

Regional Operational Plan CF.4K.2014.12

**Karluk Lake Sockeye Salmon Smolt Enumeration
Project Operational Plan**

by

Mary Loewen

April 2014

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
Weights and measures (English)		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft ³ /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	\geq
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia	e.g.	less than or equal to	\leq
pound	lb	(for example)		logarithm (natural)	ln
quart	qt	Federal Information Code	FIC	logarithm (base 10)	log
yard	yd	id est (that is)	i.e.	logarithm (specify base)	log ₂ , etc.
		latitude or longitude	lat or long	minute (angular)	'
Time and temperature		monetary symbols (U.S.)	\$, ¢	not significant	NS
day	d	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	H_0
degrees Celsius	°C	registered trademark	®	percent	%
degrees Fahrenheit	°F	trademark	™	probability	P
degrees kelvin	K	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	α
hour	h	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	β
minute	min	U.S.C.	United States Code	second (angular)	"
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
Physics and chemistry				standard error	SE
all atomic symbols				variance	
alternating current	AC			population sample	Var
ampere	A			sample	var
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				

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OPERATIONAL PLAN**

by

Mary Loewen

Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak

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Division of Commercial Fisheries

April 2014

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SIGNATURE/TITLE PAGE

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PURPOSE

Sockeye salmon smolt enumeration projects have been conducted on Karluk River intermittently since the 1920s. In recent years, annual restrictions on the sockeye salmon *Oncorhynchus nerka* subsistence, sport, and commercial fishery were necessary in order to achieve escapement, because adult returns from 2008 to 2011 were the lowest since the early 1980s. In 2010, the Alaska Department of Fish and Game (ADF&G) in conjunction with Kodiak Regional Aquaculture Association (KRAA) implemented a pilot sockeye smolt sampling project at Karluk Lake from late May to mid-June 2010 to detect possible causes between low adult returns and smolt age, size, and body condition. A more permanent smolt outmigration enumeration project at Karluk Lake was reinstated by ADF&G in 2012. In 2014, using two Canadian Fan traps and one-site mark-recapture techniques, emigrating population size will be estimated between May 16 and July 8, 2014. Sockeye salmon smolt caught in the traps will be sampled for age, size, 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 Lake sockeye salmon smolt enumeration project and the specific methods and procedures the field crew will use in 2014.

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, 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 subsistence, sport, and commercial salmon fishery in order to conserve escapement.

From 2009 to 2011 a series of memorandums were written by the Alaska Department of Fish and Game (ADF&G) 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, limnology, climate, and fish size, age, and growth for Karluk Lake sockeye salmon were investigated. The authors emphasized that the increased age, small size and low body 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 sockeye salmon often signifies decreased overall lake productivity and subsequent adult salmon returns (Foerster 1968). Sockeye salmon smolt studies have been conducted sporadically on Karluk Lake since 1925. Previous smolt projects were conducted on Karluk Lake during 1925–1936, 1961–1968, 1979–1992, 1994–1995, and 1997.

From 1999 to 2003, a smolt project was funded by the Kodiak Regional Aquaculture Association (KRAA) and implemented by ADF&G. The smolt project was continued from 2004 to 2006 as part of a larger project funded by 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, and both typical smolt age and size data were collected in addition to stable isotope sampling. In the last year of the study (2006) the average size of outmigrating sockeye was the smallest in the dataset stretching back to 1925. The average size of outmigrating freshwater-age-2 and freshwater-age-3 sockeye salmon smolt has a strong positive correlation with magnitude of total returns from an outmigration. Karluk Lake sockeye smolt size was not only much smaller than normal in 2006, but the majority of the fish were freshwater age-3. The resultant ocean-age-2 sockeye salmon returning in 2008 marked the beginning of the reduced adult runs to Karluk. Historically, freshwater-age-2 smolt have been the dominant outmigrating age class followed by freshwater-age-3 (Kyle et al. 1988; Rounsefell 1958). 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 conducted grab sampling of outmigrating sockeye salmon smolt to estimate size and body condition factor at the outlet of Karluk Lake (Figure 1). Following the 2010 smolt sampling pilot project, ADF&G and KRAA successfully submitted a proposal to the Alaska Sustainable Salmon Fund (AKSSF). The Karluk sockeye salmon smolt project was funded for three years beginning in 2011. The project goal was to collect smolt age and size information from mid-May to mid-June at the outlet of Karluk Lake in 2011 through 2013. In 2012, the department was allocated funding from the Alaska State Legislature to reinstitute comprehensive smolt enumeration, which had not been conducted since 2006; an enumeration project was implemented alongside the AKSSF isotopic sampling project. The 2012 and 2013 projects, collected isotope samples, smolt biometric data and estimated total population outmigration. Despite healthy smolt condition and age composition in 2012 and 2013, population estimates of outmigrating smolt were the smallest in the dataset dating back to the 1930s. In 2014, ADF&G was awarded Alaska Sustainable Salmon Fund project funding to extending the sampling season and collect two additional years of tissue samples for genetic stock identification. Data collected at the Karluk lake sockeye salmon smolt enumeration project in 2014 will provide a comparable source of data 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 2014 season will be the final year of the sockeye enumeration project at its current location due to cost-prohibitive land use issues. 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 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. Install, maintain and remove two Canadian fan traps in the Karluk River to catch and release sockeye salmon smolt from May 16 to July 8.
2. Describe emigration timing and growth characteristics (length, weight, and condition factor), by age class for Karluk Lake sockeye salmon smolt from May 16 to July 8. 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);
3. Estimate the total number of emigrating sockeye salmon smolt, by age class, from Karluk Lake from May 16 to July 8;
4. Collect genetic tissue samples from sockeye salmon smolt paired to AWL data for each sampled smolt;
5. Collect whole fish in each of three size classes in each of three temporal periods throughout the season for isotopic composition analysis;
6. Work with the project leader to assess the feasibility of capturing sockeye salmon smolt at the Karluk River salmon management weir; and
7. Continue to build a smolt database to estimate smolt-to-adult survival and to forecast future runs of Karluk sockeye salmon.

METHODS

SMOLT TRAP INSTALLATION AND MAINTENANCE

In previous seasons, two Canadian fan traps were fished in an upstream-downstream configuration, with the upstream trap intended to collect fish for mark-recapture tests, while enumeration and sampling was done at the downstream trap. This configuration was intended to ensure that assumptions of mark-recapture experimental design were not violated in a one-site mark-recapture test (ie. that fish captured in a trap are more likely to be captured again, or that fish learn to avoid traps).

However, in both 2012 and 2013, insufficient numbers of smolt were collected at the upstream trap at some point in the season, and it was necessary to collect fish at the downstream trap for mark-recapture tests as well. Additionally, there was evidence that the upstream trap caught more small fish than the downstream trap, which violates the assumption that all fish have an equal likelihood of being recaptured once marked and released.

In 2014, two Canadian fan traps will again be fished in the Karluk River, but both traps will be fished side-by-side at the downstream location used in 2012 and 2013. (Figure 2). The traps will be located approximately 0.6 km downstream from the lake's outlet on river right (looking downstream) the site used for the "lower trap" in 2012 and 2013 (Figure 2). Both traps will be used for AWL sample collection, enumeration of outmigrating fishes, and recapture of dyed smolt. Exact trap placement and configuration will be determined by the Project Biologist and may have to be adjusted throughout the season due to changes in stream velocity or water levels. A catch box will be attached to the rear of each trap, and perforated aluminum sheets and "speed-rail" aluminum poles will be used to make wings upstream of the traps to funnel water into the

trap and catch boxes. Perforated aluminum plate supported by a Rackmaster pipe frame will be installed as wings on either side of the trap to improve flow and increase capture efficiency. The wings will be installed so the water velocity is sufficient to force smolt into the catch box while ensuring that smolt are not injured (scale loss, pinned against the perforated sheeting, etc.).

Trap locations will be recorded with a global positioning system (GPS). Additionally, after the initial setup, multiple digital pictures will be taken from different viewpoints and dimensions (trap and wings) will be recorded. It is important that the distance from the traps to the river banks, as well as wing length of each trap, is measured and documented. Reference stakes will be driven on the bank at the leading edge of each trap and a depth gauge attached to the catch box. Any change in the trap structure, such as additions or removal of perf plate on the wings, will be recorded in the crew logbook, with the new measurements of wing length and distance across the furthest upstream wing ends noted.

It may be necessary to adjust trap location, wing configuration, or remove a trap during the season. The Project Biologist should be consulted before any major adjustments are made, and the entire crew should work together to make adjustments as needed.

The traps will

- Require frequent monitoring and maintenance to ensure that they are working properly. Daily cleaning, and sometimes multiple cleanings a day, will be required to keep the traps and wings free of debris to maintain consistent trap efficiency and minimize smolt mortality;
- Be checked a minimum of every hour or more frequently depending on volume of catch, from sunset to sunrise. Additionally, Karluk smolt have been observed to emigrate in large numbers during daylight hours; the trap will be monitored a minimum of every three hours from sunrise to sunset;
- Be fished following the sampling protocol described in this operational plan from ~ May 16 until ~July 8. Generally, five consecutive nights of trap captures less than 1% of the total seasonal outmigration, or five consecutive nights of <100 smolt, depending on relative outmigration timing and strength, will signal an end to the project. Attention to changes in migration patterns will be monitored and recorded; and
- 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 will be notified as soon as possible.

