being amended to provide for presmolt releases at the planned levels.
G. eggs = green eggs

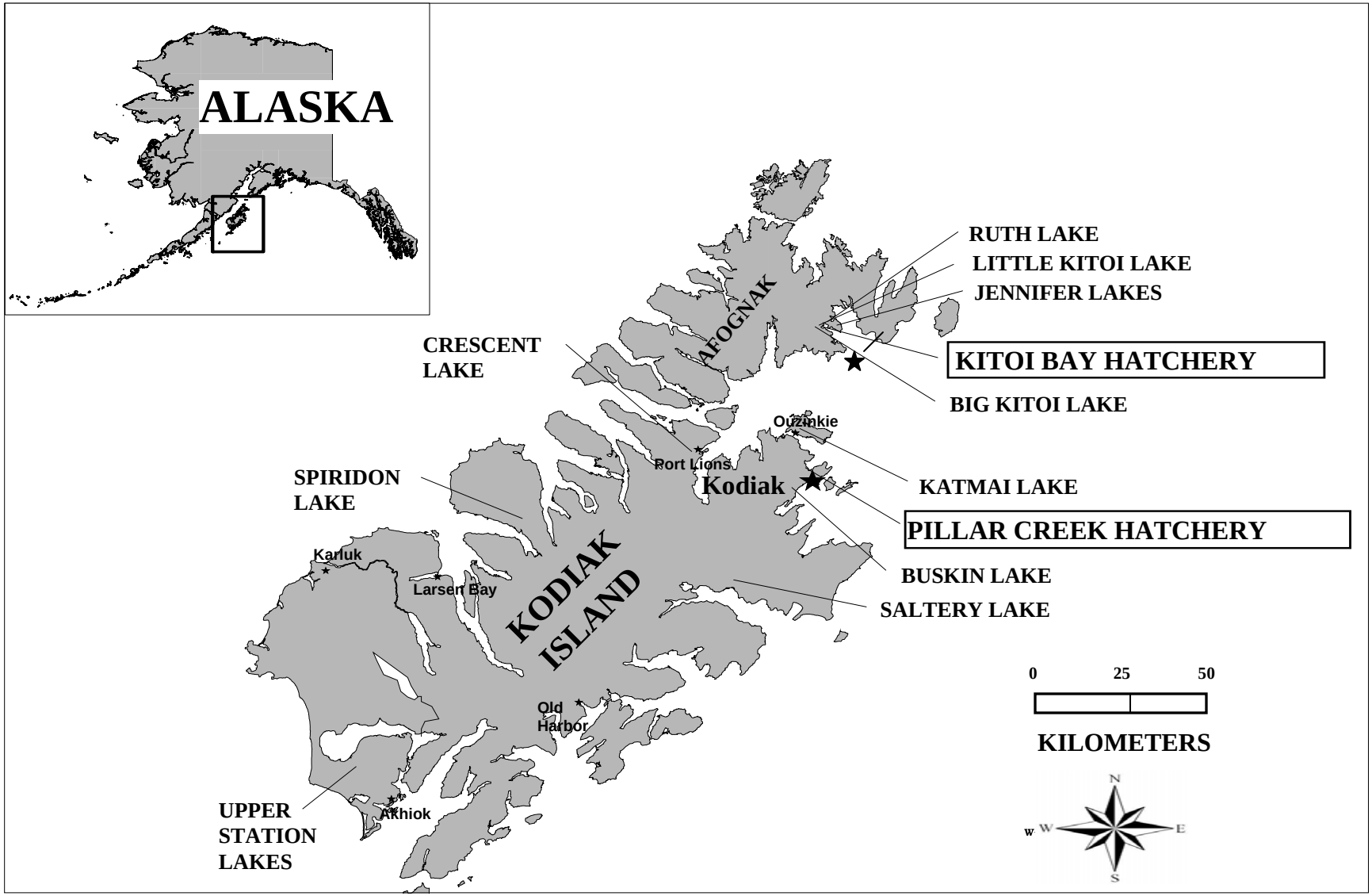

Figure 1.–Locations of salmon stocking and enhancement projects associated with Kitoi Bay Hatchery on Kodiak and Afognak Islands.

