Regional Operational Plan CF.4K.2015.09

Karluk Sockeye Salmon Smolt Grab Sampling Project Operational Plan, 2015

by

Heather Finkle

April 2015

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)

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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Division of Commercial Fisheries

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The Regional Operational Plan Series was established in 2012 to archive and provide public access to operational plans for fisheries projects of the Divisions of Commercial Fisheries and Sport Fish, as per joint-divisional Operational Planning Policy. Documents in this series are planning documents that may contain raw data, preliminary data analyses and results, and describe operational aspects of fisheries projects that may not actually be implemented. All documents in this series are subject to a technical review process and receive varying degrees of regional, divisional, and biometric approval, but do not generally receive editorial review. Results from the implementation of the operational plan described in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author if you have any questions regarding the information provided in this plan. Regional Operational Plans are available on the Internet at: http://www.adfg.alaska.gov/sf/publications/

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SIGNATURE

Project Title:	Karluk Sockeye Salmon Smolt Grab Sampling Project Operational Plan
Project Leader:	Heather Finkle, Fishery Biologist III
Division, Region and Area:	Division of Commercial Fisheries, Region IV, Kodiak
Project Nomenclature:	
Period Covered:	2015
Field Dates:	May 21–June 30
Plan Type:	Category I

Approval

Title	Name	Signature	Date
Project Leader	Heather Finkle		4/10/15
Research Coordinator	Kevin Schaberg		4/14/15

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PURPOSE

Low adult returns of sockeye salmon *Oncorhynchus nerka* to the Karluk River from 2008 to 2011 caused management biologists to close sport and commercial fisheries in order to achieve escapement goals. To address this, in 2010 the Alaska Department of Fish and Game (ADF&G) and Kodiak Regional Aquaculture Association (KRAA) implemented a pilot sockeye salmon smolt grab sampling project at the Karluk Lake outlet to assess relationships between low adult returns and smolt age, size, and condition. Between 2012 and 2014, the Alaska State Legislature, in response to public concern over the poor Karluk sockeye salmon returns, allocated funding for ADF&G to conduct a comprehensive smolt outmigration enumeration project at the Karluk Lake outlet. In 2015, land use and budget constraints forced the project to be scaled back to grab sampling and moved to the Karluk weir site. Sockeye salmon smolt will be caught by dip or fyke net and sampled for age, size, and condition. Tissue samples will be collected for genetic analysis, and whole fish will be collected for stable isotope analysis. This operational plan outlines the Karluk sockeye salmon smolt genetic identification project and the specific methods and procedures the field crew will use in 2015.

Key words: Sockeye salmon, smolt, *Oncorhynchus nerka*, Karluk River, mark-recapture, genetics.

BACKGROUND

Karluk Lake is located on the southwest side of Kodiak Island (Figure 1), and supports the largest sockeye salmon *Oncorhynchus nerka* run in the Kodiak Management Area (Foster 2011). Some of the earliest recorded commercial harvests of sockeye salmon are from Karluk Lake, dating from the late 1800s (Bean 1891). In the early 1900s, Karluk Lake sockeye salmon harvests and escapements were lightly regulated and overfishing was suspected to have occurred (Rounsefell 1958). A weir was established on the river in 1912 to enumerate escapement, and the White Act was implemented in 1924 to reserve 50% of the run for escapement. Despite these efforts, Karluk Lake sockeye salmon suffered a long-term decline in adult returns and did not significantly increase until the late 1970s (Barnaby 1944; Schmidt et al. 1997; Schmidt et al. 1998).

From 1985 through 2007, Karluk sockeye salmon runs were consistently strong, averaging roughly 1.3 million sockeye salmon annually. Established early-run upper escapement goals were exceeded 16 of those 22 years, and late-run upper escapement goals were exceeded 8 of the 22 years. Sockeye salmon stocks in Karluk Lake experienced diminished adult returns from 2008 through 2011, which necessitated annual restrictions on the sport and commercial salmon fisheries in order to conserve escapement.

From 2009 to 2011 a series of memorandums were written by ADF&G staff in Kodiak discussing the reasons for the low runs of sockeye salmon to Karluk Lake that began in 2008 and persisted through 2011. Trends in escapement, run size, rearing habitat quality, climate, and fish size, age, and growth for Karluk Lake sockeye salmon suggested that the increased age, small size, and poor condition of outmigrating smolt in 2005, and especially in 2006, likely played a role in determining marine survival and subsequent run strength (Foster 2014).

Extended freshwater residence for juvenile sockeye salmon often signifies decreased overall lake productivity and subsequent poor adult returns (Foerster 1968). Sockeye salmon smolt studies have been conducted sporadically on Karluk Lake since 1925. From 1999 to 2003, a smolt

project was funded by KRAA and implemented by ADF&G. The smolt project was continued from 2004 to 2006 as part of the Gulf of Alaska Ecosystem Monitoring (GEM) program. The GEM project was a collaborative effort between the University of Alaska and ADF&G to study the role of marine derived nutrients in the Karluk watershed. Smolt age, size, and stable isotope data were collected. Outmigrating sockeye salmon smolt in 2006 were the smallest in the dataset stretching back to 1925. The average size of outmigrating sockeye salmon smolt was positively correlated with the magnitude of total returns from an outmigration. In 2006, the majority of smolt were also freshwater age-3 as opposed to freshwater age-2 (Kyle et al. 1988; Rounsefell 1958). The resultant ocean-age-2 sockeye salmon returning in 2008 marked the beginning of the reduced adult runs to Karluk. While it has been found that lake residence time of Karluk sockeye salmon juveniles is longer than most systems (Koenings and Burkett 1987), in 2009 the freshwater-age-3 component of the adult escapement was an unprecedented 90% (as determined from scale samples collected from adult fish; Foster 2010).

In 2010, ADF&G and KRAA grab sampled outmigrating sockeye salmon smolt at the outlet of Karluk Lake to estimate size, condition, and isotopic signature (Figure 1). Following the 2010 pilot project, ADF&G and KRAA successfully submitted a proposal to the Alaska Sustainable Salmon Fund (AKSSF). The Karluk grab sampling project was funded for three years beginning in 2011 to collect smolt age and size information from mid-May to mid-June at the outlet of Karluk Lake. In 2012, the department was allocated funding from the Alaska State Legislature to reinstitute a comprehensive smolt enumeration project, which had not been conducted since 2006. The enumeration project complimented the AKSSF sampling project, collecting isotope samples, smolt biometric data and estimated total population outmigration. Data from this project revealed that despite healthy smolt condition and age composition in 2012 and 2013, population estimates of outmigrating smolt were the smallest on record. In 2014, ADF&G was awarded additional AKSSF funding to extend the sampling season and collect two additional years of tissue samples for genetic stock identification.

At the conclusion of the 2014 smolt season, all project materials were relocated to the Karluk weir site because of the loss of the conservation easement along the shores of Karluk Lake and River and resultant exorbitant costs to operate the project. To allow for future comparisons between weir and lake outlet samples, AWL and genetic samples were collected concurrently from Karluk weir and the lake outlet in 2014. This baseline provides data comparable to previous collections of smolt sampled at Karluk Lake. A better understanding of the smolt age, size, condition, and isotopic signature may prove valuable in understanding overall Karluk Lake salmon production.

