PACIFIC SALMON TREATY
RESEARCH AND MONITORING PROJECTS

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As a participant in the U.S. – Canada Pacific Salmon Treaty, Oregon is obligated to provide sound, biologically based information on salmon stocks originating in and returning to Oregon that are exploited in PST fisheries. Oregon fall chinook from the north and mid-Oregon coast migrate to the north after leaving their home river systems, and are taken in Alaskan and British Columbia commercial troll and recreational fisheries. These fisheries are managed by the Pacific Salmon Commission (PSC) under an abundance-based management scheme. To successfully accomplish this, participating states such as Oregon must provide the Commission with reliable information on the in-river catch and escapement of fall chinook for the river systems involved.

For PSC management purposes, Oregon has two aggregates of fall chinook salmon: a north-Oregon coast (NOC) aggregate comprising coastal river systems from the Necanicum south through the Siuslaw, and a mid-Oregon coast (MOC) aggregate comprising the Umpqua, Coos, Coquille, Sixes and Elk rivers. Chinook salmon originating in rivers further to the south, such as the Rogue, Chetco and Winchuk Rivers, have a different migratory pattern and are not taken in PSC-managed fisheries.

Escapement

In Oregon, for a stock to be designated as an escapement indicator stock, three components are necessary:

1) an existing or planned biologically based escapement goal

2) a precise annual estimate of the total return from the ocean, as measured by sampling both the catch and spawning abundance

3) an index of spawner abundance from a statistically designed survey that can be correlated to the more precise estimate

The NOC aggregate is recognized by the PSC. Oregon has designated the Nehalem, Siletz and Siuslaw Rivers as escapement indicator stocks. All have biologically based escapement goals that have been accepted by the Commission, and research projects described below are underway in the Nehalem and Siuslaw to develop precise escapement estimates and to calibrate spawning ground surveys to those escapement estimates. Additionally, the Salmon River hatchery fall chinook stock is coded-wire tagged (200,000 smolts annually) prior to release and serves as an exploitation rate indicator stock whereby CWT salmon are accounted for in ocean fisheries, in-river recreational fisheries and returns to the hatchery and spawning grounds. This allows reconstruction of annual runs, and subsequent estimates of the exploitation rates on any given year class of these salmon.

The MOC aggregate, with the Umpqua and Coquille rivers as escapement indicator stocks, has been proposed by the Oregon Department of Fish and Wildlife (ODFW). Biologically-based escapement goals for fall chinook salmon in these rivers have not yet been established. However, research studies are underway in these two rivers to develop escapement estimates and to

calibrate survey indices to the escapement estimates. The Elk River hatchery fall chinook stock is coded-wire tagged (200,000 smolts annually) and serves as a proposed exploitation indicator stock for the MOC in the same way as the Salmon River hatchery stock.

ODFW Research Results

Our research on these four escapement indicator stocks is done through mark-recapture methods in which fall chinook are captured just above tidewater as they ascend the river system, marked with an operculum punch, and immediately released unharmed. We then recover carcasses on the spawning grounds and develop a spawner escapement estimate from the numbers of marked and unmarked fish found. Some fish are radio tagged to allow us to track them to better understand distribution and habitat use. We are looking at our spawning ground surveys to attempt to determine if indices from standard and randomly selected survey reaches can be developed into reliable indicators of numbers of spawning salmon in the river system.

Nehalem River Escapement Indicator Stock Project

Objectives:

1. Estimate the total escapement of adult chinook from ocean fisheries into the Nehalem River within ± 25% of the true value 95% of the time and to estimate the age specific proportions of the escapement within ± 5% of the true value 95% of the time. Specific tasks that must be completed to achieve the overall objective are:

    a) Estimate the spawning escapement of chinook salmon in North Fork Nehalem River (1998 – 2001) and the mainstem Nehalem River (2000 – 2002) such that the estimate is within ± 25% of the true value 95% of the time, and estimate age/sex specific proportions of that spawning escapement such that the estimate is within ± 5% of the true value 95% of the time.
    b) Estimate the sport harvest of chinook salmon in Nehalem River and Bay such that the estimate is within ± 25% of the true value 95% of the time, and estimate age/sex specific proportions of that harvest such that the estimates are within ± 5% of the true value 95% of the time.

