Appendix 1. Chinook salmon populations analyzed in this study and included in baseline Version 1.1. Run time, hatchery (H) or wild (W) origin, life stage, collection data, and analysis laboratory are given. Region numbers and letters match the baseline map for GAPS baseline v1.

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
1	Central Valley fall	Battle Creek (a)	Fa	W	Adult	2002, 2003	SWFSC
		Feather Hatchery fall (b)	Fa	H	Adult	2003	SWFSC
		Stanislaus River (c)	Fa	W	Adult	2002	SWFSC
		Tuolumne River (d)	Fa	W	Adult	2002	SWFSC
2	Central Valley spring	Butte Creek (a)	Sp	W	Adult	2002, 2003	SWFSC
		Deer Creek spring (b)	Sp	W	Adult	2002	SWFSC
		Feather Hatchery spring (c)	Sp	H	Adult	2003	SWFSC
		Mill Creek spring (d)	Sp	W	Adult	2002, 2003	SWFSC

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
3	Central Valley winter	Sacramento River winter	Wi	W/H	Adult	1992, 1993, 1994, 1995, 1997, 1998, 2001, 2003, 2004	SWFSC
4	California Coast	Eel River (a)	Fa	W	Adult	2000, 2001	SWFSC
		Russian River (b)	Fa	W	Juvenile	2001	SWFSC
5	Klamath River	Klamath River fall (a)	Fa	W	Adult	2004	SWFSC
		Trinity Hatchery fall (b)	Fa	H	Adult	1992	SWFSC
		Trinity Hatchery spring (c)	Sp	H	Adult	1992	SWFSC
6	N California/S Oregon Coast	Chetco	Fa	W	Adult	2004	OSU
7	Rogue River	Applegate (a)	Fa	W	Adult	2004	OSU

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
		Cole Rivers Hatchery (b)	Sp	H	Adult	2004	OSU
8	Mid Oregon Coast	Coquille (a)	Fa	W	Adult	2000	OSU
		Siuslaw (b)	Fa	W	Adult	2001	OSU
		Umpqua (c)	Sp	W	Adult	2004	OSU
9	North Oregon Coast	Alsea (a)	Fa	W	Adult	2004	OSU
		Nehalem (b)	Fa	W	Adult	2000, 2002-1, 2002-2	OSU
		Siletz (c)	Fa	W	Adult	2000	OSU
10	Lower Columbia R. spring	Cowlitz H. spring (a)	Sp	H		2004	CRITFC
		Kalama H. spring (b)	Sp	H		2004	CRITFC
		Lewis H. spring (c)	Sp	H		2004	CRITFC
11	Lower Columbia R. fall	Cowlitz H. fall (a)	Fa	H		2004	CRITFC

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
		Lewis fall (b)	Fa	W	Adult	2003	WDFW
		Sandy (c)	Fa	W	Adult	2002, 2004	OSU
12	Willamette River	McKenzie (a)	Sp	H	Adult	2002, 2004	OSU
		North Santiam (b)	Sp	H	Adult	2002, 2004-1, 2004-2	OSU
13	Mid Columbia R. tule fall	Spring Creek	Fa	H		2001, 2002	CRITFC
14	Mid and Upper Columbia R. spring	Carson H. (a)	Sp	H		2001, 2004	CRITFC
		John Day (b)	Sp	W	Juvenile, Adult	2000-1, 2000-2, 2000-3, 2000-4, 2000-5, 2000-6, 2004	OSU

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
		Upper Yakima (c)	Sp	H	Adult, Mixed	1998, 2003	WDFW
		Warm Springs Hatchery (d)	Sp	H		2002, 2003	CRITFC
		Wenatchee spring (e)	Sp	W	Adult	1993, 1998, 2000	WDFW
15	Deschutes River fall	Lower Deschutes R.	Fa	W		1999-1, 1999-2, 2001, 2002	CRITFC
16	Upper Columbia R. summer/fall	Hanford Reach CR (a)	Su/Fa	W		1999, 2000-1, 2000-2, 2000-3,2001-1, 2001-2, 2001-3	CRITFC
		Methow R. summer (b)	Su/Fa	W		1992, 1993, 1994	CRITFC

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
		Wells Dam (c)	Su/Fa	H		1993-1, 1993-2	CRITFC
17	Snake River fall	Lyons Ferry	Fa	W	Adult	2002-1, 2002-2, 2003-1, 2003-2	WDFW
18	Snake River spring/summer	Imnaha R. (a)	Sp/Su	W		1998, 2002, 2003	CRITFC
		Minam R. (b)	Sp/Su	W		1994, 2002, 2003	CRITFC
		Rapid River H. (c)	Sp/Su	H		1997, 1999, 2002	CRITFC
		Sesech R. (d)	Sp/Su	W		2001, 2002, 2003	CRITFC
		Tucannon (e)	Sp/Su	H	Adult	2003-1, 2003-2, 2003-2	WDFW

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
19	Washington Coast	Queets (a)	Fa	W	Adult	1996, 1997	WDFW
		Quillayute/ Bogachiel (b)	Fa	W	Adult	1995-1, 1995-2, 1995-3, 1996-1, 1996-2	WDFW
		Sol Duc (c)	Sp	H	Adult	2003	WDFW
20	South Puget Sound	Soos Creek (a)	Fa	H	Adult	1998-1, 1998-2, 2004	WDFW
		White River (b)	Sp	H	adult	1998-1, 1998-2, 2002	WDFW
21	North Puget Sound	NF Nooksack (a)	Sp	H/W	adult	1999	WDFW
		NF Stilliguamish (b)	Su	H/W	adult	1996, 2001-1, 2001-2	WDFW
		Skagit summer (c)	Su	W	adult	1994, 1995	WDFW

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
		Suiattle (Skagit) (d)	Sp	W	adult	1989, 1998, 1999	WDFW
22	Lower Fraser River	Birkenhead River (a)	Sp	H	Adult	1996, 1997, 1999, 2001, 2002, 2003	SWFSC
		WChilliwack (b)	Fa	H	Adult	1998, 1999	DFO
23	Lower Thompson River	Nicola (a)	Sp	H		1998, 1999	OSU
		Spius River (b)	Sp	H	Adult	1996, 1997, 1998	SWFSC
24	South Thompson River	Lower Adams (a)	Fa	H	Adult	1996	DFO
		Lower Thompson (b)	Fa	W	Adult	2001	DFO
		Middle Shuswap (c)	Fa	H	Adult	1997	DFO

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
25	North Thompson River	Clearwater (a)	Fa	W	Adult	1997	DFO
		Louis River (b)	Fa	W	Adult	2001	DFO
26	Mid Fraser River	Chilko (a)	Fa	W	Adult	1995, 1996, 1999, 2002	DFO
		Nechako (b)	Fa	W	Adult	1996	DFO
		Quesnel (c)	Fa	W	Adult	1996	DFO
		Stuart (d)	Fa	W	Adult	1996	DFO
27	Upper Fraser River	Morkill River (a)	Fa	W	Adult	2001	DFO
		Salmon River (Fraser) (b)	Sp	W	Adult	1997	SWFSC
		Swift (c)	Fa	W	Adult	1996	DFO
		Torpy River (d)	Fa	W	Adult	2001	DFO
28	East Vancouver Island	Big Qualicum (a)	Fa	H	Adult	1996	DFO
		Quinsam (b)	Fa	H	Adult	1996, 1998	DFO

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
29	West Vancouver Island	Conuma (a)	Fa	H	Adult	1997, 1998	DFO
		Marble at NVI (b)	Fa	H	Adult	1996, 1999, 2000	DFO
		Nitinat (c)	Fa	H	Adult	1996	DFO
		Robertson (d)	Fa	H	Adult	1996, 2003	DFO
		Sarita (e)	Fa	H	Adult	1997, 2001	DFO
30	S BC Mainland	Klinaklini (a)	Fa	W	Adult	1997	DFO
		Porteau Cove (b)	Fa	H	Adult	2003	DFO
31	Central BC Coast	Atnarko (a)	Fa	H	Adult	1996	DFO
		Kitimat (b)	Fa	H	Adult	1997	DFO
		Wannock (c)	Fa	H	Adult	1996	DFO
32	Lower Skeena River	Ecstall (a)	Fa	W	Adult	2000, 2001, 2002	DFO

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
		Lower Kalum (b)	Fa	W	Adult	2001	DFO
33	Upper Skeena River	Babine (a)	Fa	H	Adult	1996	DFO
		Bulkley (b)	Fa	W	Adult	1999	DFO
		Sustut (c)	Fa	W	Adult	2001	DFO
34	Nass River	Damdochax (a)	Fa	W	Adult	1996	DFO
		Kincolith (b)	Fa	W	Adult	1996	DFO
		Kwinageese (c)	Fa	W	Adult	1996	DFO
		Owegee (d)	Fa	W	Adult	1996	DFO
35	Upper Stikine River	Little Tahltan River	Sp	W	Adult	1989, 1990	OSU
36	Taku River	Kowatua Creek (Taku; a)		W	Adult	1989, 1990	ADFG
		Nakina River (Taku; b)		W	Adult	1989, 1990	ADFG
		Tatsatua Creek (Taku; c)			Adult	1989, 1990	ADFG
		Upper Nahlin River (Taku; d)		W	Adult	1989, 1990, 2004	ADFG

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
37	Southern Southeast Alaska	Chikamin River (West Behm Canal; a)		W	Adult	1990, 1993	ADFG
		Clear Creek (Unuk; b)		W	Adult	1989, 2003, 2004	ADFG
		Cripple Creek (Unuk; c)		W	Adult	1988, 2003	ADFG
		Keta River (Boca de Quadra; d)		W	Adult	1989, 2003	ADFG
		King Creek (West Behm Canal; e)		W	Adult	2003	ADFG
38	Southeast Alaska Stikine R.	Andrews Creek (Stikine)		W	Adult	1989, 2004	ADFG
39	N. Southeast Alaska	King Salmon River		W	Adult	1989, 1990, 1993	ADFG

Region #	Region	Population	Run time[1]	Origin	Life Stage	Collection Date	Analysis Laboratory[2]
40	Chilkat River	Big Boulder Creek (a)		W	Adult	1992, 1995, 2004	ADFG
		Tahini River (b)		W	Adult	1992, 2004	ADFG
41	Alsek River	Klukshu River		W	Adult	1989, 1990	ADFG
42	Situk River	Situk River		W	Adult	1988, 1990, 1991, 1992	ADFG

[1] Run time abbreviations: spring (Sp), summer (Su), fall (Fa), and winter (Wi)

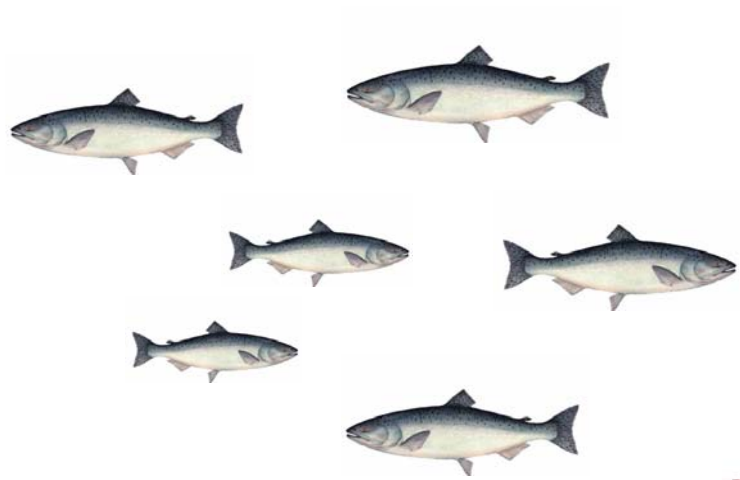
[2]Laboratory abbreviations: OSU, Oregon State University; SWFSC, Southwest Fisheries Science Center – National Marine Fisheries Service; DFO, Department of Fisheries and Oceans Canada; CRITFC, Columbia River Inter-Tribal Fish Commission; ADFG, Alaska Department of Fish & Game; WDFW, Washington Department of Fish & Wildlife.

Cooperative Research on Oregon Ocean Salmon-OWEB Approved Budget

OSU SALARIES						
		Monthly	**OPE**			
Position, Name		**Salary**	**%**	**FTE**	**MM**	**Totals**
Professor (Gil Sylvia)		$ 8,703	39.4%	1.00	1	
Assistant Prof (Jessica Miller)		$ 5,250	41.9%	1.00	1	
Assistant Prof (Michael Banks)		$ 5,665	45.0%	1.00	1	
Professor (Michael Morrissey)		$ 7,942	40.5%	1.00	0.5	
Professor (David Sampson)		$ 6,445	42.8%	1.00	0.5	
Assistant Professor (Michael Thompson)		$ 4,168	43.5%	1.00	3	
Dr. Peter Lawson		$ 7,202	29.0%	1.00	1	
Faculty Research Associate (Renee Bellinger)		$ 3,250	0.59	1	7	$ 22,750
Faculty Research Associate (Renee Bellinger)		$ 3,250	0.59	0.25	5	$ 4,063
Res. Asst:(Summer salaries for tech staff - genetics)		$ 2,000	0.1	1	3	$ 6,000
Res. Asst:(Summer salaries for tech staff - otolith chemistry)		$ 2,000	0.1	1	3	$ 6,000
TOTAL OSU SALARIES & WAGES						$ 38,813
OSU FRINGE BENEFITS						$ 17,020
EXPENDABLE SUPPLIES & EQUIPMENT - under $5,000 per unit						$ 37,000
TRAVEL						
Travel OSU						$ 5,000
Travel Salmon Commission						$ 5,000
OTHER RESEARCH COSTS (Coordination, management, vessels, etc.)						
	No.					
Programming for data logging						$ 10,000
Port Coordinators	4	2,000/July-Aug, 1,000 Sept&Oct			3000	$ 12,000
GIS Consultant						$ 20,000
Fleet management	1					$ 20,000
ODFW scale aging (Lisa Borgerson)	2000				4	$ 8,000
			Boat Charge	No. boats	No. trips	
Boat Charter for fish sampling			1200			$ 318,000
Incentive boat charter for exploration			400			$ 32,000
Otolith sampling	500					$ 500
Boat electronic data loggers	4				6000	$ 24,000
CTDs for oceanographic data	1				8500	$ 8,500
Stowaway tidbit for temp det. at point of capture	100				110	$ 10,558
ADMINISTRATIVE COSTS						$ 20,000
GRAND TOTAL						**$ 586,391**
SALMON COMMISSION PORTION						$ 458,558
OSU PORTION						$ 127,833

Cooperative Research on Oregon Ocean Salmon-OWEB Budget				
	Approved	Amended	Amended	Actual
Contract Services	Budget	Amounts	Contract	Expenditures
Agricultural Research Foundation (ARF)				
Total OSU Salaries & Wages	$ 38,813.00			
OSU Fringe Benefits	$ 17,020.00			
Travel OSU	$ 5,000.00			
Expendable Supplies & Equipment	$ 37,000.00			
Programming for data logging	$ 10,000.00			
GIS Consultant	$ 20,000.00			
Total to ARF	$ 127,833.00		$ 127,833.00	$ 155,233.00
Fleet management	$ 20,000.00		$ 20,000.00	$ 18,000.00
Port Coordinators	$ 12,000.00	$ (3,000.00)	$ 9,000.00	$ 9,000.00
ODFW scale aging (Lisa Borgerson)	$ 8,000.00		$ 8,000.00	$ 8,000.00
Boat Charter for fish sampling	$ 318,000.00	$ 39,000.00	$ 357,000.00	$ 332,100.00
Incentive boat charter for exploration	$ 32,000.00	$ (32,000.00)	$ -	$ -
Otolith sampling	$ 500.00		$ 500.00	$ -
Total Contract Services	**$ 518,333.00**	**$ 4,000.00**	**$ 522,333.00**	**$ 522,333.00**
Travel Salmon Commission	**$ 5,000.00**		**$ 5,000.00**	**$ 5,000.00**
Supplies & Materials	**$ 10,558.00**		**$ 10,558.00**	**$ 10,558.00**
Equipment	**$ 32,500.00**	**$ (4,000.00)**	**$ 28,500.00**	**$ 28,500.00**
Administrative Costs	**$ 20,000.00**		**$ 20,000.00**	**$ 20,000.00**
GRAND TOTAL	**$ 586,391.00**		**$ 586,391.00**	**$ 586,391.00**