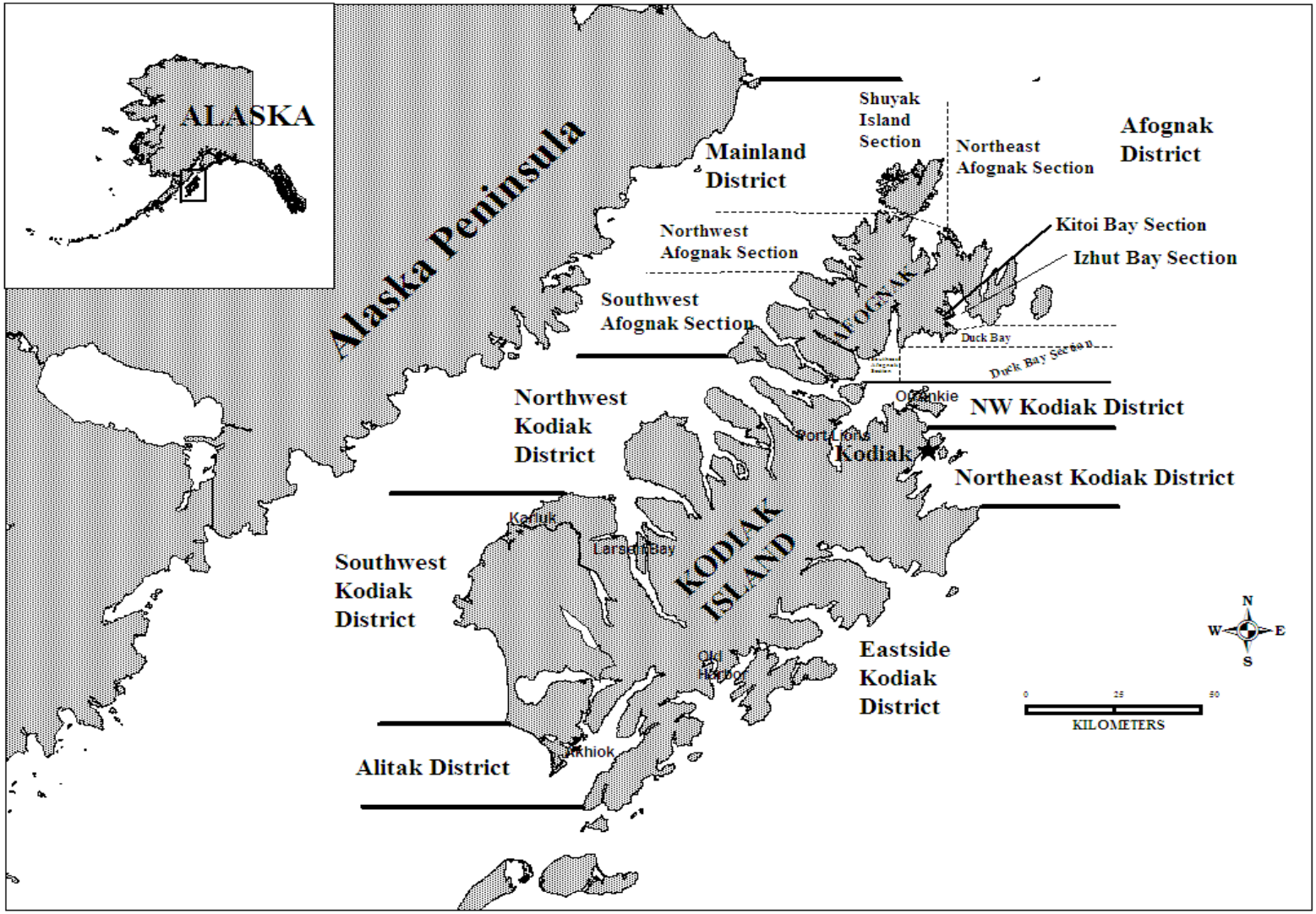

Figure 2.–Map of the Kodiak Management Area depicting commercial fishing districts and selected sections associated with Kitoi Bay Hatchery salmon returns on Afognak Island.

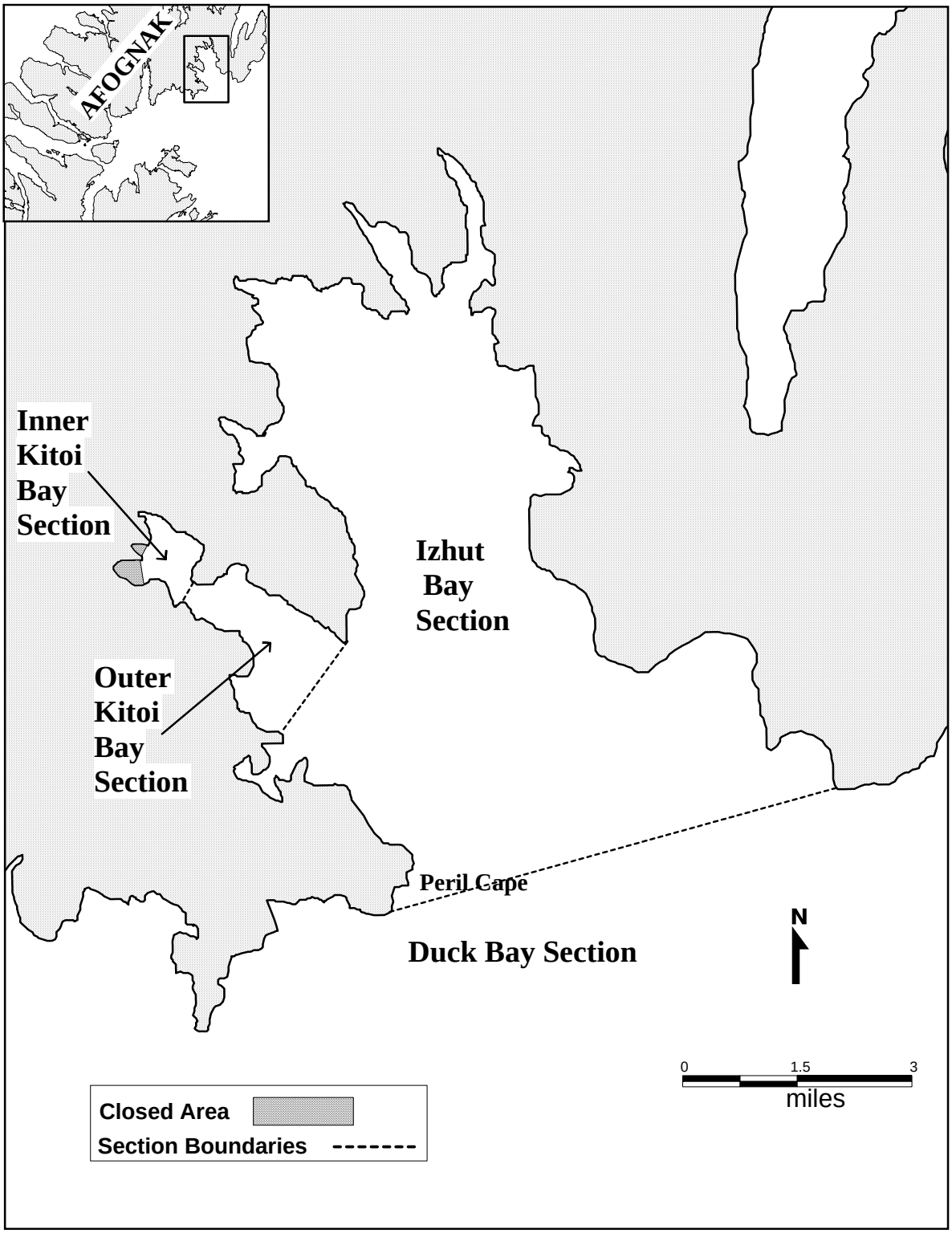

Figure 3.–Map of Izhut (252-30), Duck (252-31), and Inner and Outer Kitoi Bay (252-32) sections.