The 2015 season will be the final year of the Karluk sockeye smolt project because of exhausted funding and budget cuts. As part of the ongoing effort to monitor the health of Karluk Lake sockeye salmon stocks, smolt project personnel will travel to the Karluk River management weir, located downstream near the outlet of the Karluk River, to opportunistically trap smolt for AWL data. The project leader will work with staff throughout the season to assess the feasibility of capturing smolt with dip or fyke nets near the weir site, and compare biological data collected at this downstream site to data collected at the traditional smolt enumeration project site.

OBJECTIVES

To achieve the project goals, project personnel will:

1. Describe emigration timing and growth characteristics (length, weight, and condition factor), by age class for Karluk Lake sockeye salmon smolt from May 21 to June 30. The estimated mean weight of the major age class per strata will be within 5% and the mean length within 2% of the true value with 95% confidence (Thompson 1992);
2. Collect genetic tissue samples from sockeye salmon smolt paired to AWL data for each sampled smolt;
3. Collect whole fish in each of three size classes in each of three temporal periods throughout the season for isotopic composition analysis; and
4. Continue to build a smolt database to describe stock-specific biological measures relative to rearing habitat.

METHODS

SMOLT CAPTURE

Sampling efforts in 2014 showed that outmigrating sockeye salmon smolt could be easily collected directly from the Karluk weir using a dip net. Alternatively, a fyke net may also be used to capture outmigrating sockeye salmon smolt from the Karluk River.

Because fish are enumerated hourly passing through the weir, the field staff will be able to also observe the presence and movement of sockeye salmon smolt in the vicinity of the weir. Dip netting for smolt should occur throughout the day to provide a random sample.

The fyke net may be fished concurrently with dip net sampling. The exact location where the fyke net is fished will be determined inseason as river conditions dictate the best sites for smolt capture. The weekly frequency and duration of fishing events may vary based on sampling conditions.

The net will be set with the wings extending at 45-degree angles upstream from the net (Figure 2). A diagram of the net and the surrounding area will be drawn in a field notebook to correspond with a recorded GPS location. The net will be monitored at least every two hours; if large catches or excessive debris accumulate, the net will be monitored more frequently to avoid fish mortality or trap displacement. Smolt behavior should be monitored as they approach and enter the mouth of the net to qualitatively assess possible avoidance.

The fyke net will

- Be kept free of debris to minimize smolt mortality.
- Require frequent monitoring and maintenance to ensure that it is working properly.
- May be fished following the sampling rules lined out in this operational plan from ~May 21 until ~June 30. Attention to changes in migration patterns should be monitored and recorded as it may be necessary to fish the fyke net more frequently than outlined in this Operational Plan to assess multiple site locations or ensure catches meet the weekly sampling goals.

- Be modified or pulled from the water if conditions become dangerous or loss of equipment may occur. If this action is necessary, the project biologist should be notified and the event documented in the field notebook.
- Be removed from the water if the net becomes dislodged or unable to capture fish while deployed; the fyke net should be reset as soon as circumstances allow.

SMOLT CATCH AND SPECIES ENUMERATION

Handling of smolt should be done very carefully as smolt are sensitive to stress, and mortality can easily occur. To collect the smolt caught in the fyke net, use a small dip net to transfer the contents of the net's cod end into a 5-gallon bucket filled with river water. The fish in the 5-gallon buckets should be identified and counted by species. A tally denominator will be used to enumerate the catch to ensure accurate counts. Sockeye salmon should be moved from the bucket to the covered live box for sampling. Other species caught in the net should be released downstream of the trap. Weather and river condition data should be recorded following each time catch is reported.

All data should be entered on the CATCH SAMPLING AND AWL REPORTING FORM (Figure 3) daily. Appendix A provides color pictures and taxonomic keys for species identification. Contact the project biologist if any questions regarding identification occur.

SMOLT AGE, WEIGHT, AND LENGTH SAMPLING (AWL)

A sample of 40 sockeye salmon smolt will be collected for five consecutive days per statistical week (200 fish per week). At the end of each smolt day, 40 smolt will be randomly netted from the smolt held in the live boxes and sampled. All remaining smolt will be counted and released and the data recorded on the CATCH SAMPLING AND AWL REPORTING FORM (Figure 3). If less than 40 smolt are caught in a sampling day, all fish will be retained and the sample size for that day will be the number of fish caught.

All smolt sampling data will reflect the day in which the fish were captured, and samples will not be mixed between days. It is important that smolt be handled as little as possible, and sampled as quickly as possible.

The standard procedures for collecting and recording salmon AWL data are defined in Wattum (*In Prep*). During the 2015 season, the data recording will be accomplished using a rugged digital assistant data logger (RDA). The field crew will be provided new equipment and sampling protocols as updates become available.

All scales will be collected from the preferred area of each fish (Wattum *In Prep*) following the methods described by International North Pacific Fish Commission (1963). Scales will be mounted on microscope slides (Wattum *In Prep*). Age determination will be made by project biologists in the office by examining scales for annual growth increments using a microfiche reader fitted with a 48X lens following designation criteria established by Mosher (1968).

The most common method of age determination in Pacific salmon is the analysis of the concentric rings (circuli) on the scale and is the method to be used by this study. Fast summer growth results in wide spacing between circuli, whereas slow winter growth results in closer spaced circuli; age is determined by enumerating the number of winters observed on the scale

(Gilbert 1913). This method of age determination is ideal because the scale can be collected, processed, and aged quite rapidly.

Smolt will be sampled after capture. Smolt will be measured to the nearest mm from the tip of the snout to the tail fork (Wattum *In Prep*). Excess water will be removed from the smolt before weighing by using a paper towel as a blotter, and individual smolt weights measured to the nearest 0.1 g. A scalpel will be used to remove 5–10 scales from the preferred area of the fish (Wattum *In Prep*). The scales will be mounted on a glass microscope slide as shown in Wattum (*In Prep*). Scales from a maximum of five fish will be mounted on each slide. The left portion of each slide will be labeled with slide number, sample location, species, date, and inclusive fish numbers that correspond to information entered in to the RDA (Wattum *In Prep*). After sampling, the fish will be moved to an aerated recovery bucket and held until all smolt are swimming normally. Both the recovery and pre-sampling holding buckets will be covered to minimize stress on the fish. Smolt will be released downstream of the trap or fyke net after all fish are swimming normally in the recovery bucket.

Common mistakes to avoid include:

1. Poorly mounted scales – Too many scales in a smear, slime or debris present when mounting. The rows of scales should not be too close together to avoid confusing scales from two different smolt.
2. Improper numbering in the RDA – Take care to ensure numbers on the slides match the data and numbers put into the RDA. Look at the review screen on the RDA if it is believed a mistake has been made.
3. Scales removed from one fish contaminating the scale smear of the previous fish – Wipe the scalpel blade and dissecting probe off between each fish sampled.

