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Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska

Annual Report 2012

For Alaska Department of Fish and Game
Contract IHP-13-013

February 27, 2013

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Introduction

Prince William Sound Science Center (PWSSC) and its sub-contracting partner Sitka Sound Science Center (SSSC) are engaged in the scientific data collection and analysis services requested under the State of Alaska contract IHP-13-013 entitled “Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska”.

The plans and intentions of this contracted research are guided by two documents: 1) the ADF&G RFP 2013-1100-1020, Dated May 7, 2012 entitled “Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska and 2) the PWSSC proposal for the same project, dated June 29, 2012. The overarching purposes of this research are to: 1) further document the degree to which hatchery pink and chum salmon straying is occurring; 2) assess the range of interannual variability in the straying rates; and, 3) determine the effects of hatchery fish spawning with wild populations on the fitness of wild populations.

This annual report represents a summary of activities in the first, preliminary year of research - 2012. Because the starting date of the contract was somewhat delayed relative to the timing of the 2012 fish runs, this report summarizes logistical planning, as well as some preliminary field sampling and reconnaissance, in preparation for intensive field work beginning in 2013. The report also reflects some decisions made following the 2012 initial field season, and in consultation with the Science Panel in November 2012, that will affect the field approach for 2013.

This research project has been subdivided into four major activities for implementation, each with a separate project leader: ocean sampling near PWS; stream sampling in PWS; stream sampling in SEAK; and data management, analysis, and reporting. Methods and activities under each of these major subdivisions are reported in separate sections below.

PWS Ocean Sampling

Project Leader - Michele Buckhorn, Ph.D., PWSSC

In the proposal, a 4-5 day ocean test fish survey was planned for August 2012 to investigate the sites that were selected and to test otolith extraction methods. It was recognized by the leader of the Science Panel, Ron Josephson that, with the late season start there was no expectation of usable data for 2012. The gillnet was ordered as soon as the funds were awarded. Due to the timeframe for expedient delivery of the net, and the mesh in stock, the net used in 2012 was constructed with 3 of the planned 5 panels.

A 33’ foot diesel jet bowpicker (F/V Gizella) and captain were chartered for a 2-day run to the sites outlined in the proposal. Due to the late season start after acquiring the net, the low probability of encountering pink salmon, and the small weather window, the full 4-5 days were unwarranted.

The charter was September 10-11, 2012. The transit from Cordova to the first fishing station took approximately two hours. The distance from Cordova to the last fishing station in

Hinchinbrook Entrance was 73 miles (Figure 1). The transit from night anchorage in Hanning Bay to the last fishing station in Montague Strait was 32 miles (Figure 2). The transit from the last fishing site in Montague Strait to Cordova took approximately 4 hours. The estimated fuel usage for the whole trip was 157 gallons of diesel. That might be low in comparison to the actual field work since we did not fish all the stations for a full hour and fuel consumption will depend upon how strong the winds and currents are. It is possible that the skipper may be pulling on the net the full hour at some sets. For example, in Figure 3, the net was out 40 minutes and we did not move at all (floated with the engine off), but in Figure 4, there were strong winds that moved us around quite a bit in only 20 minutes in both sets.

No pink salmon were caught during this test run probably because we were late for the fish run. Fishing at Hinchinbrook, we could see the occasional fish hit the net but none of them gilled. While fishing at Montague, we caught 4 coho salmon and a black rockfish.

Experience and observations during the trip resulted in several questions for the Science Panel. Those questions and the Science Panel's answers are reflected in Appendix A.

Figure 1. Day 1 from Cordova to the three Hinchinbrook locations. The waypoint numbers represent the order of net sets and retrievals.

Figure 2. Day 2 from Hanning Bay night anchorage to the six Hinchinbrook locations. The waypoint numbers represent the order of net sets and retrievals.

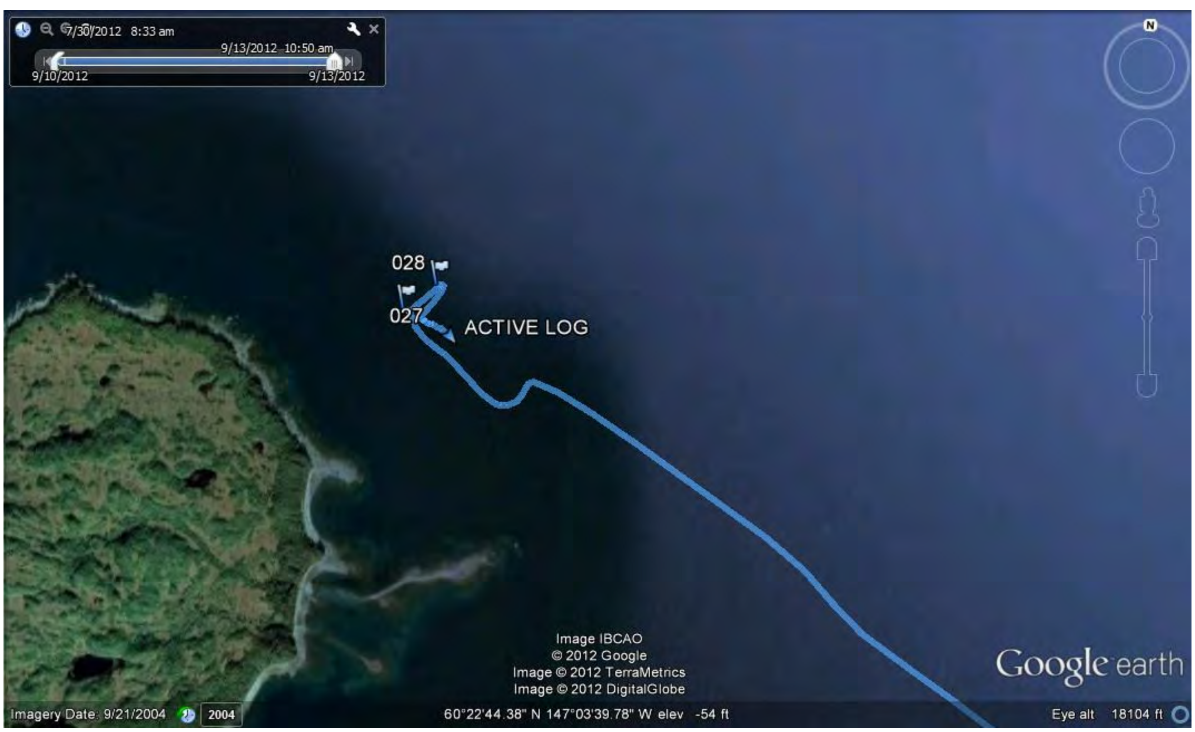


Figure 3. Net set with very little movement. Waypoint 27 was the net set location and 28 was the retrieval.