SMOLT TRAP MONITORING AND SPECIES ENUMERATION

The traps will be fished continuously throughout the sampling season. A trapping day will be defined as a 24-hour period from NOON to NOON, with the date corresponding to the calendar date of the first 12-hour period. Time will be recorded in military (24-hour) format. Smolt behavior will be monitored as they approach and enter the mouth of the trap to qualitatively assess possible avoidance. To minimize smolt mortality, the trap will be checked at least every hour between sunset and sunrise. Each day the traps will be checked and cleaned, and the catch boxes emptied by noon. It is extremely important to monitor the traps closely because smolt outmigration rates are variable and unpredictable: excessive mortality can occur quickly if smolt

are crowded in the catch box. The traps must be kept clear of debris, as increased flows and detritus may cause death or injury to captured smolt.

Each time the traps are checked, all species will be identified and counted. A dip net will be used to remove and release the fish as they are counted. Smolt needed for sampling will be placed in a covered live box. Various identification keys (e.g., Pollard et al. 1997; Appendix B) will be available and care will be taken to ensure proper identification. If identification by external characteristics proves difficult, a small number of fish will be sacrificed and internal characteristics will be examined. All fish of each species will be counted using a tally denominator to facilitate accuracy. Each time a trap is checked, all counts, including mortalities, will be recorded on the DAILY SMOLT CATCH REPORTING FORM (Figure 3). If it becomes necessary to count continuously because of high fish abundance, the tally will end for each species at the end of each hour. The data will be recorded, and a new tally will begin for the next hour. All counts will be summarized on the CUMULATIVE SMOLT CATCH REPORTING FORM (Figure 4) on a daily basis.

If direct counting is impossible because of high smolt catches, it will be necessary to estimate the trap catch using the catch-weight method. The crew will be prepared to estimate the catch using this method well before the peak outmigration begins. It may not be necessary to use the catch-weight method on both traps simultaneously; it is desirable to count individual fish when possible. It is also mandatory to keep an individual tally for each trap during catch-weight enumeration. The methods for the catch-weight estimation technique are

1. A sample of approximately 150 fish will be dipnetted from the trap(s) and weighed. This sample should be representative of the fish in the trap. This weight will be the reference weight for the next samples. The weight of the sample will be recorded in a field notebook.
2. The sample will be enumerated, by species, and any marked fish will be noted. These data will be recorded in a field notebook and the fish will then be released.
3. Subsequent samples will be taken from the trap(s). The weight of these samples will be measured and recorded, and the fish will be released.
4. A new reference weight will be taken every 10th sample or earlier if size or species compositions obviously change.
5. These data will be transferred to the CATCH-WEIGHT WORKSHEET (Figure 5) and CATCH-WEIGHT SPECIES COMPOSITION FORM (Figure 6) when passage rates slow down.

Any data generated by this method will be clearly marked on the data sheets.

SMOLT AGE, WEIGHT, AND LENGTH SAMPLING (AWL)

Throughout each night, smolt will be netted out of the catch box and placed into an instream holding box. These fish are not counted as part of the nightly outmigration (they will be counted when released). The number of fish collected hourly through the night at each trap will be proportional to the migration strength. It is important that the smolt sample represent the entire night's migration. These data are used to reconstruct the age class component of the emigration, and smolt of different sizes and ages may travel in separate schools throughout the night.

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. The fish selected should represent the proportional catches of each trap (ie. if one trap caught the majority of fish in a night, it would be inappropriate to selected 20 smolt from each trap to sample. Crew can use the number reported each night on the DAILY SMOLT CATCH REPORTING FORM to determine relative number of smolt from each trap to sample). All remaining smolt will be counted and released, unless they are being held for a future dye test, and the data added to the DAILY SMOLT CATCH REPORTING FORM (Figure 3). If less than 40 smolt are caught in a sampling night, all fish will be retained and the sample size for that day will be the number of fish caught. Dyed smolt used to estimate trap efficiency will not be selected as part of this sampling schedule.

During the first week of sampling, 40 additional smolt from each trap will be retained each night, and sampled for length and weight only. Mean length and weight will be compared using t-tests to ensure the two traps are not catching statistically different populations. If the mean length and weight are not statistically different between traps, then the daily 40 AWL samples will come from a combination of both traps, with fish selected from each trap proportional to relative catches. If the mean weight and length are statistically different between traps, then 20 fish from each trap will be selected each evening for AWL sampling. Data for fish from each trap should be recorded separately so that trap-of-capture can be tracked. At the start of each five-day sampling week this procedure should be repeated so that any changes in outmigration size modes can be detected.

All smolt sampling data will reflect the smolt 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. Smolt sampling should occur in the morning, take approximately one to one-and-a-half hours, and be completed by noon before cleaning the traps, etc.

The standard procedures for collecting and recording salmon AWL data are defined in Appendix A. During the 2014 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. Until that time, Appendix A will serve as the standard.

All scales will be collected from the preferred area of each fish (Appendix A1) following the methods described by International North Pacific Fish Commission (1963). Scales will be mounted on microscope slides (Appendix A1). 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 on the morning after capture. Smolt will be measured to the nearest mm from the tip of the snout to the tail fork (Appendix A1). 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 (Appendix A1). The scales will be mounted on a glass microscope slide as shown in Appendix A1. 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 (Appendix A1). 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 is found in Appendix C.

During periods of high smolt outmigration, it may be necessary to collect more fish than the usual 40/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 (from scale samples) 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. 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.

MARK-RECAPTURE EXPERIMENTS

Rackmaster pipe frames and 2"x12" planks will be used to create a platform for dyeing fish, and a holding area for smolt on the river right bank, approximately 125 m downstream of the lake outlet. Smolt captured at the traps downstream will be transported upstream to this holding area in large, aerated containers in a raft. No more than 150 smolt should be put into each container, to avoid crowding and stress during transport. Because the goal is to mark 800-1,100 smolt for release and retention (up to 1,000 for release, and 100 for delayed mortality and mark retention experiments), several trips between the trap and holding site will be necessary. The live boxes will be anchored in the river to minimize stream flow within the boxes. Smolt should be able to rest in these holding boxes, and changes in river condition may affect the velocity of freshwater flow through the holding boxes. Staff should remain conscientious about adjustments or placement of the holding boxes to ensure water flow does not exhaust the smolt.

Trap efficiency estimates will be made every five days, or if the trap is moved, to estimate the number of sockeye salmon smolt emigrating from the Karluk River. Bismarck Brown Y dye will be used to mark a sample of fish. The marked fish will be dyed at, and released from, the upper holding site. All smolt caught in the traps will be examined for marks, whether counting fish individually or if high catch volumes require the use of the catch-weight method. The proportion of recaptured fish will be used to estimate the proportion of the total emigration that is captured in the trap. The statistical assumptions for mark-recapture experiments (taken from Carlson et al. 1998) are

1. The population is unchanging (i.e., a closed population with no immigration or outmigration);
2. All smolt have the same probability of being marked (i.e., the initial trap capture is not selective and strata are consistent);
3. Marked and unmarked fish have an equal chance of capture (i.e., marking fish does not affect their behavior, and mortality rates are equal between marked and unmarked fish);
4. All marked fish do not lose their marks (i.e., effectively stained); and
5. All marked, recaptured fish are recognized as such (i.e., crew well trained and strata are discrete).

Every reasonable effort will be made to conform to these assumptions. The marking process can be very stressful for smolt, and care will be taken to avoid stressing the marked fish when possible. The primary causes of mortality are excessive handling, high water temperatures, low levels of dissolved oxygen, and prolonged exposure to the dye. The marked smolt will be released into the river across the width of the stream at the upper river trap site to ensure mixing with the unmarked population at a time when the migration for the evening is imminent.

The following methods will be used for marking and releasing smolt:

1. All data will be recorded on the SMOLT DYE RELEASE FORM (Figure 7).
2. Every five days, approximately 900-1,100 (which includes 100 which will be retained for mark retention and delayed mortality studies) sockeye salmon smolt will be

collected for marking. If run strength is not sufficient to capture all the smolt in one day, smolt may be held in an instream live box for up to three days. After the third evening, all smolt collected will be marked or released if the minimum sample size cannot be reached. Marked fish will not be sampled for AWL information.

