

**Kodiak Commercial Fisheries Salmon Management  
Field Camp and Weir Operational Plan, 2014**

by

**Brad A. Fuerst**



---

---

April 2014

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



## Symbols and Abbreviations

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

<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics</b>	
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 <sub>A</sub>
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	<i>e</i>
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, $\chi^2$ , 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	
		corporate suffixes:		(simple)	r
<b>Weights and measures (English)</b>		Company	Co.	covariance	cov
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	degree (angular)	°
foot	ft	Incorporated	Inc.	degrees of freedom	df
gallon	gal	Limited	Ltd.	expected value	<i>E</i>
inch	in	District of Columbia	D.C.	greater than	>
mile	mi	et alii (and others)	et al.	greater than or equal to	≥
nautical mile	nmi	et cetera (and so forth)	etc.	harvest per unit effort	HPUE
ounce	oz	exempli gratia	e.g.	less than	<
pound	lb	(for example)		less than or equal to	≤
quart	qt	Federal Information Code	FIC	logarithm (natural)	ln
yard	yd	id est (that is)	i.e.	logarithm (base 10)	log
		latitude or longitude	lat or long	logarithm (specify base)	log <sub>2</sub> , etc.
<b>Time and temperature</b>		monetary symbols (U.S.)	\$, ¢	minute (angular)	'
day	d	months (tables and figures): first three letters	Jan, ..., Dec	not significant	NS
degrees Celsius	°C	registered trademark	®	null hypothesis	H <sub>0</sub>
degrees Fahrenheit	°F	trademark	™	percent	%
degrees kelvin	K	United States (adjective)	U.S.	probability	P
hour	h	United States of America (noun)	USA	probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
minute	min	U.S.C.	United States Code	probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	second (angular)	"
<b>Physics and chemistry</b>				standard deviation	SD
all atomic symbols				standard error	SE
alternating current	AC			variance	
ampere	A			population	Var
calorie	cal			sample	var
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				

***REGIONAL OPERATIONAL PLAN CF.4K.2014.10***

**KODIAK COMMERCIAL FISHERIES SALMON MANAGEMENT FIELD  
CAMP AND WEIR OPERATIONAL PLAN, 2014**

by

Brad A. Fuerst

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

Alaska Department of Fish and Game  
Division of Commercial Fisheries

April 2014

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

*Brad A. Fuerst  
Alaska Department of Fish and Game, Division of Commercial Fisheries,  
351 Research Court, Kodiak, AK 99615, USA*

*This document should be cited as:*

*Fuerst, B. A. 2014. Kodiak commercial fisheries salmon management field camp and weir operation plan, 2014. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Operational Plan ROP.CF.4K.2014.10, Kodiak.*

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

**If you believe you have been discriminated against in any program, activity, or facility please write:**

ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK 99811-5526

U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street NW MS 5230, Washington DC 20240

**The department's ADA Coordinator can be reached via phone at the following numbers:**

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648,

(Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

**For information on alternative formats and questions on this publication, please contact:**

ADF&G, Division of Sport Fish, Research and Technical Services, 333 Raspberry Rd, Anchorage AK 99518 (907) 267-2375

**SIGNATURE/TITLE PAGE**

Project Title: Kodiak Commercial Fisheries Salmon Management Field Camp and Weir Operational Plan, 2014

Project Leader(s): Geoff Spalinger, Fishery Biologist II  
Matt Keyse, Fishery Biologist II

Division, Region and Area: Division of Commercial Fisheries, Region IV, Kodiak

Project Nomenclature:

Period Covered: January 2014 – December 2014

Field Dates: May 2014 – September 2014

Plan Type: Category I

**Approval**

Title	Name	Signature	Date
Project Leader	Geoff Spalinger		4/3/14
Project Leader	Matt Keyse		4/3/14
Section Supervisor	Jeff Wadle		4/2/14



# TABLE OF CONTENTS

	Page
LIST OF TABLES.....	iv
LIST OF FIGURES.....	iv
LIST OF APPENDICES.....	v
ABSTRACT.....	1
PURPOSE.....	1
OBJECTIVES.....	2
Opening Camp.....	2
Weir Installation.....	2
Weir Operation.....	3
Weir Maintenance.....	4
Weir Removal.....	4
Escapement Sampling.....	5
Crew Leader Responsibilities.....	5
Daily Radio Schedule.....	5
Forms.....	6
Time Sheets.....	6
Data Management.....	6
Camp Inventory and Closing Camp.....	6
Additional Guidelines And Procedures.....	6
Camp Policies.....	6
Ordering Food and Supplies.....	7
Visitors/Public Interaction.....	7
Firearms.....	7
Bears.....	7
Garbage.....	8
Fire and First Aid Safety.....	8
Drinking Water.....	8
Boats and ATVs.....	8
Equipment Maintenance.....	9
Maintenance and Cleanliness of Cabins and Outbuildings.....	9
Compliance with ADF&G Regulations.....	9
Basic Procedures Regarding Violations.....	9
Personal Injury.....	10
Emergencies.....	10
SCHEDULE AND DELIVERABLES.....	11
RESPONSIBILITIES.....	11
REFERENCES CITED.....	12
TABLES AND FIGURES.....	13
APPENDIX A. WEIR CAMPS.....	25
Weir Installation.....	30
Weir Maintenance.....	31
Miscellaneous.....	31
Opening Camp.....	33
Weir Installation.....	33

## TABLE OF CONTENTS (Continued)

	<b>Page</b>
Weir Maintenance .....	34
Miscellaneous.....	34
OBJECTIVES.....	35
METHODS.....	35
Timing of sampling .....	35
Smolt Catch and Species Enumeration.....	36
Smolt Sampling .....	36
Collection of Smolt Samples for Genetic Analysis .....	37
Reporting .....	38
SCHEDULE AND DELIVERABLES .....	38
RESPONSIBILITIES .....	38
SAMPLING PROCEDURES FOR SOCKEYE SMOLT .....	39
DATA ENTRY/MANAGEMENT .....	41
PHOTOS OF FISHES PRESENT IN THE SOUTH OLGA LAKES (UPPER STATION) WATERSHED .....	49
TISSUE COLLECTION FOR GENETIC SAMPLING.....	51
REFERENCES CITED .....	54
APPENDIX B. SATELLITE TELEPHONE AND DISPATCH INSTRUCTIONS .....	55
APPENDIX C. ELECTRICAL SYSTEM OPERATION MANUAL.....	59
APPENDIX D. GENERAL EQUIPMENT AND CAMP MAINTENANCE .....	63
APPENDIX E. JUVENILE SALMON IDENTIFICATION KEY.....	69

## LIST OF TABLES

<b>Table</b>	<b>Page</b>
1. Emergency numbers, radio frequencies and camp GPS coordinates.....	14
2. Equipment and supply list.....	15
3. Example of a weir camp closing inventory.....	17
4. Camp closing checklist.....	18

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
1. Map depicting the Kodiak Salmon Management Area.....	19
2. Map depicting the Kodiak Management Area weir locations operated in 2014.....	20
3. Picture of weir trap setup.....	21
4. Weekly weir camp reporting form.....	22
5. Daily crew leader report.....	23
6. Timesheet example.....	24

## LIST OF APPENDICES

<b>Appendix</b>	<b>Page</b>
A1. Karluk weir.....	26
A2. Ayakulik weir.....	28
A3. Upper Station weir. ....	30
A4. Dog Salmon weir.....	33
A5. Upper Station sockeye salmon smolt sampling. ....	35
B1. Satellite telephone and dispatch instructions.....	56
C1. Solar panel and electrical system operation manual.....	60
D1. General equipment and camp maintenance.....	64
E1. Juvenile salmon identification key. ....	70
E2. Juvenile salmon identification. ....	76



## ABSTRACT

The Alaska Department of Fish and Game (ADF&G) Division of Commercial Fisheries staff will operate eight weirs in the Kodiak Management Area (KMA) in 2014. These weirs are located on the Karluk River, Ayakulik River, Dog Salmon Creek, Olga Creek (Upper Station), Afognak River (Litnik), Saltery Creek, Pasagshak River and Pauls Creek. The weirs are used to enumerate salmon escapements into river systems and are critical management tools because they provide information that assists ADF&G management staff in deciding when to open and close salmon fisheries throughout the season. This operational plan informs seasonal employees of their responsibilities to run effective field camps, operate weirs, and live at remote sites. Operation dates for each weir vary depending upon the run timing of salmon populations into the different systems; however, most begin in late May and continue through mid-September. Chinook *Oncorhynchus tshawytscha*, sockeye *O. nerka*, coho *O. kisutch*, pink *O. gorbuscha*, and chum salmon *O. keta*; as well as steelhead *O. mykiss*, and Dolly Varden *Salvelinus malma* are individually counted by field crews. Escapement data collected provides the basis for inseason management actions regulating the commercial, sport, and subsistence fisheries in the KMA.

Key words: weir, escapement, salmon, Kodiak Management Area, field camp, operational plan, ADF&G, KMA, CFD, Upper Station, Litnik, Dog Salmon, Karluk, Ayakulik, Saltery, Pasagshak, Pauls, fishery, Chinook salmon, *Oncorhynchus tshawytscha*, sockeye salmon, *Oncorhynchus nerka*, coho salmon, *Oncorhynchus kisutch*, pink salmon, *Oncorhynchus gorbuscha*, chum salmon, *Oncorhynchus keta*, Dolly Varden, *Salvelinus malma*, ROP

## PURPOSE

This operational plan informs Alaska Department of Fish and Game (ADF&G) seasonal field camp employees of their responsibilities for opening and closing field camps. This operational plan instructs them on preparing, maintaining, installing, and operating weirs, and provides tips on how to effectively accomplish required tasks, duties, and responsibilities while in the field. Field employees must read the Standard Operating Procedures (SOP) pertinent to their position and be familiar with the 2014 Kodiak Management Area (KMA) commercial salmon fishery harvest strategy (Keyse *In prep*). Also this document is intended to show how the weirs will be operated in 2014 for future users of the results.

## BACKGROUND

The KMA encompasses the entire Kodiak Archipelago and that portion of the Alaska Peninsula with waters draining into Shelikof Strait from Cape Douglas to Kilokak Rocks (Figure 1). The KMA is composed of seven commercial salmon fishing districts and 52 sections, which encompass approximately 440 streams supporting commercially viable salmon runs. Five species of salmon are harvested within the KMA. The sum of the escapement goal ranges for KMA salmon spawning systems are 7,000–13,000 Chinook salmon *Oncorhynchus tshawytscha*; 789,000–1,691,000 sockeye salmon *O. nerka*; 5,800–9,800 coho salmon *O. kisutch*; 2,250,000–6,000,000 pink salmon *O. gorbuscha* in odd years and 3,250,000–8,000,000 in even years; and 255,000 chum salmon *O. keta* (Nemeth et al. 2010). Only four streams in the KMA have established coho salmon escapement goals, all of which are accessible from the Kodiak road system.

Weirs are used to enumerate the number of sockeye salmon in major systems in the KMA. These systems include the Karluk River, Ayakulik River, Dog Salmon Creek, and Upper Station (Olga Creek); (Figure 2). Litnik (Afognak River), Pauls Bay (Pauls creek), and Pasagshak weirs are the only weirs on minor systems (Figure 2) operated by ADF&G Division of Commercial Fish Research staff. Other weirs located on minor systems include Buskin River weir (ADF&G Sport Fish), and Saltery Creek weir (ADF&G with funding from Kodiak Regional Aquaculture

Association). Aerial and foot surveys are conducted to estimate escapement on streams without weirs.

ADF&G personnel will collect biological samples from sockeye salmon (i.e., scales for age, sex, and length data [ASL]). These samples provide the foundation for preseason run forecasts, escapement goal evaluation, and accurate assignment of the run to the stock of origin (run reconstruction; Moore 2013). It is important that the data collected are of the highest quality.

ADF&G will operate KMA weirs from approximately May 22 through September 15. Two crew members are assigned to each weir. Additional assistance may be provided during weir installation and removal, periods of intense salmon escapements, high water, and heavy debris loads.

James Jackson, the Kodiak Finfish Area Management Biologist, is responsible for the management of KMA commercial salmon fisheries and is the overall project supervisor. Kodiak finfish management biologists Geoff Spalinger and Matt Keyse are the weir camp project biologists. Brad Fuerst is the weir camp technical advisor. They will provide oversight, logistical, and technical support for weir operations (Table 1).

## **OBJECTIVES**

The objectives of this plan are to annually

1. Enumerate adult salmon escapement through the weir and estimate salmon abundance below the weir in rivers, lagoons and bays,
2. Monitor and collect accurate data on escapement quality, including the number of net-marked and “jack” (salmon  $\leq 400$  mm mid eye to tail fork) sockeye salmon, and
3. Collect and maintain accurate age, sex, length (ASL) data for sockeye salmon, including collection of scale samples that are representative of salmon escapements.

## **METHODS**

### **OPENING CAMP**

Gather necessary equipment from the ADF&G warehouse prior to departure (Table 2). Upon arrival at camp, the first day of work will consist of opening the field camp facility, organizing and storing supplies and personal gear, setting up the single sideband (SSB) radio & satellite dispatch phone, and preparing the necessary gear and equipment for weir installation. Weir installation will normally occur after the field cabin has been readied.

### **WEIR INSTALLATION**

Refer to Appendix A for weir operations specific to individual camps.

The following list describes procedures relevant to all camps:

- Move tripods from their staged location into the river and evenly space them across the river.
- Line up and square the tripods perpendicular to the river flow.
- Fine tune tripod spacing and leveling. Level each tripod by digging under the highest rear leg to level it out. Leveled tripods make it easier to install and level the boardwalk.

- Install the entire boardwalk shiplap on the posterior portion of the tripod arms; do not nail boardwalk down until it is all leveled. Start at one end of the weir, laying a 2” x 12” x 14’ board across the first set of tripod arms and ensuring it rests on the next consecutive tripod arm. Continue laying out the boardwalk the length of the weir.
- Level the boardwalk with spacers or leveling blocks nailed to the tripod arm, and fine tune the straightness of the boardwalk. Toenail the boardwalk to tripod arms and toenail the boards that overlap one another together with 16d duplex nails. Make sure the end of each individual board rests on a tripod arm.
- Place large rocks or sandbags on each tripod platform to weigh them down.
- Install upper and lower stringers in an alternating pattern across all tripods and extending to the riverbanks on both ends of the weir.
- Begin installing weir panels. Lay each panel flat against the stringers with the base of the panel up off the riverbed approximately 10 inches. Rake and dig a channel in the river bottom to set the panel into. Once a channel is dug, set the panel into the channel and make sure it is straight and level. Next, backfill the channel with stream gravel and rock to ensure it is fish tight. Continue setting weir panels the length of the weir.
- Install counting gate frames along with your weir panels. Determine counting gate locations based on stream depth and river flow. Install gate frames where water flow is greater and depth is adequate for fish passage.
- Tie off all of the weir panels to the upper and lower stringer with seine twine or cable ties.
- Install flash panels in front of and against each counting gate on the river bottom and weigh down with large rocks or sandbags.
- Inspect your work. Walk along the front of the weir backfilling the base of panels with gravel where necessary to ensure the weir is fish tight.
- Install fish trap (Figure 3).
- Install “keep off weir” signs at either side of the weir.

## **WEIR OPERATION**

Refer to Appendix A for weir operations specific to individual camps.