Figure 4. Net sets with substantial drift. Waypoints 21 and 23 were the net set locations and 22 and 24 were the retrieval locations.

PWS Stream Sampling

Project Leader – Thomas C. Kline, Jr., Ph.D.

Background and Methods

The goal of the late September, 2012 cruise to various streams in PWS was two-fold: 1) to investigate a set of candidate streams – each for possible selection as one of the six pedigree study streams and 2) to commence generation of spawning ground maps in candidate streams holding high promise for the pedigree study. In addition to mapping the streams, it was our intent to collect DNA and otolith samples in PWS. However, a late start due to the contract timing and the need to charter a vessel, combined with very high discharges from the targeted streams, resulted in nearly zero pink salmon available for sampling.

The first goal was met by a combination of evaluating the stream access, spawning substrate, and escapement history. We also conferred with the Science Panel on stream selection. Candidate streams were initially selected for the intensive sampling needed for the fitness (pedigree) study in PWS using the specified criteria from the tables listed in the RFP. Data of various types from various sources were compiled for candidate streams (Table 1). Historical stream survey data were obtained from ADF&G. These data consist of up to 25 years of aerial survey of more than 200 streams in PWS. The data suggest that pink salmon escapement in a given stream can range by greater than an order of magnitude. Streams with a mean run of 3,000 (RFP goal) have

Table 1. Information for candidate hatchery-wild study streams in PWS. High and low pedigree streams will be narrowed down to three high and three low. Candidate pedigree streams not elected will still be sampled for otoliths to determine the hatchery stray rate.

Stream name	Stream number	Fishing district name	Sub-district	Pedigree stream candidate type	Samples (otolith only in lc)	Consolidated stream # (21 + 3 x A + 3 x B)	Pink population size	Adjacent bodies	Stream code	1997 to 2010 mean H pink (%)	Mean pink run size	Median pink run size	Minimum pink run size	# years ≤ 100 pink	# years ≤ 500 pink	# years ≤ 1000 pink	Record length (yrs)
Hartney C	2	Eastern	221-10		pink, chum	1	Large	Hartney Bay	221-10-10020	2.0	13,206	8,429	1,498	0	0	0	25
Spring C	20	Eastern	222-10	LOW	DNA	A	Small	Simpson Bay	221-20-10200	16.3	2,184	1,331	10	1	7	11	25
Sheep R	36	Eastern	221-20		pink	2	X-Large	Sheep Bay	221-20-10360		44,317	36,474	11,967	0	0	0	25
Beartrap R	48	Eastern	221-30		pink	3	X-Large	Beartrap Bay, Gravina	221-30-10480	1.3	42,939	36,244	11,749	0	0	0	25
Short C	88	Eastern	221-40	LOW	DNA	A	Small	Port Fidalgo	221-40-10880	5.9	2,314	1,538	449	0	3	8	25
Fish C	89	Eastern	221-40		pink	4	Large	Fish Bay, Fidalgo	221-40-10890		21,614	22,005	4,574	0	0	0	25
Lagoon C	99	Eastern	221-40		pink	5	Large	Landlocked Bay, Fidalgo	221-40-10990	4.2	12,727	9,690	3,874	0	0	0	25
Millard C	115	Eastern	221-50		chum	6	Large	Galena Bay	221-50-11150		12,986	11,504	3,191	0	0	0	25
Levshakoff C	121	Eastern	221-50	LOW	DNA	A	Small	Jack Bay	221-50-11210	10.0	4,021	4,015	1,251	0	0	0	25
Long C	214	Northern	222-10		chum	7	Medium	Long Bay	222-10-12140	6.4	9,170	8,806	1,043	0	0	0	25
Spring C	217	Northern	222-10		pink, chum	8	Medium	Long Bay	222-10-12170		6,429	4,500	977	0	0	1	25
Surplus C	233	Northern	222-20		pink	9	Small	Wells Bay	222-20-12330		1,850	1,500	176	0	3	9	25
Siwash R	264	Northern	222-20		pink, chum	10	Large	Siwash Bay, Unakwik	222-20-12640 to 222-20-12644	13.9	17,877	16,460	3,275	0	0	0	25
Coghill R	322	Coghill	223-30		pink, chum	11	X-Large	Coghill Lake	223-30-13220		86,439	51,927	2,900	0	0	0	25
Mill C	421	Coghill	223-10		chum	12	Medium	Bettles Bay, Wells	224-10-14210	1.0	9,909	8,145	100	1	1	2	25
Hummer C	425	Coghill	223-10		pink	13	Small	Hummer Bay, Wells	224-10-14240		3,247	3,327	246	0	3	5	25
Paulson C	455	Northwestern	224-10		chum	14	Medium	Cochrane Bay	224-10-14550	3.8	5,948	4,197	959	0	0	1	25
Wickett C	469	Northwestern	224-10	LOW	DNA	A	Small	Cochrane Bay	224-10-14690	15.1	4,140	3,278	561	0	0	3	25
W. Finger C	485	Northwestern	224-40		pink, chum	15	Large	W. Finger Inlet, Nellie Juan	224-40-14850	0.8	12,140	11,199	3,541	0	0	0	25
Comstock C	504	Eshamy	225-20		pink	16	Small	Main Bay	225-20-15040		977	671	5	1	2	4	5
Solf C	508	Eshamy	225-30	HIGH	DNA	B	Small	Eshamy Bay	225-30-15080	55.9	2,357	1,315	0	1	6	8	25
Paddy C	601	Southwestern	226-20	HIGH	DNA	B	Small	Paddy Bay, Dangerous P	226-20-16010, 226-20-16019	41.1	2,256	1,644	100	0	1	6	25
Erb C	604	Southwestern	226-20	HIGH	DNA	B	Small	Ewan Bay	226-20-16040	30.7	3,087	2,800	1,017	0	0	0	25
Bainbridge C	630	Southwestern	226-20		pink	17	Large	Whale bay (west arm)	226-20-16300	11.5	16,597	12,160	5,122	0	0	0	25
Hogan Bay	681	Southwestern	226-30	HIGH	DNA	B	Small	Hogan Bay, Montague Strait (Knt. Is.)	226-30-16810	53.0	4,273	3,401	2,139	0	0	0	5
Swamp C	739	Montague	227-20		chum	18	Large	Montague Strait (Mont. Is. S Prt Ch.)	227-20-17390	3.8	25,637	20,835	2,581	0	0	0	25
Cabin C	747	Montague	227-20		chum	19	Large	Port Chalmers	227-20-17464		15,295	14,435	3,871	0	0	0	25
Stockdale C	752	Montague	227-20	LOW	DNA	A	Small	Stockdale Harbor	227-20-17520	6.8	4,524	3,834	1,100	0	0	0	25
Rocky Bay Head	758	Montague	227-20	LOW	DNA	A	Small	Rocky Bay	222-20-12340	11.1	3,187	2,737	110	0	2	3	25
Constantine C	815	Southeastern	228-60		pink, chum	20	X-Large	Constantine Harbor	228-60-18150	0.0	87,879	48,908	14,852	0	0	0	25
Double C	831	Southeastern	228-40		pink, chum	21	Large	Double Bay, Orca Bay	228-40-18310	2.0	13,705	8,887	2,419	0	0	0	24