Collaborative Research on Oregon Ocean Salmon (CROOS)



2006 CROOS Salmon Season Pilot Study
3 November 2006
draft

CROOS Partners:

Oregon Salmon Commission
Coastal Oregon Marine Experiment Station
Oregon Sea Grant
OSU Seafood Lab
Oregon State University

<u>Funding provided by the Oregon Watershed Enhancement Board (OWEB)</u>

Authors: Renee Bellinger, Michael Thompson, Jeff Feldner, Scott Boley, Paul Merz, Bob Kemp, Nancy Fitzpatrick, Michael Banks, Gil Sylvia, Pete Lawson, David Sampson, Michael Morrissey, Eric Shindler, Jessica Miller, Laurie Weitkamp

General Procedure

At Sea:

- Each participant will, using a zip-tie, attach a metal bar-code tag to each head of the first 70 fish (50 during September and October) harvested during an opener
- Collect 8-10 scales and one tissue sample from every tagged fish
- Record fishing location by turning on GPS unit when lines are in water and turning it off when lines are pulled up
- Press “waypoint” every time a fish is brought aboard to record the harvest location of the fish
- Write vessel name, date, time, depth of capture, fork length of fish, whether the fish has a hatchery marking, if a stomach was taken, and the waypoint number on the envelope provided for each fish tagged
- Attach an underwater temperature & depth reader (VEMCO Minilogger) on the deepest line near the deepest cannonball
- Keep a paper-logbook to record sea surface temperature in intervals at a minimum of 1 hour if a VEMCO Minilogger was not issued

Within 24 hours return from sea:

- Take samples, GPS and Miniloggers to port liaison for downloading of data and sample check-in
- Electronic logbooks will be collected at the end of each opener by logbook coordinator
- A subset of participants (volunteers) will be requested to take five to 10 stomachs from Chinook on the last day of fishing. Bags for collection will be provided.
- Port liaison will provide participants with more batteries, envelopes, datasheets, or zip-ties as necessary

GPS Units

- Fresh batteries every day so you don't stop taking a track mid-point
- When using GPS, keep it outside where it can get satellite reception (typically there is no reception in the wheelhouse)

Turn GPS **ON** when you gear is in water

Turn GPS **OFF** when gear is not in water

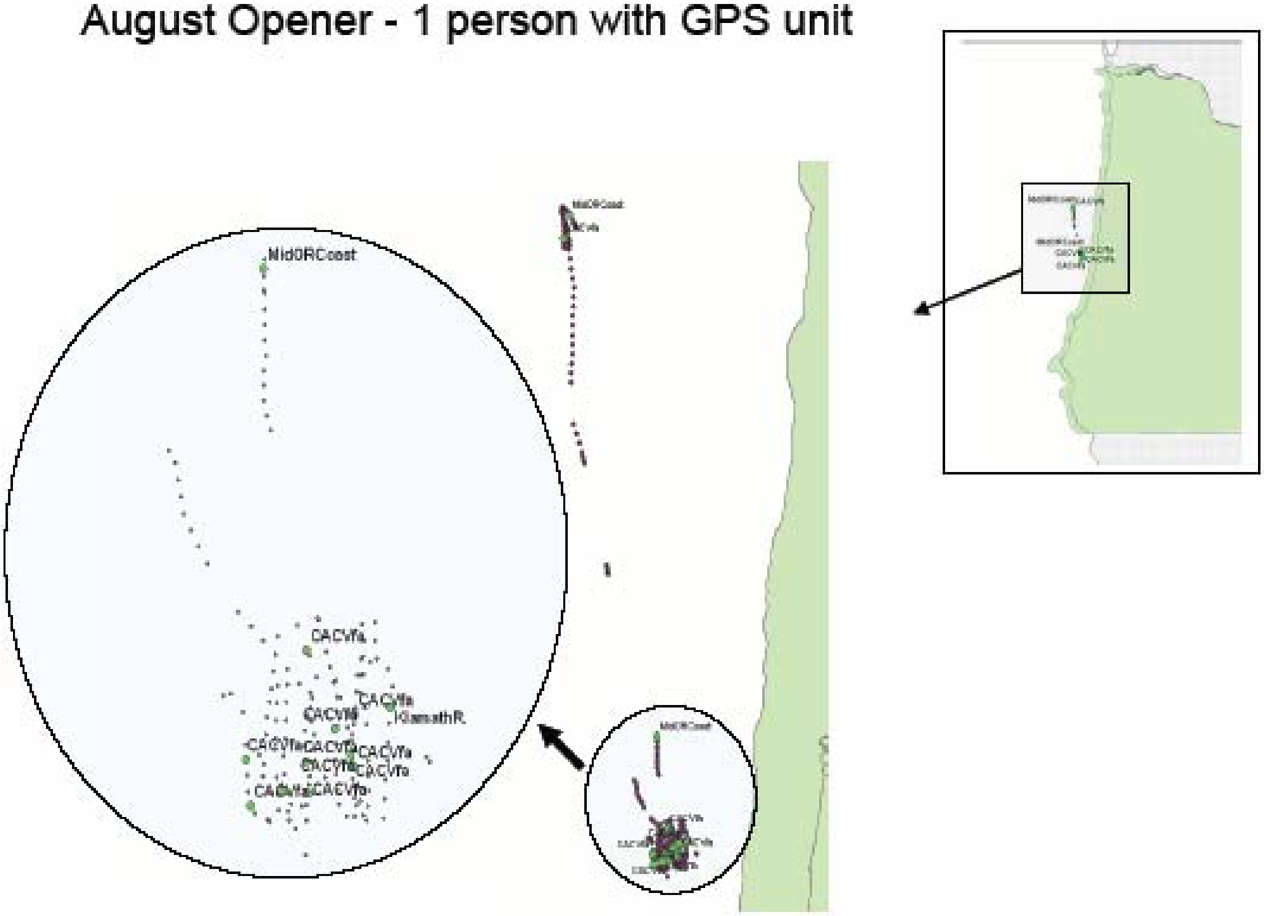
1. When you have landed a fish, press "MARK" button to record waypoint
2. Read the waypoint number recorded on the screen and note time/date
3. Hit " Enter" button to record the waypoint on the GPS unit
4. Write the waypoint number and corresponding time on the collection envelope

The GPS unit will automatically save your track as you fish. You won't see anything indicating that it is recording, but as long as the GPS is on, it is recording in 5 minute intervals.

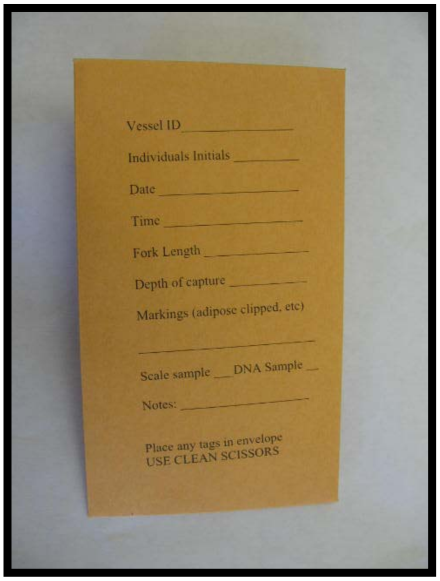
Jennifer Wimpress (Newport), Carla Hedgepeth (Winchester Bay) and Paul Merz (Coos Bay) are the contacts for downloading data from GPS units. The GPS contact person will download data from your GPS onto a computer and send to us. You can also download the data and email it if you prefer. If you have a computer and want software to view your track log, contact Jeff Feldner, who will arrange to have software sent to your home.

GPS Data will be used to locate where VEMCO minilogger data was taken, and to record where fish are NOT being harvested as well as where they are being harvested. We can match your fishing efforts to oceanographic conditions (currents, chlorophyll-a, sea surface temperature). This information may be useful to determine what triggers feeding of fish, different schooling behaviors, etc.

Example Data for one Fisherman
August Opener - 1 person with GPS unit

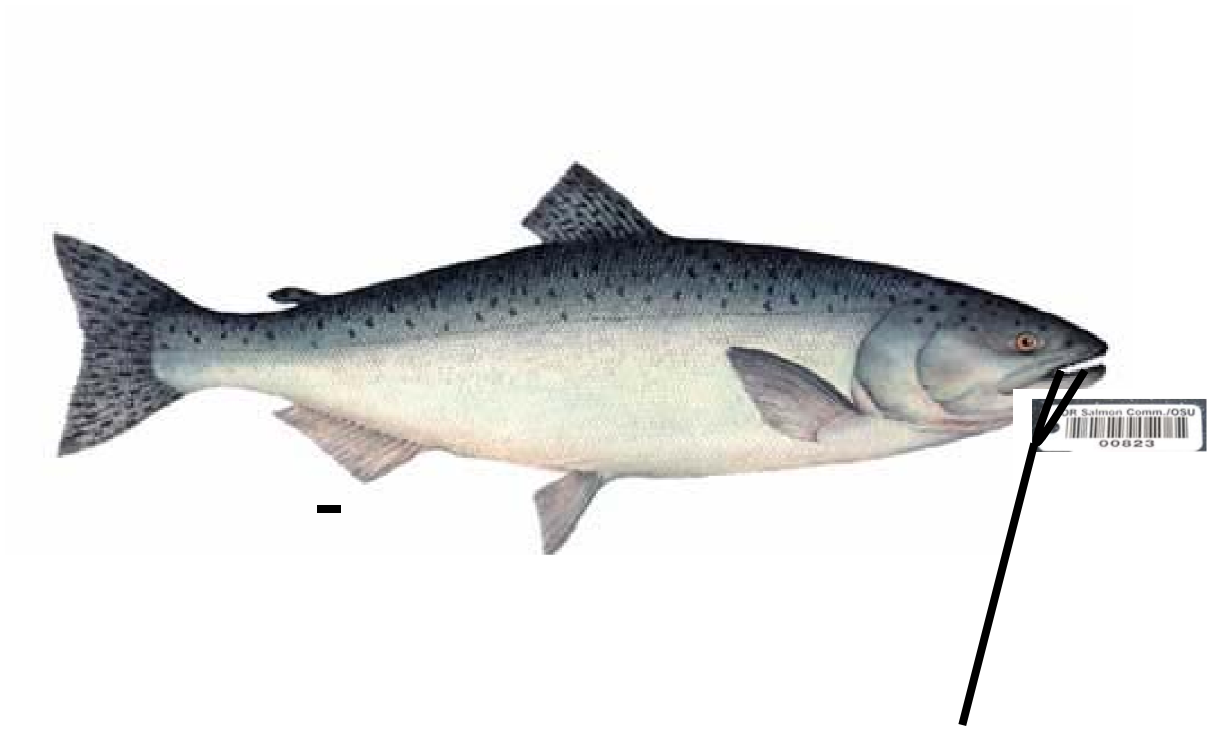


GENERAL PROCEDURE FOR EACH CHINOOK SALMON HARVESTED (Up to FIRST 50)



1) When a fish is landed, press the Mark button to record a waypoint
2) Check this waypoint number and time, and press the enter button to record the number on your GPS
3) Select the envelope that you will use for that fish
4) Write the waypoint number on this collection envelope
5) Write the time of the waypoint number on the envelope
6) Record depth of capture on envelope
7) Write your Vessel name on envelope
8) Write the date on envelope
9) Measure Fork length and write on envelope
10) Check for hatchery markings and use the envelope to indicate if you do or do not see any markings
11) Remove metal tag from envelope
12) Use a zip-tie to attach the metal tag to head (see procedure next page)
13) Remove 8 - 10 scales (see Scale Sampling Procedure)
14) Take genetic sample (see Genetic Sampling Procedure; be sure to take scales first)

Placing Metal Bar Code Tag on Fish



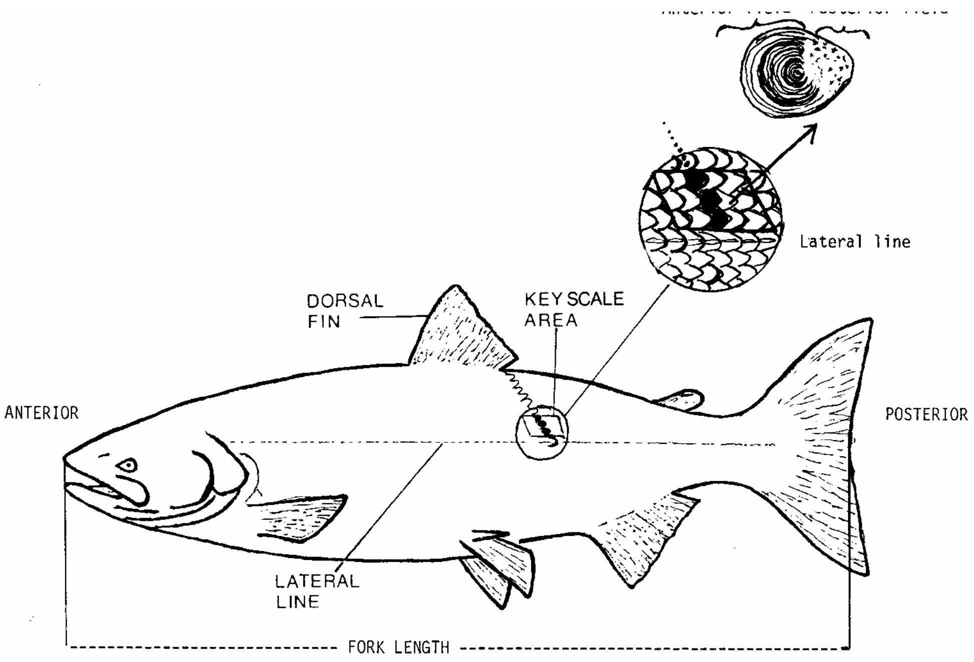
Scale Sampling Procedure
2006 Test Fishery, Ocean Chinook Salmon

1. Locate key area by following the diagonal row of scales down and back from the posterior insertion of the dorsal fin to the first 3 scales above, but not including the lateral line. One to two scales in front of (anterior) and behind (posterior) these three scales are within the key area.

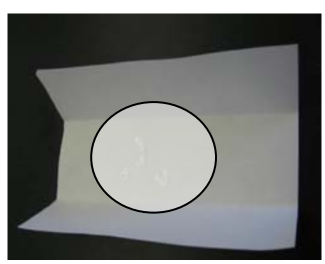
2. Scrape the key area with a knife to remove any slime. With forceps, pluck **8-10** scales from this area and place them neatly between the paper insert in the envelope. Be very careful that the scales come from the key area. Fold paper one time.

3. If scales are absent from the key area on one side of the fish, sample from the key area on the other side of the fish. **If fish has visible damage or scaring in key scale area use other side of fish for scale collection.** If both sides are damaged or scared do not take scale samples and make note on envelope in area provided (or see #4).