3. A water pump will be used to fill 24-gallon marking containers with river water. One container should have a thermometer placed inside. The fish will be transferred from the instream live box into the containers, which will then be covered. A water pump will be used to gently exchange the water in the containers. The smolt will be allowed to rest in the container for at least 30 minutes.
4. The circulation pumps will be turned off, and a solution of 5.0 g of Bismarck Brown Y dye will be mixed into each container. The amount of dye needed each event may vary depending on size of smolt and number of smolt per marking container. Three aerator units will be placed in each marking container and will operate continuously during the dyeing period.
5. After 20 minutes of dye treatment, the pumps will be restarted and the containers will be flushed with fresh water for a minimum of 90 minutes. Smolt displaying abnormal behavior will not be released with the dye test, and instead will be transported downstream of the traps and released.
6. After 90 minutes, the marking containers with all fish will be transferred to a raft. It is important to keep enough water in the marking containers so that smolt are not stressed. If necessary, fish may be transferred to 5-gallon buckets for release. A line fixed across the stream will be used to move the raft slowly across the river. Smolt will be evenly distributed across the stream by slowly pouring the smolt out of the marking containers. The dye treatment and recovery process will be timed so that the release takes place at approximately 2300 hours, and releases occur across the width of the river.
7. The traps will be monitored for recaptured marked fish beginning the day of release and continue through the next marking event. The number of marked fish will be observed and recorded on the DAILY SMOLT CATCH REPORTING FORM (Figure 3) and the CUMULATIVE SMOLT CATCH REPORTING FORM (Figure 4). The number of smolt examined will equal the number of marked smolt plus the number of unmarked smolt caught each day. The daily smolt catch will not include marked smolt, since these fish have been previously counted when they were collected to be marked. Unmarked mortalities will be recorded as usual on the DAILY SMOLT CATCH REPORTING FORM. Any marked fish recovered in the trap dead will be noted in the comments section of the DAILY SMOLT CATCH REPORTING FORM.
8. In the event that it is necessary to use the catch-weight method to count smolt during a dye test period, the number of fish examined for marks will be the number of fish counted in the reference weight samples only. The total number of marked fish recovered will be extrapolated from the catch-weight method. Data generated from the catch-weight method will be clearly labeled.

Trapping conditions will be held constant between marking events. Modifications to the trap, including adjustments in trap location, will be made immediately before a marking event. If

major changes in river flow rates or smolt migration patterns are noticed, a new marking event will follow as soon as possible. The Project Biologist will be consulted before any trap modifications are made unless immediate modifications are necessary to prevent loss of equipment or to prevent major smolt mortality. Any changes will be clearly documented in the daily log and in the comments section of the data forms.

DELAYED MORTALITY/MARK RETENTION EXPERIMENTS

A random subsample of 100 sockeye salmon smolt will be taken from the fish retained for marking for use in a combined mark retention and delayed mortality experiment. This experiment will be performed in conjunction with every dye test unless otherwise advised by the Project Biologist.

Before marking fish, 50 sockeye salmon smolt will be removed from the dye test container and placed in one side of a divided instream live box at the release site. After the marking and recovery period, an additional 50 marked smolt will be placed in the other side of the live box. These smolt will be examined daily for mortalities. The number of mortalities from each group will be recorded on the DELAYED MORTALITY FORM (Figure 8). These smolt will be released downstream of the trap at the beginning of a new mark-recapture test or after five days, whichever is first.

Additionally, a sample of marked and unmarked smolt will be used to conduct daily identification trials. The purpose of this test is not to evaluate field personnel's identification ability, but to evaluate the mark-recapture assumptions. One crewmember will examine the smolt and the other will present the smolt. The duties will switch the next day. The examiner will not look at the smolt before the trial. The presenter will, at random, select a approximately 2-4 smolt each from the held dyed and unmarked fish, present all the fish in a dip net to the examiner for approximately two seconds, and immediately release the fish back to the appropriate sides of the live box. The examiner will determine whether and how many of the smolt were marked or unmarked; the presenter will record whether the examiner was correct. The presenter will not inform the examiner of the accuracy of his determinations until 5 fish collections (approximately 10-20 fish) have been examined. It is desirable to mimic actual counting conditions as much as possible when conducting these trials; they will be performed under low light conditions. Results of this experiment will be recorded on the MARK RETENTION/IDENTIFICATION FORM (Figure 9). When the experiment is finished, all held marked and unmarked smolt are counted and released below the traps, but not included in the daily smolt catch as they have been previously counted. Any mortalities must be noted on the DELAYED MORTALITY FORM.

PHYSICAL DATA REPORTING

Air and water temperature, cloud cover, wind direction and velocity, and relative stream height will be measured twice daily (NOON and MIDNIGHT) 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 DATA OBSERVATION FORM (Figure 10).

WEATHERPORT CONSTRUCTION

A portable building will be erected onshore at the trap site each year. Instructions are located in Appendix E. At the end of each season, the portable building will be dismantled and the canvas

and metal supports shipped back to town for winter storage. In 2014, the wooden platform will be either flown whole by helicopter to a new site, or dismantled and shipped back to town.

OTHER REQUIREMENTS

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 organic matter will be disposed of in the lake. 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. Bearspray 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, **call Camp Island Brown Bear Center at 907-433-7900 or 907-433-7901**, and call the project biologist (Mary Beth Loewen) at 907-942-5273. 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°26.528 N lat and 154°6.357 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

Resupply items (e.g., groceries, fuel, mail, etc.) will be sent via chartered float plane. 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.

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 13:30 hours by telephone (486-1835) unless otherwise needed or predetermined. The crew on shift will verify that daily smolt emigration counts, water level, and water temperature has been recorded every morning accurately by 12:00 noon, while the crew leader will check data recording and entry daily. 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 demands irregular and sometimes 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 such as reading, playing games, etc.

Unexpected trap maintenance, trap adjustments, or other unforeseen items will often require working hours beyond regularly scheduled shifts. Traps will often need cleaning during the evening trap check, for example, and 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. Conversely, only one person may be needed to check the trap at 17:00 or 21:00, and periods of low flow may not require extensive daily trap maintenance, resulting in fewer daily hours worked. The crew leader is responsible for overseeing accurate recording of hours worked, and ensuring work duties, including overtime hours, are evenly distributed among the crew. Allowing adequate time off for rest and recreation is also important.

TIMESHEETS

The crew leader 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. A proposed work schedule is described in Appendix D3. 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 D1 and D2.

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 covenants and hunting restrictions in the area.

SCHEDULE AND DELIVERABLES

TASKS

1. Erect weatherport and set up field camp adjacent to trap site (0.5 km downstream of lake). Target dates May 13–May 15.
2. Install and operate two Canadian fan traps to capture emigrating sockeye salmon smolt. Target dates May 14–May 16.
3. Enumerate catch by species May 16–July 8.
4. Mark 800–1,100 sockeye salmon smolt weekly using Bismark Brown Y dye to estimate trap efficiency and the total smolt outmigration.
5. Collect physical data daily: (air and water temperature, water level and velocity, wind direction and velocity, precipitation and cloud cover).
6. Conduct weekly random sampling of 200 sockeye salmon smolt for age, weight, and length.
7. Collect tissue samples from each AWL-sampled sockeye salmon smolt for genetic analysis.
8. 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 in the cumulative count form 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 twice daily at noon and midnight.
4. Population estimates from dye tests and delayed mortality adjustments will be developed throughout the season.

RESPONSIBILITIES

Project Biologists: *Mary Beth Loewen* – Lead Project Biologist ADF&G Karluk Smolt Emigration project– Westward Region Finfish Research Biologist

Nathan Weber – KRAA Production/Operations – Collaborator for AKSSF Karluk Smolt Project

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

Field Staff: *Julienne Pacheco* – ADF&G Fish and Wildlife Tech III Field Crew Leader

Jacob Harding – ADF&G Fish and Wildlife Tech II

Sarah Ashcraft – SCA Intern (AKSSF project)

Alex Hughes – SCA Intern (AKSSF project)