apparent run sizes of zero in some years (based on aerial surveys). The historical minimum escapement size of 1,000 (desired # of DNA samples in the low stray rate streams) ± 50% was thus also made an additional consideration for stream selection. Nonetheless, it was impossible to find streams meeting the RFP high stray rate straying criterion of 50% ± 20 % (the plus–minus was added to be more inclusive) without including a few streams with a history of run sizes of ≤ 1,000, ≤ 500, or even ≤ 100 (Table 1). Supernumerary high stray rate candidate streams were selected (Table 1). The RFP suggested using "preselected" streams for the pedigree study, those from the RFP 0.04 list, however, only a few of these met the criteria (Table 1).

The second goal during the 2012 preliminary field survey of the six pedigree streams was to identify likely spawning reaches in the streams and to begin preparing base maps of the spawning areas in each stream. On the field trip, spawning reaches were marked along the streams using stakes (Figure 5). Baseline maps of the six streams are being prepared that provide sufficient resolution to enable redd mapping to inform subsequent sampling of alevins in the following spring. These base maps will be used by field crews to locate areas with pink salmon redds during each adult sampling trip.

Figure 5. Flags on stakes indicating points along margin of putative pink salmon intertidal spawning habitat in Erb Creek.

We took GPS readings at each stream reach. Positions of significant landmarks such as large trees and rock outcroppings were marked on map sketches along with stake locations to enable orienting the maps (Figure 6). The landmarks were marked by surveyors tape when feasible and marked on the sketches along with GPS locations (Figure 7). This will enable accurate positioning during later alevin sampling. Additionally, we took oblique angle photographs of stream reaches to supplement the maps (various figures in the report). We will use the most practical combination of maps and photographs to indicate locations of pink salmon redds within each stream reach on each adult sampling trip.

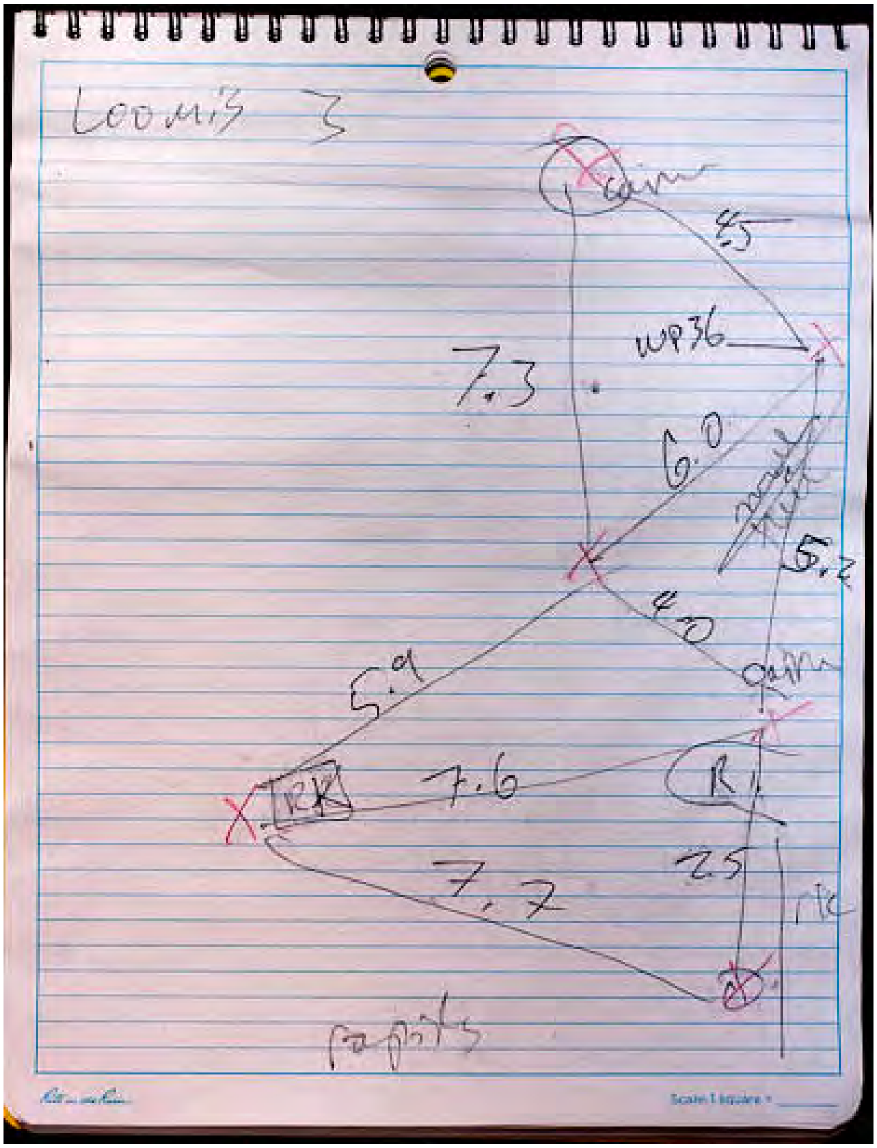


Figure 6. An example of a stream sketch made at Loomis Creek. A red X indicates a stake position. A circled red X indicates a stake position carried on to next page (sketch). Cairn indicates that the stake is held in place by a cairn. RK indicates a rock or rock wall. A small tree-fall is also indicated. WP36 indicates a GPS waypoint. Numbers indicate distances measured in meters. There was a rapids just downstream of this section.

