

2005 PROGRESS REPORT

**NONPAREIL DAM ADULT TRAP
AND
COHO GENETIC PEDIGREE PROJECT
CONSERVATION HATCHERY IMPROVEMENT PROGRAM**

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**OREGON DEPARTMENT OF FISH AND WILDLIFE
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NONPAREIL DAM ADULT TRAP AND COHO GENETIC PEDIGREE PROJECT

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Project Description

This study will conduct an experimental supplementation project for coho salmon in Calapooya Creek and tributaries (Umpqua basin), using the following hatchery scenarios: a) hatchery stock released as smolts, b) hatchery stock released as unfed fry, c) first generation wild-type hatchery stock released as smolts, and d) first generation wild type hatchery stock released as unfed fry.

Task 1. Oregon Department of Fish and Wildlife (ODFW) will evaluate the success and genetic implications of these alternative hatchery scenarios using DNA pedigree reconstruction. Adult brood stock will be collected at Winchester Dam on the North Umpqua (hatchery parents from a conventional program) and Nonpareil Dam on Calapooya Creek (wild-type parents from local stream) and subsequent spawning and rearing of fish at Rock Creek hatchery, Butte Falls hatchery, and STEP hatchbox facilities. Eggs from three consecutive brood years (2001-2003) will be used to produce annual unfed fry (400,000) and smolt releases (20,000) from 2002 to 2005. The releases for the hatchery program would be approximately 50% from hatchery parents and 50% from wild-type parents. The predicted total estimated fish releases are 1.2 million fry and 60,000 smolts, based on planned numbers (1200) of brood fish, average fecundity for female coho adults, and overall average rearing survival rates to release.

All returning adult and jack coho at Nonpareil Dam will be genetically sampled and passed from 2002 to 2010. The annual returns were predicted to range from 400 to 800 fish, but could vary considerably due to survival rates in freshwater and ocean environments during the time period of the project.

Task 2. ODFW will establish the pedigree of fish from the hatchery and subsequently above Nonpareil dam. Three generation-lines will be developed to provide replication of the study.

Task 3. ODFW will also measure the size, run time, age, and other characteristics of each returning fish to later determine if any of these factors are important in determining reproductive success.

Project Activities

Task 1. Collection of adult hatchery coho was completed at Winchester Dam for brood years 2001 to 2003. Collection of adult wild coho was completed at Winchester Dam in 2001 and at Nonpareil dam in 2002 and 2003. In the summer of 2002, an adult fish trap was constructed at Nonpareil Dam and operated during the entire 2002, 2003 and 2004 adult coho migration periods.

In summary, the total number of coho spawners included in the hatchery program for the 2001, 2002, and 2003 brood years was 1192 and included 600 hatchery and 592 wild fish. The total releases for the project for 2002-2005 was 1,308,070 fry and 66,480 smolts. These releases included 655,151 unfed WxW fry; 652,919 unfed HxH fry; 33,484 WxW smolts; and 32,996 HxH smolts. The total number of coho returning to the Nonpareil facility during the brood return years of 2002-04 was 3181 spawners. The adult fish in 2004 represent the returns of the parent generation that included wild fish production and the hatchery production from the first year of the project in 2001.

In 2001, 100 pair of adult hatchery coho (North Umpqua) were spawned at Rock Creek hatchery. The total eggtake for the hatchery fish was 317,898 green eggs. Incubation survival at the hatchery resulted in 198,689 eyed eggs that were distributed to Butte Falls hatchery and STEP hatchboxes. Eyed eggs from each parent group totaling 13,654 were included in the smolt allocation group reared at Butte Falls and a total of 185,035 eggs were distributed to STEP hatchboxes. Also in 2001, 94 pair of wild adult coho (North Umpqua) were spawned at Rock Creek hatchery. The total eggtake was 290,048 green eggs. Incubation survival at the hatchery resulted in 216,566 eyed eggs that were distributed and reared at Butte Falls hatchery (13,813 eggs) and STEP hatchboxes (202,753 eggs) in the same manner as the hatchery parent eggtake groups.

The eggs from both these 2001 hatchery and wild parent groups were randomly mixed during initial rearing and final releases into the Calapooya and its tributaries. A total of 370,576 unfed fry were released in 2002 and 24,373 smolts were released in 2003. The smolt release included 12,016 AdLm finclipped (hatchery X hatchery) and 12,357 AdRm finclipped (wild X wild) fish released in April.

In 2002, 100 pair of adult hatchery coho were collected at Winchester Dam and spawned at Rock Creek hatchery. The total eggtake was 306,664 green eggs. Incubation survival at the hatchery resulted in 290,143 eyed eggs that were distributed to Butte Falls hatchery for smolt rearing (13,756 eggs) and to STEP hatchboxes (276,387 eggs). With the construction of the collection facility at Nonpareil dam, all wild coho adults and jacks returning to the Calapooya were trapped and sorted at this facility. A total of 124 pairs were collected for brood and transported to Rock Creek hatchery. A random selection of 100 pair were actually used as broodstock for the eggtake. An additional 801 coho adults and jacks were sampled and passed over the dam to naturally distribute and spawn in the upper Calapooya subbasin. The total eggtake from the wild fish parents (100 pair) was 274,645 green eggs. Incubation survival at the hatchery resulted in 250,239 eyed eggs that were distributed to Butte Falls hatchery (13,766 eggs) and STEP hatchboxes (236,473 eggs).

The eggs from both these 2002 hatchery and wild parent groups were randomly mixed during initial rearing and final releases into the Calapooya and its tributaries. A total of 491,644 unfed fry were released in 2003 and 21,997 smolts were released in 2004. The smolt release included 11,018 AdLm finclipped (hatchery X hatchery) and 10,979 AdRm finclipped (wild X wild) fish released in April.