COLLECTION OF SMOLT SAMPLES FOR GENETIC ANALYSIS

Tissue samples will be collected from each individual smolt sampled for AWL. The large average size of Karluk Lake sockeye salmon smolt means that most tissue samples can be collected without lethally sampling the smolt. After each smolt has been sampled for length and weight, a tissue sample should be collected before scales are removed, as outlined in Appendix B. Particular care should be taken to ensure that each tissue sample ID is correctly paired with its specific AWL information, and recorded in the AWL notebook as well as into the RDA. Be sure to periodically check the vial label to ensure the vials are in the proper order. Protocols for sampling smolt for tissue samples are found in Appendix B.

During periods of high smolt outmigration, it may be necessary to collect more fish than the usual 40 fish/night. The total number collected should be agreed upon with the project biologist, and will be proportional to the outmigration strength. Each smolt sampled for genetic analysis must also have a scale, weight, and length recorded for it.

COLLECTION OF SMOLT SAMPLES FOR STABLE ISOTOPE ANALYSIS

Whole fish samples of sockeye salmon smolt will be collected for stable isotope analysis. Samples will be taken from early, midseason, and late in the smolt migration. Fish will be collected based on both timing and estimated age-class. For the purpose of this study, fish caught in the trap prior to May 25 will be considered early migrating fish. Fish caught between May 26 and June 15 will be considered middle migration, and fish caught June 16 or after will be

considered late migration. Twenty large (~>135 mm; estimated freshwater-age-3), 20 medium (~134mm-120mm; estimated freshwater-age-2), and if present, 20 small (~<120mm; estimated freshwater-age-1) smolt will be collected from each temporal group. Whole smolt samples will be kept as cold as possible and stored individually in zip-lock bags labeled with the date, fish number (to correspond to AWL data) and either "small", "medium", or "large". If freshwater-age-1 (small) fish are present throughout the season, there would be a total of 180 fish collected for stable isotope analysis. If possible, samples should be frozen after processing. If freezing the samples is not possible, it is best to collect samples when it is known that a chartered plane will be arriving in the near future, as the whole fish samples need to be frozen as soon as possible.

PHYSICAL DATA REPORTING

Air and water temperature, cloud cover, wind direction and velocity, and relative stream height will be measured once daily (NOON) throughout the season. Stream velocity will be collected at noon each day from the primary trap. This information will be recorded on the DAILY PHYSICAL OBSERVATION FORM (Figure 4).

OTHER REQUIREMENTS

Field crew for the Karluk sockeye salmon smolt genetic identification project will adhere to camp policies for the Karluk weir. Specific camp policies for firearms, bears, garbage, first aid, drinking water, boats, ATVs, and equipment maintenance can be found in Fuerst (2015).

SAFETY

Prior to field deployment each crewmember will be certified in CPR and First Aid, and have read the following sections of the ADF&G SOP guidelines.

- Safety Policy Standards
- Field Camp Safety
- Aircraft Passenger Safety
- Small Tool Handling
- Firearm and Bear Safety

The ADF&G safety policies will be reviewed by each field crewmember at the beginning of the season and followed throughout the field season.

The Karluk Lake sockeye salmon smolt study is in bear country, and trash produced from this camp will be handled in a responsible manner. All inorganic materials will be doubled-bagged with trash bags and shipped to town via the next available chartered plane.

A handheld VHF radio will be kept at the weatherport, and communication between the cabin and weatherport will be maintained to ensure safety when crew members are working alone. Bear spray and a firearm will be provided to crew, and crew will be familiar with appropriate bear safety behavior.

EMERGENCIES

In the event of a medical emergency, administer first aid to stabilize the situation. If an injury is life threatening immediately notify the US Coast Guard at **800-478-5555** on the satellite

telephone and call the project biologist (Heather Finkle) at 907-486-1848 (work) or 907-398-4932 (cell). The US Coast Guard can also be reached on SSB radio frequency 4.125 MHz or on VHF channel 16.

When contacting the US Coast Guard, have the following information ready to pass along:

- Location of your field camp or specific location of the emergency (**57°33.58 N lat and 154°23.75 W long**),
- Name and phone number of supervisor,
- General nature of medical emergency,
- Number of patients,
- Specific information regarding the patient (name, age, primary complaint, and vital signs),
- Your assessment and treatment,
- Wind and weather conditions, and
- Other information pertinent to a possible medical evacuation.

RESUPPLY AND CAMP POLICIES

Resupply items (e.g., groceries, fuel, mail, etc.) will be sent via chartered float plane and coordinated with management staff. All air charter flights will be set up by office staff. Appropriate information in regard to flight logistics and times will be relayed via satellite phone communications. When planning for the resupply flights it will be important to prepare back-haul items and maximize the use of the chartered aircraft. Items to send back to town should include empty fuel containers, mail, trash, biological data, and whole fish samples.

The use of alcoholic beverages while on duty will be grounds for dismissal. The use of illegal drugs at any time will be grounds for dismissal. For more information on possession and use of alcohol, refer to SOP II-071 and SOP III-700

Weir sites often receive many visitors that come by the camp to see bears and watch fish passing through the weir. Keep the camp clean and be courteous and helpful to visitors, but also inform them of the boundaries. All ADF&G employees are required to act in a professional manner at all times and be especially courteous to the public.

Injuries and loss or damage of state equipment must be reported to the Karluk weir field crew leader and project supervisor within 24 hours.

REPORTING

The crew leader will compile a daily log of activities and events, including personnel issues or problems with the project. This log will be submitted to the project biologist at the end of the field season, and should be a detailed account of daily activities undertaken by themselves as well as the crew. Additionally, daily activities and any unusual events will be recorded by the crew and/or crew leader in the crew notes logbook. The crew leader will contact the project biologist daily at 1330 hours by telephone (486-1848) unless otherwise needed or predetermined. The crew on shift will verify the number of smolt sampled, water level, and water temperature has been recorded every morning accurately by 1200 noon. The crew leader is also responsible for completing a comprehensive data and equipment inventory at the end of the season.

It is desirable for the field crews to photograph all aspects of the fieldwork. Photographs will be taken with a digital camera and downloaded on to the research field computer for editing and storage.

TIMELINESS OF JOB COMPLETION

All crew members should strive to complete their tasks thoroughly and in a timely manner while on shift. Smolt work sometimes demands erratic schedules, and all staff should be cognizant to use their time efficiently. Often while on shift there will be periods of low fish passage and free time; staff should be sure to first utilize this time to complete all necessary job related tasks and chores such as data entry, prep for the next day's sampling, prep for upcoming dye tests, check batteries, clean the weatherport, maintenance of tools, inventory etc... before personal activities.

Unexpected weather events or other unforeseen pitfalls may require working hours beyond regularly scheduled shifts. High fish passage may require more frequent or longer duration checks. In these instances, all crew should work together to achieve project goals in a timely manner. Each crew member is responsible for overseeing accurate recording of hours worked, and ensuring work duties, including overtime hours, adhere to project standards.

TIMESHEETS

The crew is responsible for scheduling daily tasks. Tasks will be scheduled to minimize overtime, which is limited to a maximum of 30 hours/month (7.5 hours/week) per person, unless otherwise pre-authorized. The crew leader will document, as part of the daily log, all tasks that are performed and the actual hours worked to complete those tasks.