Ms. Loewen 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 Karluk smolt enumeration project. Bruce Finney will conduct all stable isotope analyses. The FWT-III field crew leader 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. The SCA interns will assist the ADF&G technicians in all aspects of the project. 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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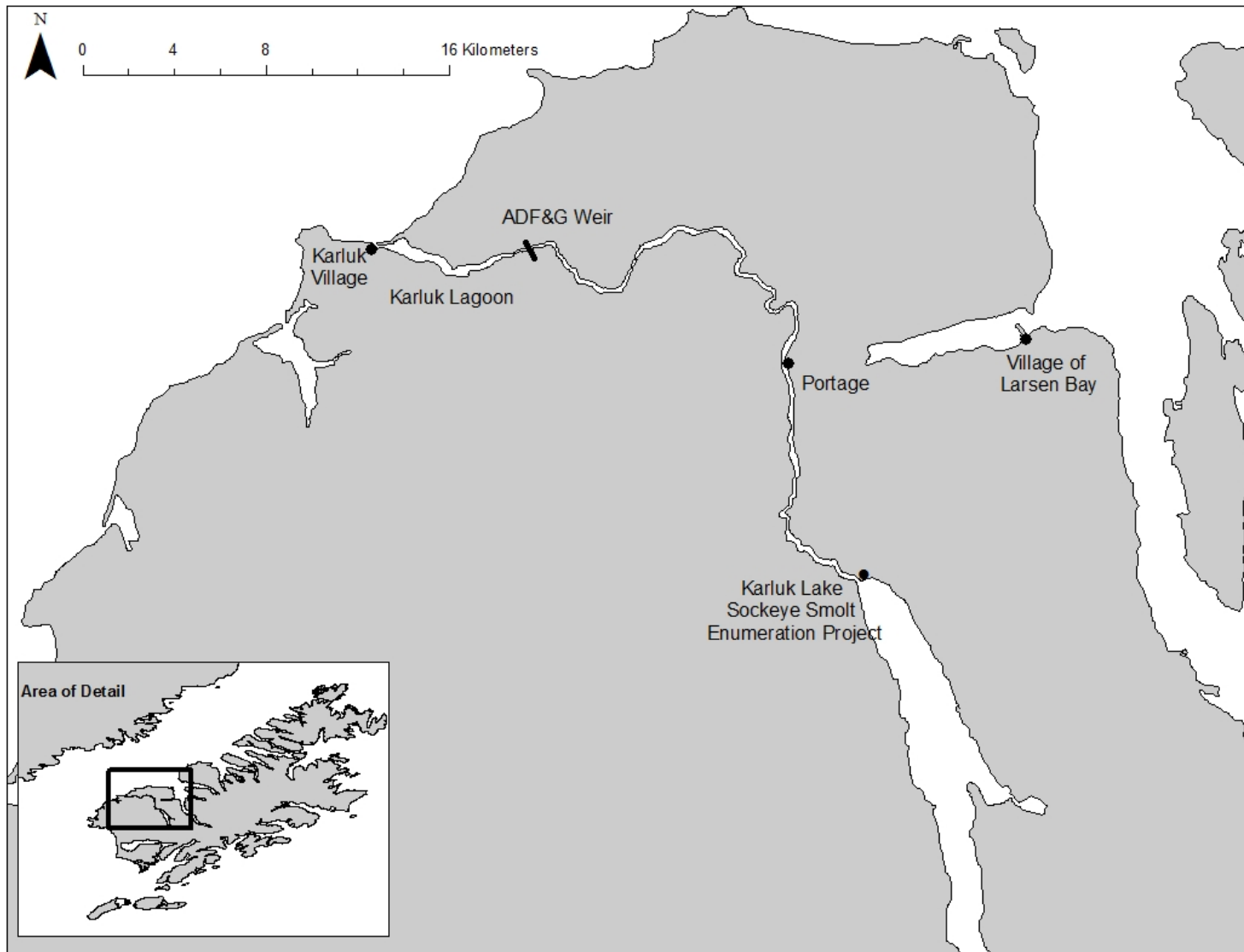


Figure 1.—Location of Karluk Lake outlet, Karluk River weir, the village of Karluk, and nearby village of Larsen Bay.



Figure 2.—Approximate Canadian fan trap location on the Karluk River. Both traps will be fished at what was the downstream location in 2012 and 2013.

CATCH-WEIGHT WORKSHEET

Date: _____ Time: _____ to _____ Project Location _____

Basket weight (wet): _____

Basket #	Weight (fish+ basket)	Basket #	Weight (fish + basket)	Basket #	Weight (fish+ basket)	Basket #	Weight (fish+ basket)
1		11		21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	
TOTAL:		TOTAL:		TOTAL:		TOTAL:	
GRAND TOTAL _____		LESS BASKET WEIGHTS _____		=		_____ (a)	

Sample Biomass (Fish plus basket weight)	CATCH	
	Sockeye Smolt	Other
1		
2		
3		
4		
5		
TOTAL:	(c)	(d)

GRAND TOTAL _____ LESS BASKET WEIGHTS _____ = _____ (b)

ESTIMATED CATCH: _____ ; SMOLT (ac/b): _____ ; OTHER(ad/b) _____ .
--

Figure 5.–Catch-weight worksheet.

SMOLT DYE RELEASE FORM					
Smolt Date _____					
Grams dye used _____					
Approx Tote Volume _____					
	Number Fish	Time (military)	H ₂ O Temp	# mortalities at end of stage	COMMENTS
Fish into Container					
Begin Recovery water exchange					
Addition of dye					
Begin water exchange					
Transfer to transport containers					
Begin transport					
Finish release					
<p>NUMBER OF FISH HELD FOR MARK RETENTION/DELAYED MORTALITY _____</p> <p>TOTAL NUMBER MORTALITIES DURING DYE PROCESS: _____</p> <p>TOTAL NUMBER SMOLT RELEASED: _____</p> <p>COMMENTS (include comments on fish vigor, any aerator problems, areas of high mortality, how well the fish appeared marked, etc.)</p>					

Figure 7.–Smolt Dye Release Form.

APPENDIX A. SMOLT SAMPLING

Sampling Procedures

Label Slides

The left portion of each slide should be labeled prior to sampling using a fine point permanent marker with the slide number, species, area sampled, date, and fish numbers of the sample (Figure 1).

Slide number

Write the number of the slide.

Species

Write out completely (e.g., Sockeye).

Area sampled

Write the area where the fish were collected.

Sampling date

The sampling day is the 24-hour period from noon of the first day to noon the following day, and is identified by the calendar date corresponding to noon on the first day.

Fish numbers

Fish should be sequentially numbered, beginning with 1 each sampling event. By starting with 1 each sampling event, it is possible to track how many fish have been sampled. Five fish are placed on each slide.

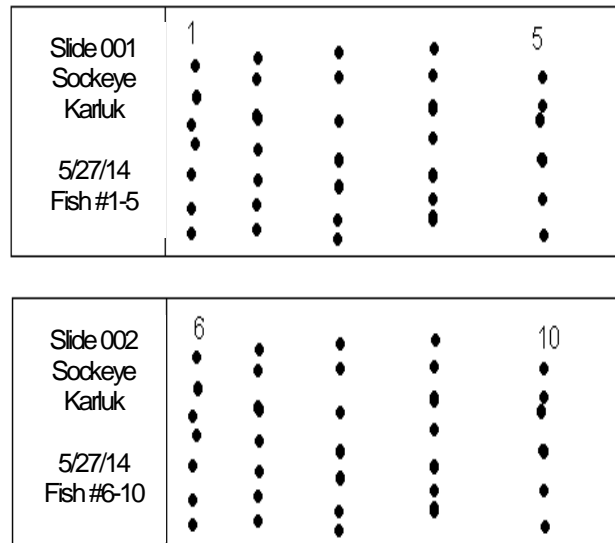


Figure 1.–Properly labeled smolt slide.

Sample ASAP

Sample smolt as soon as possible after they are captured.

Mix anesthetizing solution

Wearing latex gloves to prevent direct exposure to the anesthetic, dissolve a small amount (approximately of 1 g) of Tricane Methanesulfate (MS-222) and baking soda in about 2 L of cold water in a dish pan. The amount of anesthetic needed will vary depending on the water temperature, freshness of the chemical, and size of the smolt.

Set up recovery bucket

Set up an additional bucket of water to be used as a recovery bucket. This bucket should be filled with fresh water, aerated, and covered to avoid stress on the fish.

Transport smolt to sampling area

Transport smolt, using clean 5-gallon buckets, to the sampling area. Buckets containing smolt should be filled with fresh water, aerated, and covered to avoid stress on the fish. Fish can be placed into the bucket using a dip net, or by dipping the bucket into the live box.

Anesthetize smolt a few at a time

Place a few smolt in the anesthetic solution until they become subdued to a point where they can no longer flex their axial musculature but can still ventilate their gills. The concentration of the solution should be such that it immobilizes the fish in 2–3 minutes.

Lightly dry preferred area

After the fish are anesthetized, carefully remove a fish from the dish pan and gently pat dry with a paper towel.

Sample smolt

Place the fish on its right side to sample the left side. Quickly and carefully take length and weight measurements, record in a rite-in-the-rain notebook, and pass the fish to the other sampler. They will remove 5–10 scales from the preferred area of the smolt using a scalpel (Figure 2). On salmon species, the preferred scale is located where a straight line between the posterior insertion of the dorsal fin and the anterior insertion of the anal fin crosses the second scale row dorsal to the lateral line. If scales are not present in this area then scales should be taken from the secondary location, which is the same area on the right side of the fish.

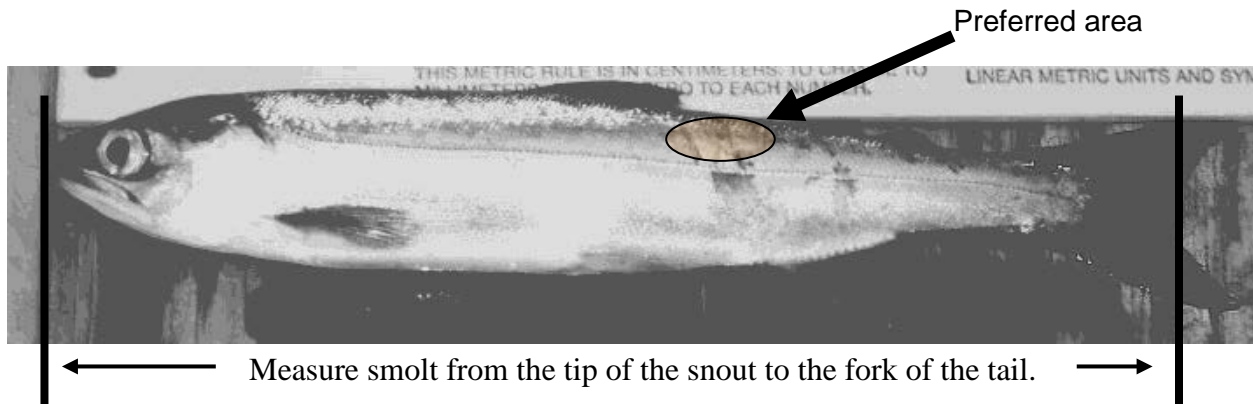


Figure 2.–Smolt with proper length measurement and preferred area highlighted.