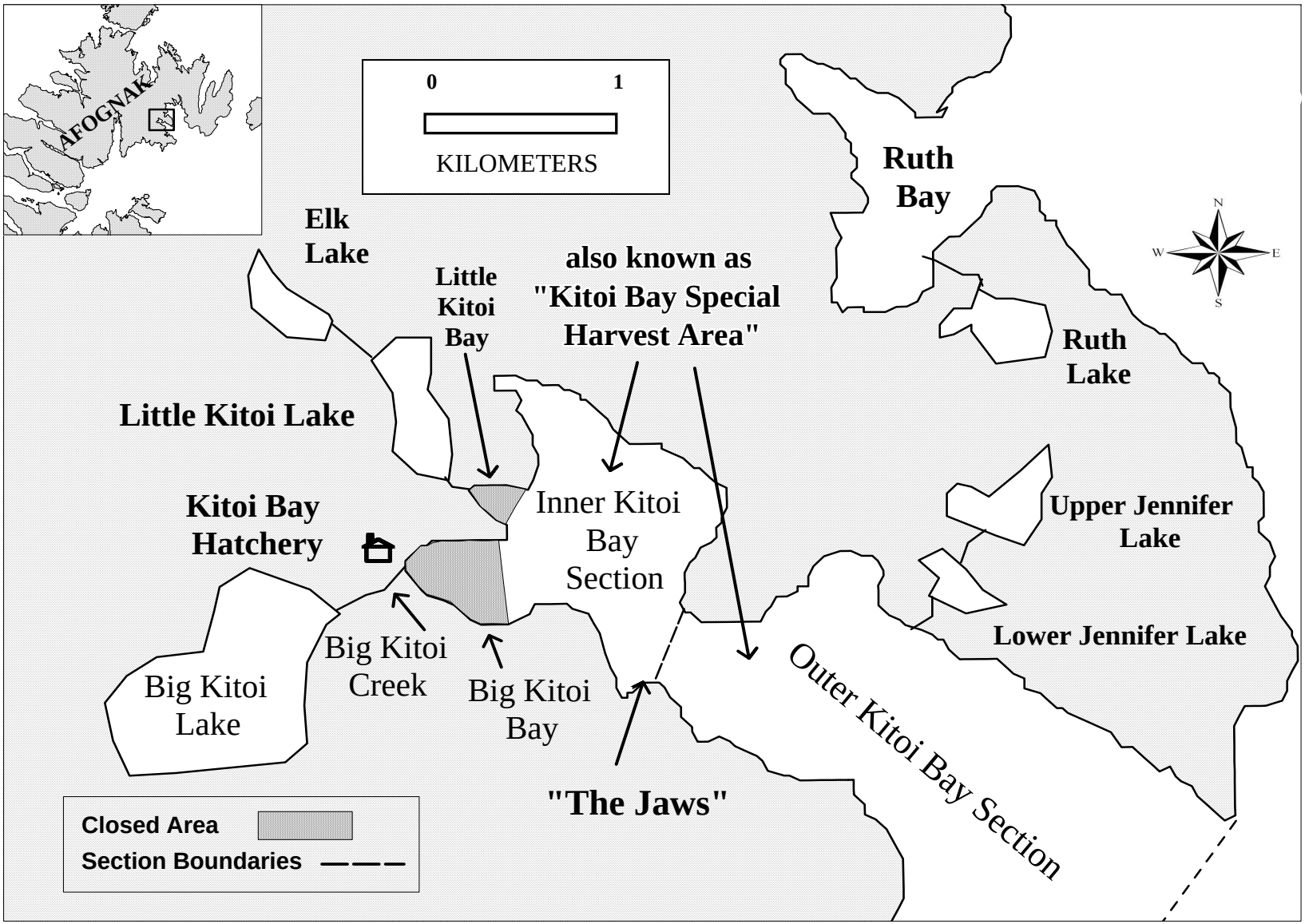

Figure 4.–Map of Inner and Outer Kitoi Bay sections (252-32).