Timesheets will be completed and mailed to Kodiak before the 15th and the last day of each month as possible with resupply flight timing. If timesheets must be sent in early, amended timesheets can be sent to the Kodiak office if the hours actually worked differ from the hours submitted on the original timesheet. Explicit directions for completing timesheets are located in Appendices C1 and C2.

RESPECT FOR HISTORIC SITES IN KARLUK AREA

The Alutiiq people of Kodiak have lived in the Karluk Area for thousands of years, and as a result, there are many archeologically important sites in the area of the smolt project. Housepits, fish weirs, and artifacts including human remains have been recorded in the direct vicinity of the smolt project. Utmost care should be taken to ensure minimal disturbance to archeological sites, and respect should be maintained for the historical, cultural, and archeological importance of the area. In the event that artifacts are discovered while working at the smolt enumeration project, they will be left undisturbed at the site where found, and reported to the project biologist, who will contact the appropriate archeological personnel. Further information on the history of the Alutiiq people can be provided to project personnel who express an interest in learning more about the area. Additionally, land use around the Karluk smolt project is subject to permitting and crew should be respectful of land use convenants and hunting restrictions in the area.

SCHEDULE AND DELIVERABLES

TASKS

1. Erect weatherport and open field camp. Target dates May 21–May 28.
2. Capture emigrating sockeye salmon smolt. Target dates May 21–June 30.
3. Enumerate catch by species May 21–June 30.
4. Collect physical data daily: (air and water temperature, water level and velocity, wind direction and velocity, precipitation and cloud cover).
5. Conduct weekly random sampling of 200 sockeye salmon smolt for age, weight, and length.
6. Collect tissue samples from each AWL-sampled sockeye salmon smolt for genetic analysis.
7. Collect a maximum of 180 whole fish samples during the season for stable isotope analysis; 20 in each size class (small, medium, large) in early, middle, and late seasons.

DELIVERABLES

1. Daily catch numbers, as well as the biological characteristics of sampled smolt (average weight and length) will be reported to the Project Biologist daily.
2. Daily catch numbers will be recorded, tallied, and summarized daily.
3. Physical data (air and water temperature, wind and water velocity, precipitation and cloud cover) will be recorded onto the Physical Data recording form daily at noon.

RESPONSIBILITIES

Project Biologists: *Heather Finkle* – Lead Project Biologist ADF&G Karluk Sockeye Salmon Smolt Genetic Identification project– Westward Region Finfish Research Biologist

Dr. Bruce Finney – Professor of Science, Idaho State University – Lead for stable isotope analysis

Field Staff: ADF&G Fish and Wildlife Tech II

Ms. Finkle will oversee the project operations and coordinate tasks such that both the AKSSF project and ADF&G project goals are achieved. She will provide logistical and technical assistance, and write annual and final reports for the project. Bruce Finney will conduct all stable isotope analyses. The FWT-II field crew will coordinate day to day work schedules, as well as maintain responsibility for the timeliness and accuracy of all data collected. The FWT-II is responsible for the accuracy of genetic sample collection and data recording, including RDA and spreadsheet maintenance. All field crew will implement the ADF&G safety guidelines, and ensure daily operations are conducted in order to achieve overarching project goals.

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FIGURES

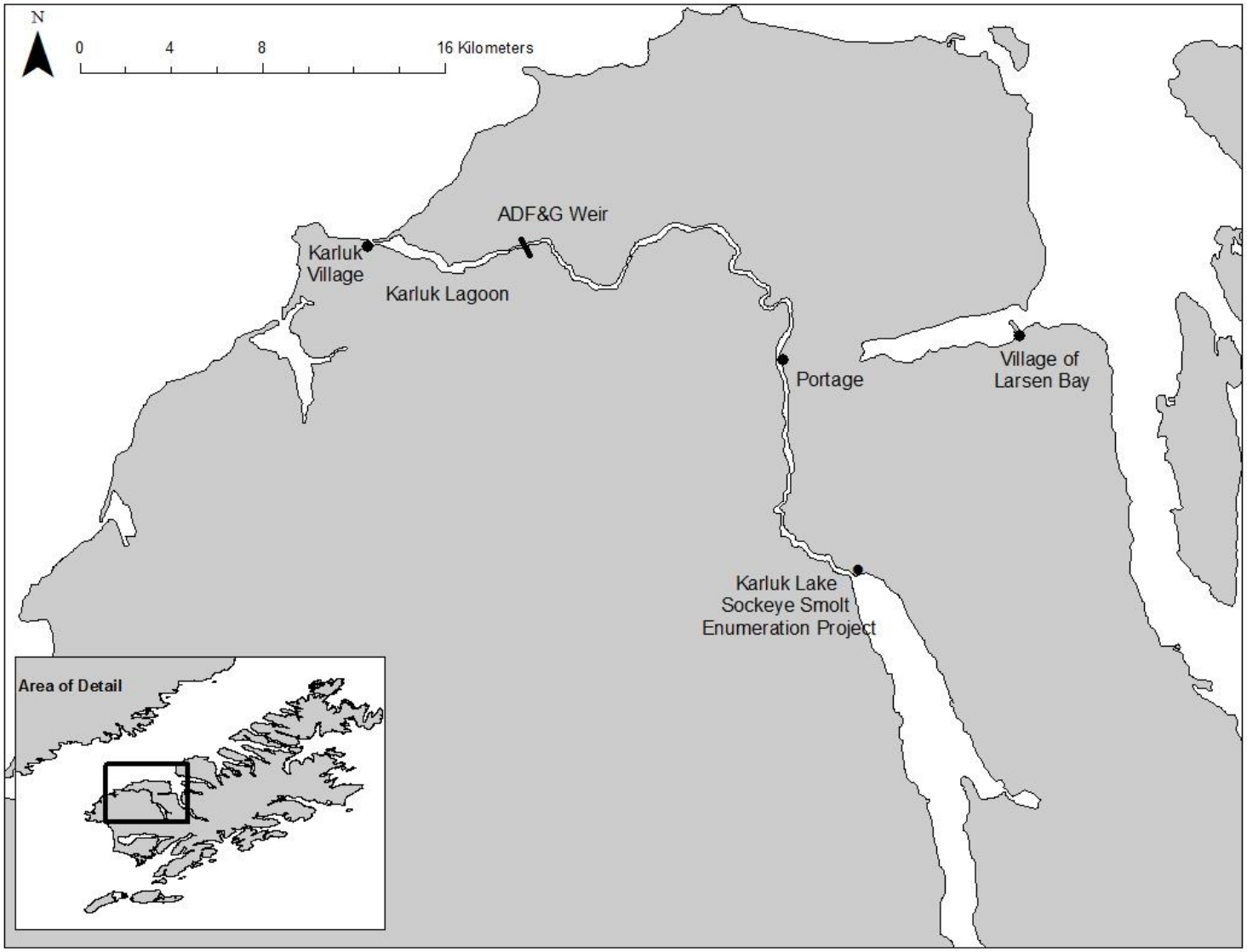

Figure 1.–Location of Karluk Lake outlet, Karluk River weir, the village of Karluk, and nearby village of Larsen Bay.