Move smolt to recovery bucket

Transfer sampled smolt from the sampling station to the recovery bucket. It is important to sample as quickly as possible and immediately place smolt into the recovery bucket to prevent mortality.

Align scales on slide

Using the dissecting probe, line up and spread out the scales on the slide under the correct fish number (Figure 1).

Clean sampling supplies

Wipe off the scalpel and dissecting probe to remove scales and slime before another smolt is sampled.

Continue sampling

Continue sampling smolt until sampling goals are met, or all available smolt have been sampled. Depending on how long it takes to complete the sample, the water in all buckets (holding, recovery, and anesthetizing) may need to be refreshed.

Release smolt

Once the sampled fish have recovered and are swimming normally in the recovery bucket, they should be released downstream of the trapping location.

-continued-

Data Entry/Management

Data obtained while sampling is recorded using a Meazura Rugged Digital Assistant (RDA). The RDA is a waterproof device used to digitally record sampling data. Sample information is transferred from the device to a netbook after each sample. A USB flash drive is used to save and transfer data from the netbooks located in field camps, to the office, throughout the season. An RDA is shown in Figure 3.

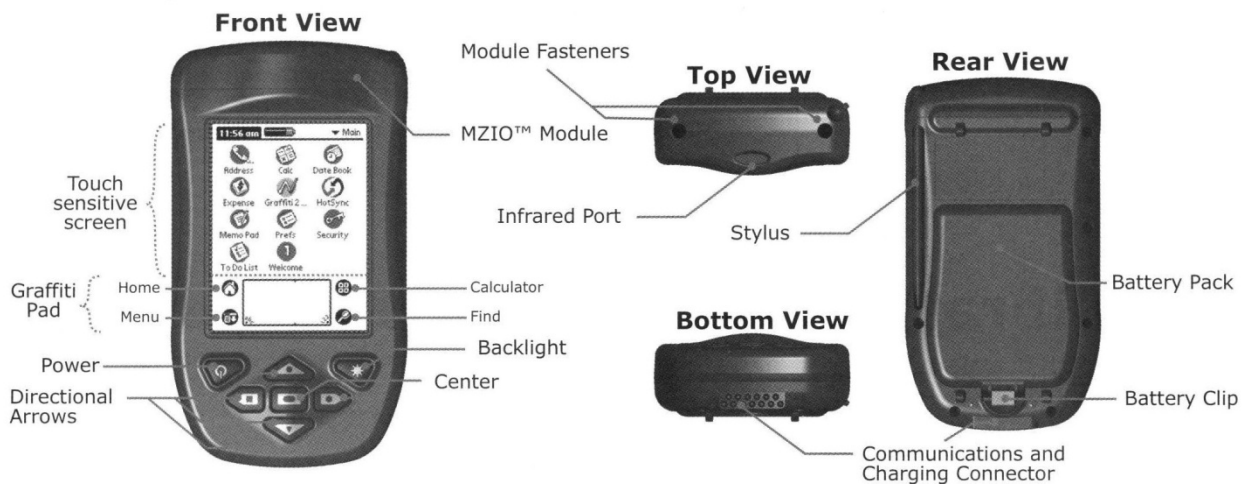


Figure 3.–Rugged Digital Assistant (RDA).

Entering Data Into The RDA

To begin using the RDA, turn it on by pressing the power button (Table 1). Using the stylus, tap the home icon in the bottom portion of the screen to bring up the main menu. It may be necessary to press the home icon several times to bring up the entire main menu. Next, tap the Forms 5.1 icon. Pendragon Forms (Forms 5.1) is the program that you will use to enter all of the sample data. After the icon is selected, the Pendragon Forms screen will appear. If a form was left open by a previous user, it may be necessary to hit the Quit or Done button to get to the main list of forms. Highlight the appropriate sampling form (Smolt_2014.XX) and select New, which is found in the lower left corner of the screen. The four main buttons of the form will now be visible: Enter Background Info, Sample Next Fish, Review, and Quit.

-continued-




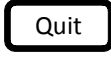
Image	Description
	Power Button - Button you will press on the RDA itself
	Home Icon - Use the stylus to navigate to the home screens
 Forms 5.1	Forms 5.1 Icon - Use the stylus to open pendragon forms 5.1
	This is an example of a button within pendragon forms. Use the stylus to select these buttons.

Table 1.–Buttons and icons addressed in the text.

Enter Background Info

Background information must be entered at the start of each sampling event. A new day always constitutes a new sampling event, so it will be necessary to enter new background information typically once per sampling day. It is important to edit background information when any change in sampling information occurs. The following topics constitute sampling information. If information in one of the following categories changes, it is necessary to change the background information.

Species

Select the appropriate species from the drop down list on the RDA.

Management Area

Choose the relevant management area from the dropdown list. Samples collected from Kodiak Island statistical areas must have Kodiak selected as the proper management area.

Area Sampled

Select the area that best represents where the fish were sampled, such as Ayakulik River, from the dropdown list.

Location ID (N/A for some areas)

Enter the site where the fish being sampled are from. For Karluk Lake sockeye salmon smolt sampling, Site 1 is the primary trap on river right as looking downstream (closest to weatherport and streambank) and Site 2 is further offshore, on river left as looking downstream,.

Location Type

Indicate the type of area in which the fish were captured.

-continued-

Gear Type

Select the type of gear in which the smolt were caught.


Date of Sample

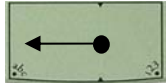
For smolt, the sampling day is the 24-hour period from noon of the first day to noon the following day, and is identified by the calendar date corresponding to noon on the first day.

Sampler Initials

Enter the initials of the sampling crew (up to 3 persons). This can be done by writing in the box on the bottom of the screen, or by using the pop up keyboard.

Notes

1. When entering text, tap on the dot by the abc icon to bring up a keyboard. 
2. To delete a character, place the stylus in the text box and draw a small straight line from right to left.



Sample Next Fish:

After entering background information, the RDA is ready to collect individual fish data. The Sample Next Fish button is used to enter the details of each fish sampled. It is not necessary to click on the Sample Next Fish button when entering the first fish of a new sample. After entering the background information, the form automatically knows to go to the sample next fish section of the form. As you continue to sample, simply tap Sample Next Fish or Next to enter individual fish data. This option is used when continuing to the next fish of a sample where no background information has changed. Fish data that is entered here is associated with the current background information logged. The following constitute fish data and should be entered for each fish.

Scale Slide (Card) Number

Slides are numbered sequentially by date throughout the season starting with 1. A separate numbering sequence will be used for each species or major location change. Consult your crew leader for the current slide number. It is crucial to make sure the number written on the slide matches the slide (card) number entered into the RDA. The slide number will automatically advance to next number after five fish have been sampled.

Fish Number

The fish number is a sequential numbering system that begins with the number 1 for each sampling event. This allows samplers to keep track of the number of fish sampled each day (or since the background was changed). By default, the fish number in the RDA will automatically advance after each fish is sampled.

Length in mm

Enter the length of the smolt from tip of snout to tail fork in millimeters (i.e., 108). If for some reason you do not collect a length measurement, enter 999.

Fin Clip and Genetics

Select the Skip Fin Clip and Genetics button if appropriate. If sampling involves fin clips or genetics you can enter the optional fin clip and genetics information.

Sample Next Fish

Select Sample Next Fish to continue sampling.

Review/Edit

The review button can be a very useful tool during sampling. It can be used to ensure data being entered is accurate, or it can be used for editing fish data during a sample. The review portion of the form displays slide number, fish number, length, and weight. The most recently sampled fish appear first. To enter the review screen, tap on the Review button on the main screen of the form. After the data has been reviewed and edited, tap the Done button on the bottom right of the screen to return to the main screen of the form. If Sample Next Fish is selected after leaving the review screen, the auto-increment will continue as if the review screen was never entered.

Reviewing Data

To review the last data entered, tap the Review button on the main screen of the form. Use the scroll bar on the right side of the screen to look at the fish that have been entered.

Editing Data

If fish data needs to be edited, tap on it using the stylus. Tap on the Sample Next Fish button to go through the fish data that was previously entered for that fish. Changes can be made as needed. Buttons chosen prior to the review are highlighted with asterisks. After a fish has been edited, the main review screen appears. If a fish is accidentally selected from the main review screen, click the button that has the slide#-fish# to return to the main review screen without going through the fish data. As mentioned above, tap Done to exit the review portion of the form and return to the main screen.

Quit

When sampling is complete, tap Quit to exit the form.

Data Management

After sampling is done for the day, the data must be backed up on the RDA itself and then transferred (by HotSync) to the netbook.