In PWS, pink salmon may spawn from the intertidal as well as considerable distances (i.e., multiple km) upstream. The actual spawning reaches, however, are often discontinuous. Effective alevin sampling will depend on accurate placement of the sampling grid on these spawning reaches and not on sections of the stream without spawning. We initiated a within-stream reach classification system to aid our observations and code our data. Using prepared maps will expedite describing locations of spawning in subsequent sampling trips. Because stream geomorphology can sometimes change, it will be necessary to have discrete maps of each spawning reach to be able to apply a sampling grid. For example, the orientation with respect to compass direction can be different for each reach. Therefore the grids will not be aligned in parallel. Instead we plan to have multiple sampling grids. Each will have finite dimensions based on our maps and later observations of actual spawning. The preliminary maps enable tallying up the spawning area so that it can be divided into the RFP-defined number of sampling grid squares (1000). As well, we will incorporate findings learned by the SEAK group during their 2012 and 2013 preliminary surveys and testing of redd pumping methods, and implement them into the PWS study.

A subset of the stakes placed in each stream was located using a Garmin GPS unit. The resulting waypoint (WP) was noted in the stream sketch (Figure 6). The WP data were uploaded into Google Earth and plotted.

The area within triangles and rectangles delineated by stakes was calculated (Figure 8) and the sum of these areas comprising a given stream reach was totaled. The sum of the stream reach totals was then divided by 1000 to estimate the alevin sampling unit area for each stream. The number of alevin sampling units per reach was estimated from this.

Figure 7. Flagging on boulder in Hogan Bay Creek intertidal. Several flagged stakes are also visible in the photograph.

Figure 8. Measuring the distance between two stakes in the intertidal of Paddy Creek.

Results

Stream Observations and Selection

Based on on-site observations during the survey, we eliminated two candidate pedigree study streams, Loomis and Rocky Creeks. Loomis Creek substrate consisted principally of recently formed (on geologic time scales) shale cobble (Figure 9). This rather coarse substrate and the steep stream gradient in the intertidal (Figure 9) is probably a factor for the tendency of this stream to have zero returns. As well, there was very poor GPS satellite reception at Loomis Creek.

No pink salmon spawning habitat was evident Rocky Creek. Due to its gradient, the stream consisted of continuous rapids from its confluence with an unnamed creek (Figure 10) to near its source lake. Due to high water at the time of our survey it was not possible to assess the nature of the gravel in the relatively low gradient section immediately below the source lake (Figure 11). As well, because of a steep V-shaped stream valley, we found many tree-falls blocking our progress. This stream would likely be even more challenging if not impossible to sample for alevins in March given a significant snowfall. The intertidal substrate was very coarse as well as having steep gradient (Figure 12) and, like Loomis Creek, a marginal spawning area. Further, the intertidal area is shared by an unnamed creek potentially confounding escapement data. The substrate in the unnamed creek above the Rocky Creek confluence looked to be better spawning habitat, however there was considerable algal growth on it suggesting little to no recent salmon spawning activity. Rocky Creek was therefore removed from further consideration as a stream for the pedigree study portion of the project.

Figure 9. Mouth of Loomis Creek looking towards Crafton Island. Rock from the cliffs forming the sides of this stream forms the substrate, which is rather coarse for spawning.

Figure 10. Confluence of Rocky Creek (from the left) with and unnamed creek (right). White water was characteristic of the flow in most of Rocky Creek.

Figure 11. The outlet of the lake forming the source of Rocky Creek and high water at the time of our survey.

Figure 12. View upstream from intertidal of Rocky Creek illustrating the steep gradient.

Immediately following our survey of Erb Creek we visited the nearby Ewan skookumchuck as the tide was rising (Figure 13). One of the preselected streams, Ewan Creek is upstream of the point where this photo was taken. T. Kline has been advised not to sample it because of the challenges presented by the skookumchuck, one of three in Prince William. The safety issue should be obvious from looking at the figure.

Figure 13. The Ewan skookumchuck. At low tide levels seawater pours out the narrow gap that isolates the upper portion of Ewan Bay.

The time of our PWS stream survey, September 2012, was characterized by multiple flood-generating storm systems (Figure 14). Flooding was widespread throughout south-central Alaska (http://www.alaskadispatch.com/slideshow/photos-flooding-southcentral-alaska). High water levels are evident in the photographs illustrating this report. This enhanced flow resulted in no intact salmon carcasses being left in any of the streams we visited. We therefore were unable to conduct any biologic sampling. We observed just three male pink salmon in total. They were alive in Paulson Creek. After returning to Cordova, live adult pink salmon were observed by T. Kline in nearby Hatchery Creek. Two were observed mixed in a large school of coho and sockeye salmon on 2 October. One live male in good condition was observed close-up after dark on 11 October.

Changes in Hartney Creek were evident during our surveying there in October. Gravel bars and pools had shifted position relative to before the flooding. A wave of gravel moving downstream in Hartney Creek was evident (Figure 15). Because flooding conditions can lead to egg mortality, we should not expect the 2014 PWS pink run to have large escapements.