The following list describes procedures relevant to all camps:

- The crew leader will organize a schedule to monitor weirs throughout the day to pass fish.
- If you don’t have experience identifying fish, your crew leader will train you to visually recognize the different salmon species and their swimming patterns.
- Open a gate and begin counting fish with hand-held tally counters, one tally counter for each species. Regulate the gate opening by using a wedge to lock the gate into position. If you open the gate too far, fish will pass through quickly and you will not be able to accurately count and identify them.
- If a counting gate will not open, it is probably locked up by gravel or a rock wedged into the framework. Do not attempt to force the gate, or the entire framework may pull out of place

along with the flash panel. Free up the gate by inspecting for wedged rock or gravel and removing it with your fingers or a fish pew.

- When counting fish and conducting surveys, wear polarized glasses for greater visual recognition and eye protection from the sun's reflection off of the water.
- Periodically check your tally counters to ensure they are working properly.
- When you are done counting make sure the counting gate is closed completely. Then write your numbers down on the dry erase board upon entering the cabin or tent.

## **WEIR MAINTENANCE**

Refer to Appendix A for weir operations specific to individual camps.

The following list describes procedures relevant to all camps:

- When out on the weir, be very careful not to injure yourself.
- The weir must be cleaned and inspected daily. Debris build up on the weir may cause poor water flow, leading to scouring at the base of weir panels and weir washout during periods of high water.
- Cleaning the weir includes getting into the river to remove sticks, logs, leaves, grass, gravel and fish carcasses.
- Throw all debris downstream of the weir, allowing it to flow down river.
- Inspect the weir to ensure it is fish tight. Look for scour holes, panels out of place, gaps that are too large between panels, and sandbags that have been pushed off of tripods by bears. Make sure flash panels are secure and in place, as well as clean.
- Make sure the framework of the weir is sound and secure. If you find any of the boardwalks loose, any section or parts of the weir broken by bears or that are unsafe, repair it immediately.
- If water levels increase considerably you may need to pull weir panels to avoid a weir wash out. When panels are pulled, an estimate of the number of salmon behind the weir at the time of pulling panels, and an estimate of what may have escaped through while panels were pulled should be documented.
- Keep bears away and off of the weir as much as possible to minimize damage. Follow camp protocol for bear determent.

## **WEIR REMOVAL**

Refer to Appendix A for weir operations specific to individual camps.

The following list describes procedures relevant to all camps:

- Remove counting seats and "keep off weir" signs.
- Cut and remove all seine twine or cable ties attaching the weir panels to the upper and lower stringers.

- Remove all weir panels, counting gates, and flash panels, and place them on the rear of the tripods. Place half of all weir panels, gates, and flash panels at staging locations on either side of the river.
- Remove all upper and lower stringers and store in appropriate staging location.
- Remove all duplex nails securing the boardwalk, then move all sections of the boardwalk and store in appropriate staging location.
- Remove all sandbags from tripods and place half of them on one side of the river bank and the other half on the other side of the river bank.
- Remove half of all tripods and stage on one side of the river; remove the other half and stage on the opposite side of the river.
- Remove all sandbags from the river.
- Stage weir materials in a location far enough from the bank of the river to avoid damage from flooding and ice movement during spring break-up.
- Remove all trash and bring to town (chewed up buoys, burned trash, old fuel buckets, etc.).

## **ESCAPEMENT SAMPLING**

In most camps, sockeye salmon ASL sampling is conducted at a rate of 240 fish per statistical week (Saturday through Friday). Ideally, 80 samples are collected each Monday, Wednesday, and Friday. If it is obvious to the crew leader that following this strategy will result in failure to obtain the desired 240 samples per week, adjustments should be made. Before the field season begins, the KMA salmon research staff will provide field crews a salmon escapement sampling operational plan (Moore *In prep*). Refer to this plan for sampling guidelines and procedures. Ask a weir camp project supervisor if you have any sampling questions.

## **CREW LEADER RESPONSIBILITIES**

Crew leaders are responsible for training new employees, establishing work schedules, prioritizing daily work assignments, and supervising camp duties. The crew leader will ensure safety is a priority and collect accurate, complete, and well organized data.

## **Daily Radio Schedule**

The previous day's counts and cumulative salmon escapement information will be reported each morning at approximately 8:10 AM on single side band (SSB) frequency 3.230 MHz (Table 1) to the Kodiak ADF&G office. A second radio report will be at 4:30 PM on the SSB. The afternoon schedule is intended to check on field personnel, discuss salmon escapement and build up, pass along short lists of supply requests, and receive the latest commercial fishery announcements. Radio schedules are very important, and must be taken seriously. Failure to make two consecutive radio schedules may result in a flight to the camp to ensure the safety of the crew. Advise your supervisor if you plan to miss a radio schedule. Keep your SSB battery charged and have spare fuses available. **You may contact someone at the Kodiak ADF&G during normal working hours (M-F 8:00AM–4:30PM) on SSB frequency 3.230 MHz.**

Use the satellite dispatch phone if the radio will not operate. **The satellite dispatch phone may also be used for communicating with the office when SSB reception is poor.** Refer to

Appendix B for satellite phone and dispatch instructions and Appendix C for instructions on operating your electrical system.

## Forms

The crew leader will fill out a weekly salmon weir camp report (Figure 4) and a daily crew leader report (Figure 5). The weekly salmon weir camp report includes weather and daily escapement data that occurred during the past week. The daily crew leader report will keep the project supervisor informed of fish estimates, conflicts with crew or public, and the duties accomplished during the past two weeks. In addition, any items that were sent to the office and any items that were not received on the most recent supply flight will be recorded. All paperwork is to be sent to the office on resupply flights.

## Time Sheets

**Crew leaders are responsible for keeping an accurate record of each employee's work hours.** Each employee will fill out a timesheet on the 15<sup>th</sup> and the last day of each month (Figure 6). Most projects can be finished within normal working hours; however, there may be occasions when the normal working day (7.5 hours) is insufficient to complete the necessary tasks. **If unusual circumstances arise that require additional overtime, the crew leader must notify the project leader immediately.** Send in signed timesheets with resupply flights. **Complete timesheets in PEN only (blue ink if available). If you cross out anything on your timesheet you must initial by where you crossed it out. Do not use whiteout.**

## Data Management

It is imperative that measurements be accurate and data be recorded properly. Forms and samples should be complete, correct, and neat. It is the crew leader's responsibility to keep a daily log that includes a record of weather, water temperature, stream depth (recorded at 7:55 AM), water conditions, work accomplished, escapement counts, and survey notes. Additional entries should include comments related to fishing activity, bear and people encounters, smolt migrations, weir problems, regulation violations, cabin maintenance, and aircraft traffic.

## Camp Inventory and Closing Camp

Each camp will be inventoried for all gear, supplies and fuels that remain on site prior to camp closure. Winterizing the cabin should include (but is not limited to) covering windows, covering and insulating propane connections, closing and locking all doors, winterizing all motorized equipment, and chaining and locking boats in a secure location. See Tables 2, 3, and 4 for examples of a weir camp closing inventory and a camp closing checklist.

## ADDITIONAL GUIDELINES AND PROCEDURES

Refer to SOP III-720 for Field Camp Safety procedures, SOP III-730 for Aircraft Safety for Passengers and SOP III-770 for Small Tool Handling.

## Camp Policies

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

- All ADF&G employees are required to act in a professional manner at all times and be especially courteous to the public.
- **Injuries and loss or damage of state equipment must be reported to the project supervisor within 24 hours.**

### **Ordering Food and Supplies**

Field crews will purchase necessary items prior to leaving Kodiak and may also request items (e.g., groceries, supplies and equipment) while in the field. Crews will only purchase items authorized by the project leader. Grocery and supply flights are scheduled twice a month. Grocery orders for 2 weeks out will need to be sent in on the backhaul of the last grocery flight (**i.e. your grocery order will need to be sent in 2 weeks early**). You can always add items to the list at a later time before the supply flight. Order enough food to eat healthy, but be reasonable. If grocery orders become unreasonable, less expensive items will be substituted. Grocery and supply orders must be in the Kodiak office at least one week prior to the scheduled flight. Grocery forms/ordering lists are provided to keep track of needed items.

Alcoholic beverages, personal grooming supplies, newspapers, magazines, and tobacco must be purchased with personal funds. Personal funds may be left with the logistics specialist who will put the funds in a secure location until requested for use in purchasing personal items.

### **Visitors/Public Interaction**

Weir sites often receive many visitors that come by the camp to see bears and watch fish passing through the weir. Keep the camp clean and be courteous and helpful to visitors, but also inform them of the boundaries. The general public is not allowed to access the weir. Make sure “keep off weir” signs are posted in visible locations at both ends of the weir. In addition to those signs make sure to install the “no sport fishing” signs 100 yards upstream and downstream of the weir. Remember, your primary role is to operate and maintain the weir and accomplish the associated responsibilities of the project.

### **Firearms**

All field camp employees must be able to safely use firearms. A state owned shotgun will be provided at each camp. Training on safe handling and shooting of firearms will be conducted for all personnel. Only load firearms when working, traveling or camping in bear country, or when firing for practice. Load a round into the chamber only when confrontation with a bear is imminent. **Anyone handling a firearm should always treat it as if it is loaded.** Guns should be cleaned frequently, especially after being fired. Make certain that firearms are completely unloaded while doing so. Firearms will be stored on site in a location out of reach of the public. **Misuse of firearms will not be tolerated and may be cause for immediate dismissal.** Always unload a firearm of all ammunition before boarding a vessel or aircraft. Ammunition should be stored in a cool place in a waterproof container to avoid corrosion. For more information on firearm safety, refer to SOP III-780.

### **Bears**

Weir camps have high concentrations of bears. Do not antagonize bears. Make every attempt to coexist with them. Each bear is a potential danger. Do not attract bears by leaving food or unburned garbage around camp. Make sure you burn trash completely and maintain a clean camp. If you are having problems with a particular bear notify your supervisor. When attempting

to frighten a bear away by shooting, shoot away from the bear to avoid inadvertently wounding it. Do not shoot a bear unless, in your best judgment, it is endangering someone's life. Do not shoot unless it is absolutely necessary. If a bear is shot, notify your project supervisor immediately. If a bear hangs around or on the weir and will not leave, cracker shells can be loaded and shot in the approximate direction of bears, but **NOT at the bears**. Rocks may also be used at your discretion, keeping in mind that a bear is a potential danger. For more information on bear safety, refer to SOP III-780 and SOP III-720.

## **Garbage**

Burn garbage completely to prevent bear problems. Do not burn during windy or dry weather conditions. The U.S. Fish and Wildlife Service prohibits garbage pits on the Refuge. Never start fires with fuel. To prevent grass fires keep grass and brush trimmed at least fifteen feet away from the burn barrel. It is best to burn trash early in the morning or late in the evening when the wind is minimal and humidity is high. Never leave a fire unattended.

Burn tin cans along with burnable garbage. Burning cans eliminates residual food and odors that attract bears. Send in burnt cans and non-burnable items on supply flights. **All garbage must be double bagged**. Empty fuel containers should also be sent in as soon as possible on return grocery flights for immediate recycling.

Use a slop bucket for biodegradable garbage (food scraps, etc.) that is dumped away from camp either in the river or bay. Do not compost food because it attracts bears.

## **Fire and First Aid Safety**

All crew members will attend a mandatory CPR and First Aid training course prior to going to the field. Ensure a fully stocked first aid kit and fully charged, operational fire extinguishers are in camp and that all personnel know where they are located and how to use them. Make sure smoke and carbon monoxide alarms are installed and operational. **(Install new batteries at the beginning of each season)**. Refer to SOP III-700 and SOP III-720 for more information regarding safety and first aid.

## **Drinking Water**

Stream and lake water may be contaminated with bacteria or harmful parasites. "Micron" water filters are provided in field camps to filter all drinking water. If filter cartridges are damaged, replace them immediately. If filters are not available, boil your drinking water for at least 10 minutes. Be sure to read the instruction manual with each filter for cleaning and care information.

## **Boats and ATVs**

Refer to SOP III-740 for Boating Safety protocol.

Some camps are furnished with boats or ATVs. They have been provided to transport materials, supplies, and equipment between campsites and supply planes or vessels. They may be used for transportation to and from assigned field duties such as surveys, fishery monitoring, or collecting harvest information. They are not intended for personal use or recreational purposes. Boats and ATVs may be accessed and operated only by trained ADF&G personnel and will be secured when not in use. Be safety conscious at all times; do not speed or drive recklessly.

All personnel must wear United States Coast Guard (U.S.C.G.) approved Personal Flotation Devices (life jacket, float coat, or exposure suit) at all times when operating boats. If you suspect conditions may be dangerously rough, do not go out on the water. A VHF radio, waterproof Emergency Positioning Indicator Radio Beacon (EPIRB), a flare kit and a tool kit (including wrenches, pliers, screw drivers, spare spark plugs, and spark plug wrench) must be in the boat or raft at all times. If you must travel at night, carry a flashlight. Know how to activate your EPIRB; check the battery power and expiration date.

Unauthorized use of an ADF&G ATV or boat will result in a notation on your evaluation, and the discontinuation of ATV or boat use at your field station, or your dismissal from employment.

- Only state employees may use ADF&G vehicles, ATVs, and boats.
- Only one employee may ride on an ATV at a time.
- A safety helmet must always be worn when riding an ATV.

### **Equipment Maintenance**

Outboard motors and generators must be kept in good operating condition and require regular maintenance. At the end of each season, equipment should be tagged with a description of the equipment's condition and most recent maintenance on the tag. All equipment returning to Kodiak is stored at the warehouse in the salmon management locker or the salmon management trailer van behind the warehouse. See Appendix D for instructions on operation and maintenance of outboards and generators.

### **Maintenance and Cleanliness of Cabins and Outbuildings**

Cabin and facility maintenance is an important aspect of camp life; the buildings must be kept clean, structurally sound, and safe. Make a list of projects and repairs that need to be accomplished during the season. Send in a list of materials needed for these projects/repairs. Order supplies in advance. Repairs and maintenance should be scheduled on days when fish migrations are slow to keep this work within normal work periods.

### **Compliance with ADF&G Regulations**

All employees are responsible for complying with local subsistence, sport fishing and hunting regulations. Copies of State and Federal regulations will be available to all field camp personnel. Any violation will be recorded on your evaluation and may be cause for immediate dismissal. Refer to SOP II-040.

### **Basic Procedures Regarding Violations**

ADF&G field personnel have a responsibility to be aware of and report violations of state or federal fishing and hunting regulations. The following is a guideline for obtaining the appropriate information and/or evidence to prove that a violation has been committed. If a violation is seen, all pertinent information pertaining to the violation should be recorded immediately, retained by the employee, and the project leader must be notified. A copy of each regulation book should be available in camp.

The use of the following five W's can aid in obtaining sufficient information pertaining to a violation:

1. What is the violation?

2. When did the violation take place?
3. Where did the violation occur?
4. Who is in violation and who are the witnesses?
5. Why was the violation committed?

Interview all witnesses to a violation and record statements pertaining to the violation along with witnesses' names and contact information (phone number and address). If you have a camera, record as much as possible on film. Always carry your camera if you suspect you may encounter a violation. Collect as much information and evidence as possible and immediately contact your supervisor or a State Trooper from the Alaska Wildlife Troopers (AWT). (907) 486-4121.

If the violator refuses to cooperate with an employee without enforcement authority, no action should be taken, other than to relay all information and evidence collected to an AWT officer as soon as possible.

### **Personal Injury**

Personal injury poses the greatest risk to personnel. In the event of major medical emergencies access to adequate care is limited due to the remote location of the facility. For minor injuries, first aid kits are located in the cabin. **In the event that you injure yourself, fill out an injury report as soon as possible and give to your supervisor.** For emergencies or injuries that require professional medical attention contact the United States Coast Guard (1-800-478-5555 or VHF channel 16) or refer to Table 1.