Backing up data

After each sample the RDA should be backed up so that data is stored on both of the compact flash drives. Turn the RDA on, and tap the home icon in the bottom portion of the screen to bring up the main menu. Tap the CardBkup icon if it is present, and then the Backup Now button at the top left of the screen. The data will now be on both flash drives. If the RDA does not have a CardBkup icon, it will back up automatically.

Downloading Data to Netbook

Connect the communications cable into the RDA and a USB port on the netbook. Press the power button to turn on the RDA and begin a HotSync by tapping the home icon, and then the HotSync icon found on the main menu. Tapping the large icon in the center of the screen will start the HotSync operation (Figure 4). Please make sure the RDA is dry before downloading any data to the netbook.

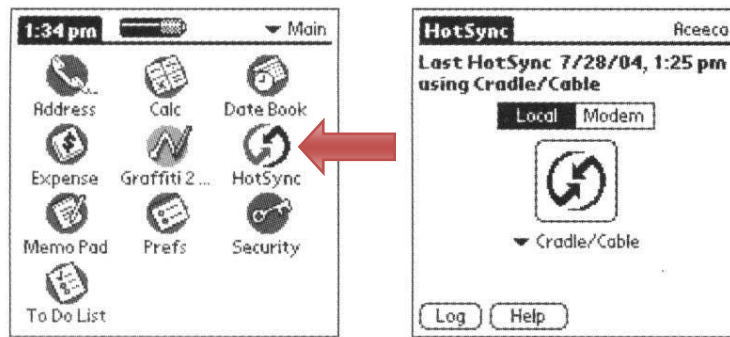


Figure 4.–HotSync Screens Found on RDA.

-continued-

Editing, Naming, and Saving Data

If a mistake is realized during a sample it is often easiest to document the mistake and send the correction in with the USB flash drive for the Kodiak office to fix. If a mistake is made during the sample it can be changed using the review portion of the form in the RDA. Data can also be changed after it is downloaded onto the netbook, but is not recommended unless the Kodiak office is consulted first. A HotSync operation after changes have been made on the netbook will update the RDA.

-continued-

To view data, HotSync the RDA and open Pendragon Forms Manager (a shortcut should be located to the right of the start menu) on the netbook. Select the form (Smolt_2014.XX), and click Edit/View under Data Functions on the right side of the window. All data will now be visible. Simply make the necessary minor changes here and exit out of the window to save. It is important to change the correct the numbers under the proper column which is where it is best to consult the Kodiak office. Hotsync the RDA to the netbook after any changes are made on the netbook to update the RDA with all changes.

After data has been edited and verified, a copy of the database will need to be exported from the Pendragon software and saved on the netbook. In Pendragon Forms Manager under Data Functions on the right side of the window, click To ASCII. Navigate to the folder in which the data is being saved. Type in the file name and then save. The file name should follow this format: Area_Sampled_Smolt_YYYYMMDD.csv (e.g., Afognak_River_Smolt20140614.csv). After saving, a window will pop up stating the file has been created. Each .csv file will contain all of the data that has been collected up to that point in the season. Do not edit or save the .csv file as an excel file or it will be difficult or impossible to upload the data into the database.

Transferring Data from Netbook onto USB Flash Drive

Up to date data should be sent into the main office as often as possible (e.g., with the grocery plane). Insert a USB flash drive into an appropriate port on the netbook. Double click on MyComputer, which is found on the desktop of the netbook. Navigate to the folder where your data is saved and highlight the most recent file (determined by the date) by single clicking. With the file highlighted, click on edit at the top of the window and then copy. Open up MyComputer and double click on the USB flash drive (often called “Removable Disk”) found under the heading “Devices with Removable Storage.” Click on edit at the top of the window, and then paste. The .csv file that was copied earlier will appear in the window indicating it was copied to the flash drive. Exit out of all windows and single click on the safely remove hardware button on the bottom right corner of the desktop in the quick start menu. Click on “Safely remove USB Mass Storage Device.” A pop-up will verify that it is now safe to remove the flash drive from the system.

Powering the Netbook and RDA

1. The RDA can be charged with either the AC or DC powering options. It is the crew leaders responsibility to keep it charged
2. The netbook can only be charged with the AC power adaptor, therefore plan accordingly for generator use. The charging light on the netbook is red when charging, and green when fully charged.
3. If there are powering problems, please contact the office immediately.

Some Notes and Reminders

1. Connect the AC adaptor to the bottom of the communications cable to charge the RDA batteries. If using the DC charger, connect the charger into the communications port.
2. If a mistake is noticed before moving onto the next fish, the previous button can be used to make changes in the RDA without having to go to the review screen or alter the data on the netbook.
3. Each length, weight, and scale must correspond to a single fish! It is the responsibility of the crew leader to be sure the data has been entered correctly.
4. Never put data from different dates onto one slide, and always enter new background information. Even if only one fish is sampled that day, enter new background information and begin with a new slide the next day.
5. Responsibility for accuracy lies first with the primary data collector(s) and finally with the crew leader. Sloppy or incomplete data or slides will be returned to individual collectors for correction.
6. Ensure that all equipment is well kept. Electronics should be stored in a clean safe place. The RDA must be completely dry before transferring data to the netbook. RDA batteries must be charged to make certain sampling is not hampered. It is the responsibility of the crew leader to make sure that all data is carefully examined and before returning it to their supervisor.

Troubleshooting

Resetting the RDA

If problems are encountered with the RDA, a soft reset can be done without losing data. To perform a soft reset hold the power and backlight button down together, and release at the same time. If a soft reset does not work, the office should be contacted about other options for resetting.



Press and release Power and Backlight button together

Hotsync Error Message

HotSync message "Exceeded user storage space limit of 500KB in form 'Smolt_2014.XX'

1. Open Pendragon Forms Manager
2. Under Form Function click on "Properties"
3. Click on "Advanced Properties"
4. Click on the "Synchronization Tab"
5. Change the Storage Limit (KB) to 5000 instead of 500.
6. Click "OK"
7. Under Form Functions Click on "Distribute"

APPENDIX B. 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 fish¹ 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 alter-

¹ Especially adult smelt, family Osmeridae.

native 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.

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-

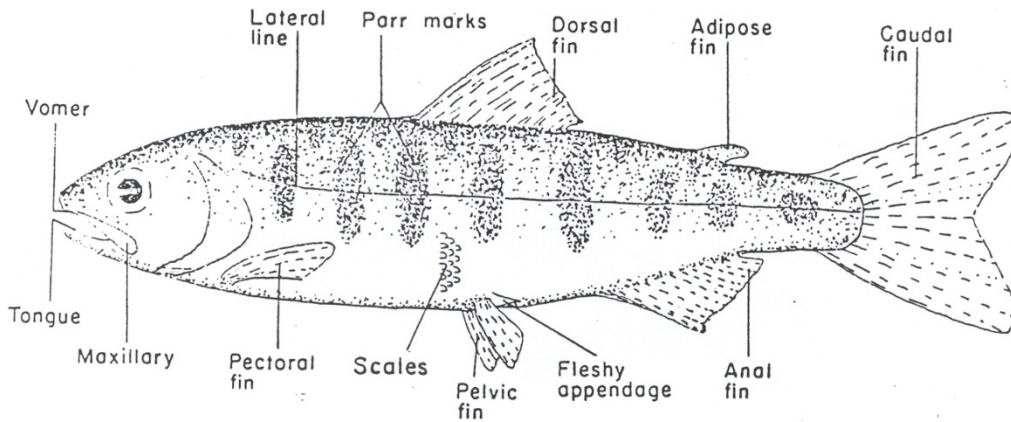


Figure 1.—A hypothetical salmonid showing external characteristics.

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)

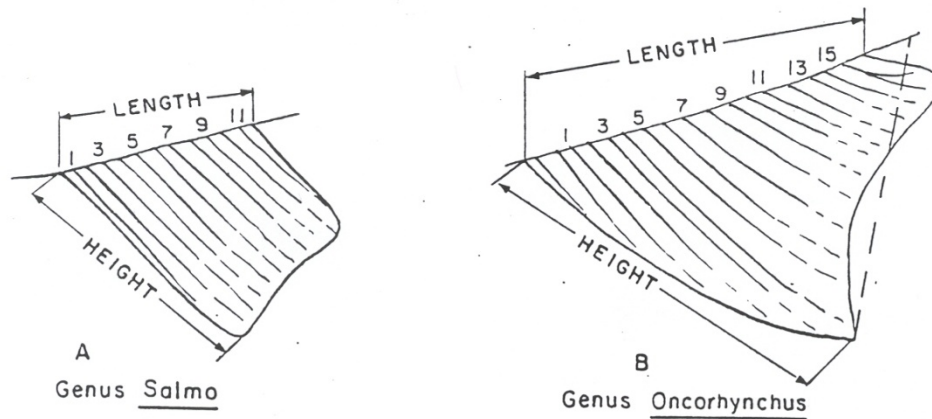


Figure 2.—Anal fins: (A) Trout, genus *Salmo*; (B) Pacific salmon, genus *Oncorhynchus*. The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior 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.)