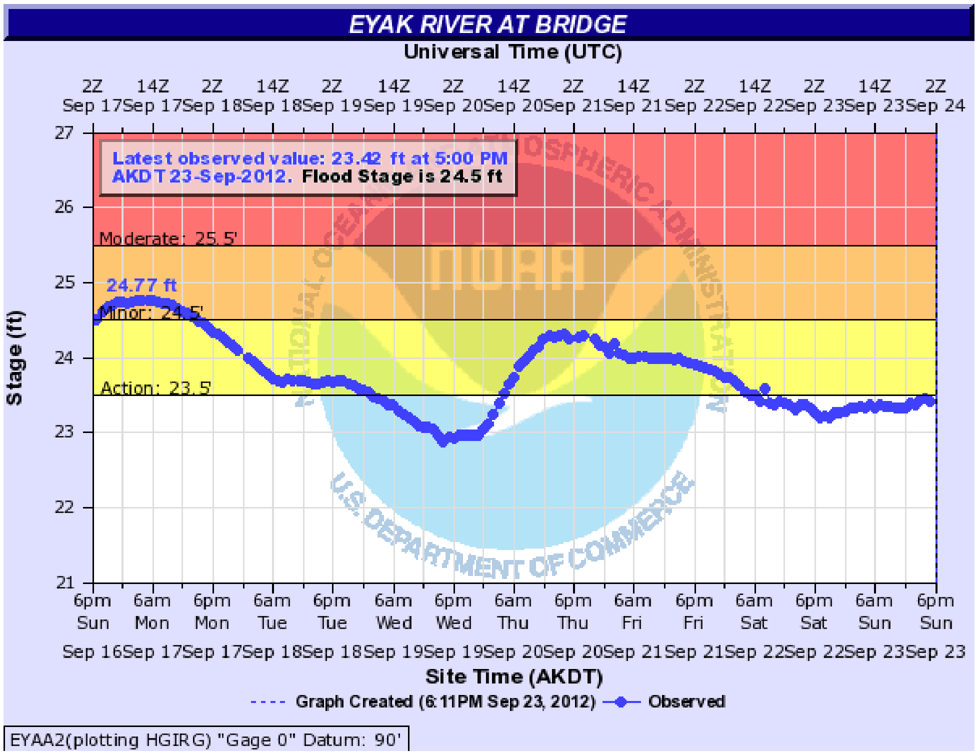


Figure 14. Hydrograph obtained on 23 September 2012 from the NOAA Advance Hydrologic Prediction Service web page (http://water.weather.gov/ahps2/index.php?wfo=pafc3) illustrating flood and near-flood conditions at the outlet of Eyak Lake, Cordova, AK.

Figure 15. A gravel wave in the intertidal of Harney Creek that had not been there prior to the September flooding. Technician Megan Hess, holding the GPS unit, provides some scale. Note that this is high quality gravel for salmon redds.

Preliminary Mapping

Table 2 summarizes the potential spawning area mapped in each stream during the 2012 survey. These data should be considered preliminary. Dividing the habitat area by1000 indicates the size of an alevin sampling unit in a given stream.

Table 2. Preliminary assessment of potential pink salmon spawning habitat mapped in candidate PWS pedigree study streams in 2012.

Stream name	Stream number	Area of spawning habitat (m^2)
Hartney Creek	221-10-10020	11,251
Paddy Creek	226-20-16010	2,324
Erb Creek	226-20-16040	770
Solf Creek	225-30-15080	3,030
Paulson Creek	224-10-14550	4,442
Loomis Creek	225-30-15060	681
Hogan Bay Creek	226-30-16810	1,139

Waypoints taken in each stream are shown plotted using Google Earth for streams with satisfactory Google Earth imagery (Figures 16 to 21). The resolution and improper timing with respect to tidal height of these images renders them not useful as a guide for re-locating specific spawning sites needed for the pedigree study.

We also found that the accuracy of handheld GPS units to be significantly inadequate for our purposes. For example, note that some of waypoints of Fig. 15 appear on land when in fact they were taken within the stream.

Figure 16. Hartney Creek section nearest to Whitshed Road show showing waypoints.

Figure 17. Hartney Creek section upstream of that shown in Figure 11 showing additional waypoints. The upper extent of the intertidal is about at WP60.

Figure 18. Paddy Creek spawning habitat waypoints. Note that point placement is clearly not accurate.

Figure 19. Solf Creek spawning habitat waypoints. Note that point placement is clearly inaccurate. For example, WP14 is located at the base of the waterfall that likely limits pink salmon migration, which is in the stream and not to the left as shown.

Figure 20. Loomis Creek spawning habitat waypoints.

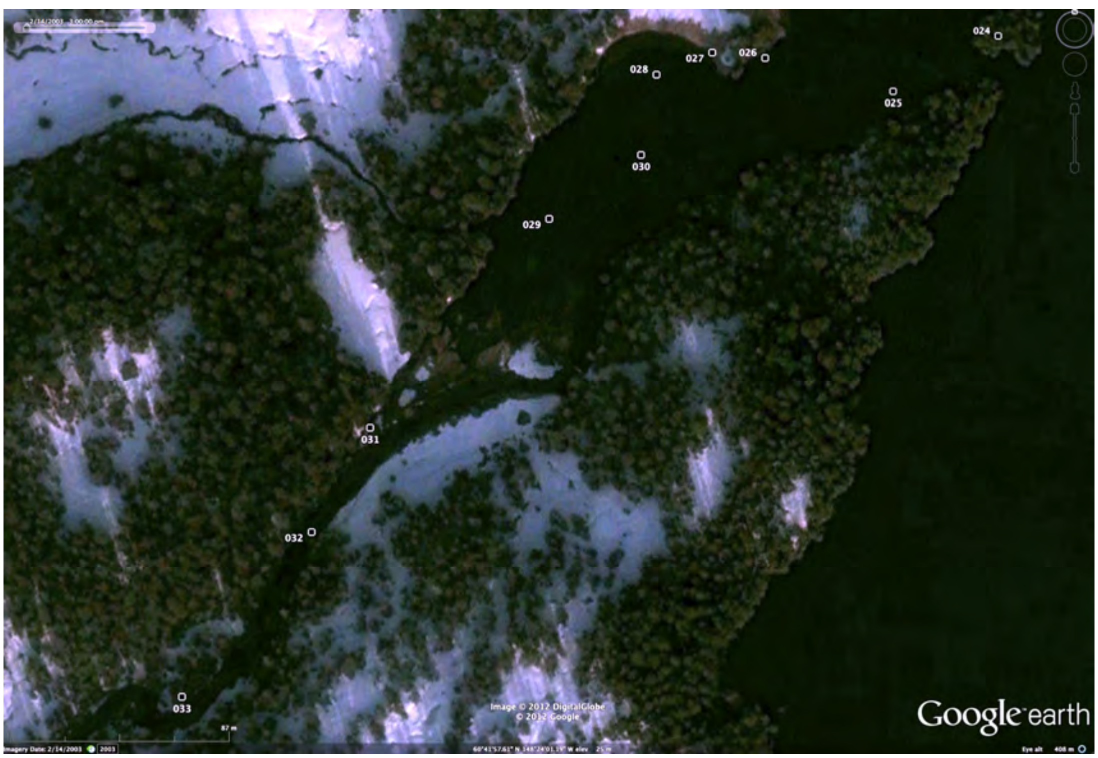


Figure 21. Paulson Creek spawning habitat waypoints.