### **Emergencies**

In the event of a medical emergency, administer first aid to stabilize the situation. If an injury is life threatening, immediately notify the USCG at their Search and Rescue Emergency phone number **1-800-478-5555** on the satellite phone. The USCG can also be reached on SSB radio frequency 4.125 MHz or on VHF channel 16.

When contacting the USCG, have the following information ready to pass along:

- Location of your field camp or specific location of the emergency (Table 1);
- Name and phone number of supervisor;
- General nature of medical emergency;
- 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.

## **SCHEDULE AND DELIVERABLES**

---

<b>Date</b>	<b>Activity</b>
Late May	Open camps, install weirs
Late May through Mid-September	Pass, enumerate, sample salmon
Every two weeks	Resupply camps, send in sampling data
Mid-September	Remove weirs, close camps

---

## **RESPONSIBILITIES**

---

Project Fisheries Biologist II	Supervise project, assist in setup as needed, coordinate logistics
Project Fisheries Biologist I	Assist crew with setup, sampling, and enumeration as needed
Project Fish and Wildlife Technician III	Crew leader, create work schedules, supervise daily activities, train new personnel, ensure project and sampling goals are met, update Project FB II daily,
Project Fish and Wildlife Technician II	Assist crew leader with daily tasks to attain project goals

---

## REFERENCES CITED

- Keyse, M. 2014. Kodiak management area harvest strategy for the 2014 commercial salmon fishery. Alaska Department of Fish and Game, Fishery Management Report No. 14-13, Anchorage.
- Moore, M. L. 2013. Kodiak management area salmon escapement and catch sampling results, 2012. Alaska Department of Fish and Game, Fishery Data Series No. 13-48, Anchorage.
- Moore, M. L. In prep. Kodiak Management Area salmon catch and escapement sampling operational plan, 2014. Alaska Department of Fish and Game, Regional Operational Plan CF.4K.2014-XX, Kodiak.
- Nemeth, M. J., M. J. Witteveen, M. B. Foster, H. Finkle, J. W. Erickson, J. S. Schmidt, S. J. Fleischman, and D. Tracy. 2010. Review of escapement goals in 2011 for salmon stocks in the Kodiak Management Area, Alaska. Alaska Department of Fish and Game, Fishery Manuscript Series No. 10-09, Anchorage.

## **TABLES AND FIGURES**

Table 1.–Emergency numbers, radio frequencies and camp GPS coordinates.

<i>Contact</i>	<i>Phone Number</i>	<i>Radio Frequency</i>	<i>Other Frequencies</i>
US Coast Guard	800-478-5555	SSB Freq. 4.125 MHZ	VHF Channel 16
ADF&G Office	486-1830 or 486-1825	SSB Freq. 3.230 MHZ (WON 32)	2.450 MHz, 4.125 MHz
State Troopers	486-4121		

<i>ADF&amp;G Staff</i>	<i>Phone Number</i>
James Jackson	(w) 486-1808, (c) 539-2097, (h) 486-2480
Geoff Spalinger	(w) 486-1804, (c) 952-567-1420, (h) 486-5582
Matt Keyse	(w) 486-1807, (c) 978-6690
Brad Fuerst	(w) 486-1810, (c) 539-9033, (h) 486-4891

<i>Camps</i>	<i>GPS Coordinates</i>	<i>SSB Radio Call Sign</i>
Ayakulik	57° 11.60' N. Lat., 154° 31.39' W. Long	WQF 466
Karluk	57° 33.58' N. Lat., 154° 23.75' W. Long.	WNJI 929
Upper Station	57° 03.33 N. Lat., 154° 21.17' W. Long.	WNJI 929
Dog Salmon	57° 07.75' N. Lat., 154° 00.10' W. Long.	WNJI 929

Table 2.–Equipment and supply list.

---

Field equipment for the commercial fisheries salmon management weir and field projects is stored at the ADF&G warehouse on Rezanof Drive.

**Tent(s)** - If needed.

**Visqueen or tarp** - Use for tent ground cloth and to keep equipment and supplies covered when you arrive or depart from field camp.

**Raft** - Make sure proper floorboards, pump-hose, oars, drain plug, and patch kit are included. Assemble and inflate raft and check for leaks. Make sure you secure extra raft chamber valves.

**Outboard motor** - Bring spare spark plugs, lower end lube, fuel hose, and fuel filters. Make sure you have the proper fuel hose and tank for your motor. Don't forget 2-cycle or 4-cycle oil for the motors, as appropriate. Gas tanks are stored in the fuel shed. Change lower end unit lube at the end of the season.

**Cook stove & hose** - If needed, check to ensure it works. Propane tanks are in the fuel shed at the warehouse.

**Cooler(s)** - If needed.

**Lantern** - Remember to purchase lantern fuel and extra mantles. Make sure it works.

**SSB radio** - Make sure the radio suitcase contains the black coaxial cable, 12-volt power cable, antenna (3.230 MHz frequency) and spare fuses.

**Satellite Phone** - Make sure battery is good and that the phone is activated.

**Communications** - Handheld VHF radios plus an extra set of AA batteries.

**12 Volt battery** - Make sure to charge battery; battery testers are available at the office or the warehouse (battery must be transported in a case).

**Solar panel** - Check wires and connections.

**Boat kit** - A Rubbermaid tote should include: Lower end lube, fuel filters, hose connectors, hose clamps, seine twine, tool kit, outboard oil, cable ties, metal wire, fuel pump diaphragms and a flare kit.

**Propane** - Make sure propane tanks are full.

**Stove oil** - Use only #1 heating oil.

**Outboard gas tank, hose, oil & gas** - Be sure to know the correct mixture of your motor. Take at least 3 containers of gas, preferably one tank and two 5-gallon containers.

**Firearm & cleaning kit** - Shotguns, ammunition, and gun cases are available at the office; check with a project supervisor. Know how to clean, load, and carry the firearm safely.

**Emergency/ safety equipment** - EPIRB, rescue light, first aid kit, mustang suit or float coat.

**Groceries** - Purchase sufficient groceries for approximately two weeks, plus some extra quick meals in case supply flights are delayed. **When selecting groceries, consider the weight and bulk of your items, as space is limited on flights.**

---

-continued-

**Paperwork** – Paperwork is located in camp boxes in ADF&G office for your camp.

**Personal gear** - Warm clothes, sleeping bag & pad, books and any other hobbies you may want to work on.

**Sampling gear** - Scale cards, write in the rain books, polarized glasses, gloves, waders, wading boots and rain gear. Also a computer and RDA will be provided for sampling purposes only.

At the end of the field season, please make sure all equipment from your camp is put away properly and in the correct place. If you choose to return next season, this may again be your gear. A few items such as lanterns, SSB radios, and 12-volt batteries probably will be shared with the herring camps. Label your personal gear (waders, rain gear, etc.) with your name to ensure you receive your gear next season.

---

Table 3.—Example of a weir camp closing inventory.

**WEIR CAMP CLOSING INVENTORY**

Weir Camp: Karluk

Date 9/2008

<b># item</b>	<b>Location</b>
1 Stihl chainsaw	Shed
1 DeWalt tool set	Town warehouse
1 Skillsaw	Shed
1 Ratchet set	Shed
1 Stihl weed-eater	Shed
2 Flashlights	Attic
2 Headlamps	Attic
1 Shotgun cleaning kit	Storage bench
1 First aid kit	Town warehouse
3 Extension cords	Shed
2 Come alongs	Shed
3 Shovels	Shed
2 Rakes	Shed
3 Pews	Shed
2 4' levels	Shed
2 Hammers	Shed
1 Toolbox	Shed
1 5 gal. Gasoline	Shed
1 5 gal. Stove oil	Shed
1 100 lb. Propane tank (1/3 full)	Shed
1 40lb. Propane tank (1/2 full)	Shed
2 Handheld VHF's	Town warehouse
<b>Need for next season</b>	
100lb. Propane tank (full)	
15 gal. Gasoline	
15 gal. Stove oil	
New headlamps	
Garbage can	

Table 4.–Camp closing checklist.

---

### **Camp Closing Checklist**

#### **Camp chores (Depending on field camp)**

Box/store food  
Clean stove  
Clean behind stove  
Clean refrigerator-defrost and block door open  
Mop floor  
Make sure coax cable is secure  
Disconnect propane lines and tape ends  
Make a pile of gear to return to town  
Clean ashes out of wood stoves  
Spray tools with WD-40  
Winterize outboard-if not brought to town  
Store gas jugs in shed  
Flip outhouse and cover hole  
Lock and chain skiffs that remain onsite  
Make sure batteries are properly hooked up to solar panels for an overwinter charge  
Place mothballs in each room  
Store all tools  
Clean up burn pit  
Board windows  
Board shed door shut  
Cover chimneys with buckets

#### **Items to bring to town**

Radios-SSB and VHF  
Shotgun  
Satellite phone  
First aid kit  
Outboard motor-dependending on camp  
Generator-dependending on camp  
Solar panels-Karluk only  
Rafts (if any)

---

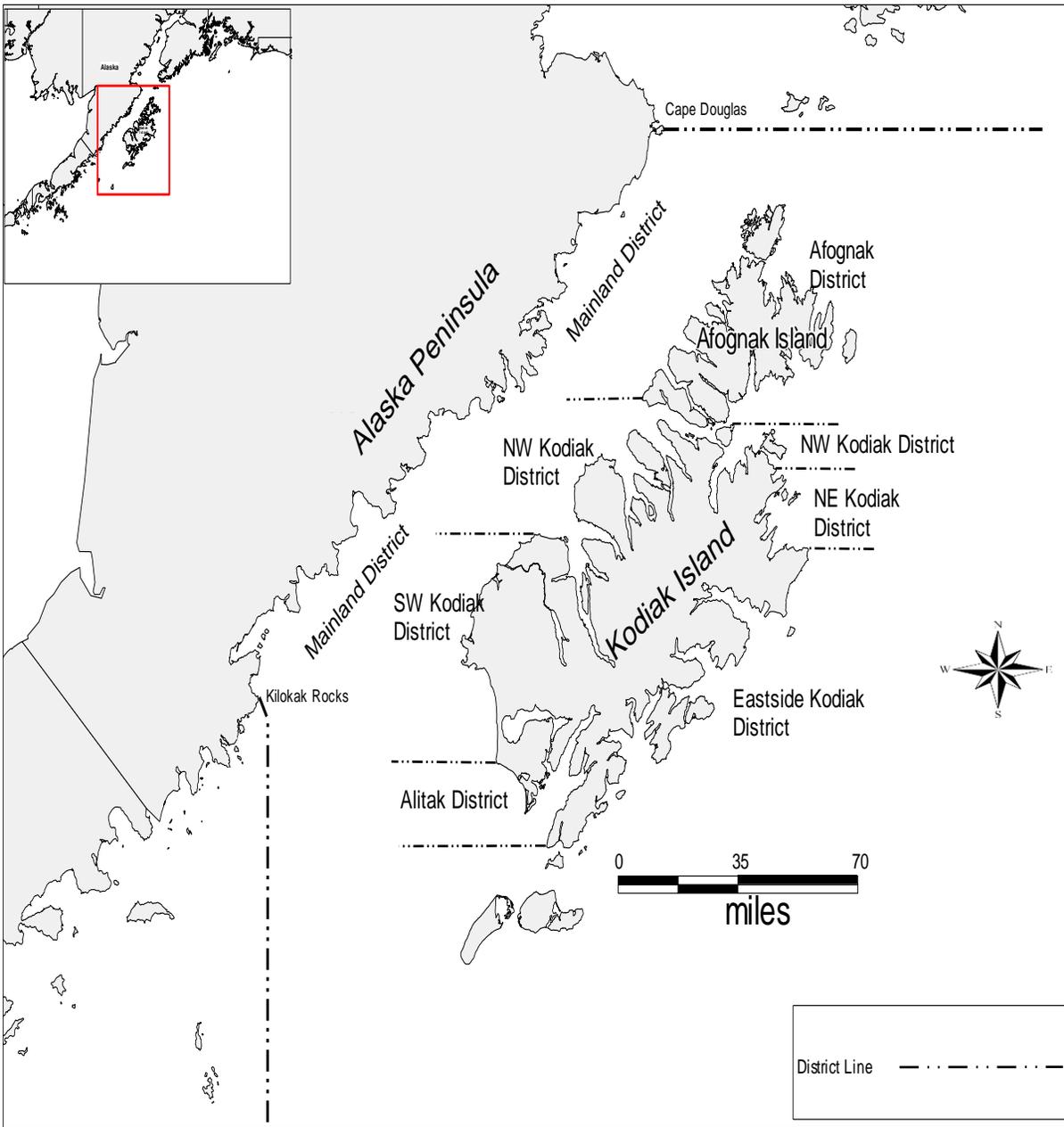


Figure 1.—Map depicting the Kodiak Salmon Management Area.

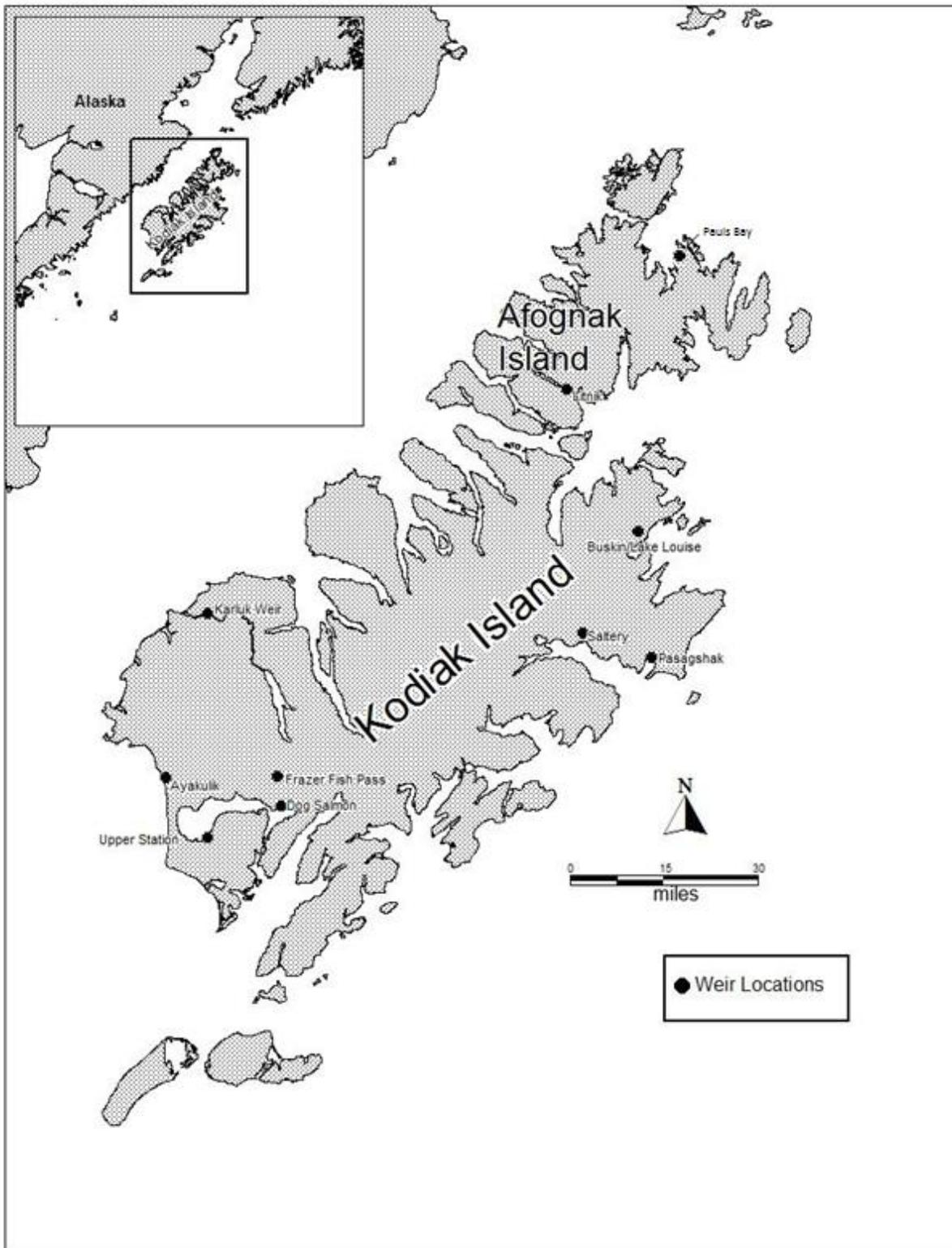


Figure 2.—Map depicting the Kodiak Management Area weir locations operated in 2014.