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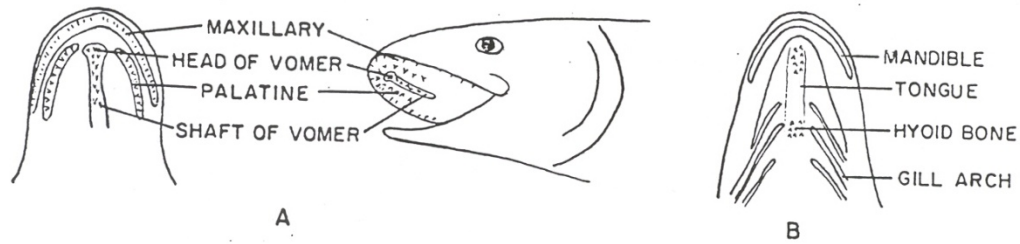
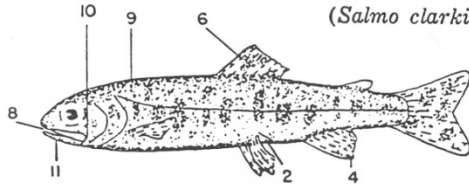


Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches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

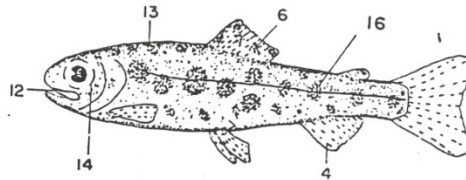
6. (18) Dorsal fin with large dark spots.
Trout
Genus *Salmo*

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*)



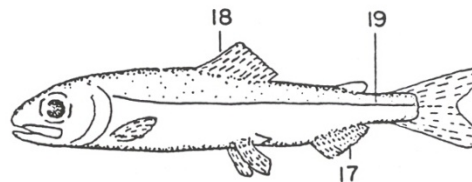
12. (8) *No teeth at base of tongue.
13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
14. (10) Maxillary short, not reaching past posterior margin of eye.
15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

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*

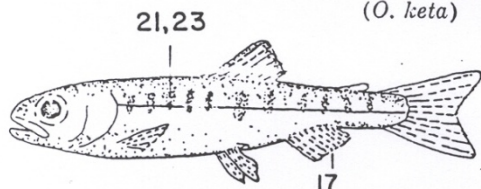
19. (20) No parr marks. Fry leave fresh water while small—approximately 1.75 inches (45 mm) long.
Pink salmon
(*O. gorbuscha*)



-continued-

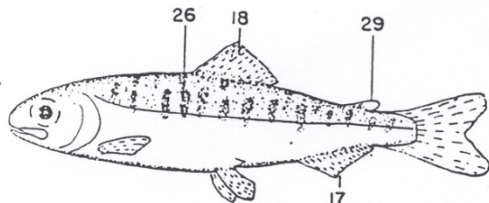
- 20. (16) Parr marks present as vertical bars or oval spots.
- 21. (30) Parr marks short, extending little, if any, below lateral line.
- 22. (25) Gill rakers on first arch, 19 to 26. ** Pyloric caeca, 140 to 186.
- 23. (26) Parr marks faint. Sides below lateral line iridescent green.
- 24. (27) Small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

Chum salmon
(*O. keta*)



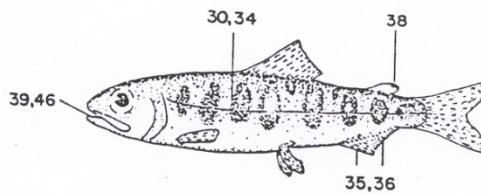
- 25. (22) Gill rakers on first arch, 30 to 40. **Pyloric caeca 60 to 115.
- 26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
- 27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
- 28. (31) Gill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

Sockeye salmon
(*O. nerka*)



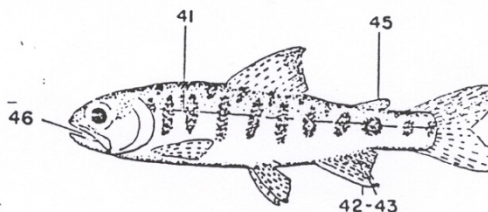
- 30. (21) Parr marks large, vertical bars centered by lateral line.
- 31. (28) **Gill rakers short and thick, fewer than 29 on first arch.
- 32. (29) Adipose fin at least partially pigmented.
- 33. (40) **Pyloric caeca more than 90.
- 34. (41) Parr marks broader than interspaces.
- 35. (42) Anterior 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) **Pyloric 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

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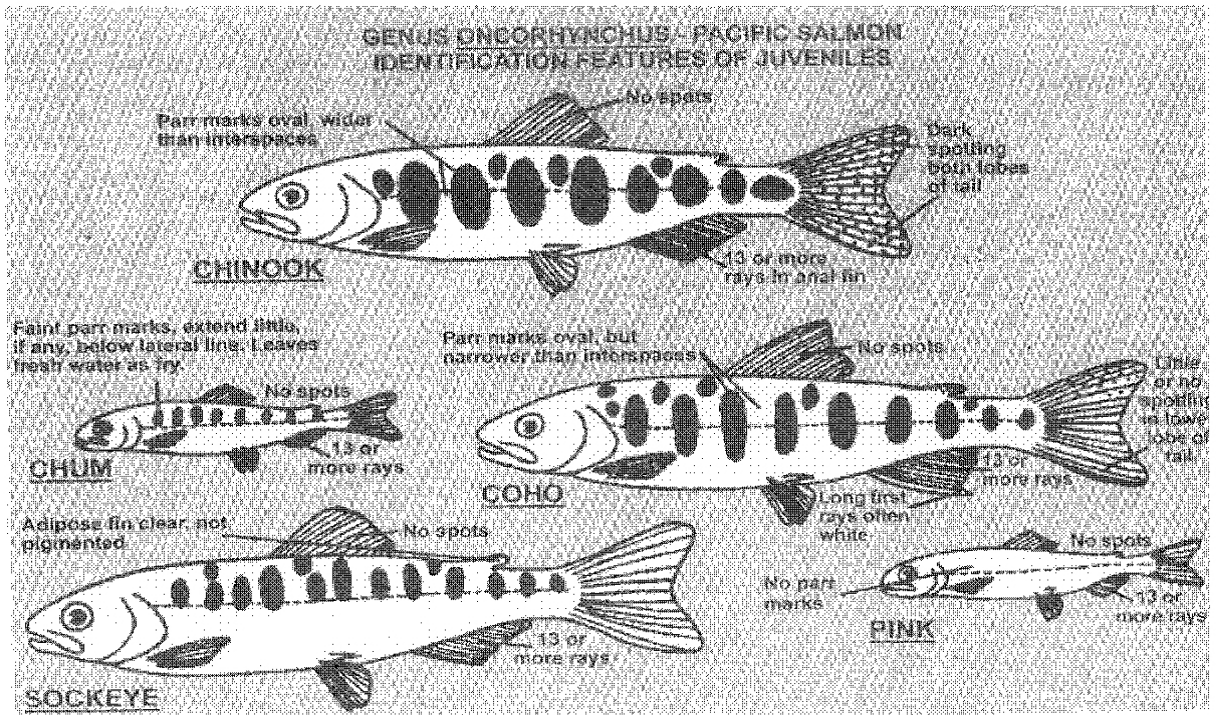
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CHINOOK FINGERLING

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.



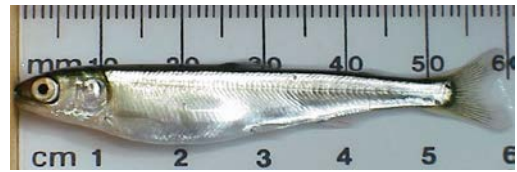
CHUM FINGERLING

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 faint, 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.



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-continued-



Juvenile Sockeye Salmon



Juvenile Coho Salmon

-continued-



Stickleback



Dolly Varden

-continued-



Coast range sculpin.

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

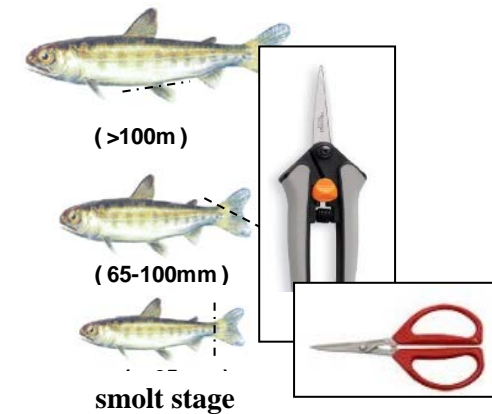
ADF&G Gene Conservation Lab, Anchorage

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



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 D. TIMESHEET INSTRUCTIONS

Appendix D1.–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 D2.-Example of a completed timesheet.