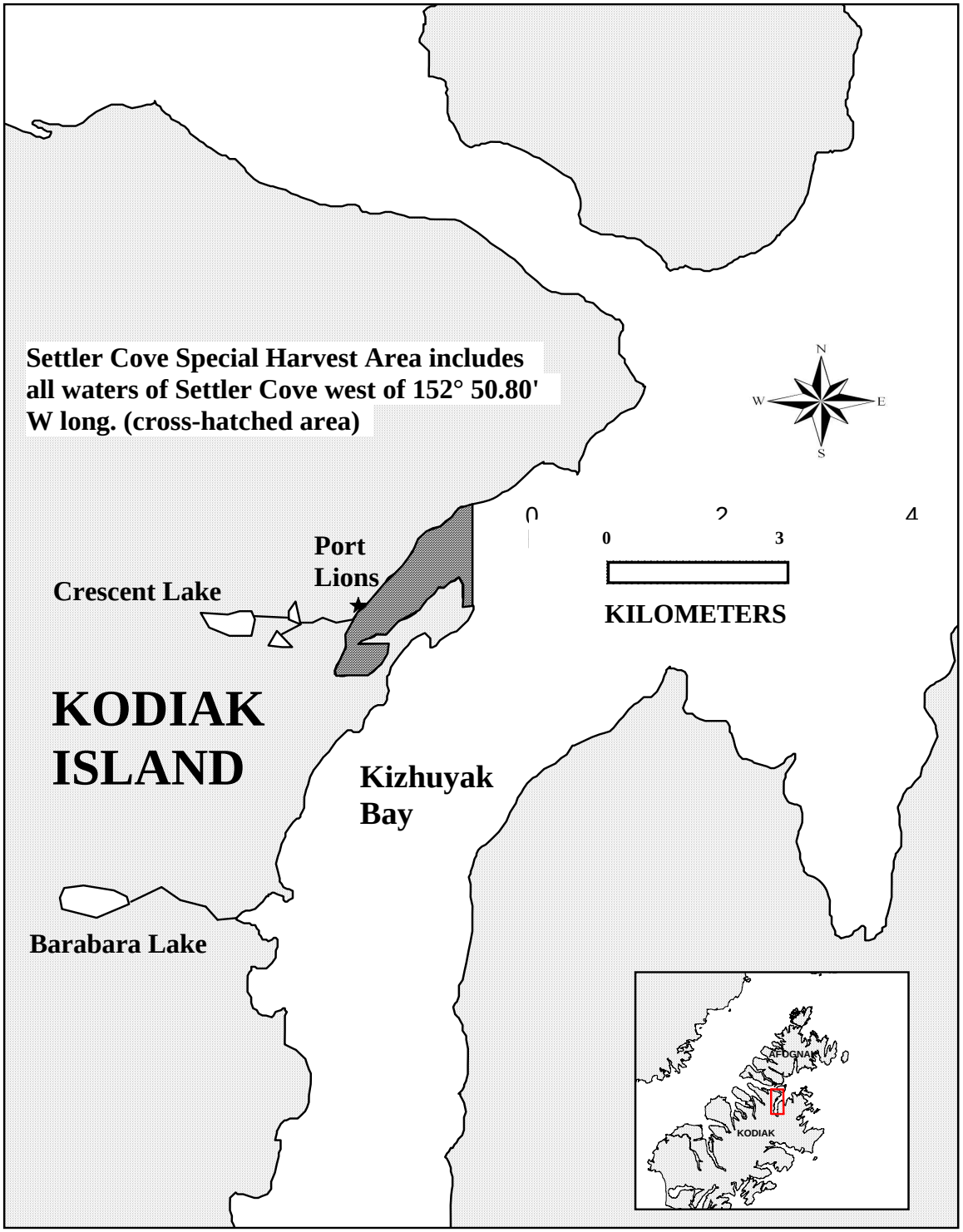

Figure 5.–A map of the Settler Cove (Crescent Lake) special harvest area boundaries in Kizhuyak Bay.

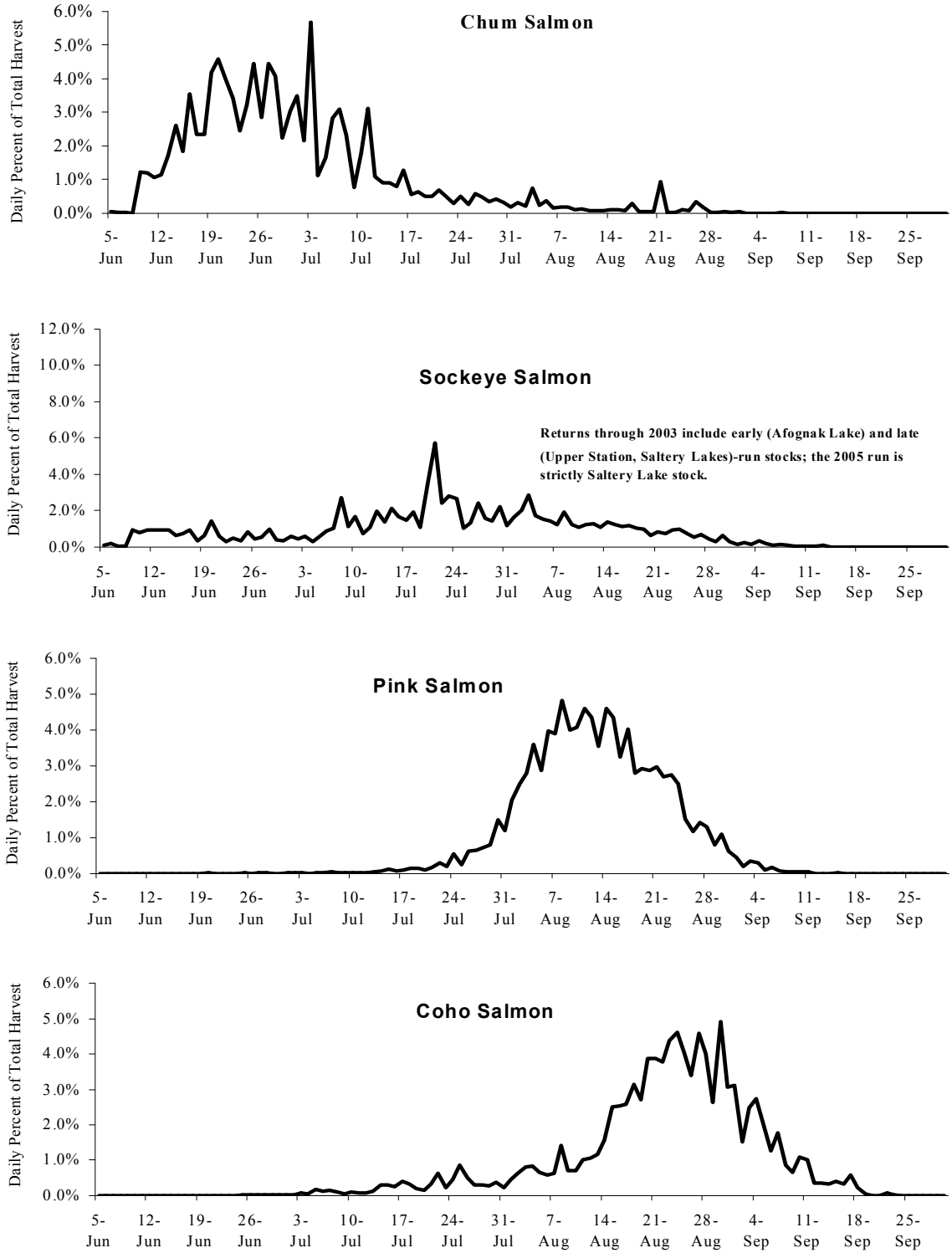

Figure 6.–The average daily (1999-2008) proportion to the total harvest of chum, sockeye, pink, and coho salmon in the Kitoi Bay area (combined harvests in the Izhut, Duck, and Kitoi Bay sections).

