

State of Alaska

Hatchery Wild Interaction Project:

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

Background

The hatchery program in Alaska is a state run program. The Department of Fish and Game is in partnership with the hatchery operators to increase salmon harvests, while protecting wild stocks.

The Alaska hatchery program provides one third of our salmon harvest each year, \$100's of millions of income and thousands of jobs. However the program is often criticized due to uncertainties regarding impacts on wild stocks. Previous research on hatchery-wild interaction is only from the lower-48 and based on studies on species that we do not culture and habitats much different than ours.

Research is needed on Alaska salmon in Alaska

The state in partnership with the hatchery operators is expanding ADFG's own direct studies of wild and hatchery interactions to better understand those relationships as they occur in Alaska. Three questions are being addressed:

1. Are hatchery-bred salmon interbreeding with wild salmon to the extent that fitness and productivity of these wild stocks are being diminished?
2. Is the annual assessment of wild stocks (which is, in large part, based on visual observation) so biased by the presence of hatchery salmon that excessive harvest of wild fish is being allowed or that escapement goals are difficult to set and difficult to assess?
3. Do density interactions diminish productivity of wild salmon?

The state's hatchery research program has advanced the science of fisheries enhancement in Alaska; we think it also increases consumer confidence in Alaskan salmon by assuring the marketplace that these products come from a sustainable and responsibly managed program. Funding for this research is from the state, the hatcheries, and the processing community. A team of scientists from state, federal, and academia guide the studies.

Work Plan

The work plan for the first 6 years focuses on the somewhat parallel studies of the variability and extent of pink and chum straying by region, and the intensive studying of spawning success of hatchery and natural origin fish based on parental genotyping. This work involves continuous field work during the summer and early fall for a number of crews in Southeast and Prince William Sound. The crews are primarily sampling for otoliths and getting tissue samples for genetic analysis.

Straying studies – In a systematic and well-designed manner the project is sampling 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.

Ocean Sampling –Ocean sampling in the entrances to Prince William Sound is providing 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 natural fish, it is a simple matter to determine the return per spawner, an important measure of productivity and fitness.

Preliminary estimates of hatchery fraction in the total return to PWS from different samples

	Pink Salmon Hatchery Fraction	
	2013	2014
Ocean Sampling	0.64	0.86
Common Property Fishery	0.80	0.95

	Chum Salmon Hatchery Fraction	
Ocean Sampling	0.72	0.51
Common Property Fishery	0.92	0.78

These results are consistent with what we expected. We knew for pinks that 2013 was a very strong wild stock year. We also expect that the fishery will harvest hatchery fish at a greater rate than their natural numbers. Preliminary estimates of hatchery fraction in natural spawning fish should be available in the next month.

Fitness Studies - Fitness is a statistic that describes the ability to both survive and reproduce. Genetic analyses have improved to the point where individual fish can be traced to their respective parents, so long as their parents have been genetically sampled. Using genetic tools for parentage, reproductive success can be estimated for hatchery-origin versus natural-origin fish in each stream, as well as provide data for comparisons between low and high stray rates for each of the two species. These data will be used as well to estimate survival rates and reproductive success to the adult stage for hatchery-origin versus natural-origin fish in each stream.

Future Planning - The pink salmon relative spawning success studies, often called pedigree because of the use of parental genotyping of known wild and hatchery fish and the ability to identify their progeny in future returns, will be completed after 6 years. We will also have a large portion of chum salmon field studies completed although this longer-lived fish will require 5 more years of sampling at a small set of streams.