SEAK Stream Sampling

Project Leader – Victoria O'Connell

Background

The Sitka Sound Science Center (SSSC) is a subcontractor to the PWSSC for the Southeast stream sampling portion of their ADF&G contract IHP-13-013 "Interactions of Wild and Hatchery Pink and Chum Salmon in Prince William Sound and Southeast Alaska". In Southeast, 34 streams will be sampled in future years. Four of these streams will be intensively sampled for adult chum salmon otoliths and genetic tissues, as well as subsequent alevins to support the pedigree/fitness studies. The candidate streams were visited in 2012 for two purposes: 1) to assess chum salmon run timing, physical access, and logistical suitability as "pedigree" study streams, and 2) to collect biological data to reaffirm the level of hatchery straying in the candidate streams prior to full sampling beginning in 2013.

Methods

The four candidate pedigree streams investigated in Southeast this year were: Fish and Sawmill creeks (high straying – Piston and Heinl 2012), and Saltery Bay Head and Swan Cove Creek (low straying– Piston and Heinl 2012). The stream sampling team staged out of Juneau. The team spent between August 9 and August 18 sampling streams with several days out of the field due to high water or poor flying conditions.

Teams walked the stream, either to the upper extent of chum salmon access or as far as feasible. The team recorded habitat types, took photographs, collected GPS waypoints, and sampled chum salmon for biological attributes. Spawning locations were mapped using GPS and described in field notes.

Post-spawning chum were hand-picked or speared fish (most of the sampling was from carcasses given the late arrival date of the team). Whenever the fish condition allowed, we sampled each fish for sex, length (MEHL), scales for aging, and otoliths to identify hatchery or wild origin. Biological data protocol was based on guidance provided by ADF&G.

Otoliths were cleaned and placed in ADF&G otolith trays and scales were attached to ADF&G scale cards. Mark-sense forms were filled in and all scale and otolith samples delivered to ADF&G. The ADF&G aging laboratory personnel aged the scales and that data is summarized below. ADF&G Thermal Mark laboratory personnel read the otoliths to determine wild versus hatchery origin.

Results

The four streams were sampled on these dates:

Stream Name	ADF&G stream number	Sampling dates
Fish Creek	111-50-10690	08/11, 08/12
Saltery Head	112-44-10100	08/11, 08/16, 08/18
Swan Cove	111-16-10400	08/14
Sawmill Creek	115-20-10520	08/15

A total of 567 chum salmon were sampled for biological attributes in the four streams. The counts of females present in all four streams were greater than males at the time of sampling, which was near the end of the spawning period.

SEX	Saltery Bay Head	Swan Cove Crk	Sawmill Creek	Fish Creek-Douglas	Grand Total
Female	95	76	77	118	366
Male	51	14	67	62	194
Unknown	7				7
Grand Total	153	90	144	180	567

Readable scales were aged from 497 chum salmon as shown below. Most chum salmon were aged 3 or 4 years old, with a majority 3 year olds in Saltery Bay Head and Swan Cove Creek and a majority 4 years old in Sawmill and Fish creeks.

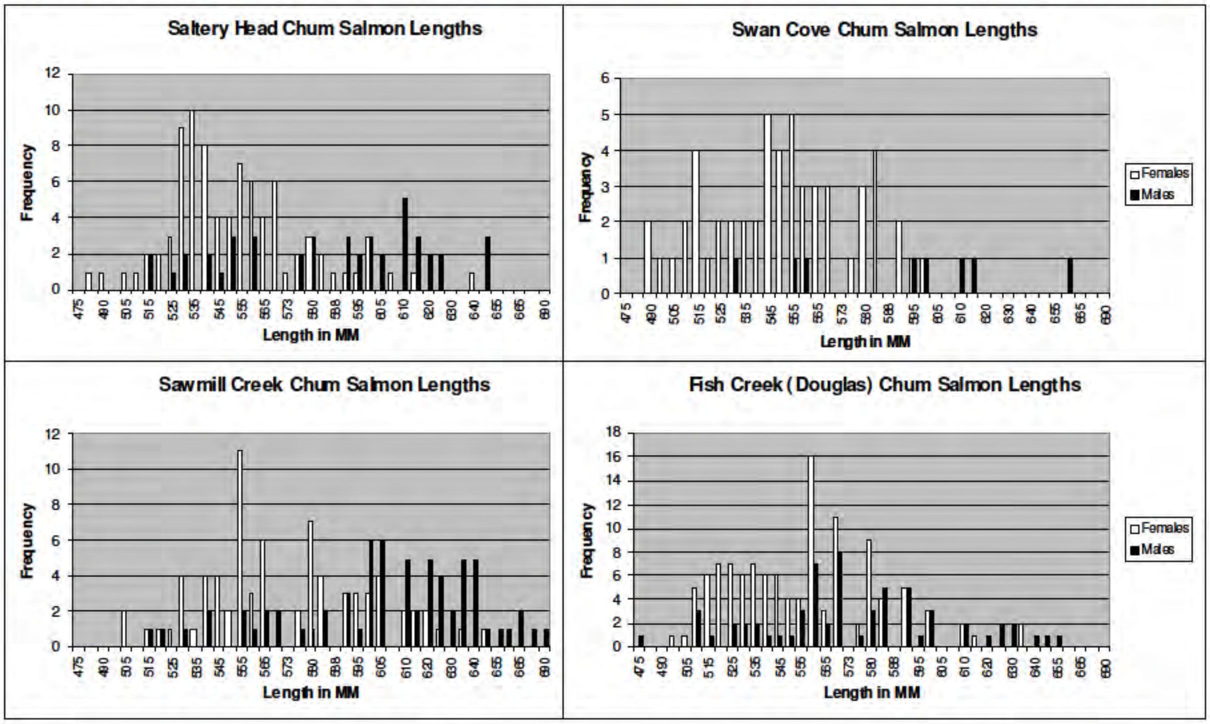
Saltwater age	Saltery Bay Head	Swan Cove Crk	Sawmill Creek	Fish Creek-Douglas	Total
2		1		2	3
3	99	55	33	66	253
4	38	25	75	100	238
5	2		1		3
Total	139	81	109	168	497

Otoliths were read from 546 chum salmon from the four streams to determine whether fish were of hatchery or wild origin, as shown below. Percent of hatchery strays ranged from less than 1% in Saltery Bay Head to almost 64% in Fish Creek.

