## State of Alaska Hatchery Research Project:

A study on the interactions between hatchery and wild pink and chum salmon in Southeast and Prince William Sound streams

Progress Synopsis May 2016

Alaska Hatchery Priority Research Questions – In May of 2011 the Alaska hatchery operators and department representatives identified three top priority research questions:

1. What is the genetic stock composition of pink and chum salmon in each region? Is there a single larger population or discrete stocks?

2. How much straying is there of both wild and hatchery pink and chum stock? How much annual variation is there?

3. What is the impact on fitness (productivity) of wild pink and chum salmon stocks due to straying of hatchery pink and chum salmon?

**Background** - The first 3 years have been completed for field studies focused on the variability and extent of hatchery pink and chum salmon straying in Prince Willian Sound (PWS), and chum salmon straying in Southeast Alaska. Work on genetic stock structure of pink salmon populations using DNA microsatellites for 2013 collections is preliminarily complete and the tissues are currently being analyzed for additional odd- and even-year pink salmon. The field crews have completed intensive sampling directed toward studies of the relative reproductive success of hatchery and wild fish on 6 pink salmon study streams in PWS and 4 chum salmon study streams in Southeast. This ground breaking work is based on identifying origin (hatchery/wild) of potential parents spawning in study streams using otolith marks. In subsequent years these parents and the returning adult progeny will be genotyped to identify parental origin (hatchery/wild) of returning fish. Collectively over 160,000 salmon have been sampled for this research.

**Straying studies** – In a systematic and well-designed manner the project has sampled representative chum salmon indicator streams in Southeast, and pink and chum indicator streams in Prince William Sound, to estimate the hatchery fraction in natural systems on a district scale. No previous study has done this. Combining this information with estimates of relative reproductive success and of hatchery and wild productivities will allow us to assess the influence, if any, of hatchery strays on wild production. Preparations are underway to publish this work now that it is completed.

Results are summarized in Table 1.

	Hatchery Proportion			
PWS	2013	2014	2015	
Pink Salmon	4%	15%	10%	
Chum Salmon	3%	3%	3%	
Southeast	2013	2014	2015	
Chum Salmon	7%	5%	9%	

Table 1. Preliminary estimates of the proportion of hatchery-origin spawners in the wild streams.

**Ocean Sampling** –Ocean sampling in the entrances to Prince William Sound has provided an un-biased estimate of the hatchery fraction in the total return of pink and chum salmon. This information, when combined with the estimates from the streams and the known removals through harvest and hatchery take provides a means to estimate: the number of wild salmon spawning in streams, the number of hatchery salmon spawning in the wild (hatchery strays), total production of hatchery salmon (including strays), total production of wild salmon (excluding hatchery strays). With knowledge of total number of fish spawning in streams and the total return of wild fish, it is a simple matter to determine the return per spawner, an important measure of productivity and fitness. It is also possible to determine the proportion of the hatchery return that spawned in wild stock systems.

(Thousands of Pink Salmon)						
	Wild	Hatchery	Total		Hatchery	
Year	spawners	spawners	spawners	Wild run	run	Total run
2013	15,698	701	16,399	33,096	69,888	102,985
2014	5,130	741	5,872	6,960	42,757	49,718
2015	30,074	3,178	33,252	55,632	67,720	123,353

Table 2. Preliminary PWS Run Size Estimates - Pink Salmon 2013-2015 (This table has some errors in numbers that will be corrected after further analysis.) (Thousands of Pink Salmon)

Table 3. Preliminary PWS Run	Size Estimates - Cl	hum Salmon 2013-2015
(Thousands of Chum Salmon)		

<u>.</u>	Wild	Hatchery	Total		Hatchery	
Year	spawners	spawners	spawners	Wild run	run	Total run
2013	894	50	944	1,141	3,007	4,148
2014	925	49	975	1,175	1,228	2,404
2015	905	28	934	1,126	2,484	3,611

These data show that from 1% to 5% of the pink salmon hatchery returns, and 1% to 4% of the hatchery chum salmon returns in PWS during the three study years spawned in natural systems.

Preparations are underway to publish run reconstruction and straying results.

**Fitness Studies** –Samples have been collected from 6 pink salmon pedigree streams in PWS and 4 chum salmon streams in SEAK for studies of potential relative difference in survival of offspring between hatchery and wild fish spawning in wild stock streams. This information will allow us to assess the ecological and genetic consequences of hatchery strays on fitness of wild spawners at the drainage scale. Evaluation of this scale is important because it will provide insight into how much these consequences can vary locally (and, potentially, why). The analysis has not been initiated yet pending more funding and selection of the SNPs (single nucleotide polymorphisms) that are used to determine parentage. The SNPs are now developed and the state's Gene Conservation Lab has submitted requests for two grants to conduct initial work on PWS pink salmon fitness studies.

**Funding** – A finance committee has been formed with hatchery operators, a processor representative, as well as the commissioner's office and hatchery aquaculture section in the department. This team has focused attention on the essentials with a pared down program primarily directed at the questions about fitness. The current situation with State of Alaska's budget precludes additional CIP funds, however 7 of the largest hatchery corporations (SSRAA, NSRAA, DIPAC, PWSAC, VFDA, KRAA, and CIAA) have combined to provide \$300,000 for the coming year's work; those funds in concert with carry forward funds, and the processor's contribution of \$500,000 are adequate for this year's field work. The hatchery groups expect to increase their contribution and provide at least \$350,000 each year. ADF&G provides considerable in-kind support as well as seeking funds from other sources.

**Future** –Field work for Questions 1 and 2 has been completed, while analyses are nearing completion and therefore the scope of work for the research project has narrowed to address the fitness question. Even so, there are still significant costs. The science panel considers the fitness studies to be the most important to our long term understanding of the hatchery wild interactions. The funding for that component of the project is now being provided by fishermen through the hatcheries via additional cost recovery, as well as the processor community through a consensus agreement. Sustained commitment by these parties is necessary for successful completion of the project. This project is expected to end in 2023 with the conclusion of the fitness analysis of chum salmon in Southeast Alaska.

Additional information on this project is available at: <u>http://www.adfg.alaska.gov/iatcheriesResearch.main</u>