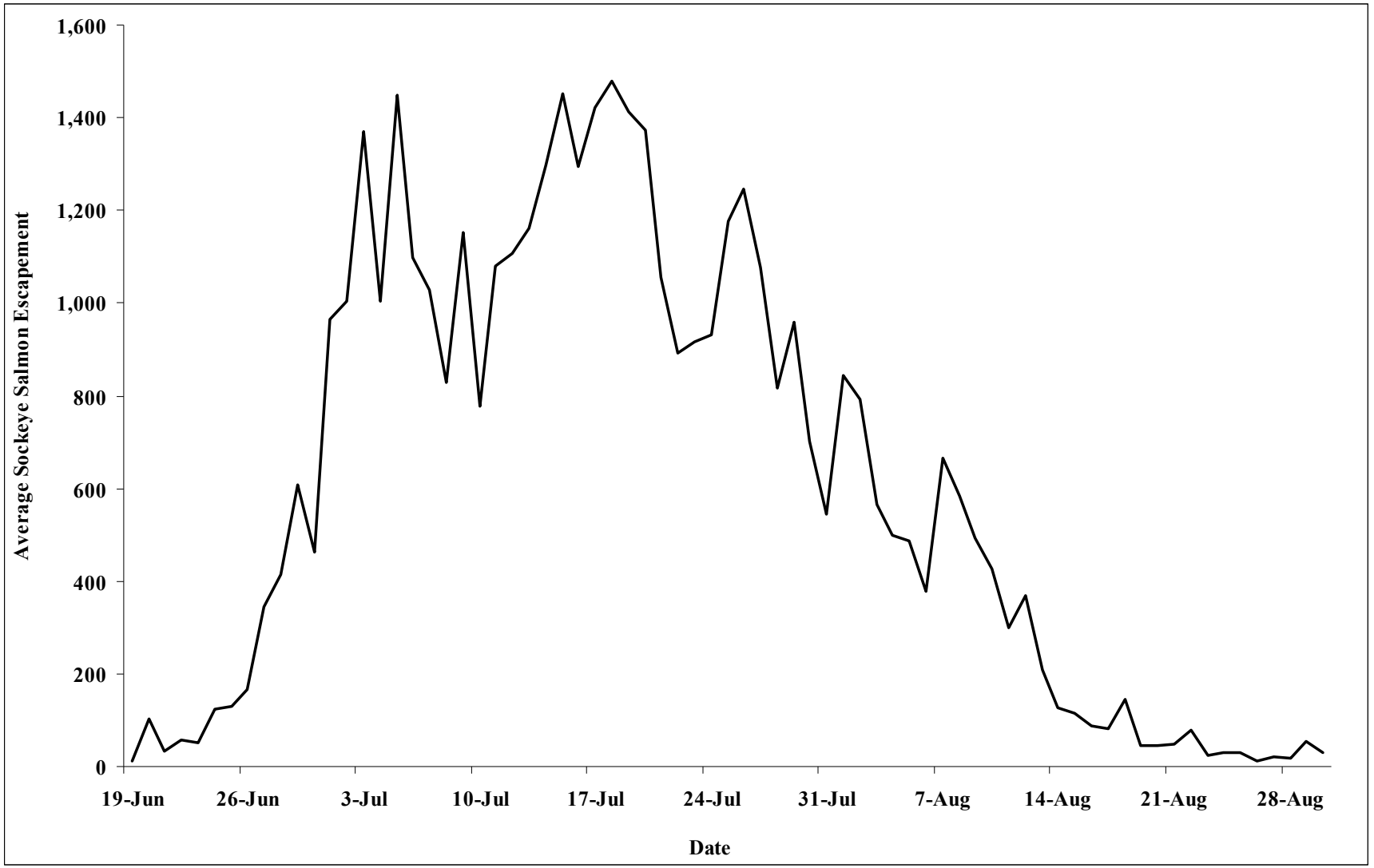

Figure 7.–Saltery Lake sockeye salmon average escapement timing, 1994-2003.

APPENDIX A: SALMON RELEASE HISTORY

Appendix A1.–Kitoi Bay Hatchery pink salmon releases, 1973-2008.

Brood Year	Pink Salmon Releases [a]		
	Year	Number	Average Weight (g)
1972	1973	493,130	nd
1973	1974	447,642	nd
1974	1975	1,226,314	nd
1975	1976	2,486,410	nd
1976	1977	4,722,152	0.50
1977	1978	17,255,424	0.44
1978	1979	17,319,537	nd
1979	1980	22,458,947	0.63
1980	1981	26,351,664	0.93
1981	1982	47,828,701	nd
1982	1983	72,054,096	0.79
1983	1984	87,065,569	0.58
1984	1985	75,109,442	0.29
1985	1986	97,773,052	0.78
1986	1987	90,017,823	0.27
1987	1988	94,172,516	0.73
1988	1989	80,502,220	0.62
1989	1990	84,907,550	0.61
1990	1991	124,148,019	0.60
1991	1992	147,145,130	0.79
1992	1993	169,552,112	0.51
1993	1994	163,192,575	0.45
1994	1995	134,104,406	0.53
1995	1996	144,045,245	0.48
1996	1997	102,583,724	0.50
1997	1998	128,101,460	0.50
1998	1999	127,685,500	0.54
1999	2000	137,702,154	0.61
2000	2001	134,823,670	0.72
2001	2002	152,990,900	0.56
2002	2003	144,823,895	0.86
2003	2004	154,073,358	0.76
2004	2005	136,287,250	0.62
2005	2006	115,661,940	0.83
2006	2007	140,898,860	0.60
2007	2008	144,920,820	0.64

[a] Juveniles are short term reared in net pens and eventually released into Big Kitoi Bay.
nd = no data

Appendix A2.–Kitoi Bay Hatchery chum salmon releases, 1982-2008.