Figure 3.–Picture of weir trap setup.

**ALASKA DEPARTMENT OF FISH AND GAME  
KODIAK MANAGEMENT AREA  
WEEKLY SALMON WEIR CAMP REPORT FOR YEAR: 2005**

Location: Ayakulik      Personnel: Chiles/Reid      Weekly Report no: 7      For Week Ending Saturday: July 7

Date	Daily Total Salmon Escapement						Daily Totals	Steelhead		Jack No.	Jack % Sockeye	Net Mark Sockeye	Reds Sampled	Dollys up	H <sub>2</sub> O Level	H <sub>2</sub> O Temp.	Weather		
	Sockeye	L. Sockeye	Chinook	Pink	Coho	Chum		Down	Up								Ceiling	Vis.	Wind Dir/Sp
Sun. D	296		56	0	0	0	352	0	0	20	6.8	4	0	12	13	7.5	2,000 solid	5	SE 15-20
7/1 C	213,789		6,211	0	0	0	220000	697	0	4,256	2.0	675		623			Rain		
Mon. D	26		100	0	0	0	126	0	0	0	0.0	1	80	36	13.5	7.5	1,000 Solid	3-5	E 10-15
7/2 C	213,815		6,311	0	0	0	220126	697	0	4,256	2.0	676		659			RDF		
Tue. D	569		29	0	0	0	598	0	0	102	17.9	15	0	50	13.5	7.5	500 Solid	1-2	NE 20-25
7/3 C	214,384		6,340	0	0	0	220724	697	0	4,358	2.0	691		709			RDF		
Wed. D	2,326		39	0	0	0	2365	0	0	156	6.7	30	80	106	14	7.5	CAVU		SW 5-10
7/4 C	216,710		6,379	0	0	0	223089	697	0	4,514	2.1	721		815					
Thur. D	781		212	0	0	0	993	0	0	68	8.7	24	0	26	14	8	CAVU		Calm
7/5 C	217,491		6,591	0	0	0	224082	697	0	4,582	2.1	745		841					
Fri. D	105		62	0	0	0	167	0	0	9	8.6	5	80	16	13.5	8	4,000	Unl.	W 15
7/6 C	217,596		6,653	0	0	0	224249	697	0	4,591	2.1	750		857					
Sat. D	265		106	0	0	0	371	0	0	18	6.8	9	0	93	13.5	8	4,000	Unl.	SW 15-25
7/7 C	217,861		6,759	0	0	0	224620	697	0	4,609	2.1	759		950					
Total for week	4,368		604				4,972			373		88	240	339					

**Additional Comments:** Bear and people problems, smolt migration, weir problems, estimated escapements, cabin repair, etc.

- 1-Jul Approximately 2,000 Sockeye in lagoon
- 2-Jul No additional build up in lagoon, small numbers of jumpers off mouth
- 3-Jul Found hole in Weir in the morning, Estimate of 200 Sockeye included in escapement counts
- 4-Jul Lots of rafters today, fishing is slow upriver
- 5-Jul Approximately 500 Sockeye in lagoon
- 6-Jul New sow with cubs trying to fish behind weir, respond well to yelling
- 7-Jul Lots of jumpers off the mouth, looks some pinks starting to jump as well

**\*Note** Daily sockeye jack counts must be included in the overall daily count

Figure 4.–Weekly weir camp reporting form.

Weir Camp: Ayakulik		Project Biologist: Geoff Spalinger						
Time Period for Report: May 1-May 14								
Date:	Weir was fish tight? yes		Hrs. compromised between:					
	If not why?		Estimated escapement through by species:					
<input type="checkbox"/>	Survey:	Kings	Reds	Pink	Coho	Chum	Time	Turbidity
	Quality:		500	20	2	1	5:25pm	clear
Describe where fish were seen:					Ceiling	Visibility	Wind dr/sp	
In banya hole					3k broken	Unlimited	Calm	
Date:	Weir was fish tight?		Hrs. compromised between:					
	If not why?		Estimated escapement through by species:					
<input type="checkbox"/>	Survey:	Kings	Reds	Pink	Coho	Chum	Time	Turbidity
	Quality:							
Describe where fish were seen:					Ceiling	Visibility	Wind dr/sp	
Date:	Weir was fish tight?		Hrs. compromised between:					
	If not why?		Estimated escapement through by species:					
<input type="checkbox"/>	Survey:	Kings	Reds	Pink	Coho	Chum	Time	Turbidity
	Quality:							
Describe where fish were seen:					Ceiling	Visibility	Wind dr/sp	
Date:	Weir was fish tight?		Hrs. compromised between:					
	If not why?		Estimated escapement through by species:					
<input type="checkbox"/>	Survey:	Kings	Reds	Pink	Coho	Chum	Time	Turbidity
	Quality:							
Describe where fish were seen:					Ceiling	Visibility	Wind dr/sp	
Date:	Weir was fish tight?		Hrs. compromised between:					
	If not why?		Estimated escapement through by species:					
<input type="checkbox"/>	Survey:	Kings	Reds	Pink	Coho	Chum	Time	Turbidity
	Quality:							
Describe where fish were seen:					Ceiling	Visibility	Wind dr/sp	

Figure 5.–Daily crew leader report.



## **APPENDIX A. WEIR CAMPS**

The Karluk weir is approximately 90 m (295 ft) long and is located about 0.8 km (0.5 mi) upstream from the confluence of Karluk River and Karluk Lagoon on the southwest side of Kodiak Island (Figure 1). The weir was first constructed in 1921 at its current location and was operated annually here until 1941. The weir was moved to “the portage,” approximately 12.9 km (8 mi) down river from the Karluk Lake outlet from 1942 to 1945. Between 1946 and 1975 it was operated at the outlet of Karluk Lake. It was re-established at its present location in 1976.

### **Opening Camp**

- Obtain keys and lock combinations from your project supervisor.
- Equipment and tools for the Karluk weir are stored in the ADF&G warehouse and labeled.
- Batteries and solar panels are stored at the ADF&G warehouse in the salmon locker.
- Fuels needed for this camp include: propane, #1 heating oil, unleaded gasoline, two-cycle oil for the sampling boat outboard, and 10W-30 motor oil for the generator, and 5W-30 oil for the Go-Devil motor. Talk to your project supervisor to determine what quantity of each item is needed.
- Weir personnel will be transported to the float plane landing in the upper lagoon and then will either cross the lagoon to the cabin to obtain the survey skiff or the plane will taxi over to the cabin site. All gear and supplies are moved to the cabin from the skiff landing.
- The cabin consists of a 2-story, 24' x 32' cabin with propane refrigerator and stove/oven, an outhouse, a tool shed and a banya.
- There is no water supply to the cabin. Water is obtained from the adjacent mountain creek and filtered for consumption.
- The banya and outhouse are located in close proximity to the cabin. Wood for heating the banya is obtained from the beach at the outlet of Karluk Lagoon.
- Weir materials are stored near the edge of the lagoon and are moved to the weir location with the scow at high tide.

### **Weir Installation**

- The 2014 weir will be placed in the same location as in 2013. The Karluk weir is a conventional wooden tripod weir. This weir also utilizes a section of floating weir panel that serves as a raft gate to allow rafters to pass down river and to flush out mass amounts of spawned out salmon. The boardwalk for the weir consists of 2” x 12” x 14’ boards and is staged with the other weir materials
- Move scow and barge from their storage locations to their docking location in the lagoon.
- Transport weir materials from staging location to weir site with scow and barge.
- Weigh tripods down with large rocks from the riverbed or sandbags.
- Install five to six counting gates accompanied by flash panels. More may be required on even years.
- Secure and tie off weir panels to the upper and lower stringers with seine twine.
- Install adult sampling trap and steelhead trap (Figure 3).
- Move spud barge up to the weir with the scow at high tide. Secure with anchors, lower drawbridge and set up weatherport.

---

-continued-

### **Weir Maintenance**

- Clean debris from the front of the weir and inspect for scour holes first thing in the morning and periodically throughout the day.
- The debris load is usually heavy after moderate to heavy rainfall and may increase later in the season especially on large pink salmon years.
- Pull some weir panels during high water events; when the river begins to cloud up, when debris build-up increases significantly, and when the water level covers the sampling trap. This will prevent from the weir washing out. Estimate the number of fish and species past the weir when not fish tight.

### **Miscellaneous**

- Install “No Sport Fishing” regulatory markers 100 yards upstream and downstream from the weir.
  - Make repairs, and maintain buildings and grounds surrounding the cabin and banya. Trim the grass along the trail to the boat landing. At season’s end, cut a trail and an area large enough to stage tripods behind the banya.
  - Repair and/or maintain the skiffs and canoe. During the season, the skiffs are moored on the running line at the skiff landing. The canoe should be stored out of the reach of bears.
  - Conduct surveys of the lagoon and river when directed by office staff.
  - Clean and lime outhouse on a regular basis to help keep bears away.
  - The grocery/supply flight arrives on the north shore of the lagoon approximately 0.5 km below the upper lagoon boat landing.
  - All tools, gear, and equipment brought out at the beginning of the season are returned to Kodiak and stored in the warehouse.
  - Remove all food from cabin at the end of the season and bring to town bunkhouse.
-

## Appendix A2.–Ayakulik weir.

---

The Ayakulik weir is approximately 35 m (120 ft) long and is located about 1.3 km (0.8 mi) upstream from the outlet of the Ayakulik River into the Shelikof Strait, on the southwest side of Kodiak Island (Figure 1). A weir was originally constructed on the Ayakulik River in 1929 at the outlet of Red Lake and operated at that location until 1969. The weir has been at its current location since 1970.

### **Opening Camp**

- Assorted tools and equipment for the Ayakulik camp are stored at the ADF&G warehouse.
- Fuels required at this camp include: gasoline, propane and two-cycle oils. Talk to your project supervisor to figure out how much of each you will need prior to going out to your camp.
- Obtain the keys to the cabin from your project supervisor. You will need a cordless drill, claw hammer and an adjustable wrench. The basement of the cabin is locked and nailed shut. The basement must be opened first to obtain a ladder to reach the window on the northeast corner of the cabin.
- Living quarters consist of a one story, 16' x 20', single room cabin with half basement and a 16' x 24' one story cabin with loft. The “big” cabin has four bunks, a propane refrigerator and cook stove, a gravity fed water system, a wood heating stove, propane and 12-volt lights.
- Propane connections are located in the basement for propane lights, refrigerator and cook stove.
- The banya and outhouse are located adjacent to the cabin. Firewood for heating the cabin and banya is obtained from the beach.
- Water for the gravity fed water system is obtained from the river and hauled to a 55-gallon drum that supplies the kitchen sink. This water is non-potable and needs to be treated before ingestion.
- The cabin has a 12-volt battery bank charged by solar panels permanently attached to the roof. This 12-volt system powers the SSB radio and VHF base station.

### **Weir Installation**

- The 2014 weir will be placed in the same location as in 2013. The Ayakulik weir is a wooden tripod weir with a 20' raft gate. The raft gate is stored below the small cabin. The tripods are staged behind the banya as well as the weir panels.
- Weigh down each tripod with large rocks from the river bottom along with sand bags.
- Install four to six counting gates accompanied by flash panels and one fish trap gate.
- Secure the upper portion of weir panels to the upper stringers with seine twine.
- Install the adult and steelhead sampling trap.
- Install the raft gate on the far bank.

### **Weir Maintenance**

- The weir is cleaned and inspected for scouring and holes every morning and cleaned throughout the day as necessary.
- Debris load is usually heavy after moderate to heavy rainfall.

---

-continued-

### Miscellaneous

- Consider pulling the weir panels when you see standing water in the yard and when water in the river begins to cloud up. An indicator rock is located 30 yards downstream from the weir. When the water level covers this rock you should evaluate the situation and consider pulling panels.
  - Install “No Sport Fishing” regulatory markers 100 yards upstream and downstream from the weir.
  - This camp has a large number of bears that frequent the weir. Do not let them loiter around the camp and weir!
  - Make repairs and maintain buildings and grounds surrounding the cabin and banya. Trim grass around buildings, the trail to weir and the boat landing at the lagoon.
  - Clean and lime the outhouse on a regular basis.
  - Repair and maintain the boat. During the season the boat is anchored on the shore of the river next to the trail by the east lodge.
  - Grocery and supply flights land in the lagoon near the lodge and sometimes on the beach.
  - At the end of the season the boat is stored next to the cabin with four to six full sandbags on top.
  - The 12-volt battery bank remains connected to the solar panel at the end of the season and the switch is to remain in the “on” position.
  - Window boards are attached with carriage bolts and the nuts are attached from the inside. You must exit the cabin through the window on the northeast corner. This window must be left open one half inch because it locks from the inside. The board covering this window is attached with two padlocks and two lag bolts.
  - All tools, generator, ladder, the old outboard motor, and fuels are stored in the basement; at the end of the season make sure to winterize and fog the outboard engine before storage. The remaining equipment including power tools, new outboard motor (if on site), and chain saw are returned to Kodiak and stored in the warehouse.
  - Remove all food from the cabin at the end of the season.
  - At the end of the season return the shotgun, SSB radio and antenna, first aid kit, cordless drill, handheld VHF, and logbooks back to Kodiak to store in the warehouse.
-

The Upper Station weir is approximately 11 m (35 ft) long and is located near the outlet of Olga Creek into upper Olga Bay on the south end of Kodiak Island (Figure 1). The weir was first constructed in 1929 just above the lagoon, approximately 0.23 km (0.14 mi) above its current location, and was operated there until 1969. From 1969 to 1992 the weir was operated near the outlet of lower Olga Lake. The weir was moved to its current location in 1993.

### **Opening Camp**

- Obtain the lock combination from your weir camp project leader before departing for this camp. You will need a cordless drill with Phillips and square-head bits to remove window board screws.
- Fuels needed for this camp include: propane, #1 heating oil, gasoline and two-cycle oil for an outboard engine that is used at the end of the season to move tripods in the metal skiff. Obtain quantity information from your camp supervisor.
- An air charter will transport personnel to Olga Bay. Personnel will then cross the creek in chest waders and install the footbridge across the creek to move gear and supplies to the cabin. The footbridge involves placement of one tripod in the middle of the creek and installing a section of boardwalk from each bank of the river to the tripod.
- Living quarters consist of a one story, 14' x 24' cabin. The cabin is wired to operate 12v DC powered lights. An oil stove heats the cabin.
- There is an outbuilding that serves as a one person bunkhouse and banya.
- The master buss bar fuse stored next to the fuse panel may need to be installed prior to operating the 12-volt solar system.
- The SSB radio, VHF, and two 12-volt lights are powered by a bank of five 12-volt batteries located on the deck near the main cabin that are connected to a permanently mounted solar panel on the roof of the cabin.
- Two propane connections for the refrigerator, stove and lights are located behind the cabin.
- Rainwater from the roof collects in plastic garbage cans and feeds the gravity fed water system to the kitchen sink. There is also a pump and hose used to pump water from the creek. There is a filtration container on site for drinking water.