In 2003, 100 pair of adult hatchery coho were collected at Winchester Dam and spawned at Rock Creek hatchery. The total eggtake was 256,175 green eggs. Incubation survival at the hatchery resulted in 232,375 eyed eggs that were distributed to Butte Falls hatchery for smolt rearing (13,614 eggs) and to STEP hatchboxes (2218,761 eggs). All wild coho adults and jacks returning to the Calapooya were trapped and sorted at this facility. A total of 114 pairs were collected for brood and transported to Rock Creek hatchery. A random selection of 102 pairs were actually used as broodstock for the eggtake. An additional 583 coho adults and jacks were sampled and passed over the dam to naturally distribute and spawn in the upper Calapooya subbasin. The total eggtake from the wild fish parents (102 pair) was 265,049 green eggs. Incubation survival at the hatchery resulted in 251,475 eyed eggs that were distributed to Butte Falls hatchery (14,280 eggs) and STEP hatchboxes (237,195 eggs).

The eggs from both these 2003 hatchery and wild parent groups were randomly mixed during initial rearing and final releases into the Calapooya and its tributaries. A total of 445,628 unfed fry were released in 2004. The 20,110 smolts included 9,962 AdLm finclipped (HxH) and 10,148 AdRm (WxW) fish and were released in April 2005

In 2004, all coho adults and jacks returning to the Nonpareil dam facility on Calapooya Creek were trapped and sampled at the Nonpareil fishway facility. The 1311 coho spawners included 911 non-finclipped fish, 213 AdLm-clipped fish, 178 AdRm-clipped fish and 9 Ad-clipped fish. All fish were released upstream to spawn in the Calapooya subbasin above the dam.

Task 2. Tissue clips and all of the required sampling information have been collected from each coho that has been included in the study activities to date since 2001. The samples and data for the project were transferred to the Oregon State University Genetics Lab in Newport for analysis. The genetic sampling protocol and tissue collection and storage has been coordinated with Dr. Michael Banks, Assistant Professor, and Dr Gregory Moyer, Post Doctorate Student, Marine Fisheries Genetics at Oregon State University's Coastal Oregon Marine Experiment Station located at the Hatfield Marine Science Center in Newport, OR. Dr. Banks submitted and received budget approval from OWEB for the OSU component of the project proposal to complete DNA extraction from all of the 1192 samples collected from the hatchery and wild broodstock in 2001-2003. This pedigree research will screen all microsatellites currently run on coho in the Marine Fisheries Genetics Laboratory in samples from the Umpqua to identify those with maximum heterozygosity.

Task 3. The following information has been collected at both Winchester Dam and Nonpareil Dam for the 1192 coho included in the brood collection for 2001-2003: run time at the respective dam, gender, adult size, age, spawning time, and origin (scales). Digital photos have also been taken of each pair of fish spawned at Rock Creek hatchery in the project. Data for the 1326 fish included in the 2004 returns to the Calapooya include return time to the dam, gender, and length. All of this information is available from ODFW, Roseburg. Results of the DNA analysis will be combined with the above data to evaluate reproductive success of fish included in the project's hatchery releases and natural spawning area in the Calapooya above Nonpareil dam.

Project Evaluation

The first four years of this 9-year study has been conducted according to the experimental design as reviewed and approved in 2001. All adult fish trapping and hatchery operations have been successfully completed to date. All scheduled fish releases for the project have been successfully completed. All genetic sampling and data gathering and recording have been successfully completed for 2001-2004 project activities. The fifth year of field work in the study is scheduled to begin at Nonpareil Dam in mid-September 2005 and continue through January 2006.

As the results of the genetic analysis from the first 3 years of project data become available in the fall of 2004, the evaluation will begin to specifically address the first two tasks of the project:

Task 1: What is the relative success of using a first generation, wild-type broodstock in a supplementation program compared to a broodstock that has been captive for multiple generations?

Task 2: What is the relative success of unfed fry releases compared to smolt releases in producing returning adults?

The 2004 and continuing years' data from returns to the Calapooya and subsequent DNA analysis will then begin to address the remaining tasks of the project.

Task 3: What is the reproductive success in the wild of adult fish from the five treatment groups? Two HxH release groups (fry and smolt); two WxW release groups (fry and smolt); and the wild fish smolt production.

Task 4: How does the supplementation program modify the effective population size of the coho population in the Calapooya?

Task 5: What is the level of inbreeding that result from the supplementation program?

Task 6: What is the incidence of natural crossing between adults from the different treatment groups while on the natural spawning grounds and the consequences of mate choice to the relative production of offspring by individuals?

Task 7: What differences in reproductive success occur by treatment by age (males), by gender, by adult run time, and by adult body length?

Task 8: Does the size of the naturally-produced population increase due to successful natural reproduction by hatchery fish? Does the contribution to this increase vary by treatment group?

Project Contributors

Thanks to everyone who have participated in the first four years of this project. The ODFW Umpqua District fisheries staff and Rock Creek and Butte Falls hatcheries staff have all contributed many hours and offered numerous excellent ideas to make the project work more efficiently and accurately. We greatly appreciate ODFW Fish Division that continues to contribute excellent review and support for this project. Also, to all of the volunteers that have helped build and monitor the fish traps, capture broodstock, spawn fish, operate hatchboxes, and release fish at various sites, we could not do the project without each of you. The Oregon Wildlife Heritage Foundation was one of the first of many partnerships developed through this project and continues to be an active supporter of the program. Thanks to Dr. Michael Banks and Dr. Gregory Moyer for bringing their outstanding expertise into the project and letting us be a part of the OSU facilities in Newport. And finally, thanks to OWEB and its staff for the continued financial support of this project.