	Chum Salmon Releases[a]		
Brood Year	Year	Number	Average Weight (g)
1981	1982	36,846	0.56
1982	1983	105,058	1.05
1983	1984	630,422	1.16
1984	1985	784,078	0.67
1985	1986	414,233	nd
1986	1987	693,166	2.00
1987	1988	4,737,587	2.10
1988	1989	3,289,878	1.85
1989	1990	1,502,501	2.44
1990	1991	0	nd
1991	1992	22,214,472	1.80
1992	1993	10,101,986	2.02
1993	1994	6,507,497	1.52
1994	1995	9,738,472	1.51
1995	1996	20,139,843	1.27
1996	1997	23,500,000	1.50
1997	1998	12,310,015	1.50
1998	1999	6,859,982	1.02
1999	2000	22,334,640	1.70
2000	2001	20,032,140	1.73
2001	2002	19,593,070	1.55
2002	2003	18,721,700	1.66
2003	2004	21,778,050	2.01
2004	2005	21,578,500	2.02
2005	2006	17,567,016	2.39
2006	2007	21,648,839	1.72
2007	2008	21,690,168	1.94

[a] Juveniles are short term reared in net pens and eventually released into Big Kitoi Bay.

nd = no data

Appendix A3.–Kitoi Bay Hatchery coho salmon releases by location, 1983-2008.

Brood Year	Brood Stock	Coho Salmon Releases				
		Year	Number	Average Weight (g)	Life Stage	Location
1986	Little Kitoi Lake	1987	9,600	5.0	Presmolt	Big Kitoi Creek
1988	Little Kitoi Lake	1990	137,493	23.3	Smolt	Big Kitoi Bay
1990	Little Kitoi Lake	1992	60,755	32.0	Smolt	Big Kitoi Bay
1991	Little Kitoi Lake	1993	613,681	18.9	Smolt	Big Kitoi Bay
1992	Little Kitoi Lake	1993	5,163	14.6	Presmolt	Big Kitoi Creek
1992	Little Kitoi Lake	1994	97,973	28.4	Smolt	Big Kitoi Bay
1993	Big Kitoi Creek	1995	258,926	25.9	Smolt	Big Kitoi Bay
1994	Big Kitoi Creek	1996	894,486	23.5	Smolt	Big Kitoi Bay
1995	Big Kitoi Creek	1997	819,046	19.6	Smolt	Big Kitoi Bay
1996	Big Kitoi Creek	1998	769,000	23.9	Smolt	Big Kitoi Bay
1997	Big Kitoi Creek	1999	1,098,338	19.3	Smolt	Big Kitoi Bay
1998	Big Kitoi Creek	2000	871,448	16.9	Smolt	Big Kitoi Bay
1999	Big Kitoi Creek	2001	936,913	20.8	Smolt	Big Kitoi Bay
2000	Big Kitoi Creek	2002	1,041,342	16.9	Smolt	Big Kitoi Bay
2001	Big Kitoi Creek	2003	1,064,864	16.8	Smolt	Big Kitoi Bay
2002	Big Kitoi Creek	2004	969,483	20.1	Smolt	Big Kitoi Bay
2003	Big Kitoi Creek	2005	1,009,200	18.5	Smolt	Big Kitoi Bay
2004	Big Kitoi Creek	2006	976,059	17.1	Smolt	Big Kitoi Bay
2005	Big Kitoi Creek	2007	1,046,365	17.0	Smolt	Big Kitoi Bay
2006	Big Kitoi Creek	2008	991,498	16.3	Smolt	Big Kitoi Bay
1987	Little Kitoi Lake	1988	241,373	1.1	Fingerling	Crescent Lake
1988	Little Kitoi Lake	1989	202,955	0.8	Fingerling	Crescent Lake
1990	Little Kitoi Lake	1991	191,416	1.1	Fingerling	Crescent Lake
1991	Little Kitoi Lake	1992	69,100	7.0	Presmolt	Crescent Lake
1992	Little Kitoi Lake	1993	68,420	14.6	Presmolt	Crescent Lake
1993	Big Kitoi Creek	1994	163,680	1.0	Fingerling	Crescent Lake
1994	Big Kitoi Creek	1995	167,778	1.2	Fingerling	Crescent Lake
1995	Big Kitoi Creek	1996	163,200	0.4	Fry	Crescent Lake
1996	Big Kitoi Creek	1997	165,000	0.4	Fry	Crescent Lake
1997	Big Kitoi Creek	1998	163,000	0.6	Fry	Crescent Lake
1998	Big Kitoi Creek	1999	165,000	0.6	Fry	Crescent Lake
1999	Big Kitoi Creek	2000	165,837	0.4	Fry	Crescent Lake
2000	Big Kitoi Creek	2001	165,000	0.9	Fry	Crescent Lake
2001	Big Kitoi Creek	2002	164,487	0.7	Fry	Crescent Lake
2002	Big Kitoi Creek	2003	164,395	0.6	Fry	Crescent Lake
2003	Big Kitoi Creek	2004	165,000	0.8	Fry	Crescent Lake
2004	Big Kitoi Creek	2005	140,000	0.8	Fry	Crescent Lake
2005	Big Kitoi Creek	2006	121,410	0.8	Fry	Crescent Lake
2006	Big Kitoi Creek	2007	143,008	1.1	Fry	Crescent Lake
2007	Big Kitoi Creek	2008	165,479	0.7	Fry	Crescent Lake

-continued-

Appendix A3.–Page 2 of 2.