Otolith mark	Saltery Bay Head	Swan Cove Crk	Sawmill Creek	Fish Creek-Douglas	Total
Wild	150	80	116	63	409
Hatchery	1	2	23	111	137
					546
Percent hatchery	0.7%	2.4%	16.5%	63.8%	

Males generally appeared to be larger than females in the four creeks (Figure 22). However, the length frequencies for Sawmill and Fish creeks in Figure 22 included both hatchery and wild fish which could confound the length frequencies by sex.

Figure 22. Length frequencies of adult chum salmon sampled in four streams August 2012.



All of the 68 females identified as hatchery fish in Fish Creek were from DIPAC's Macauley facility. Of those, 40 were from the 2007 brood release, 27 were from the 2008 brood, and one was from the 2009 brood. All the 43 Fish Creek males of hatchery origin were from Macauley except one that was from the 2008 Anita Bay release. One was identified as from the 2006 brood, 17 were from the 2007 brood, and 24 were from the 2008 brood.

Data Management

The data management techniques and procedures for this project are still in development. During 2012, data was recorded on field sheets and then entered to Excel spreadsheets.

In 2013, we will develop an integrated, geospatially related database for recording all field observations. Field observations will be recorded on handheld data collection units and downloaded to a mainframe database designed for this project. The database will provide data that is easily downloadable to ADF&G systems.

Summary and Prognosis

Due to the late signing of the contract relative to fish run timing, work on this project was of a preliminary nature during 2012. Full implementation will begin in 2013. Yet, a number of things have been accomplished to set the stage for a more successful implementation of the project in 2013.

In the PWS ocean sampling portion, we purchased an experimental gillnet, made an initial gillnet sampling run, and tested the fishing methods. This initial effort helped us to formulate questions for clarification by the Science Panel and to revise our sampling protocol somewhat for 2013.

The PWS stream sampling effort was begun with an initial cruise to six candidate pink salmon pedigree study streams for initial mapping, biological sampling, and to evaluate the streams' suitability for sampling. Although a late start combined with heavy rainfall eliminated all adult spawners from the streams, we were able to collect map data and evaluate the streams' potential for the study. Preliminary stakes were planted at locations from where base maps were developed.

Two of the six PWS candidate streams were determined to be unsuitable for the pedigree studies. Since the cruise, the list of candidate pedigree streams has been revised. There are now 10 candidate streams (Table 1), four of which have been visited and preliminarily mapped.

Four SEAK candidate chum salmon pedigree sampling streams were visited in August, 2012. Since chum spawners were available, biological attributes called for in the RFP were collected for preliminary information about the wild and hatchery populations. We also evaluated the streams' suitability as future pedigree study streams and collected preliminary geographical information about the streams, the extent of upstream chum access, and the areas used by chum spawners.

Of the four streams visited, Swan Cove Creek and Saltery Bay Head will be dropped as pedigree streams, while Fish Creek – Douglas and Sawmill Creek will be retained. This is based on too-low hatchery abundance observed in the Swan and Saltery Creeks, making them potentially unsuitable for fitness analysis, as well as difficulties with stream access. We are tentatively planning to add Prospect Creek and Admiralty Creek as alternate pedigree streams, pending some further investigations and approval by the Science Panel.

Results of the otolith analysis in Fish and Sawmill creeks indicate suitable hatchery-wild proportions. Both of these streams provide reasonable access.

Literature Cited

Piston, A. W., and S.C. Heinl. 2012. Hatchery Chum Salmon Straying Studies in Southeast Alaska, 2008-2010., Fisheries Manuscript Series 12-01. Alaska Department of Fish and Game, Anchorage, Alaska.

Appendix A. Questions for and Answers from the ADF&G Science Panel

Answers from the Hatchery-Wild Straying Science Panel

Version 2

November 16, 2012

Answers added by ADF&G December 31, 2012

The following is a summary of the discussion held between the ADF&G hatchery-wild Science Panel and the PWSSC and SSSC contractors on November 16, 2012. Since the discussion was based largely on questions the contractors presented to the Science Panel, the results are presented as questions and answers. Underlined text in the answers indicates action items for the contractors (unless otherwise noted). Further responses from ADF&G are noted in blue text.

Topic: Ocean sampling station locations

Q: What is the rationale for six sites in Montague Strait and three sites in Hinchinbrook Entrance? Is it due to the spatial extent of each entrance?

A: The purpose is to get a good representation of the hatchery/wild proportion at each entrance on each sampling date. Station HB3, as proposed, may not be as useful as a station in the center of the Hinchinbrook Entrance. So HB3 should be dropped and a new station established in the middle of Hinchinbrook Entrance. Even if we do not catch many in the mid-entrance station, it will be informative to see whether the hatchery/wild proportion is different there. If the new station (or any others) proves to catch very few fish, or especially if all the stations tend to exhibit the same hatchery/wild proportion, then some stations may be dropped later.

ADF&G Response: We agree with this synopsis. However, we also recommend that PWSSC use an adaptive approach to this sampling. It's likely that the contract skipper will have local knowledge that should be considered. The important thing is to be as consistent as is reasonable through the season.

Topic: Priorities for ocean sampling

Q: What is the sampling priority: consistent site visits and sets or 60 fish per day per entrance? Which scenario would be the preference:

- **Collect 60 fish regardless of number of sites fished?**
- **Collect 10 subsamples from each set potentially resulting in less than 60 fish for that day?**

A: The priority is to sample every station for the minimum sample size at each station (20 at each Hinchinbrook station and 10 at each Montague station) on each sample day. If a station is missed on a given day, leave blank in the data.

There is no need to catch more than the required sample sizes. The net only needs to be deployed sufficiently to catch the sample.

Record: 1) begin time net out, 2) end time net out, 3) length of net out, 4) begin time net in, 5) end time net in 6) which end of net started, 7) total number pinks caught, and 8) total number of chum caught.

Switch the net end-to-end at the end of each week (so that different mesh panels will be used when there are too many fish to deploy the entire net).

Sample the required number of fish systematically out of the total haul for each set (rather than totally randomly) if there are more in the catch than the required sample size.

ADF&G Response: We agree with this description. You should also be aware that in high abundance fishing you may not even get the net out before you need to pull it in. That is OK. Just record the times and an estimate of the amount of net that was let out.

Topic: Ocean sampling drift-netting vs. set-netting

Q: Is it more important to consistently fish the exact test locations, by set-netting instead of drifting, or to maximize the likelihood of capturing sufficient fish, even if the drift net takes us away from our pre-set locations?