### **Weir Installation**

- The 2014 weir will be placed in the same location as in 2013. The weir is located northwest of the cabin, and downstream approximately 225 yards. There is a boardwalk from the cabin leading to the weir. The beach also gives access to the weir.
- The Upper Station weir is a conventional wooden tripod weir. It has four tripods, one counting gate, and one sampling trap gate.
- Tripods for the weir are staged adjacent to the banya. The tripods are floated downstream to the weir site, and returned to the staging location at the end of the season by tilting them into a metal boat and motoring them back upstream for winter storage.
- Other weir materials are staged on the bluff above the weir site.

---

-continued-

- The bank at the northwest end of the weir needs to be reinforced with a fiberglass tarp approximately seven feet upstream and approximately five feet above the water line before the weir is installed.
- Install the sampling trap on the beach side of the creek, reasonably close to the creek bank.
- Weigh the tripods down with sandbags and rocks.
- Secure the upper portion of weir panels to the upper stringers with seine twine.
- Install the debris trap on the upstream side of the footbridge if necessary during the season.

#### **Weir Maintenance**

- The weir is cleaned and inspected for scouring and holes every morning and cleaned throughout the day as necessary.
- Debris load can be heavy after moderate to heavy rainfall, or after high easterly winds when large amounts of river and lake grass may build up on this weir.
- Consider pulling weir panels during high water, when the water in the river begins to cloud up, when debris build-up increases significantly and when the water level covers the adult salmon trap.

#### **Miscellaneous**

- Install “No Sport Fishing” regulatory markers 100 yards upstream and downstream from the weir.
- This camp has a banya for washing. There is a shortage of wood at Upper Station, however wood can be gathered with the skiff at Stintz Bluffs or elsewhere.
- Conduct a visual survey of the bay each morning before radio schedule. It is normally adequate to survey from the shore with binoculars viewing east towards Stintz Bluff and west toward Hook Point.
- Conduct salmon surveys of the stream several times per day. The best technique is to walk the beach side of the river from the mouth to the weir.
- Clean and lime the outhouse on a regular basis. The outhouse hole tends to fill with water at this site no matter where you dig a new hole.
- Grocery and supply flights are normally unloaded on the beach near the footbridge. Weather conditions may force the plane to land at lower Olga Lake. Supplies are transported in a wheelbarrow to the camp.
- The 12-volt battery bank remains connected to solar panels at the end of the season.
- Box up all food from the cabin and bring to town at the end of the season.
- The aluminum workboat is stored next to the tripods after they are staged at the end of the season which is located by the banya.
- Window boards are attached with square head screws.
- At season’s end return the shotgun, SSB, SSB antenna, first aid kit, cordless drill, handheld VHF, and logbooks back to Kodiak.

---

-continued-

- Winterize motorized equipment stored on site at the end of the season.
  - Drain and clean the rain barrels and water filter at season's end.
  - All tools and the generator are stored in the cabin at season's end. Fuels are stored in the fuel shed and remaining gear and equipment is returned to Kodiak and stored in the warehouse.
-

The Dog Salmon weir consists of three weirs, 38 m (125'), 41 m (135'), and 8 m (25') in length on the three lower forks of the Dog Salmon River, 0.5 km (0.3 mi) upstream of their outlets into Olga Bay on the south end of Kodiak Island (Figure 2). The Dog Salmon River drains from Frazer Lake.

### Opening Camp

- Before departing Kodiak for camp, obtain keys from the project supervisor.
- Fuels needed for this camp include: propane, #1 heating oil, gasoline and two-cycle oil.
- **If possible, arrange your arrival time during high tide in Olga Bay.** The air charter can then taxi into the river and drop personnel and supplies on the bank of the east river branch upstream near the trailhead close to the signpost. Have your chest waders handy.
- All tools and motorized equipment are normally stored on site.
- Living quarters consist of a 16' x 20' two-bedroom cabin with a mudroom entry and a storage and equipment shed attached at the rear. The main cabin has an oil stove, propane and 12-volt lights and is wired for 110-volt service by connecting the three prong 110 plug located in the generator shed to the generator.
- There is an outbuilding that serves as a one person bunkhouse and banya. A wood stove heats the banya. Wood used for burning is obtained from dead trees on site or wood collected on the weir throughout the season.
- A 12-volt battery bank located on the east deck of the cabin powers the SSB and VHF radios, the refrigerator igniter and 12-volt lights. This battery bank is charged by three solar panels permanently mounted to the roof.
- Window shutters are attached with wing nuts screwed to hanger bolts.
- There are three propane connections with regulators located on the west side of the cabin. Each hookup is stored under the cabin on shelving between floor joists. One hookup is for propane lights in the bedrooms, one is for propane lights in the main room and the last hookup is for the refrigerator and cook stove.

### Weir Installation

- The 2014 weirs will be placed in the same locations as the 2013 weirs. The east weir is located adjacent to the cabin. The west and far west weirs are approximately one-quarter of a mile from the cabin with trails leading to each weir. The Dog Salmon weirs are conventional wooden tripod weirs and utilize approximately 22 tripods. All weir materials are staged on the bank of their respective weir sites.
- Weigh each tripod down with sandbags.
- The gravel and rock in the riverbed at the east weir tends to scour under panels. Make sure panels are entrenched when this weir is installed.
- Install four counting gates accompanied by flash panels at both the east and west weirs.
- Secure the upper portion of weir panels to the upper stringers with seine twine.
- Install the steelhead trap on the east and west weirs.

---

-continued-

### **Weir Maintenance**

- The weirs are cleaned and inspected for scouring and holes every morning and cleaned throughout the day as necessary.
- Debris load can be heavy after moderate to heavy rainfall or high winds.
- Consider pulling weir panels during high water when the river begins to cloud up, when debris build-up increases significantly or when the water level rises two-thirds of the way up the indicator rock located just behind the west weir.

### **Miscellaneous**

- Install “No Sport Fishing” regulatory markers 100 yards upstream and downstream from the weirs.
  - Maintain buildings and grounds surrounding the cabin and banya.
  - Keep trail to the boat landing and the west weir mowed to provide good visibility or the surroundings.
  - Maintain and make repairs on two boats. The 22 foot boat is moored offshore at the edge of Dog Salmon Flats or to the east of the camp in Iverson’s Cove. The 16 foot Lund is moored in the river at upper or lower skiff landings, depending on the river water level.
  - **Fuel for boats, the generator and motorized equipment as well as propane and #1 heating oil are purchased from the Ocean Beauty tender operating in Olga Bay.**
  - Conduct surveys of the river branches and the Dog Salmon Flats Section throughout the day as required.
  - Survey the lower East River and the Dog Salmon Flats Section with the small skiff. The West River is surveyed by walking the west riverbank. The prime time to survey is three hours after low tide. Typically, fish move into the river on low tide and tend to move up to the weir on high tide.
  - Biodegradables from the slop bucket are to be dumped in the bay.
  - Clean and lime outhouse on a regular basis.
  - Check and maintain 12-volt battery bank.
  - Grocery and supply flights land in the bay on the Dog Salmon Flats. The smaller boat is used to meet the chartered flight and to transport groceries and supplies to the upper boat landing.
  - At the end of the season, the large skiff is transported back to Kodiak by tender and the smaller skiff is chained and locked to a cottonwood tree next to the east weir materials staging platform. The outboard motor for the smaller boat is stored in the equipment shed. Make sure to winterize and fog engine before storing for the winter.
  - All tools, generator, outboard motor for the smaller boat, ladders and fuels are stored on site at the end of the season. The remaining gear and equipment are returned to Kodiak and are stored in the warehouse.
  - Remove all perishable food from cabin at the end of the season and bring back to town.
  - The 12-volt battery bank remains connected to solar panel at the end of the season.
  - Window boards are attached with wing nuts and washers to hanger bolts mounted at each window.
-

Recent low returns of Upper Station sockeye salmon have generated substantial concern from Alitak Bay fishermen. In response to this concern, and with support from the Kodiak Regional Aquaculture Association, the Alaska Department of Fish & Game (ADF&G) initiated an analysis to identify data gaps pertinent to explaining the declining runs. As one result of this process, ADF&G began a juvenile sockeye salmon grab sampling project in May 2013. In 2014, ADF&G will continue to conduct grab sampling of outmigrating sockeye salmon. The project goal is to assess the age, size, and condition of sockeye salmon smolt outmigrating from the South Olga lakes to attain a better understanding of lake productivity and health of the system and its inhabitants. These data will provide insight into what further studies may benefit our understanding of Upper Station sockeye salmon productivity.

## **OBJECTIVES**

To achieve the overall project goal, project personnel will collect data to

1. Estimate average age, weight, length (AWL), and condition factor of sockeye salmon smolt outmigrating from the South Olga lakes, and collect tissue samples of each sampled smolt for future genetic analysis.

## **METHODS**

1. Use beach seines, cast nets, or dip nets to capture emigrating sockeye salmon smolt from approximately May 23 through July 15.
2. Enumerate all captured fish by species
3. Conduct weekly random sampling for a minimum of 120 sockeye salmon smolt for age (scale samples) weight and length
4. Collect genetic tissue samples from sockeye salmon smolt paired to AWL data for each sampled smolt

## **TIMING OF SAMPLING**

Because of smolt outmigration and adult run timing and the deployment of the ADF&G Upper Station weir crew, the weir crew will conduct the sampling of juvenile sockeye salmon with the help of ADF&G research staff approximately between May 20 and July 5. Duration of the sampling season may be shortened or extended based on outmigration timing and run dynamics.

Smolt migrate primarily at night, therefore a single sampling day will be the 24-hour period from noon of the first day to noon the following day and is identified by the calendar date corresponding to the first noon. Smolt should be captured approximately three times per week during dark hours (between 11:00 pm and 3:00 am).

A variety of trapping materials will be provided to the crew, including dip nets, cast nets, a small beach seine, and a fyke net. Crew should determine which method is most effective at capturing smolt, and be aware that the dynamics of the smolt outmigration may require adjustment of trapping methods throughout the season.

A minimum of 40 sockeye smolt will be collected every third day. If less than 40 smolt are caught in a sampling day and the net has fished unhindered, the sample size for that day will be the total number of sockeye salmon smolt caught. The length and weight information for individuals will be recorded in a Rite-in-the-Rain notebook and a rugged digital assistant data logger (RDA).

Various identification keys (e.g., Pollard et al. 1997) 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. Contact the project biologist if any questions regarding identification occur. 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. Daily totals will be tallied throughout the season on the CUMULATIVE SMOLT CATCH REPORTING FORM.

### **SMOLT CATCH AND SPECIES ENUMERATION**

Handling of smolt should be done very carefully as smolt are sensitive to stress, and mortality can easily occur. All species caught in one night should be identified and enumerated. To collect the smolt from the beach seine or cast net, use a dip net to transfer the contents of the net's cod end into an aerated 5-gallon bucket on the streambank filled with river water. All fish captured should be identified and counted by species, although only sockeye salmon smolt should be retained. A tally denominator should be used to enumerate the trap's catch to ensure accurate counts. Other species caught in the net should be released downstream.

Sockeye smolt retained for sampling may be held overnight in 5-gallon buckets equipped with aerators, but care should be taken to avoid crowding of smolt (ie. use multiple buckets), and to avoid extremes of temperature (ie. do not allow buckets to sit in the sun).

Weather and river condition data should be recorded each time catch is reported.

### **SMOLT SAMPLING**

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). All scales will be collected from the preferred area of each fish following the methods described by International North Pacific Fish Commission (1963). Scales will be mounted on microscope slides. 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).

---

-continued-

Smolt will be sampled on the morning after capture. 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 will be measured to the nearest mm from the tip of the snout to the tail fork. 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. Length and weight should be recorded into a Rite-in-the-Rain notebook.

A scalpel will be used to remove 5–10 scales from the preferred area of the fish. The scales will be mounted on a glass microscope slide as shown in the included instructions. 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. 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 South Olga lakes sockeye salmon smolt means that most tissue samples can be collected without lethally sampling the smolt. Later in the season when younger smolt are typically outmigrating, it may be necessary to lethally sample the smolt when collecting tissue samples. After each smolt has been sampled for length and weight, a tissue sample should be collected before scales are removed, as outlined in the included instructions. Particular care should be taken to ensure that each tissue sample ID is correctly paired with its specific AWL information, and recorded in the AWL notebook as well as into the RDA. Be sure to periodically check the vial label to ensure the vials are in the proper order. Protocols for sampling smolt for tissue samples are supplied by the ADF&G Gene Conservation Laboratory in Anchorage.

During periods of high smolt outmigration, it may be possible 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.

## **REPORTING**

The crew leader will compile a log of activities and events each time an attempt is made to capture smolt, including problems with the project or materials. This log will be submitted to the Project Biologist at the end of the field season.

Scales and data should be sent in each time adult scales and data are sent in to town. It is desirable for the field crews to photograph all aspects of the fieldwork. Photographs will be taken with a digital camera and downloaded for editing and storage.

## **SCHEDULE AND DELIVERABLES**

Smolt sampling should occur every third day from ~May 23 through ~July 15. The total minimum goal for AWL and tissue samples is 700 sockeye salmon smolt.

## **RESPONSIBILITIES**

Project Biologists: *Mary Beth Loewen* – Field Project Leader (smolt) – Westward Region  
Finfish Research Biologist (Fishery Biologist II)

*Matt Keyse*— Field Project Leader (adult weir) –Kodiak Assistant Area  
Management Biologist (Fishery Biologist II)

Field Staff: *vacant* – ADF&G Fish and Wildlife Technician III

*vacant* – ADF&G Fish and Wildlife Technician II

Mary Beth Loewen will provide training in smolt capture and sampling techniques, logistical and technical assistance, age smolt scales, and write a season summary with the assistance of other project biologists. Matt Keyse will oversee the field crew and all aspects of adult salmon enumeration at the weir. The field crew leader will coordinate day-to-day sampling schedules, ensure data quality and accuracy, and inform the project leader of any problems that may arise.

Field staff will implement the ADF&G safety guidelines and ensure daily operations are conducted.

## SAMPLING PROCEDURES FOR SOCKEYE SMOLT

### 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.

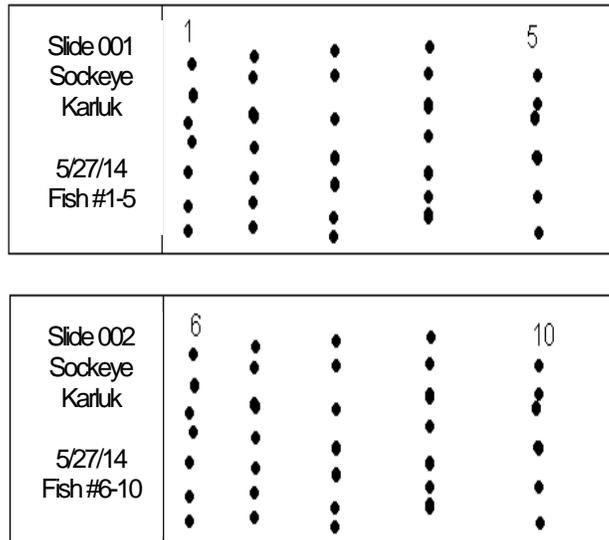


Figure 1.–Properly labeled smolt slide.