Brood Year	Brood Stock	Coho Salmon Releases				
		Year	Number	Average Weight (g)	Life Stage	Location
1991	Little Kitoi Lake	1992	162,387	4.5	Fingerling	Jennifer Lakes
1992	Little Kitoi Lake	1993	135,486	1.9	Fingerling	Jennifer Lakes
1994	Big Kitoi Creek	1995	165,000	1.5	Fingerling	Jennifer Lakes
1996	Big Kitoi Creek	1997	163,000	0.4	Fry	Jennifer Lakes
1997	Big Kitoi Creek	1998	165,000	0.5	Fry	Jennifer Lakes
1998	Big Kitoi Creek	1999	136,000	0.6	Fry	Jennifer Lakes
1999	Big Kitoi Creek	2000	155,688	0.4	Fry	Jennifer Lakes
2000	Big Kitoi Creek	2001	120,000	0.9	Fry	Jennifer Lakes
2001	Big Kitoi Creek	2002	201,320	0.6	Fry	Jennifer Lakes
2002	Big Kitoi Creek	2003	197,590	0.6	Fry	Jennifer Lakes
2003	Big Kitoi Creek	2004	200,000	0.8	Fry	Jennifer Lakes
2004	Big Kitoi Creek	2005	110,000	1.0	Fry	Jennifer Lakes
2005	Big Kitoi Creek	2006	199,943	0.8	Fry	Jennifer Lakes
2006	Big Kitoi Creek	2007	209,577	1.2	Fry	Jennifer Lakes
2007	Big Kitoi Creek	2008	200,655	0.9	Fry	Jennifer Lakes
1986	Little Kitoi Lake	1987	22,349	0.5	Fingerling	Katmai Creek
1987	Little Kitoi Lake	1988	20,000	0.7	Fingerling	Katmai Creek
1991	Little Kitoi Lake	1992	14,973	8.0	Presmolt	Katmai Lake
1992	Little Kitoi Lake	1993	15,052	14.6	Presmolt	Katmai Lake
1993	Big Kitoi Creek	1994	13,178	23.3	Presmolt	Katmai Lake
1994	Big Kitoi Creek	1995	16,489	5.9	Presmolt	Katmai Lake
1995	Big Kitoi Creek	1996	15,246	5.0	Presmolt	Katmai Lake
1996	Big Kitoi Creek	1997	15,735	7.3	Presmolt	Katmai Lake
1998	Big Kitoi Creek	1999	15,000	8.2	Presmolt	Katmai Lake
1999	Big Kitoi Creek	2000	15,000	7.4	Presmolt	Katmai Lake
2000	Big Kitoi Creek	2001	15,000	8.4	Presmolt	Katmai Lake
2001	Big Kitoi Creek	2002	15,000	6.2	Presmolt	Katmai Lake
2002	Big Kitoi Creek	2003	15,000	7.4	Presmolt	Katmai Lake
2003	Big Kitoi Creek	2004	15,000	7.0	Presmolt	Katmai Lake
2004	Big Kitoi Creek	2005	15,000	6.7	Presmolt	Katmai Lake
2005	Big Kitoi Creek	2006	15,000	6.5	Presmolt	Katmai Lake
2006	Big Kitoi Creek	2007	13,593	7.7	Presmolt	Katmai Lake
2007	Big Kitoi Creek	2008	27,265	7.8	Presmolt	Katmai Lake
1994	Big Kitoi Creek	1995	59,500	1.7	Fingerling	Ruth Lake
1996	Big Kitoi Creek	1997	35,000	0.4	Fry	Ruth Lake
1997	Big Kitoi Creek	1998	35,000	0.5	Fry	Ruth Lake
1998	Big Kitoi Creek	1999	35,000	0.6	Fry	Ruth Lake
1999	Big Kitoi Creek	2000	30,695	0.7	Fry	Ruth Lake
2001	Big Kitoi Creek	2002	30,000	0.7	Fry	Ruth Lake
2002	Big Kitoi Creek	2003	30,000	0.6	Fry	Ruth Lake
2003	Big Kitoi Creek	2004	30,000	0.8	Fry	Ruth Lake
2004	Big Kitoi Creek	2005	30,000	1.0	Fry	Ruth Lake
2005	Big Kitoi Creek	2006	30,886	0.8	Fry	Ruth Lake
2006	Big Kitoi Creek	2007	30,000	1.2	Fry	Ruth Lake
2007	Big Kitoi Creek	2008	30,000	0.9	Fry	Ruth Lake

Appendix A4.–Kitoi Bay Hatchery coho salmon releases by location (non-active), 1983-1995.

		Coho Salmon Releases				
Brood				Average		
Year	Brood Stock	Year	Number	Weight (g)	Life Stage	Location
1982	Buskin	1983	77,348	0.9	Fingerling	Buskin Lake
1983	Buskin	1984	43,288	0.6	Fingerling	Buskin Lake
1984	Buskin	1985	45,645	1.9	Fingerling	Buskin Lake
1985	Buskin	1986	50,024	0.8	Fingerling	Buskin Lake
1994	Big Kitoi Creek	1995	59,030	2.5	Fingerling	Elk Lake
1994	Big Kitoi Creek	1995	28,350	2.4	Fingerling	Finger Lake
1987	Little Kitoi Lake	1988	137,585	1.1	Fingerling	Hidden Lake
1988	Little Kitoi Lake	1989	239,817	0.9	Fingerling	Hidden Lake
1990	Little Kitoi Lake	1991	250,889	1.3	Fingerling	Hidden Lake
1983	Little Kitoi Lake	1984	131,825	1.0	Fingerling	Kodiak Road System
1984	Little Kitoi Lake	1985	109,568	0.9	Fingerling	Kodiak Road System
1984	Little Kitoi Lake	1985	12,731	2.6	Fingerling	Kodiak Road System
1985	Little Kitoi Lake	1986	141,750	1.1	Fingerling	Kodiak Road System
1986	Little Kitoi Lake	1987	103,824	1.0	Fingerling	Kodiak Road System
1987	Little Kitoi Lake	1988	84,600	1.2	Fingerling	Kodiak Road System
1988	Little Kitoi Lake	1989	87,585	0.8	Fingerling	Kodiak Road System
1989	Little Kitoi Lake	1990	36,040	1.8	Fingerling	Kodiak Road System
1990	Little Kitoi Lake	1991	83,530	1.2	Fingerling	Kodiak Road System
1991	Little Kitoi Lake	1992	51,500	1.6	Fingerling	Kodiak Road System
1991	Little Kitoi Lake	1992	15,200	8.0	Presmolt	Kodiak Road System
1992	Little Kitoi Lake	1993	64,000	1.8	Fingerling	Kodiak Road System
1983	Little Kitoi Lake	1984	127,700	1.0	Fingerling	Little Kitoi Lake
1984	Little Kitoi Lake	1985	33,472	1.5	Fingerling	Little Kitoi Lake
1985	Little Kitoi Lake	1986	53,360	6.1	Presmolt	Little Kitoi Lake
1986	Little Kitoi Lake	1987	171,103	1.8	Fingerling	Little Kitoi Lake
1987	Little Kitoi Lake	1988	43,807	1.5	Fingerling	Little Kitoi Lake
1991	Little Kitoi Lake	1992	70,605	1.4	Fingerling	Little Kitoi Lake
1992	Little Kitoi Lake	1993	139,147	1.3	Fingerling	Little Kitoi Lake
1983	Little Kitoi Lake	1984	5,000	2.5	Fingerling	Shemya