2) Determine the appropriate spawner survey methodology that can be implemented at the aggregate level to estimate chinook spawner abundance in the other 5 Chinook production river systems in the NOC, by:

    a) measuring several indexes of spawner abundance using ODFW's standard spawning survey methods.
    b) estimating adult chinook salmon spawner distribution among mainstem and tributary spawning areas by radio telemetry.

Summary Results to Date:

This project began as a feasibility study of mark-recapture methods using an existing fish trap on the North Fork Nehalem River in 1998. We had successes and failures in this effort. We demonstrated that mark-recapture methods can work in Oregon coastal rivers, but the small numbers of fall chinook in this system meant that we never developed the desired precision in our estimates. In 2000, the Nehalem stock

indicator project shifted its emphasis to the mainstem. Our efforts here have been much more successful, which is a credit to the field crews learning and adapting their techniques. In 2000, we estimated an adult spawner escapement level of 10,600 with a 95% relative precision of 51% (this means that we are 95% confident that the true value of fall chinook escapement in that year is within 51% of our estimate of 10,600). This improved in 2001 with a spawner escapement estimate of 12,400 (95% relative precision of 24.8%) and to 19,950 in 2002 (95% relative precision of 10.1%). Relative precision is influenced most strongly by our success (or lack of success) in 'recapturing' marked chinook when we find carcasses on the spawning grounds.

The Nehalem River is popular with anglers fishing for chinook, the average harvest in the Nehalem River and Bay from 1997 to 2000 is 2470 fall chinook based on Oregon punch cards. Year 2001 and 2002 punch card estimates are not yet available. Our project creel survey estimates for 1999 through 2002 are 2002, 3357, 2978 and 2460 fall chinook taken in the recreational fishery. In the two years of overlap, our creel study estimate was 95.6% of the punch card estimate (1999) and 154% of the punch card estimate in 2000.

Radio telemetry of fall chinook in 1999 and 2000 showed that about three quarters of Nehalem fall chinook use 'mainstem' habitat; this result is consistent with what we have found in other basins such as the Siuslaw and the Coos Rivers.

Siuslaw River Stock Indicator Project

Objectives:

1) Estimate the total escapement of adult chinook from ocean fisheries into the Siuslaw River within ± 25% of the true value 95% of the time and to estimate the age specific proportions of the escapement within ± 5% of the true value 95% of the time.

2) Determine the appropriate spawner survey methodology that can be implemented in the Siuslaw basin and in the other five chinook salmon production river systems in the NOC, by measuring several indexes of spawner abundance using ODFW's standard spawning survey methods.

3) Estimate the distribution of spawning adult chinook salmon between mainstem and tributary habitat strata based on radio telemetry (2002 only).

Summary Results to Date:

This project began in 2001, and we estimated there were 8600 adult spawners (95% relative precision of 22.6%) in 2001 and 22,500 (95% relative precision 13.9%) adult fall chinook spawners in the mainstem Siuslaw system. In 2002, we expanded our efforts to include the North Fork Siuslaw, and we estimate 1550 adult spawners there (95% relative precision of 50%). Calibration of spawning survey indices is very preliminary at this point as we have only 2 years of data and no clear patterns are emerging yet.

Radio telemetry tracking of fall chinook in the mainstem Umpqua in 2002 suggests that 75 – 80% of the fall chinook spawn in what is classified as 'mainstem' habitats. This is consistent with similar studies in other basins such as the Nehalem and Coos.

In 2002, we also performed an experimental study to coded-wire tag downstream

migrating juvenile chinook in the Siuslaw. The impetus for this study was the then-expected closure of Salmon River hatchery which serves as the exploitation rate indicator stock for the North Oregon coast fall chinook aggregate. We successfully tagged nearly 42,000 fall chinook pre-smolts with a mortality rate of just over 1.1%. It is generally agreed that using a wild stock as an exploitation rate indicator is preferable to using a hatchery stock that may not have the same ocean movement patterns as the wild counterparts. While our feasibility study can be viewed as a success, it must also be noted that a wild stock juvenile tagging project would be much more expensive to conduct than a comparable hatchery tagging project. With Salmon River hatchery apparently remaining open at this time, we do not have the funding from the Pacific Salmon Commission or the Department to continue this work at this time.