A: Start at the designated station and drift. Record the position of beginning and end of set.

ADF&G Response: We agree.

Topic: Differential Sampling of stray-rate study streams

Q: Is it more important to sample a stream thoroughly (and perhaps take a long time, potentially precluding getting to other streams), or to sample all the streams more frequently (perhaps obtaining less samples per stream)? (This question is somewhat related to the following question, especially for PWS.)

A: It is preferable to sample all the streams as much as possible rather than miss streams by spending too much time on any one stream. Overall, the general priorities for sampling are:

1. Sample every stream on the list
2. Sample throughout the length of the stream
3. Visit every stream at least two, preferably three, times throughout the run timing
4. Completely represent each subregion.

ADF&G Response: We agree with 1 -3.

Point 4 is a subjective statement. The selected streams were chosen in a manner designed to adequately represent each subregion and so long as 1 -3 are met, the field crew priorities will not have an effect on this point.

Topic: Stream Replacement

Q: May we change some of the streams that will be used for the study?

A: For the otolith sampling, it is important to have a representation of the different types and sizes of populations distributed through each subregion. It is also important that the steams be among the ADF&G summer chum index streams.

The Southern Southeast Alaska otolith streams were settled on as Harding, Carroll, Marten, Hidden Inlet, and King Creek. (King Creek is our proposed substitution for Blossom, which has significant access issues - a helicopter would need to transport a jet boat across a log jam).

For the pedigree streams, it is important that they range in approximate hatchery stray proportions of 5% to 80%, with two at the lower end of the range (5-20%) and two at the upper. It is agreeable to drop Saltery Bay Head because of its difficult access. The contractors will review possible Southeast pedigree streams and select four that meet the criteria for stray rate and reasonable access (As of this writing, and based on the discussion, we will keep Sawmill and Fish creeks as the high straying streams and are planning to switch to Game and Spasski creeks for the low straying streams if access is granted from the landowners. Three of these four systems are on the road system making them easier to sample near daily).

In PWS, the proposal to combine effort on otolith sampling for pink and chum by selecting streams that have both species is generally acceptable. However, the proposed list should be modified by adding back 2-3 small pink streams, especially in districts 221, 222, and 226.

If circumstances dictate decisions about sampling priorities, some streams could be sampled twice instead of three times. However, the higher priorities are to sample pink streams with high stray rates three times and pink streams over chum streams.

PWS pedigree streams should be further reviewed to get a final list that includes streams that have at least 5-20% stray rate.

ADF&G Response: We agree with Southeast synopsis. PWS stream sampling decisions are still outstanding.

Topic: Effects of High Proportional Sampling of Small Streams

Q: What are the effects of sampling 25% or more of the alevin population, and potential trampling of alevins, on the long-term population numbers in the pedigree streams?

A: No concerns were identified on this topic.

ADF&G Response: We agree.

Topic: Sampling Pedigree Streams

Q: Should we avoid sampling streams that have a high proportion of non-target species spawning in the same area as our target species? The concern is that the effects of spawning by the other species may bias the outcome for the target species.

A: No concerns were identified on this topic.

ADF&G Response: We agree.

Topic: Electronic data collection.

Q: Can ADF&G accept data that we collect electronically if we work together to ensure that such data will be compatible with ADF&G needs?

A: Yes. Coordinate with Tim Frawley, Scott Johnson, and Eric Lardizabal (DNA Lab) as we develop our data collection and management system so that information can be transferred into the relevant ADF&G databases. Add a scanning technique to track the DNA samples. The electronic data collection will allow real-time tracking and reporting of data to ADF&G on weekly basis. There is already electronic data capture happening in Cook Inlet and it has been trialed in the Sitka Port Sampling office as well. The Contractor will look into duplicating one of these systems.

ADF&G Response: We agree with this synopsis.

Topic: Otolith processing

Q: Who will be reading the ototliths from PWS and where should we deliver those?

A: This still needs to be resolved within ADF&G.

ADF&G Response: We will let PWSSC know our plans for otolith reading well before the sampling starts.

Topic: Scale cards

Q: Is it possible to use the old scale cards (the cards currently used are flimsy and disintegrate in the rain)?

A: Bill Templin said that he can redesign the cards. We need to coordinate with him.

ADF&G Response: We agree.

Topic: Permits

Q: May we have a waiver on a collecting permit, or at least on the rigorous reporting requirements?

A: We will need ADF&G collecting permits for the project. Chris Habicht should be able to assist us with the correct language. We should not need to submit a complicated annual report, since we are working under contract to ADF&G and our annual and final reports by default include all the same information required in the permit report.

Also, there is a need for a DNR permit for alevin sampling. ADF&G can assist with this.

ADF&G Response: We will assist with ADF&G permits, and DNR to the extent that we are able.

Topic: DNA sampling of adults

Q: Who should we coordinate with on DNA sample collecting and shipping methods?

A: Coordinate all DNA sampling with Chris Habicht via a teleconference soon. Judy Berger is in charge of sampling and shipping logistics. Eric Lardizabal is the DNA data manager.

ADF&G Response: We agree.

Q: How should we sample adult tissues for DNA?

A: Sample only live spawned-outs (white tails). If live are unavailable, try to get individuals with still-pink gills. Only sample older carcasses if no other fish are available. If there is exterior fungus, sample heart or internal cartilage. Specify what tissue is collected and the condition of the fish.

ADF&G Response: We agree with this synopsis.

Topic: Mapping spawning areas for subsequent grid sampling of alevins

Q: How specific and exact does the alevin sampling grid need to be?

A: The basic idea is to identify the spawning areas as accurately as reasonable and then sample them systematically. The alevin sampling of the grid does not need to be extremely accurate. "Stepping off" the approximate location of the repetitious sampling locations within the pre-determined spawning areas is sufficient.

ADF&G Response: We agree with this synopsis.

Topic: Assumptions for estimating number of hatchery salmon in streams and hatchery vs. wild productivity

Q: What are the assumptions, explicit and implicit, for extrapolating the data that will be derived from the samples we will be collecting? Should these assumptions be validated during the study? (These questions are not directly related to the contract. However, answering these questions may help in answering some of the foregoing questions and may help in the ultimate analysis.)

A: No comments on these questions.

ADF&G Response: We agree.

Other Topics Discussed:

Ron Josephson will track down at least three redd sampling pumps for use in this study.

ADF&G Response: I am still working on this.