Figure 2.–Example of a fyke net properly deployed and fishing.

Catch Sampling and AWL Reporting

Project: Karluk Smolt 2015 Page: _____of _____

Date: _____

Time: _____

Water temp: _____

Samplers: _____

Location: _____

Samples used for (check yes or no)

Genetics: Yes ☐ No ☐

Isotopes Yes ☐ No ☐

Gear type: Fyke net ☐

Dip net ☐

Fish No.	Sockeye		
	AWL no.	Length (mm)	Weight (g)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Fish No.	Sockeye		
	AWL no.	Length (mm)	Weight (g)
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			

Total sockeye catch		Incidental catch count			
Smolt (>45 mm)	_____	Dolly	_____	Sculpin	_____
Fry (< 45 mm)	_____	Coho	_____	Rainbow	_____
		Stickleback	_____	Isopod	_____
		Chinook		Other	

Comments:

Figure 3.–Catch sampling and AWL reporting form.

KARLUK SMOLT 2015 Page _____ of

		TEMPERATURE		CLOUD COVER		WIND		Stream		
Date	Time	Air (°C)	Water (°C)	Cloud cover %	Visibility (miles)	Direction	Velocity (mph)	Depth (in)	Velocity	Comments

Figure 4.–Daily physical observation form.

APPENDIX A. JUVENILE SALMON IDENTIFICATION

Key to Field Identification of Anadromous Juvenile Salmonids in the Pacific Northwest

By

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ABSTRACT

A key is presented with descriptive illustrations to help in field identification of live, juvenile salmonids in fresh waters of the Pacific Northwest. Other juvenile fish that may be mistakenly identified as salmonids are included.

INTRODUCTION

Species identification of live, anadromous juvenile salmonids is frequently a problem to the field biologist. The purpose of this key is to list and illustrate the external characteristics which will expedite field identification of juvenile salmonids in the Pacific Northwest.

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish [1] that may be mistaken for salmon or trout in fresh water are described in this key.

USE OF KEY

The characteristics for identification are listed in a series of alternative statements, some of which are illustrated. To use the key, examine the first statement; if applicable, proceed to the next and continue to successive statements until the species is identified. If a statement is not applicable, pass to the alternative characteristics indicated by numbers in parentheses (numbers on the drawings correspond to numbers of statements in the key). Continue in this manner until the specimen is identified. Some external characteristics are positive separating features (marked with asterisk), whereas others are not. Therefore, two or more statements should be considered before final rejection. If a precise identification cannot be made using the external characteristics —and the fish can be sacrificed, a positive identification can usually be made from internal features (marked with double asterisks). A bibliography of keys that utilize more descriptive internal characteristics is included in this paper.

[1] Especially adult smelt, family Osmeridae.

KEY

1. (47) Adipose fin and scales present. (Fig. 1)
2. (48) Fleshy appendage at base of pelvic fins present.
3. (49) Mouth large, reaching at least to center of eye.

Family Salmonidae

-continued-

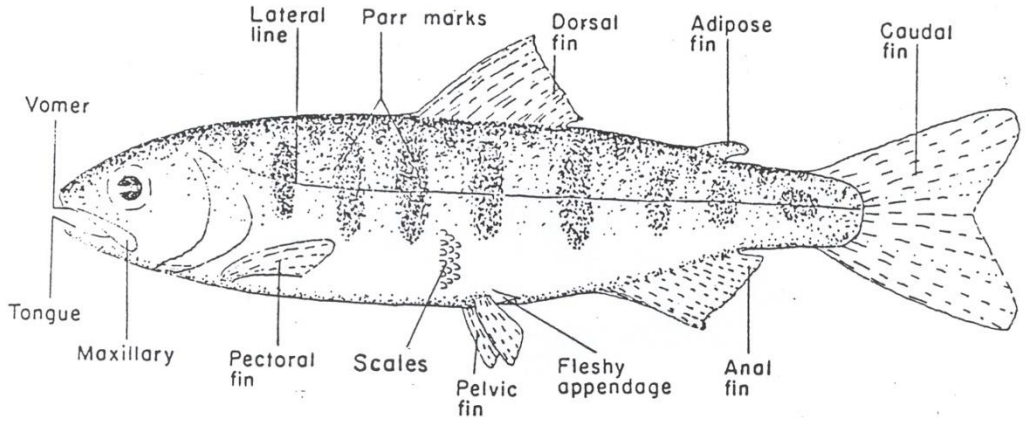


Figure 1.—A hypothetical salmonid showing external characteristics.

4. (17) Anal fin higher than long, with 8 to 12 developed rays (Fig. 2A)
5. (52) *Teeth on head and shaft of vomer. (Fig. 3A)

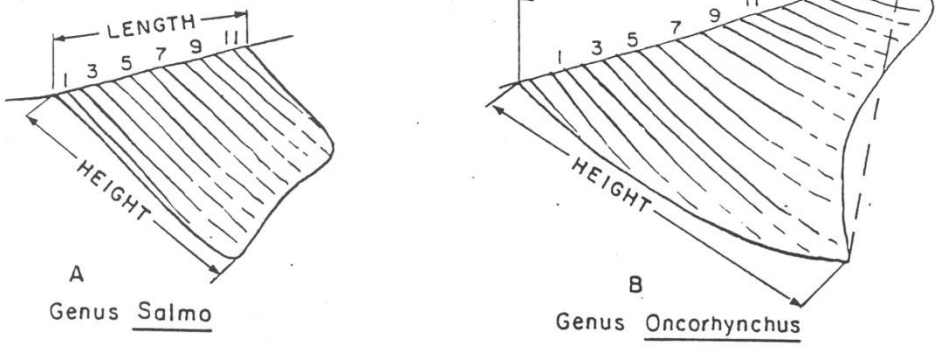


Figure 2.—Anal fins: (A) Trout, genus *Salmo;* (B) Pacific salmon, genus *Oncorhynchus.* The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior lobe. In counting fin rays, include only those which originate from the base and terminate at the outer margin of the fin or are half as long as [or greater than] the longest ray.)

-continued-

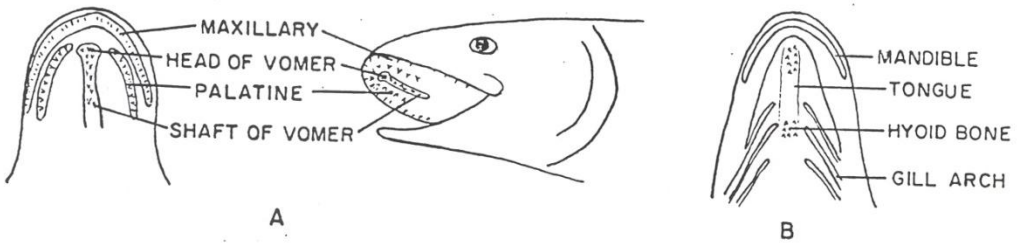
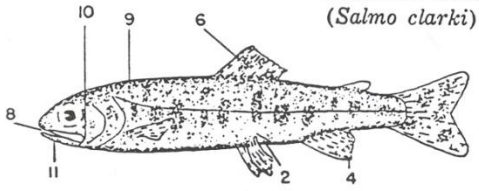


Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches of the lower jaw and are difficult to find.)