Umqpua River Escapement Indicator Stock Project

Objectives:

1) Estimate the total escapement of adult chinook salmon from ocean fisheries into the Umpqua River within ± 25% of the true value 95% of the time and to estimate the age specific proportions of the escapement within ± 5% of the true value 95% of the time. Specific tasks that must be completed to achieve the overall objective are:

    a) Estimate the sport harvest of chinook salmon in Umpqua River such that the estimate is within ± 25% of the true value 95% of the time, and estimate age/sex specific proportions of that harvest such that the estimate is within ± 5% of the true value 95% of the time (2001 and 2002 only).

    b) Estimate the spawning escapement of chinook salmon in Umpqua River such that the estimate is within ± 25% of the true value 95% of the time, and estimate age and sex specific proportions of the spawning escapement such that estimates are within ± 5% of the true value 95% of the time. This sub-objective focuses on the South Umpqua River and Cow Creek. Beginning in 2000, additional marking in the mainstem Umpqua River enables a basin-wide spawner escapement estimate in addition to the S. Umpqua/Cow Creek estimate.

2) Estimate the distribution of spawning adult chinook salmon between mainstem and tributary habitat strata based on radio telemetry.

3) Derive an expansion factor that relates the mark-recapture population estimate to aerial survey redd counts.

Summary Results to Date:

This project has been underway since 1998, with a focus on the South Umpqua/Cow Creek portion of the system where the majority of fall chinook are understood to spawn.

Spawning escapement estimates by year (with 95% relative precision) are:

Year	Escapement Estimate	95% relative precision
1998	1,231	105.14 %
1999	1,979	

		21.08%
2000	2,697	16.48%
2001	5,402	9.81%
2002	10,477	10.20%

In 2001, we started tagging in the mainstem Umpqua with the objective of developing a full basin estimate of fall chinook. The estimates developed (6600 in 2001 and 13,000 in 2002) suggest that 80% of the Umpqua fall chinook go into the South Umpqua/Cow Creek subsystem.

We radio tagged 31 fall chinook in 2001 and 72 fall chinook in 2002. Tracking these fish shows that many ascend into the South Umpqua/Cow Creek subsystem, but that a substantial proportion of spawning chinook use the lower South Umpqua and the mainstem Umpqua. This hints that the spawning population may be much larger than the table above suggests.

Spawning surveys in the South Umpqua are conducted by aerial counts of chinook salmon redds. We have three years of data to calibrate redd counts against spawning escapement numbers (1999 to 2001, no flights were conducted in 2002 due to funding constraints) and we see an average of 3.2 chinook salmon per redd with a fairly close coefficient of variation of 17%. As in the other basins, this population (excluding jacks) is dominated by age 3 and 4 individuals.

Recreational harvest of fall chinook in the Umpqua has averaged 1695 fish from 1998 through 2001 as estimated by Oregon punch cards. Creel survey estimates of harvest are 1436 (76.5% of the punch card estimate) in 2001, and 948 in 2002 (no punch card estimate available).

Coquille River Escapement Indicator Stock Project

Objectives:

1. Estimate the total escapement of adult chinook salmon spawners in the Coquille River such that the estimates are within ± 25% of the true value 95% of the time.

2. Estimate the age and sex composition of chinook salmon spawning in the Coquille River such that all estimated fractions are within ±15% of their true values 95% of the time.

3. Calibrate fall chinook spawning ground surveys against adult spawner escapement estimates to identify one or more survey indices that will robustly track spawner abundance.

Summary Results to Date:

This project began in 2001. We estimated a spawner escapement of 12,512 in 2001 (95% relative precision of 25.8%) and 13,675 in 2002 (95% relative precision of 13.8%). Scale analyses from 2001 show that the adult population (>600 mm fork length) is predominately age 4 fish. Males returning to the river are about evenly split between age 3 and age 4 individuals, with a few of age 5. Females of age 4 make up about 75 – 80% of the population. Calibration of spawning survey indices is very preliminary at this point as we have only 2 years of data and no clear patterns are emerging yet.