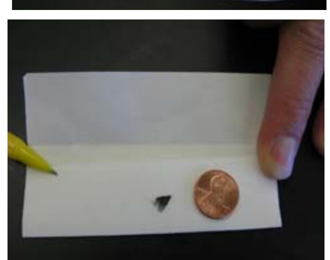
4. If scales are absent from key areas on both sides of fish, scales may be taken from under the dorsal fin but only from 1-4 scale rows above or below the lateral line. "Non-key" must be recorded on the envelope on the comments line.



TAKE 8 - 10 SCALES FIRST
Place in middle of paper

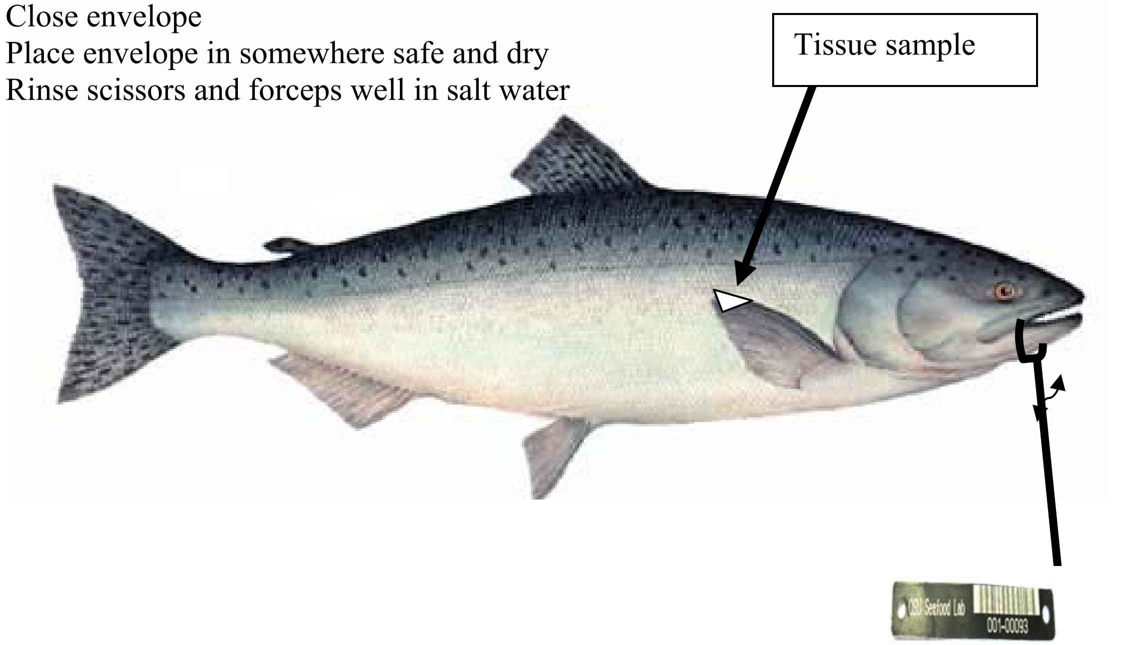


Fold paper once over scales
DNA tissue sample will go on next fold
(pictured to right)

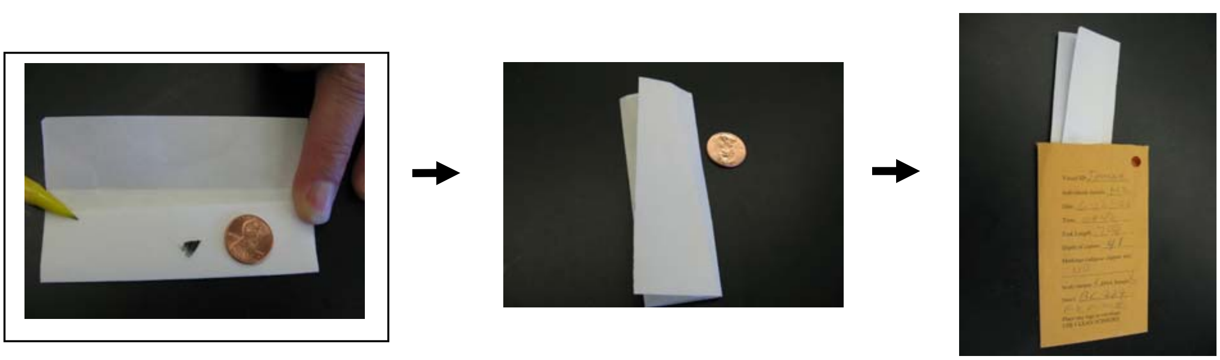


Genetic Sampling Protocol

1) Use ONLY **CLEAN** scissors and forceps
2) Remove small portion from pectoral fin (not larger than a dime)
3) Place fin snip flat on paper
4) Place flat on paper
5) Fold paper over
6) Slide paper in envelope
7) Close envelope
8) Place envelope in somewhere safe and dry
9) Rinse scissors and forceps well in salt water



Place small bit tissue on paper



Filling out Envelope Data:

We use date and time to match capture location to GPS data (or double-check if you write down waypoint information) and to record depth of capture, fork length, markings, and what biological samples have been taken (scales, DNA tissue sample, and stomach).

There are three different versions of envelopes because we have been modifying them as we proceed. This is the newest version.

Vessel Name___________________	**WRITE YOUR VESSEL NAME**
Date __________________________	**Date** - day, month, year
Time _________am ________ pm	**Time** - Write time in appropriate slot, AM or PM
Depth of capture __________ fthms	**Fork Length** - from snout to fork in tail, in inches to the closest 1/2 "
Fork Length _________inches (to ½)	**Depth of capture** – in fathoms
No Mark ____ Ad Clip ____ Vent Clip____ Dye mark ____	**Hatchery markings** – check box for no markings, adipose fin, right vent, left vent, or dye-markings
Scale___ DNA___ Stomach____	Check box to indicate if scale, DNA, and/or stomach sample has been taken
GPS Waypoint ______________________________	**Waypoint number**
notes:_________________________	**Additional notes (white salmon, etc)**
Place any pit-tags in envelope	If you find a pit-tag, place in envelope.
USE CLEAN SCISSORS/FORCEPS	**** **USE CLEAN SCISSORS** ****

Paper Logbook

Paper logs will be used to plot sea surface temperature with GPS data. Please use the following format to record data in Paper Logbook:

	Vessel Name			
	Collector Name			
	Date			
	GPS Unit			
	Time (record every hour at minimum in 24-hour format)	**Sea Surface Temperature**	**Bycatch with last haul?**	**Bar Code # (optional) or other notes**
Example →	0615 (start)	50.2		Lines in
	0657	49.6	Coho, 2 shakers	

Stomach Collection Protocol – only three boats per opener:

- Collect stomachs from at least 5 (stop at five if stomachs are full) up to 10 fish during your last day of fishing.
- Use a new bag for every stomach. Fill out one Data Record for each stomach and place inside plastic bag
- Place the complete stomach and intestines in the plastic bag
- If fish or other stomach contents fall of out the stomach while removing it, place the contents in the plastic bag with the actual stomach
- Once collected, keep the stomachs on ice
- If freezer space is available, place stomachs bags in the freezer as soon as you arrive in port. Otherwise, keep on ice until they can be collected from you.
- When in port, please contact Laurie Weitcamp for pickup at 541-867-0504 (w)

Data Record for Stomachs

Vessel Name
Date
Time
ID (bar code number)
Notes:

VEMCO Temperature Depth Minilogger instructions

Vemco miniloggers automatically record temperature and depth in 5 second intervals. The data is stored in the minilogger until it is downloaded onto a computer. We use the GPS data to match where temperature/depth data was taken.

Placement of Minilogger

Place within 1 meter of cannonball on the deepest line.

Care of Minilogger when not in water

Batteries of loggers run down when they are exposed to extreme temperatures. Please don't place tidbit by a window where sun might shine on it for extended periods of time, especially if it is sitting in your vehicle.

Downloading data from VEMCO Miniloggers

- Only Vessels with computer logbook (download daily) or Port Coordinators

1. Run "minilog" software (double click on shortcut icon on desktop)
2. Dry Minlogger so it does not get the docking station wet
3. Place Minilogger on docking station so the serial number on the back of the Minilog is facing up.
4. Rotate the Minilog in the docking station interface until the silver temperature sensor drops into the guide hole in the interface. The serial number on the Minilog should be in the same orientation as the text on the top of the interface.
5. Click the *Load data from Minilog* button with the red arrow, shown here on the right. The software will communicate with the Minilog and begin to download the data from the Minilog's memory.
6. Wait while the data is downloading from the Minilog. A bar in the bottom left corner of the *Downloading data* window shows the progress of the download.
7. Select the YES button when prompted if you want to view the graph of the data
8. Remove the Minilog from the computer interface.

This next section is background information on the science in this project. The section after includes instructions on using Electronic logbooks while at sea.

CROOS collection of salmon heads for otolith collection
– for information only

- Heads will be collected by processors/buyers from a subset (at least 500) of the 2000 fish used for genetic analysis. This is why all fish need tags on their heads. Also, any fish with coded-wire tags detected by ODFW will have tags removed and returned to OSU.
- Collection of heads from buyers will be coordinated by Jeff Feldner and Jessica Miller.
- Once heads have been acquired, a tissue sample will be collected and stored in ethanol when otoliths are removed. Otoliths will be cleaned, dried, and stored with tissue sample and individual ID tag.

Contact:

Jessica Miller
Coastal Oregon Marine Experiment Station
Hatfield Marine Science Center
Oregon State University
2030 SE Marine Science Drive
Newport, Oregon 97365
541-867-0381 (office) 503-939-9812 (mobile)
Jessica.Miller@oregonstate

CROOS Otolith Collection

The otoliths of a sub-set of the Chinook salmon used for stock identification will be collected for chemical analyses. Briefly, otoliths are crystalline structures, comprised primarily of calcium carbonate, located in the inner ear and function as balance organs. Otoliths begin to grow during the egg stage and grow continuously throughout the life of a fish. Daily and annual rings, similar to a tree ring, are deposited in salmon. As an otolith grows, certain elements, such as magnesium, barium, and strontium, are incorporated into the crystal structure in relation to the amount of those elements in the water. Some variation occurs with water temperature as well. Therefore, an otolith can be used as a natural tag to provide information on past periods in the life of a fish. If fish reside in water masses with different chemical compositions and/or temperatures, those properties will be reflected in otolith composition. We will examine otoliths of fish from three to five selected stocks identified with genetic analyses and examine the chemical composition of the otoliths throughout the life history. This will allow us to examine fish of known origin and capture location and examine aspects of their past migration history. We can then compare aspects of the migration histories of fish from different stocks, as inferred from chemical composition, of the otolith rings. This will provide a first look at whether fish of similar age and origin appear to be following similar migration pathways and/or residing in similar water masses while in the ocean.

Project CROOS Electronic Data Collection System

Introduction, Installation and Operating Instructions

INTRODUCTION

The electronic fish data collection system is comprised of four main components which are listed below under System Components. This system was designed to provide accurate data collection at sea through the use of computers by utilizing touch screen technology for data entry. It replaces the need to record information manually on the specimen collection envelopes and allows for rapid data entry into the Project CROOS Chinook Salmon database.

The following sections will show you the systems components and how to install and operate the system on your vessel.

SYSTEM COMPONENTS

The Electronic Data Collection System is made up of the following four main components:

Laptop Computer

GPS Receiver

Handheld Computer

Docking Station for handheld

Each system includes:

- Dell laptop computer
- DAP CE8640 Handheld computer
- DAP CBCE840 Handheld computer docking station
- GARMIN 17 HVS GPS receiver
- AC or DC power cord for laptop computer
- AC or DC power cord for handheld computer
- AC Power bar with surge protection

Make sure that all system components are present before beginning the installation. Before installation it is important to identify what you will need in order to supply power to the three pieces of equipment. Each unit can be powered by AC or DC through the use of various adapters. The standard power option is

110 AC utilizing standard AC plugs. Each unit will be supplied with a 5 slot power bar with a built in surge protector so only one AC outlet is required on the vessel. If your vessel does not have an AC inverter then DC power options are available. The standard DC power options are through the use of cigarette lighter plugs. If necessary a female DC adapter can be hardwired into the vessel that has multiple outlets to power all three components. Please identify which power options are appropriate for your vessel prior to system installation and they will be provided to you.

The following is a break down of the individual components and some basic information on how to operate then and where the various connections need to be made for installation.

Laptop Computer:

Dell Laptop Computer   **AC/DC Power Cord**

This section will give basic details about the laptop computer and what you will need to know to in order to start and operate the system. The laptop comes with its own AC or DC power cord that will need to be connected prior to use. You will also need to attach the GPS receiver to the computer before you start the system (see System Installation below). Once all the components are properly connected you are ready to turn on the laptop and get the system ready by following these instructions. Below is a picture of the laptop with important features highlighted:

To **turr** ... the **power button**. To op ... ill need to use the **Mouse** or **Touch Pad** to move the mouse pointer. To move the pointer touch the pad with your finger and move it around the pad until the pointer is in the desired location. To activate a program you will need to use the left or right **Mouse Buttons**. To activate a program using the **left mouse button** place the pointer over the screen icon and click the left mouse button quickly twice. You can also click on the left mouse button once, which will highlight the icon, and then press the **Enter key**. To open a program using the

right mouse button move the pointer on top of the screen icon and press the right mouse button once. This will pull up a drop down menu. Move the pointer over **Open** and **press** the **right mouse button** again or hit **Enter**.

If you are not able to supply power to the computer at all times you will need to turn off the computer when power is not available. Each laptop comes equipped with an internal battery; however it will only supply power for several hours. If power is terminated without properly shutting down the computer some data may be lost. To prevent this, **shut down** the computer by **pressing** the **Power button**. You can also shut down the computer by moving the mouse pointer over to the **Start** icon on the lower left hand corner of the screen and pressing the left mouse button. This will pull up a menu, move the pointer over shut down and click again. Make sure it says shut down in the box and then **press OK**.

Instructions for installing the system and starting the data collection and GPS programs are in the following Installation and Operating sections.