-continued-

## **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.

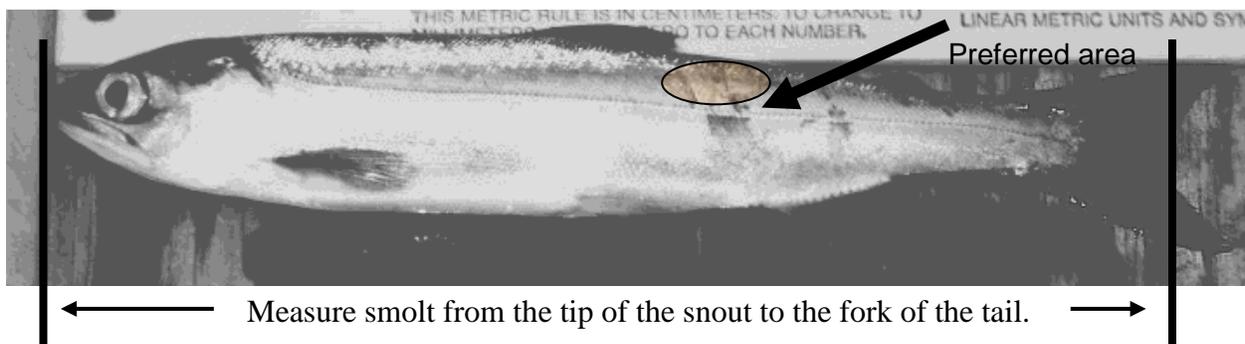


Figure 2.–Smolt with proper length measurement and preferred area highlighted.

### **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.

## **DATA ENTRY/MANAGEMENT**

All data (AWL and tissue sample number) should be recorded into a hard copy Rite-in-the-Rain notebook. Data obtained while sampling is also 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.

-continued-

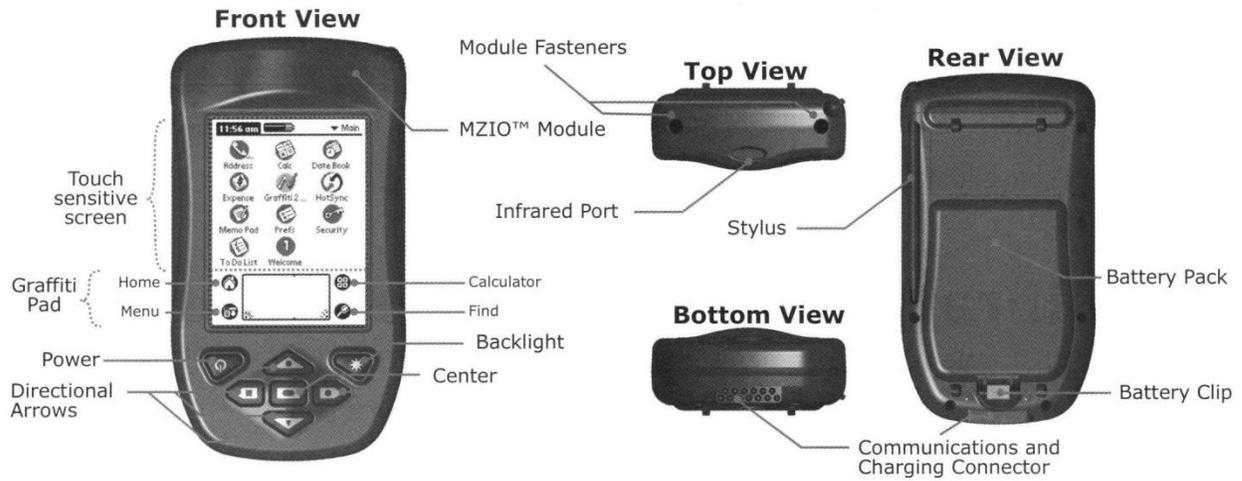


Figure 3.–Rugged Digital Assistant (RDA).

## 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.

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 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.

-continued-

## **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.

### **Gear Type**

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

### **Date of Sample**

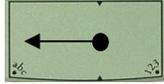
For smolt, the sampling day is the 24-hour period from noon of the first day to noon the following day, and is identified by the calendar date corresponding to noon on the first day.

### **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**

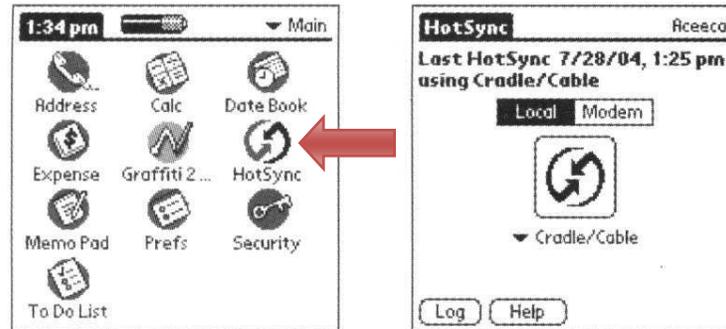
After each sample the RDA should be backed up so that data is stored on both of the compact flash drives. Turn the RDA on, and tap the home icon in the bottom portion of the screen to bring up the main menu. Tap the CardBkup icon if it is present, and then the Backup Now button at the top left of the 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.

---

-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.

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.

---

-continued-

## **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"

**PHOTOS OF FISHES PRESENT IN THE SOUTH OLGA  
LAKES (UPPER STATION) WATERSHED**



Juvenile sockeye salmon.



Juvenile coho salmon.

---

-continued-



Juvenile pink salmon.



Dolly Varden.



Pygmy whitefish.



Coast range sculpin.



Pond smelt.



Stickleback.

-continued-

## TISSUE COLLECTION FOR GENETIC SAMPLING

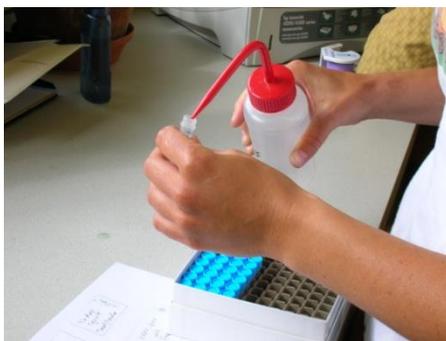
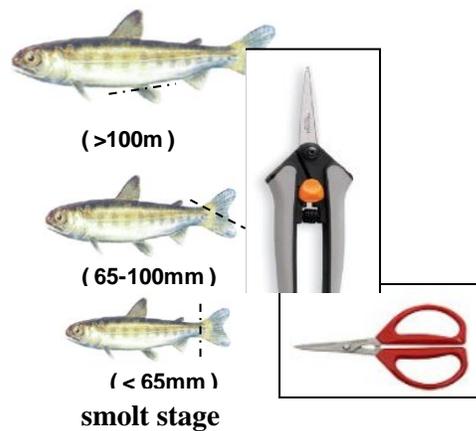
### ADF&G Gene Conservation Lab, Anchorage

#### 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 EtO
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.

-continued-





## REFERENCES CITED

- Gilbert, C. 1913. Age at maturity of the Pacific coast salmon of the genus *Oncorhynchus*. United States Bureau of Fisheries Bulletin 32:1-22.
- International North Pacific Fisheries Commission. 1963. Annual report 1961, Vancouver, British Columbia.
- Mosher, K. 1968. Photographic atlas of sockeye salmon scales. Bureau of the U.S. Fish and Wildlife Service. Fishery Bulletin 67(2):243-280.

**APPENDIX B. SATELLITE TELEPHONE AND DISPATCH  
INSTRUCTIONS**

---

## Appendix B1.–Satellite telephone and dispatch instructions.

---

The following information serves as a Policy Statement regarding the allowable uses of ADF&G satellite phones and instructions on the proper method to successfully set up and operate the satellite phone system assigned to your camp.

These systems are not like standard telephones or cell phones, nor are they like a single side band or VHF radio. Communication is sent through the transmitter to low level satellites, then is beamed down to ground stations, either directly to another satellite phone system or to a switching station linked to standard telephone lines. As such, there is a much higher cost involved in operation than with standard telephone long distance or cell phone charges.

Under no circumstances may you use this satellite phone system for personal calls unless, for each event, you have obtained direct and explicit permission from your project supervisor. This does not mean that field crew leaders may grant permission for personal use of this phone. Only the project supervisor may give you such permission. Any deliberate misuse of this system, such as making unapproved, non-emergency, or personal calls, will result in disciplinary action which may include suspension or discharge. **After each authorized use of the satellite phone-business or personal, the log must be filled out. This log is to be turned into the office on every other resupply flight.**

The primary purpose for having this satellite phone is for your safety. The secondary purpose is for secure, reliable communications between remote field stations and ADF&G offices (Kodiak, Chignik, Cold Bay, Sand Point or Port Moller), ADF&G research vessels (Resolution or K-Hi-C), Fish and Wildlife Protection vessels and offices or other field camps that are similarly equipped. With these phones you are capable of directly dialing emergency services at any time of the day or night. It is essential that these phone systems are maintained in good working order, are fully charged or hooked to sufficient power at all times, and remain available for official or emergency use.

### **Instructions**

The portable sat phone/dispatch unit must be charged with power. There is an internal battery pack and a 12-volt adapter is available in order to hook the phone to a larger battery bank that may in turn be recharged by generator or solar panels.

Turn the unit on using the power switch in the lower left corner. A green light, just above the switch, should come on indicating that the unit is sufficiently powered. If no light or a red light comes on, you will need to charge the unit or attach it to your 12-volt battery bank via the appropriate connections.

The back or top of the briefcase unit is the antenna and it must be oriented correctly in order to access the receiving satellite. The top of the case should be open and pointed in a general east-southeast direction. You must have a fairly clear line-of sight to the horizon in that direction; this unit will not work through walls or mountains. The angle of the antenna should be almost vertical; remember to lock the support arm that attaches the lid to the main body of the unit along the right side.

---

-continued-

This system has two means for calling: a telephone-like handset (for dial in or dial out phone calls), and a push-to-talk microphone (for ‘dispatch’, unit to unit, calls). All calls made with the handset are billed per minute of use, at an expensive rate. All calls on the ‘AlaskaNet’ dispatch system, using the microphone, are essentially free.

When first turned on, the handset and microphone should become active with the display panels on the top of the phone handset and microphone lighting up (one LED panel, should read sleep). The display will show, after a few moments, whether a connection has been established with the satellite and how strong the signal is (ex. *B05 S 21*). Turn the unit slightly and raise or lower the lid/antenna slightly until the highest possible signal strength is indicated (normally above 20 but will work down to 8). Lock the lid/antenna in place and do not turn the unit again until your communications are finished. Once a strong signal is acquired push the “\*” button for 2 seconds. Wait until there is a “beep” and the LCD screen displays ‘00:DN ??’, then dial the number. To intercept a call, follow the above procedure.

### **Alaska Dispatch System**

Because all calls made on the dispatch system are free, this is the method of choice for using the satellite phone units. There are several ADF&G offices, many field camps and two research vessels on the AlaskaNet dispatch system.

On the microphone display, below the signal strength, there should be a query, ‘00:DN ??’. This is asking you to ‘dial’ in the 4-digit dispatch number that you wish to call. After you have entered the 4-digit dispatch number of the unit you wish to contact, hold in the microphone key and a connection will be made with the satellite, which will then try to connect with the dispatch number you punched in. If a connection is made you will hear two beeps (“bird chirps”) and the microphone display will read SELF. While continuing to hold in the microphone key, call the station you wish to talk to. Use all the same formalities as when calling on a SSB radio. For example, say “Calling the ADF&G Kodiak Office, Calling the ADF&G Kodiak Office; this is Karluk Weir”. When you release the microphone key, the unit will beep again.

Be patient. It will take some time for the signal to go up to the satellite, then down to the number you called. It may take the other party some time to get to the microphone and respond (this is especially true for calls to the ADF&G office; supervisors have to walk down to the radio room to respond). When they respond, their 4-digit dispatch number (DN) will show on the microphone display. This is a private conversation.

## **LOCKING UP**

Occasionally if someone hits the wrong buttons on the portable ST-151 model (suitcase model) it could lock up the handset. To unlock the handset there is an unlock code which can be generic or specific to your phone. Turn on the phone and hit 0 0 0 0 (the generic code). If that doesn't unlock the handset punch in FCN 8, 2 (function, 8, 2). The phone should then give you an UNLOCK CODE message followed by 4 digits. Enter these 4 digits and it should unlock the handset. If this doesn't work sometimes you can unlock your handset by punching FCN 8, 2 followed by 0 0 0 0. One of these methods should unlock your handset.

## **PHONE SYSTEM**

Do not use the handset to place calls unless absolutely necessary. All calls made with the handset are billed per minute of use, at an expensive rate. Calls should only be made to supervisors either when radio or dispatch contact is not possible or when a confidential message needs to be relayed. Calls are made by dialing out, almost like a standard telephone. Punch in the area code and telephone number, then press send (button located in the upper right corner of the handset). Because there is a satellite relay, there will be a slight delay between when you speak and when the other party hears you, so be patient.

**Note every call on the satellite phone in the phone logbook, except for dispatch calls.** The system will show you the amount of time you've used on the call, on the LED panel. Note the number called, the date, approximate time and the length of the call (minutes and seconds). When the call is completed, you must push the end button (top right corner of handset buttons) otherwise the system will remain active and you will be billed for the time (at almost a dollar a minute). **Remember to press end.**

If someone calls in to this unit, it will ring like a standard telephone. Press the **SEND** button to start the conversation but remember to press **END** to finish the call. ADF&G is billed for all calls made using the handset—both the calls you dial out, and any calls dialed in.

## **IN CASE OF EMERGENCY:**

If there is a medical emergency, or a real danger to life or health, immediately call the US Coast Guard Rescue Coordination Center at **1-800-478-5555**. Be ready to tell them your name, exact location (latitude and longitude or nearby major landmark) and the exact nature of your emergency. They may question you extensively so be prepared. There are emergency doctors on-call that can advise you. After the call is completed, immediately call your supervisor, at work or at home, and relay the details of the situation.

If there is an enforcement emergency, use the dispatch microphone to call the Kodiak office or the Alaska State Trooper, Bureau of Wildlife Enforcement (**DN 6370**).

**See page 10 for further instructions concerning emergencies.**

---

**APPENDIX C. ELECTRICAL SYSTEM OPERATION  
MANUAL**

## SOLAR PANELS

Each field camp utilizes an independent power system consisting of 12-volt photovoltaic (PV) solar panels and a PV charge controller that charge a 12-volt battery bank for powering needed electrical components. Solar PV panels, when oriented towards the sun, will create direct current (DC) electricity. This DC electricity will effectively charge a bank of 12-volt batteries by providing a higher voltage than the battery voltage. In our common 12-volt systems, each solar PV panel will generate approximately 20 volts open circuit when directly oriented towards the sun. Any cloud cover or partial shading will reduce solar PV output considerably.

Both amperage and voltage numbers are displayed digitally on the PV charge controller. The PV charge controller regulates and limits the amount of electrical flow generated by the solar PV panels to the battery bank that is necessary to keep the 12-volt battery bank fully charged. Learn to understand what the amperage and voltage numbers represent and you will be in control of your power system.