ALASKA DEPARTMENT OF FISH AND GAME Time and Attendance Report

Pay period ending: 6/15/2003 SSN: 191-11-1111 Name: Joe Shmo Division Commercial Fisheries

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	
Sun	6/1	8:00	12:00	13:00	16:30											7.50				0.00	7.50	
Mon	6/2	8:00	12:00	13:00	16:30											7.50				0.00	7.50	
Tue	6/3	8:00	12:30	14:00	18:00											8.50				0.00	8.50	
Wed	6/4	8:00	12:00	13:00	16:30	17:00	19:00									9.50				0.00	9.50	
Thu	6/5	8:00	12:00	13:00	16:30											7.50				0.00	7.50	
Fri	6/6	8:00	12:00	16:00	19:00											7.00				0.00	7.00	
Sat	6/7	8:00	12:00	13:00	16:30											7.50				0.00	7.50	
Sun	6/8																			0.00	0.00	
Mon	6/9	8:00	12:00	13:00	16:30											7.50				0.00	7.50	
Tue	6/10	8:00	12:00	13:00	16:30											7.50				0.00	7.50	
Wed	6/11	8:00	12:00	13:00	16:30											7.50				0.00	7.50	
Thu	6/12	8:00	12:00	13:00	16:30											7.50				0.00	7.50	
Fri	6/13																			0.00	0.00	
Sat	6/14																			0.00	0.00	
Sun	6/15	8:00	12:00	13:00	16:30	17:00	18:30									9.00				0.00	9.00	
TOTALS															0.00	0.00	94.00	0.00	0.00	0.00	0.00	94.00

EXAMPLE

Charge to:			Comments		Comments	
	Notation	CCLC				
1			6/1		6/9	
2			6/2		6/10	
3			6/3		6/11	
4			6/4		6/12	
Total			6/5		6/13	
			6/6		6/14	
			6/7		6/15	
			6/8			

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

Joe Shmo Date: 6/15/03
Employee's Signature

Supervisor's Signature Date: _____

Approving Officer Signature Date: _____

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	CCLC
Leave & Holiday	0.00	No code needed for Leave & Holiday

Ver. 1.8.4
Revised 2/20/99

Appendix D3.–Sample schedule for smolt crew

EMPLOYEE	Activity	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total
FWT-III	trap check & enumeration	00:00-4:00	00:00-4:00	00:00-4:00	00:00-4:00	00:00-4:00	00:00-4:00	00:00-4:00	
	trap check & enumeration	23:00-23:59		23:00-23:59	23:00-23:59	23:00-23:59	23:00-23:59		
	Dye test		20:00-23:59					20:00-23:59	
hours		5	8	5	5	5	5	8	41
FWT-II	sample & clean traps	10:00-13:00	10:00-13:00	10:00-13:00	10:00-13:00	10:00-13:00	10:00-13:00	10:00-13:00	
	trap check	17:00-18:00	17:00-18:00	17:00-18:00	17:00-18:00	17:00-18:00	17:00-18:00	17:00-18:00	
	trap check	21:00-22:00		21:00-22:00	21:00-22:00	21:00-22:00	21:00-22:00		
	Dye test		20:00-23:59					20:00-23:59	
		5	8	5	5	5	5	8	41
College Intern	trap check & enumeration	00:00-4:00	00:00-4:00	00:00-4:00	00:00-4:00	00:00-4:00	00:00-4:00	00:00-4:00	
	trap check & enumeration	23:00-23:59		23:00-23:59	23:00-23:59	23:00-23:59	23:00-23:59		
	Dye test		20:00-23:59					20:00-23:59	
		5	8	5	5	5	5	8	41
College Intern	sample & clean traps	10:00-13:00	10:00-13:00	10:00-13:00	10:00-13:00	10:00-13:00	10:00-13:00	10:00-13:00	
	trap check	17:00-18:00	17:00-18:00	17:00-18:00	17:00-18:00	17:00-18:00	17:00-18:00	17:00-18:00	
	trap check	21:00-22:00		21:00-22:00	21:00-22:00	21:00-22:00	21:00-22:00		
	Dye test		20:00-23:59					20:00-23:59	
		5	8	5	5	5	5	8	41

Note: This schedule leaves time for unexpected trap maintenance, trap adjustments, or other unforeseen items. It is intended to be adjusted for daily variations as needed. Traps will often need cleaning during the evening trap check, for example, and high fish passage may require more frequent or longer duration checks, or the morning check to occur before 10:00 AM. During periods of low fish passage, only one employee may be needed to check the trap at 17:00 or 21:00.

**APPENDIX E. WEATHERPORT ASSEMBLY
INSTRUCTIONS**

Appendix E1.-Instructions for set up of Weatherport.



ALASKA FABRICS, INC. DBA
ALASKA TENT & TARP
529 Front Street - Fairbanks, AK 99701
(907) 456-8328 - Fax (907) 452-5260
1-800-478-8368 (within AK)
E-mail: aktent@ptialaska.net
<http://www.ptialaska.net/~aktent>

INSTRUCTIONS
FOR SETTING UP A
12x PORTABLE BUILDING

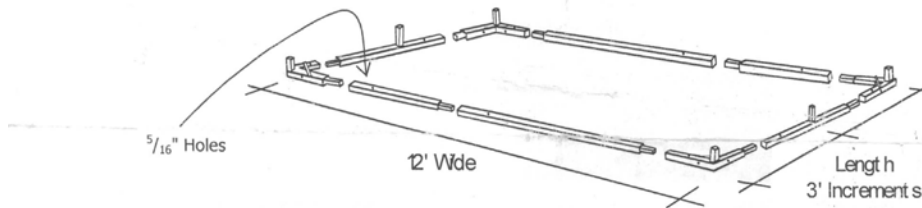


Thank you for purchasing an ALASKA TENT & TARP Portable Building. You should have received five (5) bags:

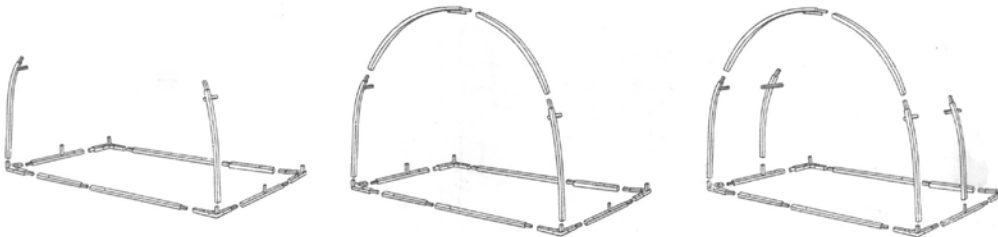
- 1) Fabric Top Cover and Fabric End Panels
- 2) Base Frame and Corners
- 3) Wall Legs
- 4) Arches
- 5) Spanners and Augers

Your building has been set-up in our shop. We believe you should have all the correct pieces and parts. (see Parts List) The set-up procedures are as follows:

- 1) Prepare the building site. If you are building a platform, the finished dimensions are that of the building's footprint. (e.g. 12' x 18' Portable Building fits onto a 12' x 18' platform)



- 2) Layout the four (4) corners and base pieces and slip fit together. Each base piece has a $\frac{5}{16}$ " drilled through it. These holes are used to anchor the building to a platform (use $\frac{1}{4}$ " lag screws – not included) or to the ground (use nail spikes – not included). Do not anchor the base frame at this time, because the fabric cover and web straps are drawn under the frame.



- 3) Starting at one end of the base (front or back) install the wall legs, then, the arches – one section at a time. (If you put all the wall legs in first, they tend to torque and stress the base frame)

NOTE: The four (4) wall legs used for the end panels have insert posts that need to point inward. There are two left-hand and two right-hand legs.

The two (2) long arches for the end panels are identical. Since the insert posts are top center, the long arch can go on the left side or the right side, whichever is necessary so that the insert posts point inward.

12xPB-8 Written Instruction

-continued-

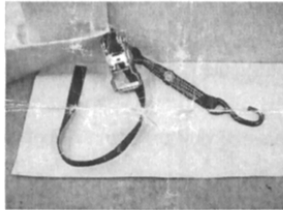


7) Your top cover has been fan folded. Standing outside of the building and looking at the front, place the cover outside the building on the ground on the left side and unroll it to the back.

NOTE: We suggest you remove the two ratchets from the edge of the cover that is going to be pulled up and over the frame. If the ratchets are left in place, they tend to get hooked up on the frame and there is the possibility of being hit by them.

Pull the cover up and over the frame. The cover should overlap each end by about six (6) inches.

8) Going inside the building, pull all of the web straps under the base frame and put them into the spring buckles. Leave loose.



9) Anchor the four (4) ratchets. There are several options offered:

- a) Anchor the ratchet to the base corner. Using a 1/4" x 2" hex cap bolt, through bolt the ratchet to the base corner. You will need to puncture a hole in the fabric wall end for the bolt to go through.
- b) Anchor the ratchet to the building platform. Using the grommet that is in the web strap hook, bolt the web strap to your platform.
- c) Anchor the ratchet to the ground. Using the augers (provided) screw the auger into the ground and hook, bolt, or tie the web strap to it.

NOTE: In high wind areas it is very important to securely anchor your building to the ground if possible for the building to blow away.

**APPENDIX F. LANDS SURROUNDING KARLUK SMOLT
CAMP**

Appendix F1.-Koniag land use map.