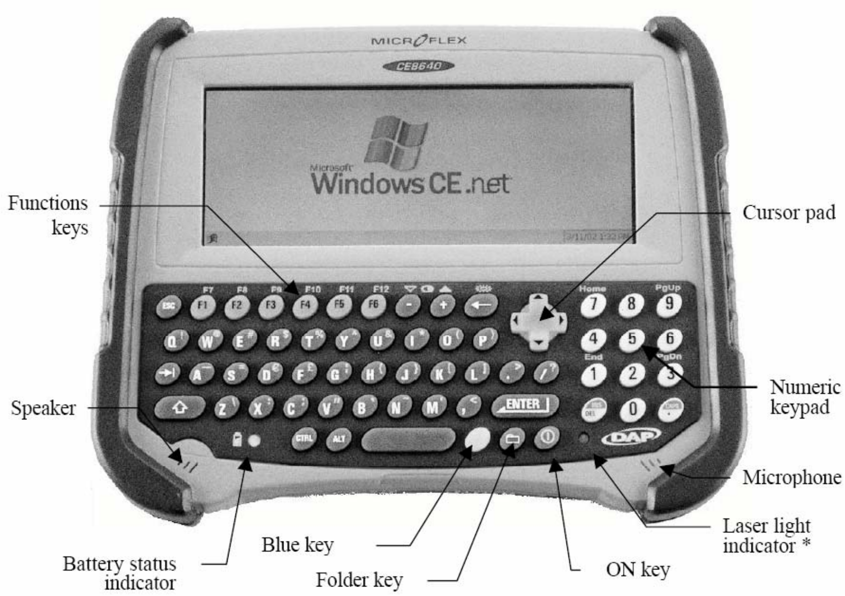
HANDHELD COMPUTER

Handheld Computer

Docking Station

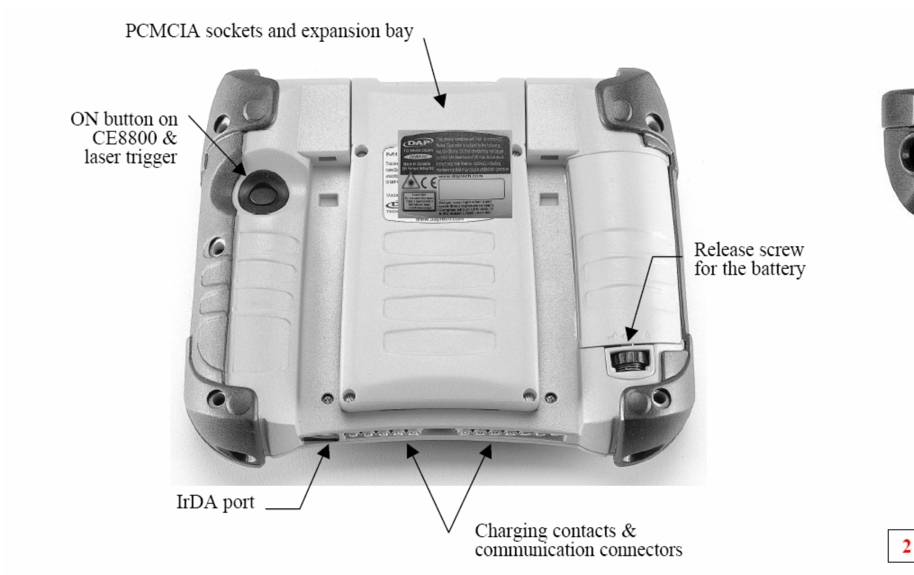
AC/DC Power cord

The handheld computer is a sealed computer that is used on the weather deck of the vessel to enter fish data. Below is a layout of the handheld computer with important features highlighted:

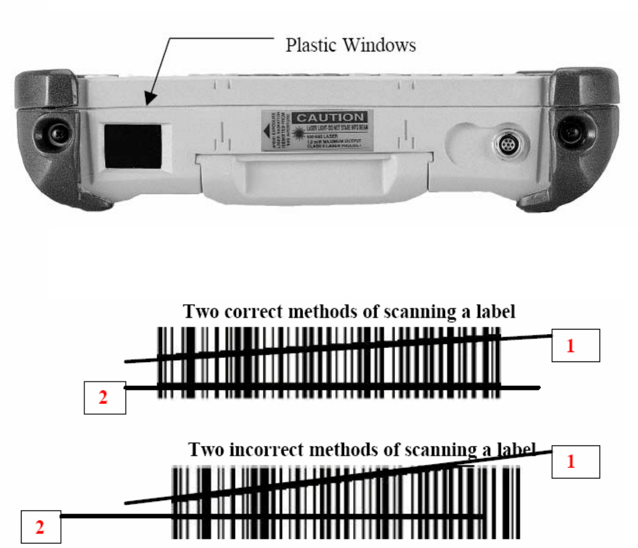


It comes equipped with an internal laser barcode scanner and a wireless networking card so that it can communicate with the laptop computer in the wheelhouse. Entering data is done by using the touch screen and the number pad after a barcode has been scanned into the system. To turn on the handheld computer **press** the **On** key. Once the computer is on the touch screen will become activated. To use the touch screen simply touch the screen where the icon or data box appears. To activate or open a program **touch the screen rapidly twice** on the program **icon**, which is similar to using the mouse button on the laptop. You can also touch the desired icon once to highlight it and then **press** the **Enter key** to open the program. To **turn off** the handheld you must **press** the **On key** again. This will put the system in stand-by and will conserve battery power (the unit has been programmed to go into standby mode after 3 minutes of inactivity while on battery power). The unit has been set up to remain active when placed in the Docking Station so it will not go into standby mode, however the screen will turn off. To reactivate the screen, when the system is not in standby, simply touch the screen or press the On key. To reactivate the system from the standby mode you will need to press the On key.

When a fish is caught it will need to be bar-coded in order to identify the samples in the lab. In order to scan a barcode tag you will need to use the internal barcode reader. To activate the barcode reader **press** the **Laser Trigger** on the rear of the right handle (shown below). The laser is located on the top of the computer behind the small plastic window. To **read a barcode** place the barcode tag in front of the laser window, about 6 to 12 inches away, and press the Laser Trigger, making sure that the laser is placed horizontally across the label (see below). When the barcode tag has been read successfully the computer will indicate this by beeping and the barcode number will appear in the data box on the touch screen.

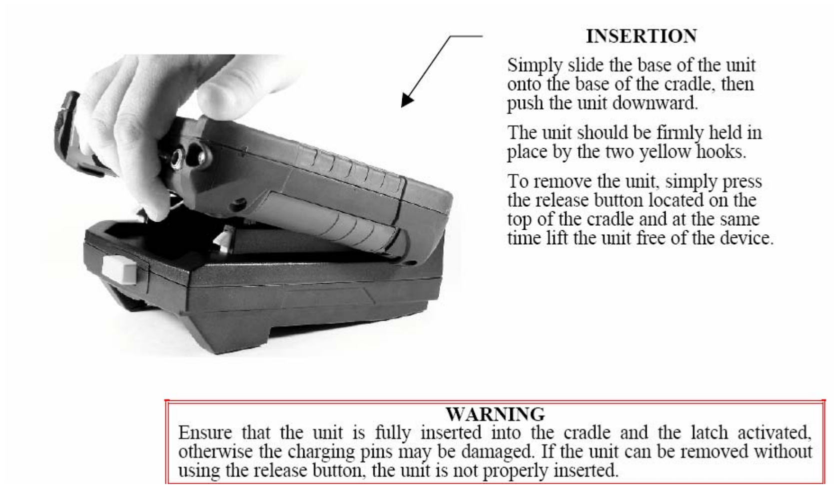


Rear of Handheld computer showing laser trigger and battery compartment



Top of Handheld showing laser window (top) and proper placement of laser for barcode scanning (below)

In order to recharge the battery on the handheld unit it must b… to be connected to the vessels power supply. To mount the handheld computer on the docking station place the bottom of the unit into the dock and then gently press the top of the unit onto the station (see below). Once the unit is in place the charge light (see handheld picture above) should come on indicating that the unit is properly installed and the battery is charging.



To check battery condition click on **START** icon on lower left of handheld screen. Touch **Settings** to go to the **Control Panel** and touch the icon on screen. Go into **Power** (the one without the underline - _Power). Open this program and it will show battery power available. Hit **X** to close program.

GPS RECEIVER

Garmin GPS Receiver

USB to Serial Connector

Each system comes with a Garmin 17 HVS GPS receiver with a 30 foot long data/power cable that has a DB9 serial port connector and a DC cigarette lighter power plug. The DB9 serial port connector will be attached to a USB to serial connector. This will need to be attached to the computer (see installation instructions). The DC power attachment can be plugged into either a DC female cigarette lighter connector or into a AC to DC converter, depending on power availability on the vessel.

The GPS receiver needs to be mounted on the outside of the wheelhouse in a location where it is open to the sky for satellite reception. The cord needs to be run through an opening into the wheelhouse so that it can be connected to power and the laptop computer. If no permanent opening is available on the vessel the GPS cord can be run through the open door during the day and brought in at night if the door needs to be secured. See the installation instructions below to connect the GPS unit to the laptop.

SYSTEM INSTALLATION

System installation is quick and easy requiring only several minutes. No tools are required to install the system on the vessel unless the power supply needs to be hardwired to the vessel (in which case you may need a pair of wire cutter/strippers and some wire nuts or electrical tape). The only required items for installation are a means to attach the GPS receiver (i.e. – cable ties or duct tape) in a location on the vessel that is open to the sky. Once you have checked that all system components are present you are ready to install the Electronic Fish Data Collection System on your vessel.

Continuous power must be supplied to the laptop computer and GPS receiver while fishing activities are taking place. The handheld computer docking station needs power supply only when the handheld computer is attached for recharging, although a continuous power supply is recommended so that the unit can be placed into the station and charged whenever it is not is use. Keep in mind that both AC and DC power options are available for these systems so please inform your Port Coordinator which power option you require for your vessel prior to installation.

To install the system on your vessel please follow these steps:

1. Place the laptop computer in a safe and secure position in the wheel house of the vessel where it will not get dropped or wet. Make sure all power cords reach the vessel supply.

2. Plug the AC or DC power cord into the computer (see below) and to the power supply, either a standard AC outlet or a DC cigarette lighter plug (Also shown is the DB9 Serial port connector):

3. Next attach the GPS receiver to a secure location outside by using cable ties or another secure attachment method so that it has a clear path to the sky for satellite reception. Run the GPS USB/power cord through an existing opening into the wheelhouse.

4. Plug the USB connector from the GPS receiver (see GPS receiver above) into the top USB port on the rear of the right side of the computer:

5. Plug the GPS cigarette lighter plug into an available power outlet which can be either an AC to DC converter or into a DC plug on the vessel. **Make sure the power is off to the GPS unit whenever you turn on the laptop and do not turn the GPS power on until the laptop is operating.**

6. Connect the DAP power cord to the rear of the DAP CBCE840 docking station and then into either an AC or DC outlet. Take the DAP Docking Station power cord and screw it into the receptacle on the rear of the docking station. Make sure the connection is secure then plug the unit into the vessels power supply.

7. Place the DAP CE8640 handheld computer into the docking station for charging prior to use making sure the battery charging light on the handheld computer is visible (see Handheld computer above).

This completes the installation process. The following section will give you instructions on how to turn on the system and get it ready to start recording data.

SYSTEM OPERATION

Once the system is set up on the vessel it can be used to record data. In order to start the system follow these steps:

1. Turn **power on** to the laptop computer and enter password (if required).
2. Make sure **GPS receiver is connected** to computer with USB connector then turn on power to GPS on the cigarette lighter plug (light indicates power on). Make sure the power to the GPS unit is off when you turn on the laptop computer. If it is not you will need to turn off the power to the GPS, restart the computer and then turn the power back on to the GPS unit.
3. Start **Astoria GPS program** on laptop by moving the mouse pointer over to the screen icon and opening the program (see laptop computer above for opening or starting programs).
4. Make sure wireless network **CROOSNET (#1 – 4)** is enabled. If connection is not available then open up the **Intel Wireless Pro** program by double-clicking on the screen icon. Make sure the CROOSNET network appears on the wireless networks available screen. Click on **CROOSNET** (make sure it is highlighted in blue) and then click on **Connect** (at lower left of screen). Hit **OK**, then hit the **YES** button, when it asks to connect to a network already existing. Hit **Next** button until the **OK** button appears. Hit OK and network should be identified and connected.
5. Before taking handheld to deck turn on the unit by pressing the power button. Once the unit is on **check battery power** (see handheld computer above).
6. Test wireless connection by opening **Internet explorer** ,by double-clicking icon on top right hand corner of screen, on the handheld unit. Make sure Astoria tracking program is operating on handheld. You should see a large fish on the screen. To begin program simply touch the fish.
7. Once the power and connection has been checked the unit is ready to record data. The handheld can now be used on the deck of the vessel to record data during fishing.

<u>FLEET MANAGER</u> Personal/Professional Services Contract

STATEMENT OF WORK:

a. **Authority** Pursuant to ORS 576.304 (4), the Commission may "Enter into contracts which it deems appropriate to the carrying out of the purposes of the commission as authorized by ORS 576.051 to 576.595."

b. **General Information** The Oregon Salmon Commission (OSC) with the Coastal Oregon Marine Experiment Station (COMES), Oregon Sea Grant, OSU Seafood Lab, and Oregon State University is working on a pilot project to collect and use genetic information to address the Klamath weak stock crisis for Oregon's ocean salmon fishery. This Collaborative Research on Oregon Ocean Salmon (CROOS) project, composed of Oregon-based fishermen and scientists, has applied to the Oregon Watershed Enhancement Board (OWEB) for funding the pilot project for this season. This funding is contingent on approval by the Legislative Emergency Board on June 23, 2006. If the funding is approved, the pilot project will take advantage of new genetic science technologies to gather more information on harvested stocks. The project will consist of fishermen participating in sampling Chinook fin-clip tissue, scales and length (for aging), date, location, and other oceanographic data. Four vessels will use a digital technology system for datalogging individually harvested fish. The rest of the vessels will collect the data and record it using paper-based logbooks. Data from all sampled fish will be recorded and tracked using barcodes. This job could yield much information about the ocean stocks. Up to 50 boats will be hired to collect the data.

c. **Work Elements**

1. Attend training session(s) to learn protocol and purpose of pilot project
2. Be responsible for port liaisons
3. Train port liaisons on requirements for vessel communication and answer questions as they arise
4. With scientific team, develop sampling protocols
5. Train vessels on sampling protocol
6. With Commission, plan fleet structure for number of boats fishing each opener
7. Communicate with port liaisons at least once a day during sampling periods
8. Communicate with scientific team and port liaisons
9. Keep daily records of vessels and days fished as reported from port liaisons
10. Maintain master list of vessels in project
11. Communicate progress of fleet sampling performances and relay instructions from the scientific team to the port liaisons and vessels when needed.
12. At end of each opener, communicate with port liaisons and scientific team on total boats fished, number of fish sampled
13. As this is a pilot project, work with the Commission and the scientific team to adapt the project and make changes as necessary
14. Assist the Commission and the scientific team with the final report

d. **Delivery Schedule**

Begin: This contract shall begin when all signatures are affixed and upon approval of funding.

End: This contract shall expire on __January 31, 2007__

<u>LIAISONS</u> Personal/Professional Services Contract

STATEMENT OF WORK:

a. **Authority** Pursuant to ORS 576.304 (4), the Commission may "Enter into contracts which it deems appropriate to the carrying out of the purposes of the commission as authorized by ORS 576.051 to 576.595."

b. **General Information** The Oregon Salmon Commission (OSC) with the Coastal Oregon Marine Experiment Station (COMES), Oregon Sea Grant, OSU Seafood Lab, and Oregon State University is working on a pilot project to collect and use genetic information to address the Klamath weak stock crisis for Oregon's ocean salmon fishery. This Collaborative Research on Oregon Ocean Salmon (CROOS) project, composed of Oregon-based fishermen and scientists, has applied to the Oregon Watershed Enhancement Board (OWEB) for funding the pilot project for this season. The pilot project will take advantage of new genetic science technologies to gather more information on harvested stocks. The project will consist of fishermen participating in sampling Chinook fin-clip tissue, scales and length (for aging), date, location, and other oceanographic data. Four vessels will use a digital technology system for datalogging individually harvested fish. The rest of the vessels will collect the data and record it using paper-based logbooks. Data from all sampled fish will be recorded and tracked using barcodes.

c. **Work Elements**

1. Attend training session(s) to learn protocol and purpose of pilot project
2. Be responsible for a small (5-15) pod of vessels collecting samples
3. Train each vessel in pod as necessary on sampling protocol and answer questions as they arise
4. Communicate with each vessel in pod at least once a day during sampling periods
5. Keep daily records of each vessel in pod and days fished
6. On project fishing days, report to fleet management at least once a day with general locations of boats
7. At end of each opener, communicate with fleet management on total boats fished, number of fish sampled
8. Since this is a pilot project, other duties may arise that are necessary for the successful completion of the project

d. **Delivery Schedule**

Begin: This contract shall begin when all signatures are affixed and upon approval of funding.