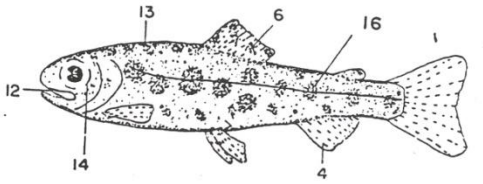
6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

7. (53) Adipose fin not orange; no row of pale round spots along lateral line.
8. (12) *Small hyoid teeth at base of tongue. (Fig. 3B)
9. (13) Not more than five parr marks on mid-dorsal ahead of dorsal fin.
10. (14) Maxillary reaching past posterior margin of eye.
11. (15) Red or yellowish hyoid mark under lower jaw. Tail usually black spotted.
Cutthroat trout
(*Salmo clarki*)



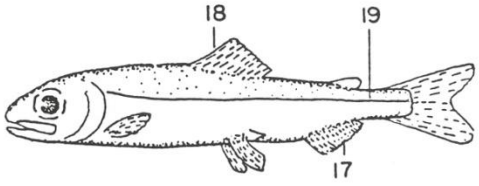
12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

16. (20) Parr marks almost round.
Rainbow or steelhead trout
(*Salmo gairdneri*)



17. (4) Anal fin longer than high, with 13 or more developed rays. (Fig. 2B)
18. (6) Dorsal fin without large dark spots, may be black tipped.
Pacific salmon
Genus *Oncorhynchus*

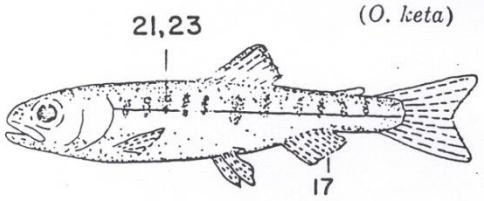
19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.
Pink salmon
(*O. gorbuscha*)



-continued-

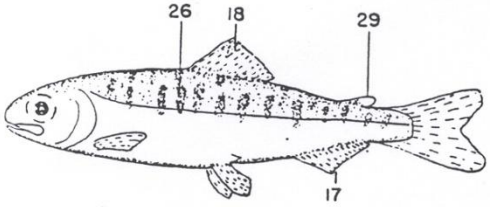
20. (16) Parr marks present as vertical bars or oval spots.
21. (30) Parr marks short, extending little, if any, below lateral line.
22. (25) Gill rakers on first arch, 19 to 26. ** Pyloric caeca, 140 to 186.
23. (26) Parr marks faint. Sides below lateral line iridescent green.
24. (27) Small when migrating from fresh water, approximately 1.5 inches (40 mm) long.

Chum salmon
(*O. keta*)



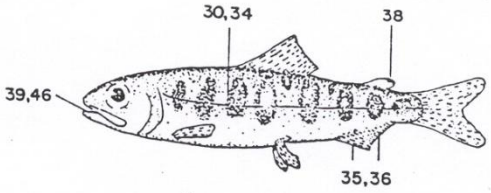
25. (22) Gill rakers on first arch, 30 to 40. **Pyloric caeca 60 to 115.
26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
28. (31) Gill rakers long and slender, more than 29 on first arch.
29. (32) Adipose fin clear, not pigmented.

Sockeye salmon
(*O. nerka*)



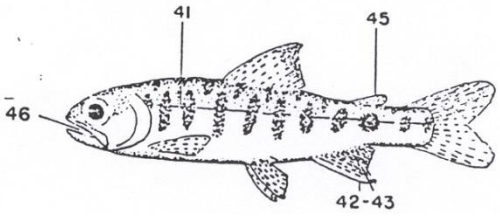
30. (21) Parr marks large, vertical bars centered by lateral line.
31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
32. (29) Adipose fin at least partially pigmented.
33. (40) **Plyloric caeca more than 90.
34. (41) Parr marks broader than interspaces.
35. (42) Anterior rays of anal fin not distinctly longer than rest, not white edged.
36. (43) Anal fin not pigmented.
37. (44) Black spots, when present, on both lobes of caudal fin.
38. (45) Adipose fin not completely mottled, clear area at anterior base of fin.
39. (46) Black gums along base of lower teeth.

Chinook salmon
(*O. tshawytscha*)



40. (33) **Plyloric caeca less than 80.
41. (34) Parr marks narrower than interspaces.
42. (35) Anterior rays of anal fin elongated; when depressed they extend to base of last ray. (Fig. 2B)
43. (36) Anal fin pigmented between rays, resulting in black banding.
44. (37) Black spots, when present, on upper lobe of caudal.
45. (38) Adipose fin completely pigmented.
46. (36) Mouth gray to white.

Coho salmon
(*O. kisutch*)



-continued-

47. (1) Adipose fin not present; scales present or lacking.

Not Salmonidae

48. (2) No fleshy appendage at base of pelvic fins.

Smelts
Family Osmeridae

49. (3) Mouth small, not reaching center of eye; teeth weak or absent.

50. (51) Depressed dorsal fin, shorter than head.

Whitefishes
Genus *Coregonus*

51. (50) Depressed dorsal fin, longer than head.

Arctic grayling
(*Thymallus arcticus*)

52. (5) **Teeth on head of vomer only.

Chars
Genus *Salvelinus*
Dolly Varden (*S. malma*)

53. (7) Adipose fin orange; row of distinct pale round spots along lateral line.

Brown trout
(*Salmo trutta*)

ACKNOWLEDGMENTS

We especially thank Dr. Arthur D. Welander, Professor of Fisheries, and Dr. Bruce S. Miller, Research Biologist, College of Fisheries, University of Washington, Seattle, for their valuable suggestions. We also thank Galen H. Maxfield, Fishery Biologist, and Dr. Alan J. Beardsley, Fishery Biologist, both from the NMFS Northwest Fisheries Center, Seattle.