Voltage is the most important reading you'll need to understand. A common misconception is that when a 12-volt battery meters 12.0 volts the battery is fully charged. The reality is that at 12.0 volts the battery is in a very discharged state. Many electronics may not work properly at such a low voltage. **A 12-volt battery isn't fully charged until it reads at least 12.7 volts.** The solar panels, batteries and the loads (power being utilized or withdrawn from the system) in each system work in a dynamic equilibrium. The voltage rises and falls as power is deposited and withdrawn throughout the day and night. The actual reading that is important when assessing the state of charge of a battery is the "rest" voltage. This voltage is defined as the voltage reading when the batteries have been at "rest" for several hours. This means no loads on and no solar power coming in. In practical terms this is the voltage early in the morning before any loads are on and after the sun (solar energy) has been off the panels for a few hours.

If your solar array can't keep up with your essential loads then it will be necessary to add more solar PV panels or run the gas generator to re-charge the batteries as needed. Most of the small gas generators in the field camps have 2 DC output lugs, one positive lug and one negative lug. These output lugs can be wired in parallel to the battery for recharging. Typically these chargers put out a maximum of 8.3 amps DC. At Dog Salmon and Upper Station the gel cell batteries must be trickle charged (less than 2 amps).

Batteries and connections are prone to corrosion in a marine environment. It is essential that battery terminals, all wiring and connections are clean and tight. A good cleaning with a wire brush and a check of all bolts and screws for proper tightness should be performed at the beginning and end of each field season. Most of the batteries that are now in use in our field camps are sealed or gelled electrolyte type. These batteries do not require any maintenance other than cleaning. Some of the older electrolyte lead/acid batteries have removable plastic caps and require a periodic topping off with distilled water. Filtered rainwater can safely be used where no distilled water is available. When the electrolyte level falls below the lead plates in the older style lead/acid batteries, add distilled water. Terminal and connections that are dressed with grease or LPS-3 will be far less prone to corrosion.

---

-continued-

One problem inherent in the operation of the solar powered radio is that some of the charge controllers will create Radio Frequency (RF) noise or static on some radio frequencies when they are regulating voltages above 14.2-volts. In this case, it may be necessary to throw the solar PV input switch to the off position temporarily while you use the radio or device that is experiencing the RF static. After you use the device just remember to put the input switch back in the on position to resume proper charging.

### **SEASONAL SHUTDOWN PROCEDURE**

In most cases the solar panels are left in their permanent position and the charge controller remains in the charging mode. The essential thing to remember is that all loads need to be disconnected by throwing the “main load” switch or breaker to the fuse panel to the off position. This disconnects any electrical current flowing to the fuse panel. Remove any other loads that may be directly attached to the battery such as radios, clocks, DC chargers etc. Leave the “PV input” switch or breaker in the **ON** position.

Batteries can freeze and burst if left in a discharged state in cold ambient temperatures. A fully charged battery will not freeze even at 60 degrees below zero. **Make sure you don’t leave the battery bank in a discharged state.** If necessary run the generator in order to bring the batteries to a full state of charge before departing camp.

### **BATTERY STATE OF CHARGE REFERENCE GUIDE**

Battery near full charge while charging.....	13.8 to 14.2 volts
Battery near full discharge while charging.....	12.3 to 13.2 volts
Battery fully charged with light load.....	12.4 to 12.7 volts
Battery fully charged with heavy load.....	11.8 to 12.5 volts
Rest voltage 100% charged.....	12.7 volts
Rest voltage 80% charged.....	12.5 volts
Rest voltage 60% charged.....	12.2 volts
Rest voltage 40% charged.....	11.9 volts
Rest voltage 20% charged.....	11.6 volts

### **Troubleshooting**

The first step in troubleshooting is ensuring that you have the proper voltage to the device that’s experiencing a problem. Most electronics in these systems are wired to a DC fuse panel. Next check the fuse panel for a blown fuse. If the fuse is intact, then check to ensure all electrical connections are clean and tight. In addition some devices such as VHF and single sideband radios may also have inline fuses, check these as well. Blown fuses and poor connections are the most common culprit. If the solar PV panels are not charging the 12-volt battery bank, check the main solar input fuse to make sure it is good and ensure that the breaker switch is in the on position. If the solar PV panels still do not put out proper voltage, check the wiring between the panels and the charge controller and check the connections on the rear of the solar PV panels. Make sure all connections are tight and clean. If corrosion is evident, use contact cleaner and or fire emery cloth or sand paper to gently clean connections.

---



**APPENDIX D. GENERAL EQUIPMENT AND CAMP  
MAINTENANCE**

## **GENERAL EQUIPMENT AND CAMP MAINTENANCE**

### **FUEL**

Kodiak ADF&G weir camps use three types of fuel: # 1 diesel, regular unleaded gasoline, and propane. There are usually a few containers of leftover fuel at the camp and we take more in on the first flight in. Additional fuel is ordered from town to supplement fuel levels as needed throughout the season.

#1 Diesel (heating oil) is used for building heat.

Unleaded Gasoline is used for skiff outboards, ATVs, and portable generators as well as landscaping equipment.

Propane is used for ovens and refrigerators.

### **Engine Oil (2-stroke vs. 4-stroke)**

2-stroke engines do not have a dedicated engine oil lubrication system similar to those found in conventional automobiles. Thus, 2-stroke type oil must be mixed with gasoline to lubricate the engine while gas is consumed. Most small outboards require a 100:1 gas/oil mix (5 ounces oil for 1 gallon gas).

Many larger 2-stroke outboards have a 2-cycle oil tank and automatically add oil to the engine as needed. Check the outboard for the presence of this tank before adding 2-cycle oil to the fuel tank. To add 2-stroke oil to the 2-stroke outboard motors: directly add the correct ratio of 2-stroke oil to the gas tank. The proper ratio can be located on the back of the 2-stroke oil container. Failure to add 2-stroke oil will quickly destroy any 2-stroke engine.

In contrast, 4-stroke engines have dedicated oil lubrication systems. 4-stroke engine oil is not consumed during normal operation but engine oil must be regularly checked by removing the cowling and checking the oil level on the dipstick. Under normal conditions, 4-stroke engine oil typically needs to be changed only once every season.

Refer to the owner's manuals in the office for detailed information on each outboard.

**NOTE:** 2-stroke and 4-stroke oils are not interchangeable. Use the appropriate oil type at all times.

### **DRIVE SYSTEMS (Propellers vs. Jet Drives)**

Outboards with propellers are more efficient than jet drives and are used for towing, boating long distance, in deep water or in rough water conditions. In shallow water, extra caution must be used with propellers. Reduce RPM's to a minimum and tilt the outboard up to prevent striking bottom. Before operating propeller driven skiffs, become familiar with the steering and tilt mechanisms specific to each outboard and ensure a spare prop and the proper tools are onboard. Before and after each use, check props for nicks, rolled tips, or bent blades. Damaged propellers will cause a loss in performance and can create vibrations harmful to the engine. Props with worn blades might also allow the engine to accelerate beyond the recommended operating range resulting in permanent damage to the engine. When a propeller is damaged while operating, stop and assess the damage before continuing. If the prop is severely damaged, slowly proceed to the nearest level shoreline and replace.

---

-continued-

**To change propellers use the following procedures:**

Remove cotter pin holding castle nut in place.

Remove castle nut with wrench by turning counter-clockwise while holding the propeller in place.

Carefully note order, and remove bushing(s) between castle nut and propeller.

Slide propeller off drive shaft.

Slide replacement propeller on by aligning grooves inside propeller with those on the drive shaft.

Replace bushings in same order and arrangement they were removed.

Tighten castle nut such that the cotter pin hole in the drive shaft is visible between the ‘castle’ grooves such and a cotter pin can be inserted to prevent the nut from spinning loose.

Do not over-tighten the castle nut.

Insert new cotter pin and bend the ends outward to secure it in place.

Jet drives work by forcing water through a tapered sleeve (housing) using an internal impeller. The result is a water jet that propels the skiff forward. To work efficiently, there must be a close fit between the impeller and sleeve. Thus, pulling sand, gravel, wood, weeds or other foreign objects into the jet drive can damage both the impeller and sleeve resulting in permanent damage or loss in performance. The impeller may need to be shimmed with washers to achieve a close fit.

When foreign objects (i.e. eel grass in Karluk Lagoon) are pulled into the jet unit (indicated by loss of power or change in rpm’s), stop immediately and turn engine off. Lift outboard and remove all objects from the ‘foot grate’ on the bottom of the jet unit. A screw driver or pocket knife may be needed to remove objects lodged in the grate. In some instances the foot will need to be removed to clear objects that have passed through the grate. To remove the foot, slowly proceed to the nearest shoreline and carefully unbolt the foot from the lower unit, clean thoroughly, and replace ensuring the pointed end of the foot is oriented forward (towards bow).

---

**COOLING SYSTEMS**

All facility outboards are water cooled. Cold water is pulled into the outboard below the waterline and circulated throughout the engine before it’s discharged with the exhaust. Thus, there are no antifreeze levels to check or radiators to maintain. However, all outboards have a small valve above the waterline on the back of cowling that discharges a small stream of water at all times while running. This discharge valve is an indication that the cooling system is working properly. It is important to ensure the discharge valve is working properly before and after each use or immediately after hitting bottom. **Running outboards while water is not being ejected from this valve may result in damage to the engine.**

Occasionally weeds or other objects get sucked into the water system that can damage the water pump or clog the small hose that leads to the discharge valve. If the outboard is overheating (loss of power, surging RPM’s, knocking and/or getting louder), turn off immediately. Raise the lower unit to ensure the water intake ports (located on both sides of lower unit just above the prop, and on the foot of the jet unit) are free from weeds. If the intakes are unobstructed and no water is emitted from the discharge valve after restarting, turn off and check to ensure the valve itself is unobstructed by feeding a short flexible length wire into the valve outlet on the back of the outboard. If the outboard continues to overheat (or you suspect cooling system failure) tow the

---

-continued-

skiff to the weir facility and consult the owner's manual for troubleshooting cooling system components.

### **Outboard Operation**

- The correct outboard motor fuel mixture for standard 2-stroke engines is 100:1. Newer Precision Blend outboards mix the two-cycle oil and gas automatically, but older engines require their fuels pre-mixed. Always pour the oil into the tank first, then add 2 or 3 gallons of gas and mix thoroughly. Fill tank to capacity always using a large funnel and chamois filter.
- Always mix fuel tanks or equipment under cover to prevent water contamination and always use a funnel and filter. **Always mark the container “Premixed” if that is the case, ratio and for what machinery.**
- Always place outboard motors in neutral when starting or shutting off the engine. Always make sure a safety line is attached to the boat and motor, in case the motor detaches from the transom.
- Perform a check daily of the screw clamps that hold the outboard to the transom. Also routinely check the motor for loose screws and bolts, cracks and breaks, especially in the area of the lower unit.
- Never start or run an outboard in the fully upright position.
- Check the gear oil in the lower unit of the propeller powered outboard once a week and drain and replace the gear oil every 50 hours of operation.
- If the skeg or jet unit hits bottom, check the screws for tightness, and look for housing damage or oil leakage.
- All outboards are to be tilted in the up position when moored.
- At the end of the season, winterize all outboard motors.
- Boats are to be kept clean and free of loose tools and debris. Only moor boats where they are not subject to damage from wave action or contact with the river bottom in rocky areas.
- Maintain a bowline on each boat and ensure that each boat is properly moored at the end of each workday.
- Check for leaks.

### **If your outboard will not start, check the following:**

- Make sure the on/off switch and safety "kill switch" clip is in the on position
- Check to see if the fuel line is connected to the motor and the tank and not pinched or kinked, and that the air vent on the tank is open.
- Check to see if there is water in the gasoline.

---

-continued-

- If the engine is flooded, wait five minutes for the plugs to dry before attempting to start again.
- Check the spark plugs, they may be fouled or defective (replace if needed), also check for corroded, loose, or disconnected wires.

## **WINTERIZING OUTBOARDS AND SKIFFS**

All skiffs and outboards are removed from the water, winterized and stored for the winter. Following are the general guidelines for winterizing outboards and skiffs:

### **Outboards**

6. Disconnect spark plug wires, remove, inspect and clean/replace sparkplugs.
7. Spray fogging oil into each cylinder (1-2 seconds) and replace spark plugs.
8. Turn over engine several times to distribute fogging oil within each cylinder.
9. Rinse exterior with freshwater and clean residue from all surfaces. Remove corrosion and lubricate electrical connections.
10. Remove outboard from skiff and hang upright in outboard shop.
11. Change lower unit lubricant by removing the lower drain plug and upper vent plug. Once all lubricant has drained, inject new lubricant into lower drain plug until lube begins to drain out of vent hole. Quickly replace both plugs.
12. Inspect props and jet impellers sleeves. Service or replace as necessary.
13. Change crankcase oil in 4-stroke engines. Refer to owner's manual for specific procedures and oil types (located in office file cabinet). Fill oil reservoirs in 2-stroke models.
14. Lubricate all service points, including grease zerks, shift/throttle linkages, and steering cables. Refer to owner's manual for specific lubrication points.
15. Date and record maintenance activities on a label and attach directly to each outboard (include which skiff the outboard came from).

### **Skiffs**

16. Remove, clean and label all gas tanks/lines, anchors, toolboxes, oars, bilge pumps and floatation devices. Store in outboard shop. Use a wire brush to remove any rust on tools and lubricate with anti-corrosion spray before storing for winter.
17. Remove batteries. Clean, label and fully charge for storage.
18. Drain, inspect and replace fuel filters as necessary.
19. Scrub hull and floorboards with bleach and water solution.
20. Clean and lubricate steering and throttle parts to prevent corrosion. Label all cables and hoses that are removed and make a detailed description of where they are reattached for the following season.
21. Remove drain plugs and attach to the hull.
22. Secure all skiffs with a sturdy line or chain to prevent them from floating or blowing away during winter.

---

-continued-

### **Generators**

Portable generators are supplied to field camps. Their maintenance follows the same line as outboards. Generators have 4-cycle engines; mixed gas must not be used. The crankcase oil reservoir should be checked daily and maintained at the full level. After 25 hours of operation the oil should be changed. Spark plugs should be checked every season for fouling and gap.

---

**APPENDIX E. JUVENILE SALMON IDENTIFICATION  
KEY**

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

By

ROBERT J. McCONNELL and GEORGE R. SNYDER

National Marine Fisheries Service  
Northwest Fisheries Center  
2725 Montlake Boulevard East  
Seattle, Washington 98102

## ABSTRACT

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

## INTRODUCTION

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

Five species of Pacific salmon (pink, chum, sockeye, chinook, and coho); four species of trout (cutthroat, brown, Dolly Varden, and rainbow or steelhead); and other juvenile and adult fish<sup>1</sup> 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-

<sup>1</sup> 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-

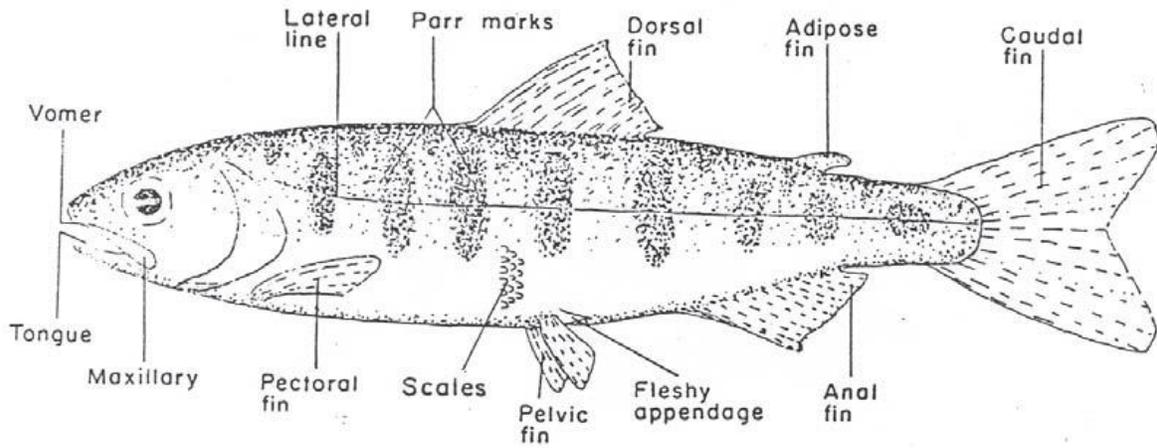


Figure 1.—A hypothetical salmonid showing external characteristics.