End: This contract shall expire on __December 31, 2006__

VESSEL/FISHERMAN Personal/Professional Services Contract

STATEMENT OF WORK:

a. **Authority** Pursuant to ORS 576.304 (4), the Commission may "Enter into contracts which it deems appropriate to the carrying out of the purposes of the commission as authorized by ORS 576.051 to 576.595."

b. **General Information** The Oregon Salmon Commission (OSC) with the Coastal Oregon Marine Experiment Station (COMES), Oregon Sea Grant, OSU Seafood Lab, and Oregon State University is working on a pilot project to collect and use genetic information to address the Klamath weak stock crisis for Oregon's ocean salmon fishery. This Collaborative Research on Oregon Ocean Salmon (CROOS) project, composed of Oregon-based fishermen and scientists, has applied to the Oregon Watershed Enhancement Board (OWEB) for funding the pilot project for this season. If the funding is approved, the pilot project will take advantage of new genetic science technologies to gather more information on harvested stocks. The project will consist of fishermen participating in sampling Chinook fin-clip tissue, scales and length (for aging), date, location, and other oceanographic data. Four vessels will use a digital technology system for datalogging individually harvested fish. The rest of the vessels will collect the data and record it using paper-based logbooks. Data from all sampled fish will be recorded and tracked using barcodes. Up to 50 boats will be hired to collect the data.

c. **Work Elements**
   1. Attend training session(s) to learn protocol and purpose of pilot project
   2. Participate in up to 4 salmon season openers on specific dates as directed by the Commission to collect sampling information
   3. Collect sampling data per protocol as developed for the project (see Exhibit D attached)
   4. On project fishing days, report to port liaison at least once a day with fishing location, sampling progress, number of fish sampled, questions
   5. At end of each opener, drop off samples per protocol (see Exhibit D attached)
   6. Invoice the Commission after each opener fished within fourteen days
   7. Upon receiving payment, if vessel has a crew, vessel shall pay crew member within seven days the designated amount (see below) in addition to their normal pay
   8. Since this is a pilot project, follow any revised protocol as necessary that will appear in an amendment to this contract

d. **Delivery Schedule**

   Begin: This contract shall begin when all signatures are affixed and upon approval of funding.

   End: This contract shall expire on __December 31, 2006__

P.O. Box 983
Lincoln City, OR 97367

Ph/Fax 541-994-2647
njf@class.oregonvos.net

OREGON SALMON COMMISSION

Collaborative Research on Oregon Ocean Salmon (CROOS) Fishermen Survey (January 2007)

We appreciate the work that you did this past season on the CROOS pilot project.

Included in this mailing is this survey, return envelope, overall summary of the genetic findings, and your Federal 1099 for the 2006 income you received from this project.

To help us evaluate the fishermen's task and responsibilities in this project, we would like you to fill out this survey and **return it by Wednesday, January 31, 2007** in the self-addressed stamped envelope. Your responses are important to us and will become part of the final report and help us plan for future at-sea research projects. (If you still have any project equipment, please contact the Salmon Commission.)

Please rate each of the below on a scale of 1-5	Easy			Difficult		Not Applicable
1. Filling out the paper logs	1	2	3	4	5	n/a
2. Using the hand-held GPS units to record data	1	2	3	4	5	n/a
3. Using the datalogger (n/a if you didn't use one)	1	2	3	4	5	n/a
4. Attaching bar code tags	1	2	3	4	5	n/a
5. Writing information on the envelopes	1	2	3	4	5	n/a
6. Completing steps while fishing	1	2	3	4	5	n/a
7. Understanding the protocols for collection	1	2	3	4	5	n/a
8. Turning in sample envelopes/paper logs	1	2	3	4	5	n/a
9. Picking up supplies (envelopes/batteries/etc.)	1	2	3	4	5	n/a
10. Invoicing the Salmon Commission for payment	1	2	3	4	5	n/a
11. Downloading the GPS unit	1	2	3	4	5	n/a

Please answer the following questions:

12. Was the compensation adequate? Yes No

13. Would you be willing, with additional compensation, to fish outside of the "normal" area to gather samples/data? Yes (go to question 13a) No (go to question 14)

13a. How much additional compensation on a daily basis would be enough?
$100 $200 $300 Fill in Amount _________

Please answer the following question regarding the liaison positions:

14. How satisfied were you with:	Not Satisfied				Very Satisfied	Not Applicable
a. Ability to answer questions	1	2	3	4	5	n/a
b. Availability	1	2	3	4	5	n/a
c. Communication with vessels	1	2	3	4	5	n/a
d. Distributing & picking up supplies	1	2	3	4	5	n/a
e. Downloading GPS data	1	2	3	4	5	n/a
f. Willingness to help	1	2	3	4	5	n/a

15. Identify the aspects of the project that worked well or were the most successful: _______________

____

____

16. Identify parts of the project that didn't work or should be adjusted: ___________________________

____

____

17. Do you think this project will:	No Improvement				Significant Improvement	
a. Improve Science	1	2	3	4	5	Unsure
b. Improve Management	1	2	3	4	5	Unsure
c. Improve Marketing	1	2	3	4	5	Unsure
d. Improve Public Relations	1	2	3	4	5	Unsure

18. How satisfied were you with the overall project?	Not Satisfied				Very Satisfied	Not Applicable
	1	2	3	4	5	n/a

19. Do you think this project was useful?	Not Useful				Very Useful	Not Applicable
	1	2	3	4	5	n/a

20. Please write down any additional comments you have about the project: _____________________

____

____

____

Thank you from Nancy Fitzpatrick, Oregon Salmon Commission; Jeff Feldner, Fleet Management; Renee Bellinger, OSU Genetics Lab.

CROOS Fishermen Survey
Results

Of the 77 surveys sent out, 41 were returned. 53% of the vessels participating in the project returned completed surveys.

	Easy			Difficult		n/a
1. Filling out the paper logs	54%	20%	24%			
2. Using hand-held GPS units to record data	71%	17%	5%			7%
3. Using the datalogger (n/a if didn't use one)	10%	2%	5%	5%		76%
4. Attaching the bar code tags	66%	24%	10%			
5. Writing information on the envelopes	56%	29%	15%	2%		
6. Completing the steps while fishing	27%	15%	44%	12%	5%	
7. Understanding the protocols for collecting	73%	25%	2%			
8. Turning in sample envelopes/paper logs	68%	27%	5%			
9. Picking up supplies (envelopes/batteries/etc)	63%	24%	12%			
10. Invoicing the Salmon Comm. for payment	85%	15%				
11. Downloading the GPS unit	36%	14%	10%			40%

12. Was the compensation adequate? Yes 100%

13. Would you be willing, with adequate compensation, to fish outside of the "normal" area to gather samples/data? Yes 88% No 7%

Amount of additional compensation		
	$100	2%
	$200	22%
	$300	24%
	$400	7%
	$450	2%
	$500	15%
	$900	2%
	$1,000	5%

14. Relating to the liaison positions, how satisfied were you with:

	Not Satisfied			Very Satisfied		n/a
a. Ability to answer questions	5%		2%	29%	61%	
b. Availability	2%	5%	22%	32%	37%	
c. Communication with vessels	2%	12%	24%	19%	29%	10%
d. Distributing and picking up supplies	7%	2%	5%	39%	44%	
e. Downloading GPS data	2%		7%	22%	39%	24%
f. Willingness to help	7%		2%	12%	76%	

15. Identify the aspects of the project that worked well or were the most successful:

- Data will help improving science management and marketing.
- All aspects of this project seemed to work really well.
- Drop box, Englund Supply pickup, GPS usage, use of Jen W. to make complete turnaround.
- The program seemed to work well and fairly smoothly for a new program.
- Fleet cooperation, availability of fleet manager and science community.
- I believe everything worked fine.
- After learning to use the GPS, it was rather easy. It gets a little hectic to keep up when fishing along, but doable!!
- The GPS (hand held) addition really helped. Filling out paper logs was a hindrance.
- I feel the project worked well because the CROOS staff provided everything possible to make it easy for the fishermen.
- Overall, I would say the entire project went well.
- Working together with the boats.
- Project worked well for its first year.
- Works fine on quota fisheries – 50 fish was a good number
- Being directly involved in a research project that may enhance the salmon industry.
- Tagging method was quick to attach and number envelopes. GPS system worked well for marking fish and was easy.
- Teamwork – high morale
- It all went pretty well.
- We like the GPS units – they made logging a lot easier.
-The whole deal went fairly smooth for me
- Everything was great for us – I just wish I could have caught a few more salmon.
- Fishing in an area that contained fish.
- In good fishing it will be more difficult to do this – need computers also.
- When the rains really came, it was hard recording info on envelopes. After learning how to look up past marks, this became a breeze. GPS units were great!
- Hand held GPS to mark where fish were caught helped a lot.
- I couldn't see anything wrong.
- I thought it all worked well, for the first year. I am sure there's room for improvement.
- Working with Nancy and the others – they were always there if you needed something
- Liaisons very helpful and cooperative – equipment and supplies were readily available. 'Can do' type folks from Nancy to Renee made this work!
- The project all worked well. The best part, in my opinion, was the added income in a low-income year.
- Most everything considering first time around for project.
- When fish are biting good, it's hard to stop catching them to take samples, they only bite so long.
- Meeting that showed how to collect data and run GPS. Being able to ask questions while in the field on radio and phone.
- Prompt payment – minimum of red tape.
- I believe everything worked fine.

16. Identify parts of the project that didn't work or should be adjusted:

- Datalogger entails too many connections, problems. Need more reliability.
- It was hard to do when everything is wet with rain, fog, wind.
- Just common sense adjustments which will get better through time.
- Need to sample south coast. How can we avoid rotten tissue samples? For a quick & dirty project, this went amazingly well! Why is the sport fishery especially south of Florence not included in the genetic study?
- It seemed it worked ok for me. If I had a question, Darus or Nancy were there to help.
- Communication regarding meetings, etc.
- Trying to write information on yellow envelopes while keeping everything clean and dry. Very difficult to do this by yourself if the fishing is good as you have to let the lines go for too long a time.
- Delivery sites for GPS download. Jen was great to do this at our convenience, but shouldn't be expected to open her home for all. Is there the possibility of an office?
- Nothing comes to mind.
- Not being allowed to fish south of Florence in deep water. Fishing inside the 30 fathom line was a waste of time and money. We have no data on salmon patterns south of Florence.
- I agree with the program – but you need more boats in a broader area – or just be directed more if the program can't afford more boats.
- Trying to keep the fish separated for the DNA.
- Trouble with data loggers (remote computer).
- Require minimum effort. Hours/fish caught/integrity
- Filling out fish log every hour – at times was a hassle.
- Collection of FAS heads.
- At sea contact with group representative needs adjustment, not much though.
- Working closer with the boats.
- Just keep it simple.
- Being allowed to fish weather permitting rather than fishing openers is a breakthrough!
- Had a problem keeping samples from getting everything else wet, filling out sample envelopes, etc. Need a better way to record.
- Difficulty of keeping daily contact at sea. Requirement to deliver downloadable tracklines or paper position logs would make this unnecessary.
- I would like to see the program expanded to fishing closed areas, so we can get an accurate impact on Klamath River fish in the closed areas by sport fishermen.
- Data loggers were too complex, out of Newport landings were difficult to track and do logistics, better communication with leaders.
- To gather data outside of normal fishing area, Coos Bay, Bandon, etc.
- Mostly believe everything workable.

17. Do you think this project will:	No Improvement			Significant Improvement		Unsure
a. Improve Science	2%	2%	17%	32%	43%	7%
b. Improve Management	5%	5%	17%	24%	22%	24%
c. Improve Marketing		10%	29%	27%	10%	19%
d. Improve Public Relations		5%	29%	34%	12%	15%

18. How satisfied were you with the overall project?

Not Satisfied			Very Satisfied		n/a
		10%	19%	68%	

19. Do you think this project was useful?

Not Useful			Very Useful		n/a
	2%	2%	22%	71%	

20. Please write down any additional comments you have about the project.

- I believe if fishermen really got into fish, it becomes a hardship to tag and report everyone. In this case, for example, 50 fish day, it would be easier to tag 2 out of 5 fish and with GPS download the science and configure from there.
- I believe this project is a step in the right direction.
- 2006 river of origin and harvest rates by river of origin should be offered to council tech team to compare to CWT data. Need some digital cameras to record at-sea activities. Project should have included a sampling of the 6,999 Chinook harvested by recreational fishermen south of Florence.
- To receive money, should have to clock in a certain amount of fishing hours.
- I though the project was interesting, I was disappointed in not being able to participate more (weather). I hope to be able to participate again. The project also helped out financially, the dismal season, and lack of time.
- I am appreciative to be a part of this worthy project from the pilot, and look forward to participating for the duration.
- If I had a better catch, I would have a better feeling about my contribution.
- The project only was able to track fish caught north of Florence due to season laws. It would be informative for future seasons to be able to do research south of Florence.
- For the first year, I think it went well and hopefully it will get better and become a very useful in-season management tool.
- As I fish by myself on a small boat, the GPS made the project much simpler for me, than writing data. As I averaged $750 to $1000 a day on fish, to fish outside open area's would require fair compensation.
- Well organized. Thank you very much.
- Good job!
- I felt the project went rather well considering lack of training, but it got easier as time went on. GPS, envelope samples, and tagging I feel is most important. Size of fish is questionable.

- Salmon for a very long time has been contested for resource ownership – public – private corporations – even large trawlers – sport, etc. So it is under overwhelming political pressure.
- It was a big help in making a better financial outcome to the season.
- I think the project was very interesting and it really helped financially.
- I am looking forward to any opportunities for 2007.
- Just thank you so much, it helped us get through a tough year. The people involved were very helpful. That makes it great.
- We need to gather data on fish on the southern coast, as well as the northern coast. Allow a few boats to fish these areas with no fathom restrictions. Let's broaden the scope of our research.
- I was happy to be a part of this. The time constraints on our season hurt the project and we need to be given longer fishing opportunities to really get a handle on where fish migrate. Just wish I was a better fisherman.
- The project was useful in that it was a way to financially assist commercial fishermen in a very difficult year. However, the information obtained was not really new. Our coded wire tag system has revealed pretty much the same results for years.
- To notify each vessel involved to know number of days of participation and to allow them to select days during reasonable weather and fishing conditions.
- Thank you for allowing me to participate.
- I think everybody involved with this program did a very good job trying to make it as easy as possible for the fishermen. For a first year project, they did good.
- It did help a lot of fishermen earn an income. The genetic stock information should be very important.
- Provides real time accurate scientific data – will management do what's right? This is the best management tool ever – hope it continues and provides us more quality fishing time in the future. Thank you all.
- Contract fishing in other areas needs to be discussed in a meeting. This is the most important aspect of the whole project from a management standpoint.
- Everyone involved seemed very helpful.
- The money that was paid really helped compensate because of poor fishing. Last year was the poorest salmon fishing I've seen in 35 years.
- The public access to the website needs to be updated.

Project CROOS Website and GIS Development Proposal

A. CROOS Website/GIS Design:

Given the limited budget for the web design and GIS integration ($25,000) the scope of what should be attempted with the website by the end of this funding cycle needs to be determined. At the last CROOS meeting, the team discussed what could possibly be accomplished with the GIS salmon database by the end of this year. Below is a summary of these discussions broken down into the three areas of focus for GIS on the website:

> **Scientist and Fishermen Access:** To provide a page on the website that will allow participating scientists and fishermen to access a limited amount of data (3 or 4 weeks). This data would be presented as a series of layers on a base map that can be turned on and off through the web interface. The purpose of this is to provide a functional GIS database on the web as a demonstration of what could be accomplished with the website and the tools available to us through the use of ArcGIS.
>
> **Consumer Access:** To provide a web page that will allow consumers to enter the barcode number of a CROOS sample salmon and get information on catch history (what information needs to be determined by the industry). This would/could include a map display and an informational box.
>
> **General Access:** Although not specifically addressed, this is a vital portion of the website. General access would refer to the informational pages on the website and what is displayed on them (i.e. the map on the current website). Should there be a series of maps that general users can explore or one or two maps (and will these be updated) in the text of the website that are not interactive.