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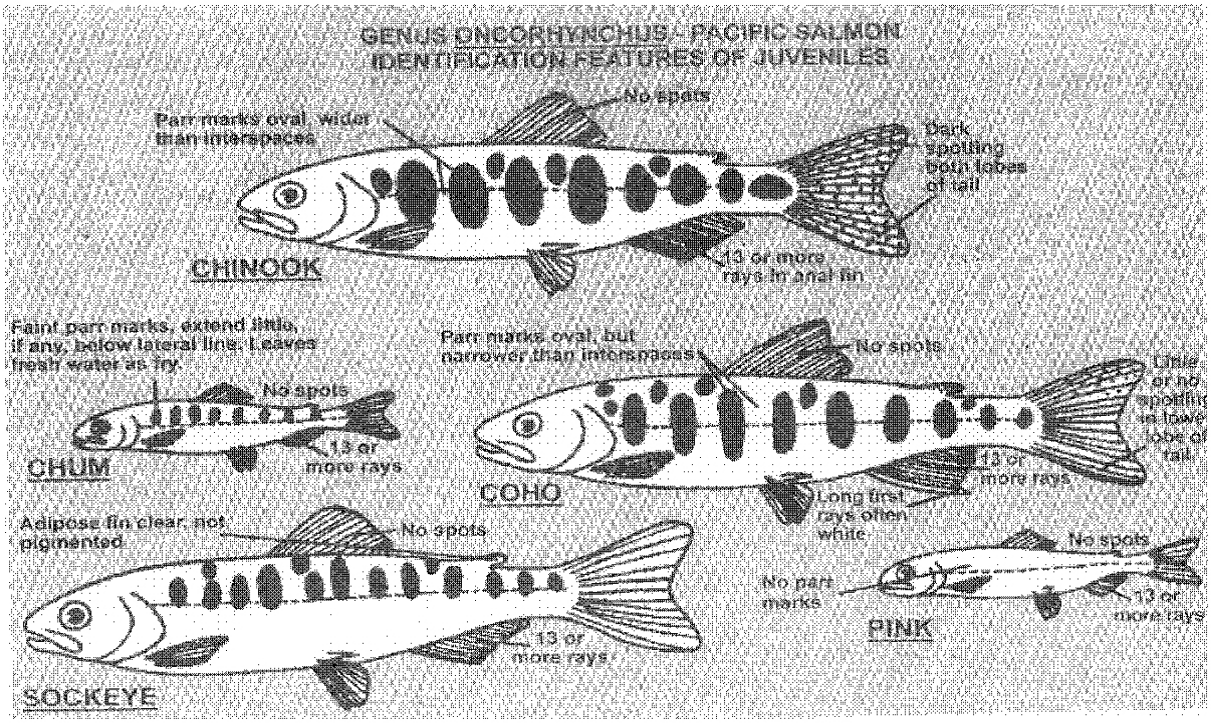
Appendix A2.–Photos of fishes common in the Karluk watershed.



CHINOOK FINGERLING

Length 4 – 8 cm.; dorsal fin with dark leading edge and white tip; parr marks are prominent, and are above and below lateral line and are about equal with light portions; anal and pelvic fins have white or light leading edges; adipose fin with dark edge. Smolts are bright silver with faint parr marks.

COHO FINGERLING

Length 3 – 4 cm; dorsal and anal fin have conspicuous white leading edge followed by dark stripe; parr marks above and below lateral line, but with rounded dark areas above lateral line; reddish tail.

COHO SMOLT

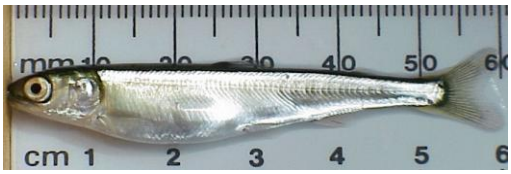
Length 8 – 13 cm; dorsal surface brown or green; parr marks small, faint, or absent when bright silver; vertical surface silver; tail and dorsal fin have black tips with few spots.

CHUM FINGERLING

Length 3.5 – 4 cm; slender body with faint parr marks above lateral line; dorsal surface dark green; ventral surface and sides silver.

PINK FINGERLING

Length 3 – 6 cm; slender body with no parr marks; dorsal surface dark green; ventral surface and sides silver.



SOCKEYE AND KOKANEE FINGERLING

Length 2 – 3 cm; light green back; parr marks fait, short, oval and mainly above lateral line.

SOCKEYE SMOLT

Length 8 – 13 cm; dorsal surface brown or green; parr marks small, faint or absent when bright silver, ventral surface silver.

-continued-

Juvenile Sockeye Salmon

Juvenile Coho Salmon

-continued-

Stickleback

Dolly Varden

-continued-

Coast range sculpin.

APPENDIX B. NON-LETHAL SMOLT FINFISH TISSUE SAMPLING FOR DNA ANALYSIS

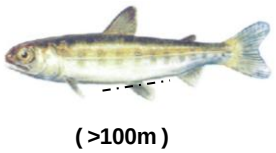
ADF&G GENE CONSERVATION LAB, ANCHORAGE

GENERAL INFORMATION

We use a portion of the fin tissue sample from individual fish to determine the genetic characteristics and profile of a particular run or stock of fish. The most important thing to remember in collecting samples is that **only quality tissue samples give quality results**. If sampling from carcasses: tissues need to be as "fresh" and as cold as possible and recently moribund, do not sample from fungal fins.

Preservative used: Isopropanol/Methanol/Ethanol (EtOH) preserves tissues for later DNA extraction. Avoid extended contact with skin.

SAMPLING METHOD



(>100m)

(65-100mm)

smolt stage

III. Supplies included in sampling kit:

1. Scissors - for cutting a portion of selected fin.
2. Cryovials - 2.0ml pre-labeled plastic vials.
3. Caps – cap for each vial.
4. Bullet box- box for holding cryovials while sampling.
5. EtOH – ethanol in Nalgene bottle(s).
6. Squirt bottle – to fill and/or "top off" each cryovial with EtOH
7. Laminated "return address" labels.
8. Hazmat – hazmat paperwork for ethanol transport.
9. Sampling instructions.

- Wipe excess water and/or slime off the selected fin prior to sampling to avoid getting either water or fish slime into the 2.0ml vial (see diagram on reverse side).
- Prior to sampling, fill the tubes half way with EtOH. Fill only the tubes that you will use for each sampling period. The squirt bottle is for day use only since it will leak overnight when unattended.
- Cut selected fin tissue from one size category along dotted line (shown in diagram to left and reverse side) using scissors to collect tissue sample from selected fin size.
- Place one clipped fin tissue into a 2.0ml vial pre-filled with EtOH. Ethanol/tissue ratio should be **slightly less than 3:1** to thoroughly soak the tissue in the buffer. Not a problem with juvenile samples.
- Top up vials with EtOH and screw cap on securely. Invert vial twice to mix EtOH and tissue. Periodically, wipe or rinse the scissors with water so not to cross contaminate samples with any tissue from the previous fish sampled.
- **Only one fin clip per fish into each vial/location.**
- Data to record: Record **each vial number to paired data** information (i.e. location, lat./long., sample date(s), etc.). Electronic version preferred.
- **Tissue samples must remain in 2ml EtOH**, these small EtOH quantities require HAZMAT paperwork for transport. Store vials containing tissues at room temperature but away from heat. In the field: keep samples out of direct sun, rain and store capped vials in a dry, cool location. Freezing not required.

APPENDIX C. TIMESHEET INSTRUCTIONS

Appendix C1.–Instructions for filling out a timesheet.

All ADF&G employees must fill out a timesheet biweekly (every two weeks) and these timesheets must be turned in to the Administrative staff in Kodiak in a timely manner. Please follow these instructions when filling out your timesheets to avoid payroll problems. When a flight comes out to drop off groceries, or for any other reason, near the end of a pay period, camp personnel need to send in their timesheets. Fill in the timesheet up to the day you send them in and attempt to project your remaining hours worked.

Fill out each of the following on the top of the timesheet:

Pay period: pay periods start on the 1st or 16th of each month and end on the 15th or end of the month (example: June 1-15 or June 16-30).

SSN: your social security number

Name: full name

Division: Commercial Fish

In the actual timesheet table fill in the following items:

Day: Monday, Tuesday, etc.