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)

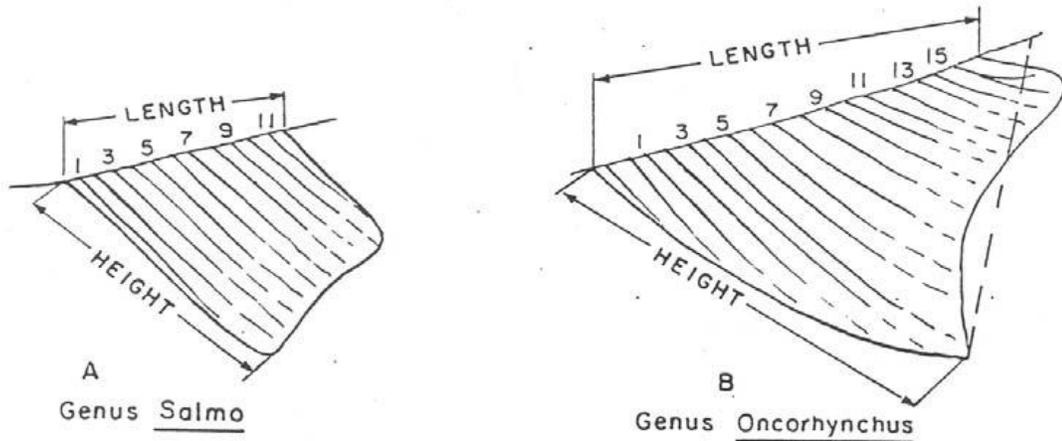


Figure 2.—Anal fins: (A) Trout, genus *Salmo*; (B) Pacific salmon, genus *Oncorhynchus*. The two drawings show differences in structure and fin ray count. (Note that the length of the anal fin is its overall basal length, and its height is that distance from the origin of the fin to the tip of the anterior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

-continued-

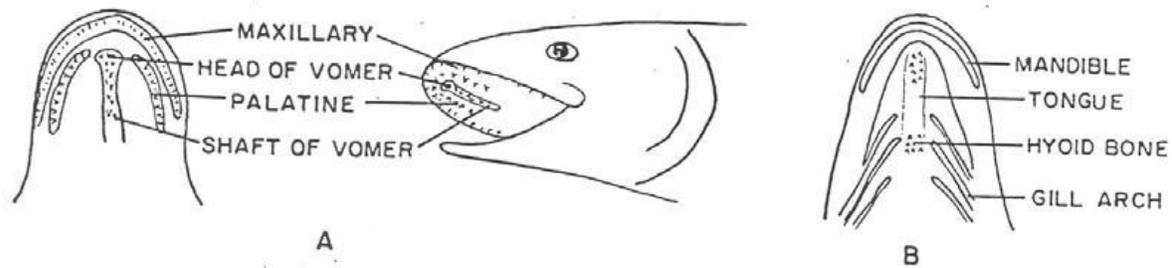
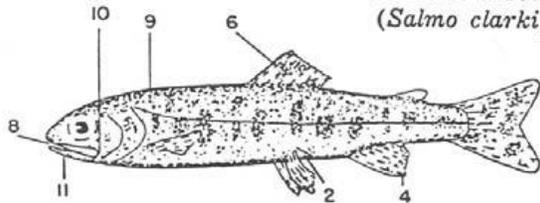
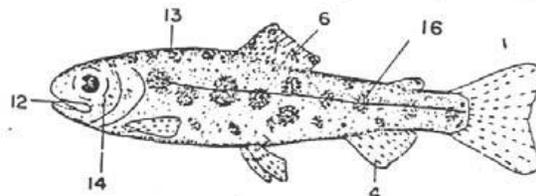


Figure 3.—Location of dentition in (A) the roof and (B) the floor of the mouth of salmonid fishes. (Presence or absence of teeth on the vomer or tongue may be determined by use of the little finger or a blunt instrument. The small hyoid teeth at the base of the tongue are located between the gill arches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

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

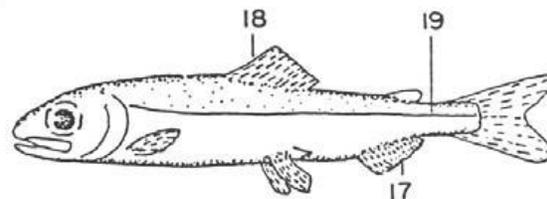


- 16. (20) Parr marks almost round.  
Rainbow or steelhead trout  
(*Salmo gairdneri*)



- 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*)

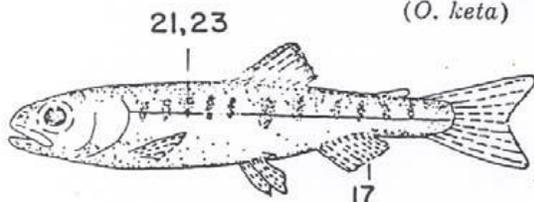


- 12. (8) \*No teeth at base of tongue.
- 13. (9) Five to 10 parr marks along mid-dorsal ridge ahead of dorsal fin.
- 14. (10) Maxillary short, not reaching past posterior margin of eye.
- 15. (11) No hyoid mark under lower jaw. Few or no spots on tail.

-continued-

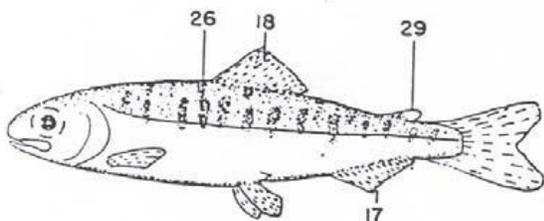
- 20. (16) Parr marks present as vertical bars or oval spots.
- 21. (30) Parr marks short, extending little, if any, below lateral line.
- 22. (25) Gill rakers on first arch, 19 to 26.  
\*\* Pyloric caeca, 140 to 186.
- 23. (26) Parr marks faint. Sides below lateral line iridescent green.
- 24. (27)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

Chum salmon  
(*O. keta*)



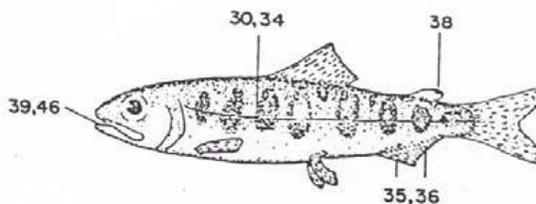
- 25. (22) Gill rakers on first arch, 30 to 40.  
\*\*Pyloric caeca 60 to 115.
- 26. (23) Parr marks usually sharply defined. Sides below lateral line silvery, not iridescent green.
- 27. (24) Relatively large when migrating from fresh water, approximately 3 to 5 inches (80 to 126 mm) long.
- 28. (31)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

Sockeye salmon  
(*O. nerka*)



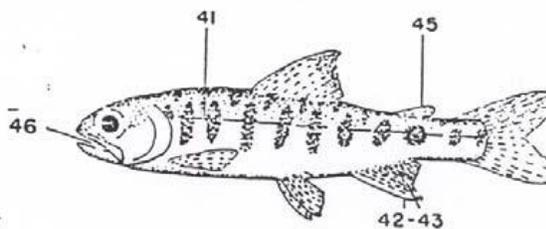
- 30. (21) Parr marks large, vertical bars centered by lateral line.
- 31. (28) \*\*Gill rakers short and thick, fewer than 29 on first arch.
- 32. (29) Adipose fin at least partially pigmented.
- 33. (40) \*\*Pyloric caeca more than 90.
- 34. (41) Parr marks broader than interspaces.
- 35. (42) Anterior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

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

#### BIBLIOGRAPHY

##### Alaska

- MEEHAN, W. R., and J. S. VANIA.  
1961. An external characteristic to differentiate between king and silver salmon juveniles in Alaska. Alaska Dep. Fish Game, Inf. Leaflet 1. 5 p. (Processed.)

##### WILIMOVSKY, N. J.

1958. Provisional keys to the fishes of Alaska. U.S. Fish Wildl. Serv., Fish. Res. Lab., Juneau, Alaska. 113 p. (Processed.)

##### California

##### SHAPOVALOV, LEO.

1947. Distinctive characters of the species of anadromous trout and salmon found in California. Calif. Fish Game 33: 185-190.

##### Canada

##### CARL, G. CLIFFORD, W. A. CLEMENS, and C. C. LINDSEY.

1967. The fresh-water fishes of British Columbia. B. C. Prov. Mus., Dep. Recreation Conserv., Handb. 5. 192 p.

##### CLEMENS, W. A.

1935. The Pacific salmon in British Columbia waters. B. C., Rep. Comm. Fish. 1934: K103-K105.

##### CLEMENS, W. A., and G. V. WILBY.

1946. Fishes of the Pacific Coast of Canada. Fish. Res. Board Can., Bull. 68. 368 p.

##### FOERSTER, R. E., and A. L. PRITCHARD.

1935. The identification of the young of the five species of Pacific salmon, with notes on the fresh-water phase of their life-history. B. C., Rep. Comm. Fish. 1934: K106-K116.

##### SCOTT, W. B.

1958. A checklist of the freshwater fishes of Canada and Alaska. R. Ont. Mus., Div. Zool. Palaeontol. 30 p.

##### Montana

##### WEISEL, G. F.

1957. Fish guide for intermountain Montana. Mont. State Univ. Press, Missoula. 88 p.

##### Oregon

##### BOND, CARL E.

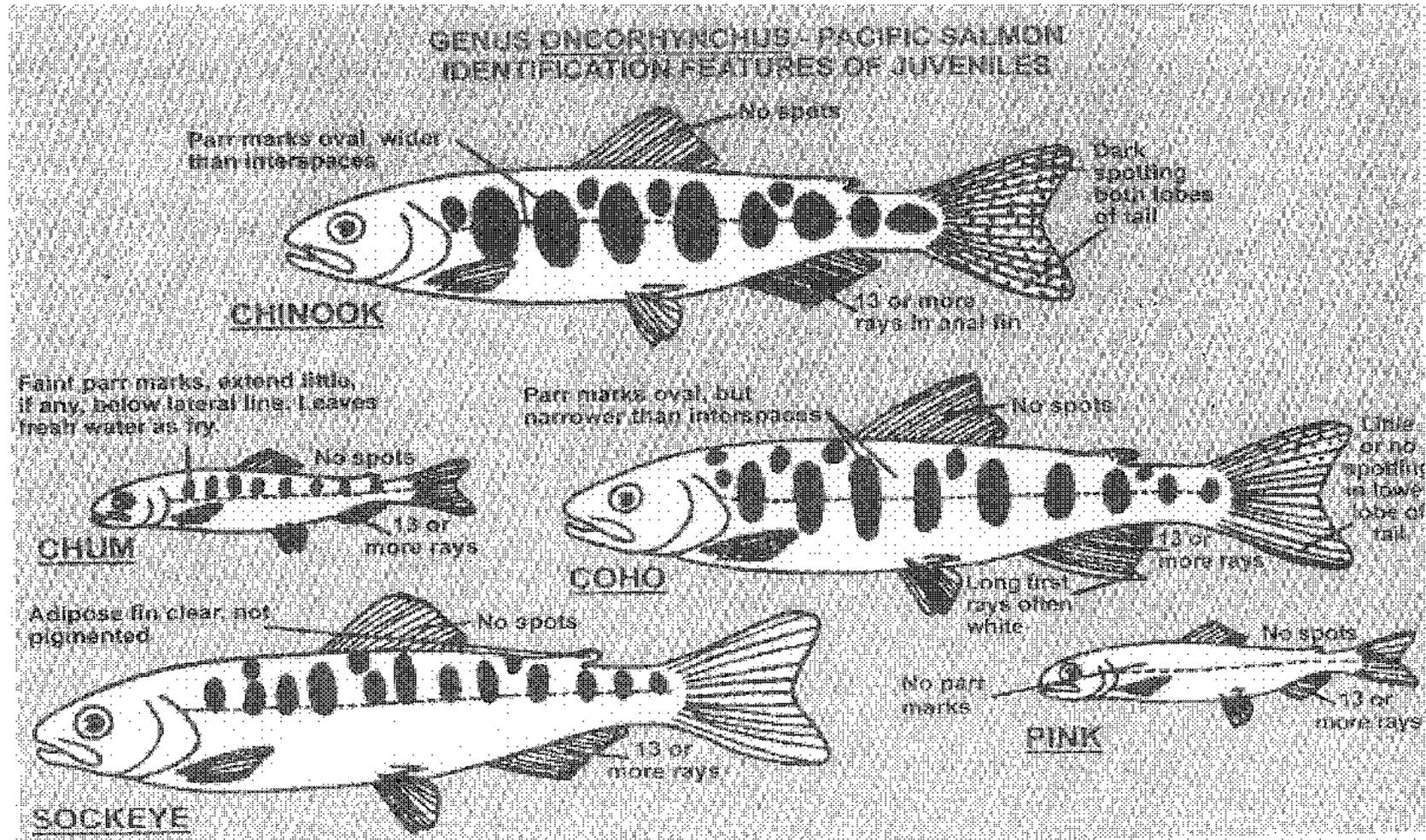
1961. Keys to Oregon fresh-water fishes. Oreg. State Univ., Agric. Exp. Stn., Tech. Bull. 58. 42 p.

##### Pacific Northwest

##### BURGNER, R. L. (edited by William A. Smoker).

1955. Preliminary key for identification of salmon fry, juveniles, and adults. State of Wash., Dep. Fish. 8 p. (Processed.)

-continued-



Appendix E2.–Juvenile salmon identification.

---

**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.



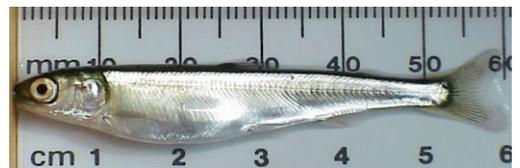
**CHUM FINGERLING**

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.



Copyright c 2010  
by Earl N. Steele

---

-continued-

**RAINBOW (STEELHEAD) FINGERLING**

Length 1 – 4 cm.; forward dorsal surface has parr-like marks; parr marks are prominent; marks are longer than are wide at lateral line; dorsal fin is spotted and has white tip on six rays; adipose fin with continuous dark edge; white leading edges on anal and pelvic fins.

**RAINBOW (STEELHEAD) JUVENILE**

Length 7 – 15 cm.; body spots abundant; dorsal fins are spotted with white tip over six rays; caudal fin is spotted; anal and pelvic fins with white tips; pink or red strip on side of body; parr marks may be present.



**CUTTHROAT FINGERLING**

Length 2 – 4 cm.; parr marks prominent, circular in shape at lateral line; dorsal fin spotted, has white tip on three rays; adipose fin has dark edge; white leading edges on anal and pelvic fins.

**CUTTHROAT JUVENILE**

Length 7 – 15 cm.; body spots abundant; spotting below lateral line, equally heavy on anterior and posterior halves of body; dorsal fin spotted with white tip over three rays, caudal fin is spotted, anal and pelvic fins with white tips; parr marks may be present.



Copyright c 2010  
by Earl N. Steele