The overall design of the website also needs to be addressed. Attached is a flow chart of the website with areas of responsibility for the different aspects of the project. In order to provide the web designer with an outline of what is intended to be accomplished (and a timeline), the CROOS group should go over this flow chart and make any changes/additions necessary. In addition the responsibilities of each participant should be outlined in relation to the website pages which address their area of focus.

A. Integration of GIS mapping tools into ProjectCROOS.com:

In order to provide the CROOS salmon database with ArcGIS mapping tools to participants and consumers on the website, there would need to be additional ESRI (maker of ArcGIS) applications available through OSU's ESRI site license program. This software is available to University researchers at no cost, however, small fees may be applicable for USB access keys ($50 each or 3 for $90). In addition to ArcGIS 9.1 (which has already been installed) the following ESRI software applications would need to be installed on a university server in order to provide ArcGIS generated maps and graphics through ProjectCROOS.com (or utilize a university server that already has the applications installed). Below is a list of the software (attached is an architecture of this platform):

- **ArcIMS** – GIS Internet Management Service – this program provides the interface between ArcGIS software running on the server and the internet, allowing for ArcGIS generated maps to be displayed on the website.

- **ArcSDE** – Advance Spatial Data Server – this program allows the user to access data from other commercial databases (MS SQL, etc.) for ArcGIS applications. ArcGIS geo-databases are currently configured using an enterprise database (ArcGIS Access – similar to MS Access). Although MS Access gives the capabilities currently required, it is limited when compared to MS SQL server database, which would allow for more advanced queries for the fishermen and scientist interfaces (as we see them in the future).

In addition to the ESRI software several other applications would be needed. These would include:

- **A web server application**: A number of these are open-source software, meaning they are free to use. The one that is currently being used by both the Goldfinger lab and OSU web services is Apache servlet engine (http://www.apache.org/). There is also a Microsoft product available through the university called Internet Management Services (IIS) that is being used as the web-server on the tracking system.

- **Server Database**: The option is available to use the ArcGIS Access enterprise database that comes with ArcGIS 9.1. This would allow the CROOS team to provide maps on the website without the need to use ArcSDE, however, it is limited in terms of future development. Many larger GIS applications are using more sophisticated database applications like MS SQL server or Oracle. These databases are more flexible and provide advanced tools for designing user interfaces that allow for complicated queries.

MS SQL Server (media and license) $350

Looking at ways to accomplish this, several meetings were held with outside contractors and scientists from COAS (Chris Goldfinger) who are working with GIS web applications. Through these discussions it became apparent that the COAS lab has been working on getting GIS application on their website for the past several years. They currently have a server (purchased by NOAA) that is housed in their office and have invested approximately $50,000 in GIS web applications. Chris is very interested in helping with this project and has indicated that it could "piggy-back" on his GIS application. Below is a list of options for integrating GIS with ProjectCROOS.com:

Option 1: **Outside contractor –** A meeting was held with Alsea Geospatial (a GIS consulting firm in Corvallis) about setting up the web architecture (as has already been done at the COAS lab). They can do the work and get the GIS applications running but the rough estimate of costs ranged in the $50,000 to $75,000 ranges. By using the current architecture in the COAS lab (which would accomplish the scientist/fishermen portion), both the scientist/fishermen page and the consumer page (with query) could be had for an estimated cost of around $10,000 to $15,000.

Option 2: **Goldfinger collaboration –** Chris Goldfinger has been developing a website with GIS application for his groundfish inventory project. He has expressed interest in working with the CROOS project. He has already invested a considerable amount if getting the GIS architecture up and running so that maps and simple queries can be run through their website. He currently houses his site on a NOAA purchased server. Chris talked with Liz Clarke, and CROOS will not be allowed to host its site on this server at this time. However, he is willing to let CROOS utilize the GIS applications he has already developed and hire his research assistant (Chris Romsos) to help Thompson and Bellinger with the set up of the project's salmon GIS database and layers so that they can be displayed on the web. The application also has some limited query abilities that could be incorporated into the site before the end of the year. Chris believes that the maps and layers can be displayed on the website by the end of October, if effort begins soon. Because the site would not be hosted on the NOAA server, the GIS applications would need to be developed on a local computer (which will also be a server). This would get the site up and running, and then the CROOS team could decide where the database would be permanently housed (on a university server).

Cost for Research Assistant (Romsos) $1,500 / week

Option 3: **OSU webservices -** web services can install and set up the CROOS GIS applications on their university servers (they do not currently have ArcGIS running on their servers). The costs of this process are not yet known but much of the installation would probably require a level 3 programmer at $102 / hour. If this is the avenue chosen, then a detailed scope of work would need to be submitted to them in order for them to provide an accurate estimate of costs. They expressed that it would be preferable for the CROOS project (cost wise) and them to have the GIS database and maps generated on a separate server and linked to the CROOS website (see hosting below).

A. Design and Hosting ProjectCROOS.com:

Todd Barnhart (Beartooth Creative) is currently designing the website, and CROOS will be paying for it to be hosted on a third-party server, outside of the university. There are several options available for designing and hosting the website. As mentioned above, in order to utilize the university's license agreement with ESRI, the GIS component of the website will need to be housed on a university server. There are several options for hosting and designing the site, which can still be hosted outside of the university.

Option 1 - Off-site: As it currently is, the website can continue to be hosted on a third party server and link to the GIS mapping applications located on a university server via the website. The design of the website can still be done by an outside contractor (Beartooth Creative, for example) of choice.

Website hosting:	**$20 / month**
Website Design – Todd Barnhart	**$40 / hour**

Option 2 - On-site: If the website is to be hosted within the university it can be hosted by OSU Web Services. They provide a full range of services from basic hosting to development and design. They have the ability to install the GIS applications on their servers (which they do not currently have) so that the website can be run from a central location without the need to link to other university servers. This would involve additional costs based on their rate schedule. There are several advantages to this. First, it would be located in one location on campus and would not require links to other servers. Second, they would be responsible for making sure the website functioned properly and getting it back up, in case of a crash, in a timely manner. They also provide other services on demand including back-up and recovery and special programming. However, it may be expensive to have them set up the GIS applications on their servers and it was "suggested" in the meeting with them that it would be preferable for us to set up the GIS applications on another server and link it to the website.

Start up fee (one time)	**$50**
Website hosting:	**$10 / month**
Website Design – depending on staff level	**$23 to $102 / hour**

A. GIS Training (Renee Bellinger)

It was decided at the last meeting that Renee Bellinger would utilize a portion of the budget for training on GIS applications. She is currently looking into training opportunities. The cost for the training and travel is not yet known but should be budgeted into the project when she finalizes her plans.

GIS Training Costs - Bellinger	**~$2000**

Computer and GIS Budget

Budget for website design	$5,000.00
Current Expenditures	$800.00
Amount Remaining	$4,200.00
Budget for Dataloggers	$5,000.00
Current Expenditures	$4,312.50
Amount Remaining	$687.50
Budget for GIS consulting	$20,000.00
Bellinger Training	($2,000.00)
Current Expenditures	$0.00
Amount Remaining	$20,000.00

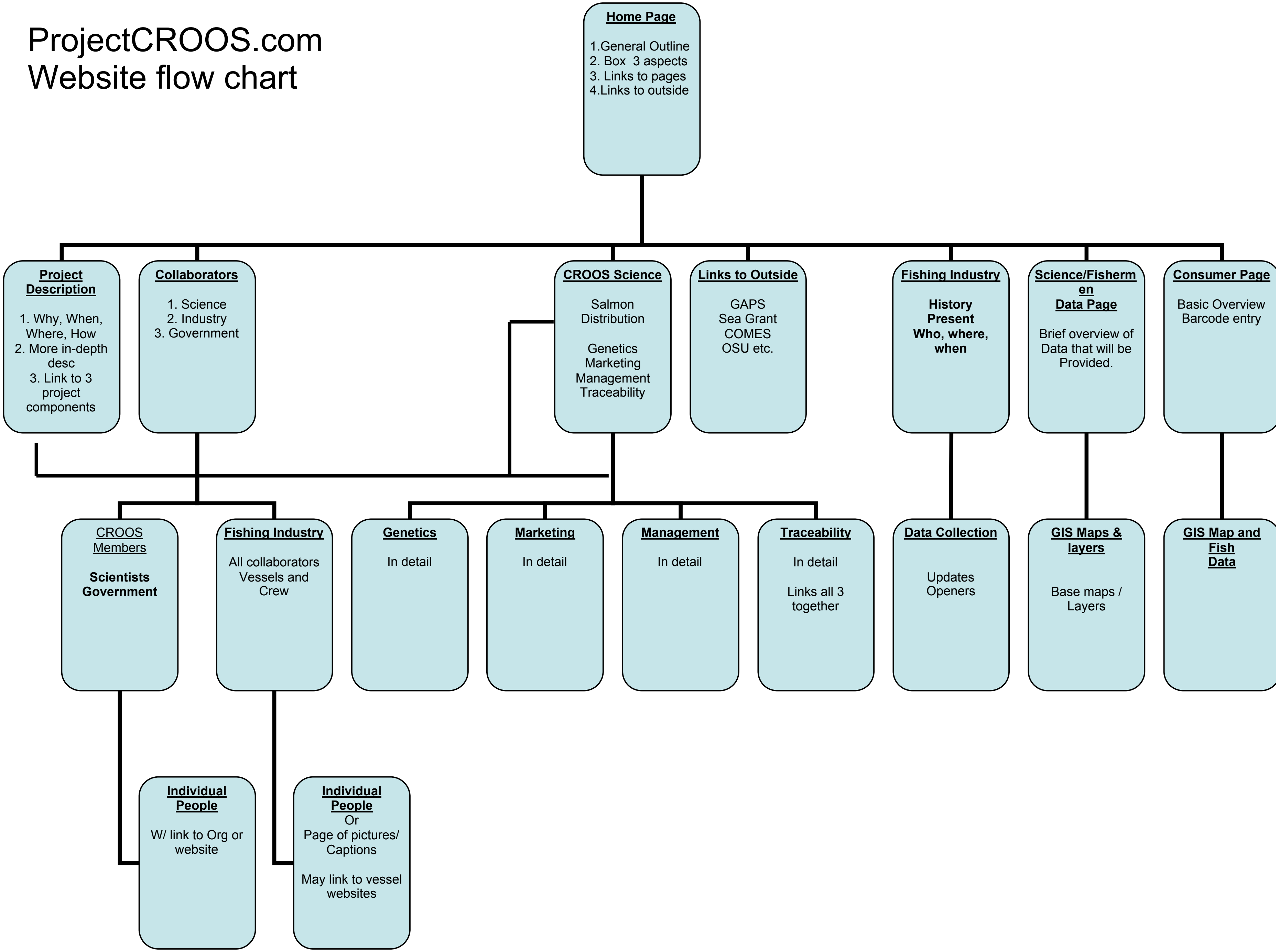
Potential GIS layers for Scientist and Fishermen (20 layers)

1. Base map of US West Coast
    a. Bathymetric contours
    a. SST (7 day composites)
        i. SST (week 1)
        i. SST (week 2)
        i. SST (week 3)
    a. Chlorophyll (7 day composites)
        i. Chlorophyll (week 1)
        i. Chlorophyll (week 2)
        i. Chlorophyll (week 3)
    a. All fish
        i. All fish (week 1)
        i. All fish (week 2)
        i. All fish (week 3)
    a. All Klamath Fish
        i. Klamath Fish (week 1)
        i. Klamath Fish (week 2)
        i. Klamath Fish (week 3)
    a. All Sacramento Fish (or other)
        i. Sacramento fish (week 1)
        i. Sacramento fish (week 2)
        i. Sacramento fish (week 3)
    a. All Oregon Stocks
        i. Oregon Stocks (week 1)
        i. Oregon Stocks (week 2)
        i. Oregon Stocks (week 3)

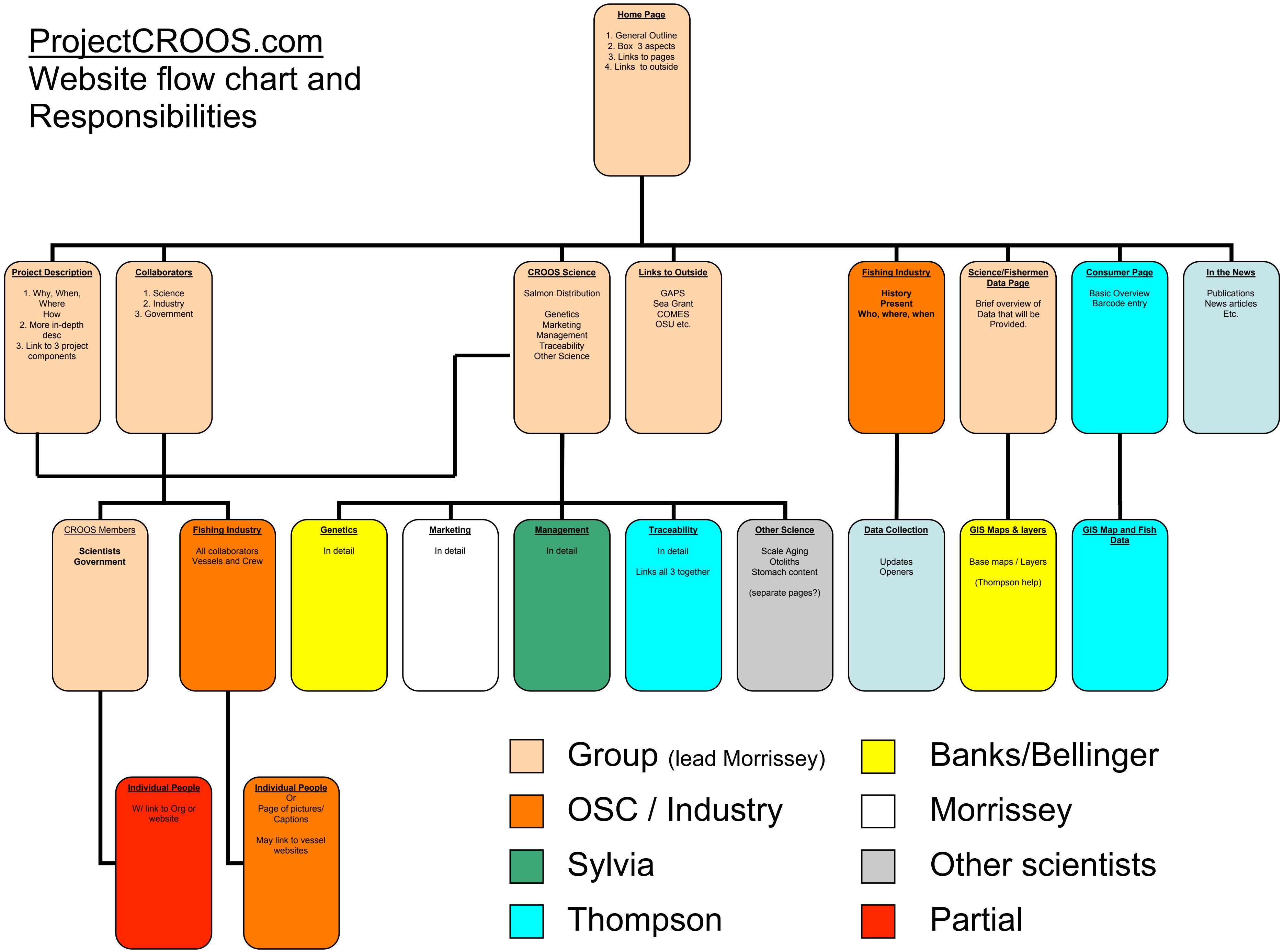
Potential base maps and layer for Fishermen (for 1 vessel) (17 Layers)

1. Base map of US west coast
    a. Bathymetric contours
    b. Bathymetric relief
    c. SST (7 day composites)
        i. SST (week 1)
        ii. SST (week 2)
        iii. SST (week 3)
    d. Chlorophyll (7 day composites)
        i. Chlorophyll (week 1)
        ii. Chlorophyll (week 2)
        iii. Chlorophyll (week 3)
    e. Vessel track
        i. Vessel track (week 1)
        ii. Vessel track (week 2)
        iii. Vessel track (week 3)
    f. All fish
        i. All fish (week 1)
        ii. All fish (week 2)
        iii. All fish (week 3)
    g. Klamath Fish
        i. Klamath fish (week 1)
        ii. Klamath fish (week 2)
        iii. Klamath fish (week 3)

ProjectCROOS.com Website flow chart



ProjectCROOS.com
Website flow chart and Responsibilities



SALMON METHODOLOGY REVIEW

Each year, the Scientific and Statistical Committee (SSC) completes a methodology review to help assure new or significantly modified methodologies employed to estimate impacts of the Council's salmon management use the best available science. This review is preparatory to the Council's adoption, at the November meeting of all anticipated methodology changes to be implemented in the coming season, or in certain limited cases, of providing directions for handling any unresolved methodology problems prior to the formulation of salmon management options in March. Because there is insufficient time to review new or modified methods at the March meeting, the Council may reject their use if they have not been approved the preceding November.