Appendix A5.–Kitoi Bay Hatchery sockeye salmon releases by location, 1989-2008.

Brood Year	Brood Stock	Sockeye Salmon Releases				
		Year	Number	Average Weight (g)	Life Stage	Location
1988	Upper Station	1989	143,725	2.5	Zero Check Smolt	Little Kitoi Bay
1989	Upper Station	1990	249,346	0.2	Fry	Spiridon
		1990	241,000	0.5	Fingerling	Little Kitoi Lake
		1990	337,932	0.2	Fry	Little Kitoi Lake
		1990	854,610	3.2	Zero Check Smolt	Little Kitoi Bay
		1990	458,118	0.5	Zero Check Fingerling	Little Kitoi Bay
1990	Upper Station	1991	1,250,000	2.5	Zero Check Smolt	Little Kitoi Bay
1991	Upper Station	1992	1,463,000	1.6	Zero Check Smolt	Little Kitoi Bay
1992	Upper Station	1993	52,418	3.1	Presmolt	Little Kitoi Lake
		1993	180,000	0.5	Fingerling	Jennifer Lakes
		1994	326,500	15.0	Smolt	Little Kitoi Bay
1993	Upper Station	1994	1,672,710	1.1	Zero Check Smolt	Little Kitoi Bay
	Little Kitoi Lake	1994	10,108	4.6	Presmolt	Little Kitoi Lake
		1995	916,677	10.1	Smolt	Little Kitoi Bay
1994	Upper Station	1995	266,952	1.8	Zero Check Smolt	Little Kitoi Lake
	Little Kitoi Lake	1995	84,861	5.0	Presmolt	Little Kitoi Lake
		1996	573,242	12.7	Smolt	Little Kitoi Bay
1995	Little Kitoi Lake	1996	155,687	3.2	Presmolt	Little Kitoi Lake
	Upper Station	1997	587,435	12.1	Smolt	Little Kitoi Bay
1996	Little Kitoi Lake	1997	77,039	3.3	Presmolt	Little Kitoi Lake
	Little Kitoi Lake	1998	99,085	11.7	Presmolt	Little Kitoi Lake
	Little Kitoi Lake	1998	397,000	15.1	Smolt	Little Kitoi Bay
1997	Saltery Lake	1999	106,658	17.7	Smolt	Little Kitoi Lake
1998	Saltery Lake	1999	98,737	7.0	Fingerling	Little Kitoi Lake
		1999	74,463	14.6	Presmolt	Little Kitoi Lake
		1999	23,756	14.4	Presmolt	Little Kitoi Bay[a]
1999	Saltery Lake	2000	154,039	11.3	Presmolt	Little Kitoi Lake
2000	Saltery Lake	2001	282,089	9.5	Presmolt	Little Kitoi Lake
2001	Saltery Lake	2002	212,418	6.6	Presmolt	Little Kitoi Lake
2002	Saltery Lake	2003	102,822	8.8	Presmolt	Little Kitoi Lake
2002	Saltery Lake	2003	193,646	25.7	Presmolt	Little Kitoi Lake[b]
2003	Saltery Lake	2004	20,664	9.4	Presmolt	Little Kitoi Lake
2003	Saltery Lake	2005	279,962	24.2	Presmolt	Little Kitoi Lake[b]
2004	Saltery Lake	2005	20,000	7.9	Presmolt	Little Kitoi Lake
2004	Saltery Lake	2006	379,687	22.8	Presmolt	Little Kitoi Lake[b]
2005	Saltery Lake	2006	206,884	6.1	Presmolt	Little Kitoi Lake
2005	Saltery Lake	2007	402,911	19.6	Presmolt	Little Kitoi Lake[b]
2006	Saltery Lake	2007	133,533	7.7	Presmolt	Little Kitoi Lake
2006	Saltery Lake	2008	414,376	19.9	Presmolt	Little Kitoi Lake[b]
2007	Saltery Lake	2008	116,459	8.0	Presmolt	Little Kitoi Lake

[a] This release resulted from a dissolved oxygen crash in the transfer tank.

[b] LKL net pen releases.

SIGN-OFF for the 2009 Kitoi Bay Hatchery Annual Management Plan

Andrew Aro: Kitoi Bay Hatchery Manager, KRAA — 9-2-09 Date

Steve Schrof: Regional Resource Development Biologist, CFD — 9/2/09 Date

Jeff Wadle: Regional Finfish Management Supervisor, CFD — 9/9/09 Date

Mark Witteveen: Acting Regional Finfish Research Supervisor, CFD — 9/8/09 Date

Steve Honnold: Regional Supervisor, CFD — 9/8/09 Date

Donn Tracy: Area Biologist, SFD — 09/02/09 Date

James Hasbrouck: Regional Supervisor, SFD — 9/16/2009 Date

Kevin Brennan: Executive Director, KRAA — 9-2-09 Date

The 2009 Hatchery Management Plan for PCH is hereby approved:

Denby S. Lloyd: Commissioner, ADF&G, Juneau — 10/15/2009 Date