Date: 6/16, 6/17, etc.

Hours worked box: start and stop time in military time.

Code 1: fill in the number of hours worked for that day (see example in Appendix G2).

Work hours and Code 1 Totals should both equal the sum of daily hours worked. If your timesheet is sent in before the end of the pay period, project your time for the remaining days so you can total your columns.

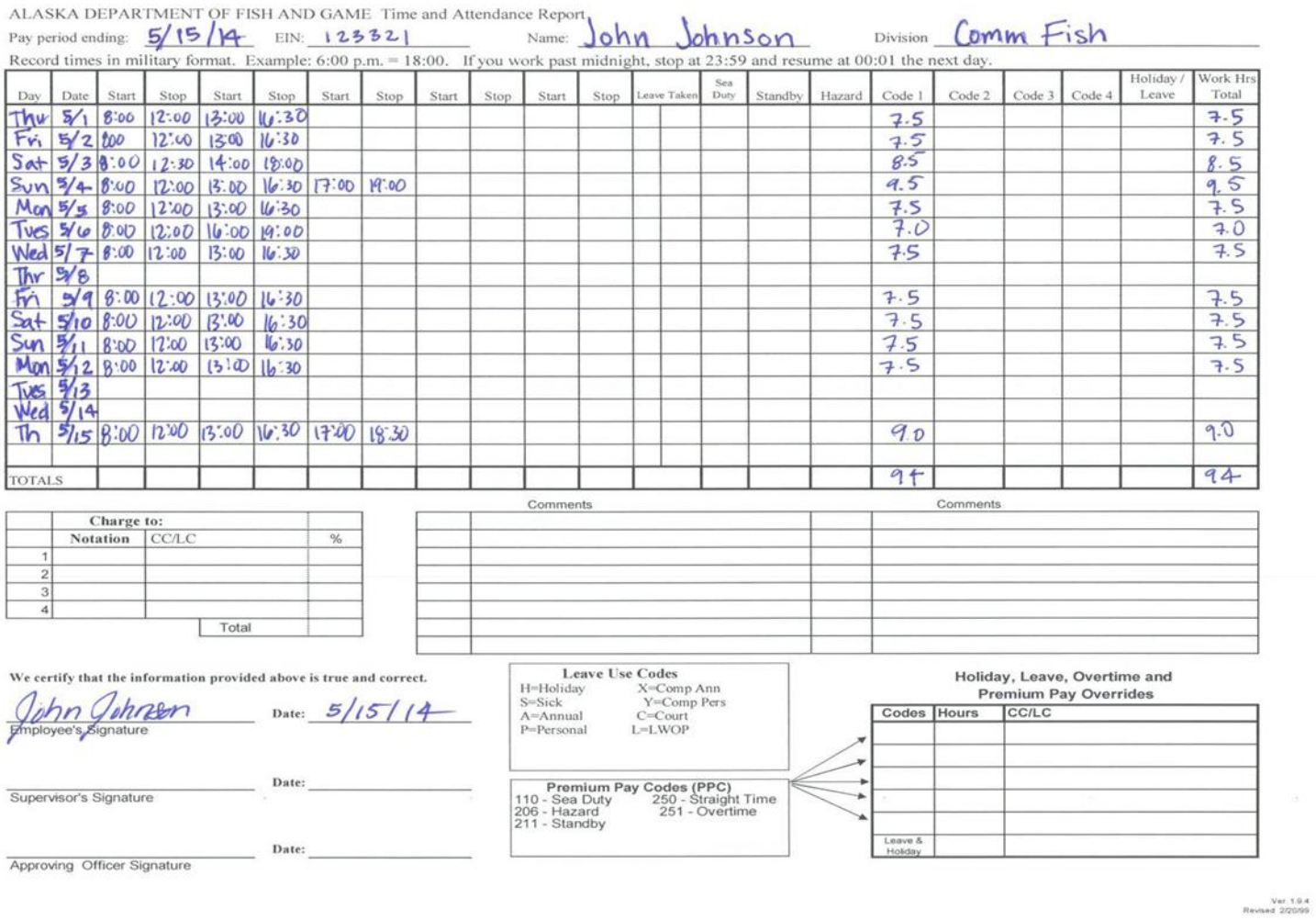
Charge to Table located on the bottom left-hand side of the timesheet should be left blank unless otherwise instructed by your project supervisor.

Comments Table located on the bottom right-hand side of the timesheet should be left blank unless otherwise instructed by your project supervisor.

Employee's signature and date: Be sure to sign and date your timesheet.

Crew leaders are responsible for reviewing each crew member's timesheet before sending them to town to ensure that they are properly filled out.

Appendix C2.–Instructions for filling out a timesheet.



ALASKA DEPARTMENT OF FISH AND GAME Time and Attendance Report

Pay period ending: 5/15/14 EIN: 123321 Name: John Johnson Division Comm Fish

Record times in military format. Example: 6:00 p.m. = 18:00. If you work past midnight, stop at 23:59 and resume at 00:01 the next day.

Day	Date	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Start	Stop	Leave Taken		Sea Duty	Standby	Hazard	Code 1	Code 2	Code 3	Code 4	Holiday / Leave	Work Hrs Total
Thu	5/1	8:00	12:00	13:00	16:30												7.5					7.5
Fri	5/2	8:00	12:00	13:00	16:30												7.5					7.5
Sat	5/3	8:00	12:30	14:00	18:00												8.5					8.5
Sun	5/4	8:00	12:00	13:00	16:30	17:00	19:00										9.5					9.5
Mon	5/5	8:00	12:00	13:00	16:30												7.5					7.5
Tues	5/6	8:00	12:00	16:00	19:00												7.0					7.0
Wed	5/7	8:00	12:00	13:00	16:30												7.5					7.5
Thr	5/8																					
Fri	5/9	8:00	12:00	13:00	16:30												7.5					7.5
Sat	5/10	8:00	12:00	13:00	16:30												7.5					7.5
Sun	5/11	8:00	12:00	13:00	16:30												7.5					7.5
Mon	5/12	8:00	12:00	13:00	16:30												7.5					7.5
Tues	5/13																					
Wed	5/14																					
Th	5/15	8:00	12:00	13:00	16:30	17:00	18:30										9.0					9.0
TOTALS																	94					94

	Charge to:		
	Notation	CC/LC	%
1			
2			
3			
4			
		Total	

Comments

Comments

We certify that the information provided above is true and correct.

John Johnson Date: 5/15/14
Employee's Signature

Date:
Supervisor's Signature

Date:
Approving Officer Signature

Leave Use Codes

H=Holiday X=Comp Ann
S=Sick Y=Comp Pers
A=Annual C=Court
P=Personal L=LWOP

Premium Pay Codes (PPC)

110 - Sea Duty 250 - Straight Time
206 - Hazard 251 - Overtime
211 - Standby

Holiday, Leave, Overtime and Premium Pay Overrides

Codes	Hours	CC/LC
Leave & Holiday		

Ver. 1.9.4
Revised 2/20/99

APPENDIX D. LANDS SURROUNDING KARLUK SMOLT CAMP

Appendix D1.–Koniag land use map.