This year the SSC is expected to report on documentation of the Chinook and Coho Fishery Regulation Assessment Model (FRAM), Columbia River fall Chinook abundance forecasts, and a genetic stock identification (GSI) study proposal, which includes a request for consideration of an exempted fishing permit (EFP) (Agenda Item I.2.a, Attachment 1).

Council Action:

1. **Approve methodology changes as appropriate for implementation in the 2007 salmon season.**
2. **Provide guidance as needed, for any unresolved issues.**
3. **As appropriate, adopt FRAM documentation package for final editing and general distribution.**
4. **Provide direction on development of GSI study and EFP application.**

Reference Materials:

1. Agenda Item I.2.a, Attachment 1; Pilot Program to Apply Genetic Stock Identification in Pacific Salmon Fisheries in 2007.
2. Agenda Item I.2.d, STT Report.
3. Agenda Item I.2.b, Supplemental SSC Report.

Agenda Order:

a. Agenda Item Overview — Chuck Tracy
b. Report of the SSC — Bob Conrad
c. Agency and Tribal Comments
d. Reports and Comments of Advisory Bodies
e. Public Comment
f. **Council Action**: Adopt Final Salmon Methodology Changes for 2007

PFMC
10/25/06

Pilot Program to Apply Genetic Stock Identification in Pacific Salmon Fisheries in 2007

Purpose and Goals

There are many distinct salmon stocks along the west coast of the United States. Although population sizes vary year to year, some of these stocks are relatively productive and could support a substantial fishery, while other stocks cannot withstand much fishing pressure at all. These stocks intermix in the ocean and, at the time of harvest, it is usually impossible to determine which salmon come from abundant stocks and which come from weaker stocks in need of protection. Salmon regulations are crafted each year to protect the weak stocks, using the best available information from Coded Wire Tags (CWTs) and modeling outputs based on past fishing seasons. Because of the need to protect weak stocks, this often results in severely constraining fishermen's access to abundant salmon stocks. For example, to protect Klamath River fall Chinook (KRFC), the 2006 salmon regulations resulted in some of the largest closures ever experienced in this fishery.

Genetic stock identification (GSI) technology for identifying Chinook stocks is developed to the point where it is potentially useful for fishery management. Genetics labs from Alaska to California have collaborated on a coastwide data base (GAPS) including more than 40 reporting groups comprising 165 individual Chinook stocks. The GAPS data base allows the identification, from a small piece of tissue, of the origin of most Chinook salmon in the northeast Pacific. As a result we can now determine the stock composition of ocean fisheries at a finer scale than with CWT data alone.

The long-term goal of this project is to increase the information available to managers on the temporal and spatial distribution of specific west coast salmon stocks. If it is proven that substantial variation in temporal and spatial distribution exists, this may allow commercial fishermen access to relatively abundant stocks of salmon while protecting weak stocks. The first step in applying GSI technologies to fisheries management is to explore and map the distributions of stocks in Council-managed fisheries. It is anticipated that Chinook fishing in 2007 will be highly restricted, similar to the 2006 season. This request is for an Exempted Fishing Permit that will allow us to begin mapping stock distributions in ocean fisheries in 2007 in times and areas outside of the regulation season. In addition, this proposal will allow us to test the feasibility of new techniques that could allow rapid-turnaround quota management in limited areas and times in the future. However, the biggest gains will ultimately come from an improved understanding of stock-specific marine distributions and migration pathways in relation to submarine topography and oceanic conditions. In the long term this constitutes a step toward ecosystem-based management for salmon.

Council Research and Data Needs

The draft 2006-2008 Research and Data Needs for the Pacific Fishery Management Council (Council) identifies as its highest priority the development of GSI for fisheries management applications. The report states:

> Advances in genetic stock identification, otolith marking, and other techniques may make it feasible to use a variety of stock identification technologies to assess fishery impacts and migration patterns: The increasing necessity for weak-stock management puts a premium on the ability to identify naturally reproducing stocks and stocks that contribute to fisheries at low rates. The CWT marking system is not suitable for these needs. The Council should encourage efforts to apply these techniques to management.
>
> Substantial progress has been made on this item in the past 6 years. A coastwide microsatellite database for Chinook has been developed. A similar database for coho salmon is under development, but needs resources to coordinate efforts for the entire coast. GSI techniques have improved so that samples can potentially be analyzed within 24-48 hours of arrival at the laboratory. GSI is actively being used in Canada to manage coho salmon fisheries off the west coast of Vancouver Island. Studies are under way to evaluate the potential usefulness of real time GSI samples in Chinook management, particularly in relationship to Klamath fall Chinook. There are proposals to develop operational alternatives to time-area management using these techniques, in combination with existing CWT marking, mass marking, otolith microchemistry, and other emerging stock identification techniques. These studies are now the highest priority for salmon management.

The report also identifies emerging issues related to this priority. From the report:

> Emerging issues are related to the high priority recently assigned to the implementation of GSI technologies in weak-stock fishery management. Research tasks and products necessary for this to be successful are:
>
> 1. Identification of the error structure of GSI samples taken from operating fisheries.
>
> 2. Development and application of technologies to collect high-resolution at-sea genetic data and associated information (time, location, and depth of capture, ocean conditions, scales, etc.)
>
> 3. Identification of stock distribution patterns useful for fisheries management and appropriate management strategies to take advantage of these distribution patterns.
>
> 4. Development of pre-season and in-season management models to implement these management strategies and integrate them with PFMC management.

The studies proposed here will work toward resolving these issues. The second and third items will be addressed directly. Work on the first item will also be progressing during the course of this study. The fourth item, development of new management models, is a future project that depends on results of the proposed study and similar sustained efforts over the next few years.

NMFS Strategic Plan for Fisheries Research

In the NMFS Strategic Plan for Fisheries Research, Section I.A. treats "Biological research concerning the abundance and life history parameters of fish stocks." From that section:

> Understanding aspects of the life history of fish stocks will be of increasing importance in the management of the Nation's living marine resources. Describing migratory and distribution patterns, habitat use, age, growth, mortality, age structure, sex ratios, and reproductive biology will be essential information for scientists and managers to optimize sustainability and yield of these resources... There is an increasing need to identify and characterize discrete stocks. This will allow scientists and managers to correctly structure stock assessments and design stock specific management measures for groundfish complexes, salmon species, coastal migratory and oceanic migratory species and reef fish. Stock identification involves many techniques, including mark-recapture, otolith shape analysis, parasite distributions, and biochemical genetic methods.

The improved understanding of ocean distributions that will result from conducting studies like this over a period of years will help us characterize discrete stocks and design stock-specific management measures. This is also directly related to Goal 1 of the Strategic Plan:

> GOAL 1: Provide scientifically sound information and data to support fishery conservation and management. (Ongoing)
>
>> Objective 1.3: Determine and reduce the level of uncertainty associated with stock assessments through improved data collection and advanced analytical techniques. (FSP Strategy 1.2.1)
>>
>> Objective 1.6: Collaborate with the Councils and other management authorities to develop fishery management regimes that will effectively control exploitation. (FSP Strategy 1.1.4)

Need for this EFP

The application of GSI technology to management has many aspects beyond the identification of stocks. Considerable preliminary work in 2006 toward implementation of this technology has been done in pilot projects in California and Oregon. Work in 2007 is designed (1) to extend the development of techniques and methodologies based on 2006 experience, (2) to provide relief to fishermen via payment for participating in sampling programs, and (3) to start to answer questions relative to distribution of Chinook stocks that may prove useful for management. It is too early to actively apply GSI technologies to fishery management on the west coast, although a simulation of a potential in-season weak stock quota management application may be conducted based on data collected during this study.

Projects in Oregon and California are currently evaluating techniques for sampling and analysis. The Oregon project has successfully collected data on the specific location, time, and depth of capture of individually identified Chinook salmon from 80 boats in the commercial troll fishery. The California project has incorporated a stratified random sampling design to estimate stock proportions in the recreational fishery. In 2007 we plan to apply these techniques more widely to gain experience with the methodology and to test its usefulness to answer some basic questions for fisheries management. Since restricted fishing opportunities, similar in scope to the 2006 season, are expected in 2007, this creates a need for fisherman relief and may be an obstacle to effective development of GSI applications to fishery management. While much data collection is anticipated within the regular season structure, we expect that an EFP will be needed to allow limited commercial salmon fishing outside of the legal season for the purpose of obtaining adequate sample sizes and testing specific fishing patterns in space and time. Impacts may be minimized in some fisheries through catch and release.

Project Organization and Personnel

To be developed

Objectives

The primary objective is to improve information on spatio-temporal distribution of west coast Chinook salmon for use in salmon management. To achieve this we propose to continue collecting time- and location-specific genetic samples, along with scales, otoliths, stomachs, and oceanographic data. The purpose of these collections would be to begin developing a database of stock distributions for comparison with the historical CWT database. This work will not have a direct impact on 2007 fisheries, but will support fishermen through payments to participate. It will be part of an ongoing process that could inform managers in future years. Because we anticipate that regulation fishing seasons will be highly restricted in 2007 we propose that sampling be extended to closed times and areas to collect more comprehensive data. It will also be necessary to sample in areas that would not normally be fished, even during open seasons. This component of the project includes development and testing of a statistical sampling design. The distribution of sampling between regular season fisheries and experimental fisheries will depend on how much fishing opportunity is permitted in 2007. Sampling in closed areas will be done through the EFP. The exact mix of regular season and experimental fisheries will, necessarily, be determined during the preseason planning process.

This data collection effort has great potential benefits to fishery management. Over time we expect to develop a data base similar to the CWT contribution rate data base but with fewer assumptions (e.g.; fewer hatchery indicator stocks representing natural production) and much higher resolution in space and time. This will enable us to examine migration routes, evaluate "hot spots" and see how long they persist, relate fish distributions to ocean conditions, and generally expand the range of information available to fishery managers. Compilation of such a database will require several years. We anticipate providing preliminary results to fisheries managers after 3 years of sampling, with continuing improvement in the information in future years.

With this data collection effort as a framework we also plan to begin testing three specific hypotheses:

1). Inshore/offshore differential in Klamath impacts

Spatial distribution of catch samples from the fishery will be analyzed to test the hypothesis that Klamath stocks are disproportionately distributed offshore. This has been proposed in the past, but no sufficient experimental data exist (Winans et al., 2001). CWT data, aggregated by area of catch, have insufficient spatial resolution to resolve this question. The observation has been that recreational fisheries tend to have lower Klamath impacts than commercial fisheries in the same time and area. This, combined with the observation that recreational fisheries tend to occur closer to shore than commercial fisheries, has led to the distribution hypothesis. It may be necessary to employ fishers to fish in areas where they would not routinely fish (i.e., commercial trollers in inshore areas). The experiment will need to be repeated over several seasons before it can be applied to management.

Potential benefit would come from improved knowledge of the local distribution of Klamath stocks, leading to possible fishing strategies to reduce impacts and increase fishing opportunities.

2). North-south distribution in San Francisco catch area

It may be that KRFC are more concentrated in the northern portion of the San Francisco catch area, providing an opportunity to fish with lower impacts in the south. We will contrast contribution rates of KRFC in the southern area from Pigeon Point to Point Reyes with the rate in the area from Point Reyes to Point Arena. To achieve a statistically interpretable result we will need to collect an adequate number of samples from each sub-area. What constitutes an adequate number of samples will be determined before the start of the fishery.

Potential benefit would include an increased opportunity to fish in the southern portion of the catch area. This kind of information, applied more generally, may be one of the major benefits of GSI monitoring of fisheries.

3). Rapid-turnaround weak stock quota management

It has been suggested that we could monitor catch composition in a fishery and manage for a numerical limit on weak stock (e.g., KRFC) impacts. There are several concerns with this approach: rapid turn around in this case is at least 48 hours longer than the time needed to implement quotas based on overall catch; it will be impractical in most cases to sample all landings, so a statistically valid sampling plan needs to be developed; accuracy of setting weak-stock quotas depends on accuracy of stock assessments and models of stock distribution (i.e., setting an appropriate quota will not be possible without the ability to produce more accurate stock abundance projections). With the results of the 2007 fishery we hope to simulate this management technique and explore the potential improvement in management precision. The intended benefit is to develop a tool that enables managers to allow fishing on abundant stocks to proceed without exceeding predicted impacts on stocks of concern.

Research Design and Methodology

Methodology

The advent of a "production version" of the GAPS microsatellite baseline, combined with global positioning system (GPS) technology, provides an opportunity for sampling ocean fisheries in a way not previously possible. The Cooperative Research on Oregon Ocean Salmon (CROOS) project has, in 2006, developed and tested sampling protocols that link genetic information from individual fish with GPS-determined time and location of catch and associated data. Additional data may include length, scales, stomachs, depth of capture, sea surface temperature, and a temperature/depth profile. Most of these data can be collected during the normal fishing operation. The basic technique involves a hand-held GPS unit that records the vessel location every 5 minutes when the boat is actively fishing. When a fish is caught a "waypoint" is entered on the GPS. The fish is measured, a small fin clip is placed in an envelope, and the envelope is labeled with the waypoint number and any other desired data (depth, sst, external marks, etc.). On landing the GPS data are downloaded to a computer and the envelopes are returned to the genetics lab for analysis. Each sample can then be associated with a specific waypoint in the GPS data. Another aspect of the CROOS project includes attaching a bar-code tag to the jaw of each fish to allow tracking through the market system. In addition, CROOS is developing data loggers that would make the fishing operation more streamlined and also reduce the necessity of entering data from the envelopes by hand.

The CROOS data collection protocol was tested in Oregon fisheries in the summer and fall of 2006. It is planned to expand use of the system to sample all fisheries described in this proposal.

All seven of the current management areas for Klamath River fall Chinook between Cape Falcon, OR and Point Sur, CA will be sampled (Figure 1). In addition, the San Francisco area will be divided into two sub-areas: a northern area (Point Arena to Point Reyes) and a southern area (Point Reyes to Pigeon Point), yielding a total of eight areas between Cape Falcon and Point Sur. Each of these eight areas will be further stratified into inshore and offshore areas. The dividing line between inshore and offshore areas is yet to be defined; definitions currently under consideration are 3 nautical miles, 6 nautical miles, or a 50 fathom depth contour. During all commercial fishery openings between Cape Falcon and Point Sur, 20 commercial fishing boats will sample in each management area, with boats divided equally between inshore and offshore strata. Boats contracted to obtain tissue samples will be allowed to retain all legal fish.

In addition, to the extent that funding and impacts on Klamath River fall Chinook allow, the same number of boats may be contracted under an EFP to conduct sampling in management areas when commercial fisheries are closed. During closed periods, boats would be contracted to fish using the same inshore/offshore stratification and collecting the same data as during open fisheries, but all fish sampled would be released. Hook-and-release mortality and dropoff mortality associated with this closed area sampling will be accounted for and included in the assessment of fishery impacts of management measures adopted by the Council in April. Sampling in closed areas will be limited to the minimum sample size necessary to achieve resolution in the estimated contribution rates down to about one percent: 400 fish per week in each management area, with 200 collected offshore and 200 collected inshore.

A total of approximately 10,000 samples will be drawn from the tissues collected and divided between the NMFS Santa Cruz, Montlake, and OSU labs for analysis. Each sample will be scored for the 13 standardized GAPS loci, and assigned a stock identity and associated assignment probability. The number of samples from each time/area strata will depend on the number of strata from which tissues are collected. Sampling only open areas in 2006 summer fisheries, with the inshore/offshore stratification and the north/south subdivision of the San Francisco management area, would have yielded a total of 50 unique strata and thus 10,000/50 = 200 samples per strata, the minimum necessary. Sampling closed areas and/or expanded fisheries would reduce the number of samples per stratum.

The GAPS-derived stock identity results will provide distribution data on all the reporting groups in the GAPS data base that are encountered in the fisheries, and will be used for example to test hypotheses concerning differences in fishery contact rates; in particular in KRFC area-specific contact rates inshore versus offshore, and in the San Francisco northern versus southern area. To test these hypotheses, the GSI sample identity results will be expanded to the total catch of the respective sample fleet, and then standardized (divided) by the total effort of the respective sample fleet. Differences in these stock-age-specific catch/effort ratios for a given time period (e.g., month) will reflect differences in the underlying contact rates (and sampling/measurement error), and these differences will be tested for statistical significance. It is not necessary to know the respective cohort abundance (contact rate denominator) to conduct such a test since the two quantities being compared are stock-age-time-specific (the abundance is the same for both).

Literature Cited

Winans, Gary A., Dan Viele, Allen Grover, Melodie Palmer-Zwahlen, David Teel, and Donald Van Doornik. 2001. An update of genetic stock identification of Chinook salmon in the Pacific northwest: test fisheries in California. Reviews in Fisheries Science 9: 213-237.

Figure 1. Klamath River fall Chinook management areas between Cape Falcon, OR and Point Sur, CA. The proposed study design includes dividing the San Francisco area into a northern and southern sub-area (Point Arena to Point Reyes, and Point Reyes to Pigeon Point), and in each area an inshore/offshore stratification.

SALMON TECHNICAL TEAM REPORT ON THE 2006 SALMON METHODOLOGY REVIEW

Columbia River Fall Chinook Ocean Abundance Forecasts:
The Salmon Technical Team (STT) reviewed proposed methodology for forecasting the pre-season ocean abundance of Columbia River Chinook stocks. Current methodology forecasts the return to the river mouth using datasets that can vary from year to year and reflect different ocean fishery impacts. These terminal run forecasts must be converted into ocean abundance forecasts for fishery management planning by the Council. The methods currently employed to perform these conversions are inconsistent and undocumented.

The Model Evaluation Workgroup (MEW) developed post-season estimates of ocean abundance from reconstructed age-specific terminal run sizes and estimates of ocean fishery exploitation rates derived from coded wire tags (CWT). Two methods of forecasting ocean abundance using simple linear regressions and log-log regressions were presented. These two proposed methods and the status quo were evaluated in a hindcasting exercise to compare their performance in forecasting ocean abundance using the metrics of root mean squared error and average percent error from post-season estimates of ocean abundance. The MEW document did not describe the methods and results with sufficient detail to permit full evaluation by the STT, but the MEW concluded that none of the three methods consistently outperformed the others.

The STT recommends that the MEW revise its report to correct errors, document the methods currently employed to convert terminal run forecasts to ocean abundance projections, and clarify the data and methods employed in its evaluation of forecasting alternatives. The MEW report does not provide a sufficient basis for changing forecasting from the methods currently employed. Therefore, the STT recommends no change in the methodology for forecasting Columbia River Chinook for the pre-season process for 2007. The STT also recommends that ocean abundance forecasts using all three methods be prepared for further evaluation.

Genetic Stock Identification (GSI) Exempted Fishing Permit (EFP) Proposal:
By combining GSI, Global Positioning System (GPS), depth, temperature, and biological data, the proposed study provides a means to gather important information regarding the timing and location of capture for individual fish. The potential for such data to serve as a basis for examining a variety of issues, such as estimation of stock compositions, detection of schooling behavior, and inferences regarding migration routes at a fine spatial and temporal scale, is promising.

However, the description of the proposed study lacks the definitive information regarding the methodology for analysis and interpretation of these data, which is necessary to evaluate the adequacy of the study design. For example, what are the specific elements to be estimated? What is the desired precision and accuracy of the statistics to be generated? What methods and assumptions are to be employed for estimating stock compositions and migration patterns? What are the error structures surrounding the collection and analysis of the data and uncertainty of parameters to be employed in the analyses?

The analysis, interpretation, and limitations of the results of GSI analysis and DNA fingerprinting and their future use in salmon fisheries management need to be carefully defined and explicitly described. Without such information, there is a serious potential for misunderstanding, misinterpretation, and misapplication of results.

Currently, salmon fishery management in the study area is based on constraining stock and age-specific impacts. GSI can provide direct estimates of the harvest of stock groups whose components do not have associated CWT tagged fractions. For example, GSI methodologies can provide an estimate of the total Sacramento River winter run Chinook ocean harvest and, when coupled with CWT, and age analysis, provide data that would allow fishery managers to differentiate the harvest of hatchery and natural winter run Chinook. However, GSI methods are not currently capable of accurately identifying all stock units currently managed by the Council. For example, GSI is currently not capable of discriminating between California Coastal Chinook (CCC) and Blue Creek Chinook, which is a tributary of the Lower Klamath River, or of discriminating between Klamath River fall Chinook (KRFC) and Klamath River spring Chinook. For purposes of current salmon fishery management, accurate data on aging must be combined with accurate assignment of individual fish to stocks of interest based on GSI data. The current management for CCC is linked to the age-4 ocean harvest rate of KRFC. In addition, brood strength and brood proportion natural are used to estimate the number of adults expected to return and spawn in natural areas of the Klamath basin. Although the collection of scale and otolith data are mentioned, the proposal's description does not indicate the number or percentage of fish from which scales or otoliths are to be collected or the methods to be employed to "ground truth" such data. Accurate aging by scale reading, for example, should by no means be assumed (see report of the PSC Expert Panel on CWT analysis). The collection and aging of scales from all fish identified as KRFC by the GSI analysis would need to be verified by some means, such as using CWT known-age scale reads. To meet the current management conservation objectives of the PFMC, fishery monitoring will need to rely on CWT recoveries from retention fisheries and the stock composition in nonretention fisheries will be limited to the stock groupings identified by GSI analysis.

Experimental designs for the collection of tissues will need to be further developed and consider factors such as controlling potential variation among boats in catch rates or fishing power. In addition, methods need to be developed to independently evaluate the accuracy of data collected at sea. For example, the use of vessel monitoring systems (VMS) could be used to further evaluate ways to track effort and area of catch in the proposed fisheries. The VMS information could be compared to the catch location data recorded during GSI-sampled fisheries. In addition, other methods may need to be explored to evaluate such factors as the cross contamination of genetic samples or other data collection and recording errors.

Experimental design, including methods for collection and analysis of GSI, age, and other necessary data, should be evaluated within a framework that considers the error structures for assigning individual fish to specific stocks and cohorts; such a framework is not presented in the proposal. Instead of providing such a framework, the proposal calls for the collection of samples that appear to be stratified by time, area, and fishery, but are arbitrary in size. The target number of tissues and other data to be collected by study cell appears to be related solely to budgetary and logistical considerations rather than including statistical design in the sample size requirements. For some strata, the collection of 200 samples would provide, at best, a glimpse of contributions of particular stocks and age groups of interest; uncertainty surrounding estimates of stock-age compositions of groups that comprise a small percentage of the exploited populations in such strata would be extremely high.

Lastly, the STT comments that no cost estimates or budget allocations are attached to the proposed study. There are indications that the cost of the study as presented could easily exceed $20 million. Budget information, such as the amount proposed for compensating participating fishermen to provide samples, process and analyze samples, or develop technology and methodology, overhead, and agency contributions, would be critical for evaluation and should be fully disclosed.

The STT recommends that careful experimental design and well thought out methods for assuring data quality due to the inherent difficulties of collecting data at sea will be required for success of this project. The scope of the research should be sufficiently narrowed to maximize on the potential for success and minimize the potential for misinterpretation or misuse of the data collected.

FRAM Documentation:
The STT has reviewed the set of five reports prepared by the MEW (FRAM Overview, User Manual, Technical Documentation, Base Data Development, and Programmers Guide). The STT believes that these reports sufficiently document the structure, parameters, and data employed by the FRAM models for Chinook and coho fishery planning.

PFMC
10/26/06

SALMON ADVISORY SUBPANEL REPORT ON SALMON METHODOLOGY REVIEW

The Salmon Advisory Subpanel (SAS) recommends that Council proceed with assisting and collaborating with industry, NOAA Fisheries, and respected academic fisheries research institutions on the development of a Pilot Genetic Stock Identification Program, as described in Agenda Item I.2.a, Attachment 1, November 2006.

It is expected that this project will be a collaborative effort evolving from experience gained in projects already underway in California, Oregon, and elsewhere, and will depend on securing funding from outside the Pacific Fishery Management Council.

It is understood that the scale and scope of the project will largely depend on the extent and timing of this funding. In preparation for this, draft budgets are being prepared and reviewed by the tentative collaborators in the project, and preliminary funding requests have been initiated to the Federal Congressional delegation. Some state funding could also be anticipated.

The SAS appreciates the concerns about this proposal which have been identified in the reports of the Salmon Technical Team and the Scientific and Statistical Committee. Most of these concerns have been anticipated and discussed in the work already being done in Oregon and California. Some have been already been addressed to varying degrees in those projects.

Full acknowledgement of these challenges further reinforces the "pilot stage" nature of this work. Definitive answers to some of these questions and satisfactory description of strategies to address them will only be possible when the depth of investigation and the duration of the work have been agreed upon. Final project definition will require anticipation of potential season opportunities, and planning must address these uncertainties.

It is clearly anticipated that methodologies and analytical techniques will be adapted and improved upon as the project proceeds.

The SAS agrees with the need to clearly identify this work as preliminary and experimental, in order that misunderstanding, misinterpretation, or misapplication of the results or data can be avoided.

In support of this project, the SAS recommends that the Council:

a. Proceed with the application for one or more Exempted Fishing Permits for the continuation of this research in the 2007.
b. Designate appropriate Council technical personnel or Council team members to assist in the collaborative research design process.

PFMC
11/17/06

SCIENTIFIC AND STATISITICAL COMMITTEE REPORT ON SALMON METHODOLOGY REVIEW

The Scientific and Statistical Committee (SSC) Salmon Subcommittee and the Salmon Technical Team (STT) conducted a joint Salmon Methodology Review on October 10, 2006. Topics included a comparison of alternative ocean abundance forecasts for Columbia River fall Chinook salmon, the status of Fishery Regulation Assessment Model (FRAM) documentation, and a genetic stock identification (GSI) pilot program.

There remain difficulties in interpreting the "Ocean Abundance Forecasts for Columbia River Fall Chinook Salmon" document. The current method was compared to methods independent of the FRAM model. None of the three methods was clearly superior to the others. Further evaluation is warranted before any new method is adopted.

For three years the Model Evaluation Workgroup (MEW) has been working on the FRAM documentation. As of summer 2006, they have produced an extensive set of documents. Due to the voluminous nature of the documentation, a full review of the documents has not yet been accomplished, but such a review or other appropriate next steps can now be planned. The time may be approaching for the model to be rewritten in a newer programming language. Among other things, this would allow for the incorporation of GSI data into the model. The SSC commends the MEW for producing this substantial body of documentation for the FRAM model. It is clear that these documents have made the FRAM more transparent, accessible, and useful.

The document "Pilot Program to Apply Genetic Stock Identification in Pacific Salmon Fisheries in 2007" outlines a program to collect tissue samples for genetic analysis from Chinook salmon caught in ocean fisheries off the coasts of Oregon and Northern California. The goal of this program is to provide data describing the distribution of Chinook stocks among various time and area strata during the 2007 through 2009 fishing seasons. A series of years with this stock-specific distributional data will provide important information to help in the conservation and management of Chinook stocks, especially for those stocks that have conservation concerns. Several years of data collection will be necessary before these data will be adequate for management support.

If salmon fisheries for Chinook are greatly restricted during the coming seasons, as occurred in 2006, the proposed project will need to apply for one or more exempted fishing permits (EFP) from the Pacific Fishery Management Council to allow the collection of tissue samples from all area and time strata identified in the experimental design for the project.

If the project goes forward, the SSC requests that future project operational plans presented to the Council address the following technical issues:

- There is a concern about the collection of samples by commercial boats with no on-board observer. Specifically, there is a concern that some fishers may incorrectly report data (e.g., the location of capture of sampled fish) or may non-randomly select fish for sampling. There should be some explanation of why this will not be a problem, or some methods should be considered for "ground-truthing" the data collected by the fishers, using either test fisheries, on-board observers, or other methods. Because a large number of different commercial boats will be used to collect the tissue samples, there is concern that a "boat-effect" may influence the results. For example, the fishing practices of a particular boat (gear used, method the gear is fished, location the gear is fished) may affect the stock composition of the Chinook caught by the boat. The possibility of a boat-effect needs to be considered during the analysis.

- To be useful for stock assessment, age data (i.e., scale samples) will need to be comprehensively collected as part of the sampling program. The area-and-time distribution information that the project provides for stocks will be much more valuable if it can be associated with specific brood years.
- The spatial and temporal resolution of the baseline will need to be reviewed to determine how useful the data from the project will be for management purposes.
- A more thorough analysis of experimental design should be undertaken to optimize the value of the data collection.

While the proposed project may provide information that could be valuable to salmon management, there are a number of issues that need to be better defined: (1) what types of information will the project provide for management, (2) how could this information be used by management, (3) what is the timeline for information being appropriate for management use, and (4) more details on the experimental design.

Until these issues are addressed, the SSC views the GSI pilot project as promising, but cannot conclude whether it will be able to accomplish all of its stated goals. The SSC supports the consideration of an EFP, if necessary, for the continuation of this research in 2007.

PFMC
11/15/06