Oregon Department of Fish and Wildlife
Coastal Chinook Research and Monitoring Program

Field Methods
for
e-Creel
May 2024

Introduction

Coastal Chinook Salmon (*Oncorhynchus tshawytscha*) are an essential part of the socioeconomic and ecological functions of the Oregon coast. They are a cultural icon and vital heritage of both indigenous peoples and European settlers. A highly sought food fish, Chinook Salmon contribute to the ecological balance of Oregon's coastal food web and are considered a primary food source for some resident killer whales. All Chinook Salmon life stages fill both prey and predator niches and provide a source of nutrients after death. Salmon are typically rewarding targets for sport and commercial fisheries, and angler dollars support local economies directly and through participation in support industries, including lodging, restaurants, stores, guides, and boat dealers. The Research Group (2013) estimated the total economic contribution for Oregon's non-Columbia River coastal inland estuary and freshwater recreational fisheries at $33.5 million for the 2012 season. Of this, salmon fisheries provided $27.3 million to coastal economies. Additionally, the Oregon commercial salmon fishing industry generated $18.2 million in total personal income in 2015 (The Research Group 2016).

Chinook Salmon's migratory life history exposes them to a wide range of threats. Early life stages are vulnerable to scouring flow events, predation, and sedimentation. Juveniles and smolts are frequent prey of larger fish, marine mammals, and birds during their migration through river and estuary to the ocean. Once in the Pacific Ocean, Chinook salmon from many of Oregon's coastal rivers and streams travel north to feed and grow off the coasts of Washington, British Columbia, and Alaska. They will remain at sea for up to 6 years before returning to natal waters to spawn.

While feeding in the marine environment, these fish are susceptible to intensive harvest by commercial and sport fishers, particularly in the waters off Alaska and British Columbia. The Pacific Salmon Treaty (PST) forms the principal framework that regulates harvest management for all Pacific salmon stocks of common interest to the U.S. and Canada. To effectively manage harvest of Oregon's coastal Chinook Salmon stocks and respond to population downturns within local and international management regimes, accurate and precise measures of spawning adults and in-river harvests are required.

Background

Pacific Salmon Treaty

In March 1985, the United States and Canada ratified the Pacific Salmon Treaty (PST), agreeing to cooperate in management, research, and enhancement of Pacific salmon stocks of mutual concern. The PST is a written agreement between the United States and Canada, signed by all participating entities with the intent to protect and manage salmon stocks that originate in one country and are subject to harvest by another country. The agreement establishes abundance-based fishing regimes based on run strength for the major salmon-intercepting fisheries in the United States and Canada, potentially allowing larger catches when abundance is higher and constraining catches in years when abundance is down.

The Pacific Salmon Commission (PSC) is the authority responsible for implementing the PST and serves as a forum for cooperation in the establishment of PST principles by the Parties. Expectations from implementation of these principles are to provide conservation measures for all species of Pacific salmon to achieve optimum production, and to divide the harvests so each country reaps the benefits of its management investment. The PSC also serves as a forum for consultation between the Parties on their salmonid enhancement operations and research programs.

Chinook Monitoring

The Chinook Agreement (Chapter 3), signed in 1999, amended the PST from a fixed-ceiling harvest management strategy to a coast-wide, aggregate abundance-based management (AABM) approach. Chapter 3 outlines management measures intended to sustain natural populations of Chinook stocks while maintaining fisheries benefits for both U.S. and Canadian entities, with allocation agreed between the parties. The intent was to allow the Parties to cooperatively manage their respective fisheries, sustain healthy stocks, and rebuild stocks that have yet to achieve robust, biologically based escapement

objectives. This fundamental PST management approach provides the opportunity to equitably distribute the conservation responsibility between the two countries, attain escapement objectives for shared salmon stocks, and ultimately sustain dependent fisheries.

Within the PST, Chinook Salmon fisheries are managed under two different regimes: aggregate abundance-based management (AABM) and individual stock-based management (ISBM). The AABM fisheries consisting of mixed stocks include the sport, net, and troll fisheries from Southeast Alaska (SEAK), Northern British Columbia (NBC) troll, Queen Charlotte Islands (QCI) sport, and West Coast Vancouver Island (WCVI) troll and certain sport fisheries. All other fisheries that intercept stocks encountered in AABM fisheries fall under the ISBM management regime and Pacific Fisheries Management Council (PFMC) obligations.

Oregon coastal Chinook stocks fall under both AABM and ISBM regimes. The objective of ISBM management is to constrain average annual exploitation impacts to natural spawning Chinook Salmon stocks or stock groups. The PST designed these regimes to implement the conservation and harvest sharing principles of the Treaty.

North Coast Aggregate and Mid Coast Aggregate

The North Oregon Coast (NOC) Chinook Salmon stocks (Figure 1) are an aggregate of far north migrating populations of fish that return to spawn in Oregon's coastal rivers from the Necanicum River south to the Siuslaw River. Historically, the NOC aggregate has been a very productive and resilient stock and is primarily caught in or affected by AABM fisheries and in Oregon's terminal fisheries. The Mid Oregon Coast (MOC) Chinook Salmon stocks are an aggregate of migrating populations of fish that return to spawn in Oregon's coastal rivers from south of the Siuslaw River south to the Elk River. Age at maturity is typically 3 to 5 years with a small component of age-2 precocious males. Chinook Salmon production in these aggregates occurs mostly from naturally spawning, fall-returning, ocean-type life histories of fish, though some life history variants exist.

Indicator Stocks

A subset of stocks, known as Escapement Indicator Stocks (EIS), are subject to PST management and have escapement goals established to help ensure sufficient spawning numbers among coastal Chinook populations. Failure to reach escapement goals over the last decade has prompted greater interest in quantifying the performance of this group. The three EISs that represent the natural production of the NOC aggregate include the Nehalem, Siletz, and Siuslaw. There are two EISs representing the Mid-Oregon Coast Aggregate (MOC) (Umpqua and Coquille).

Currently, harvest rates of north-migrating fish in the oceans and rivers are determined through the PST Exploitation Rate Indicator Stock Program (ERIS), creel surveys, and angler harvest as reported through punch cards. Implementation of the ERIS program occurs through coded wire tagging of adipose fin-clipped hatchery fish and subsequent recovery in the ocean and freshwater fisheries, on spawning grounds, and in the hatchery brood stock collection. The coded wire tags are read to determine the origin of the adipose clipped fish (from which hatchery they were released). On the Oregon coast, the Salmon River (NOC) and Elk River (MOC) hatcheries (Figure 1) produce and release these fish. CCRMP uses the comparison of the numbers released and recovered to reconstruct the spawning run and harvest rates in the various fisheries. <u>This is the basis for much of PST management.</u>

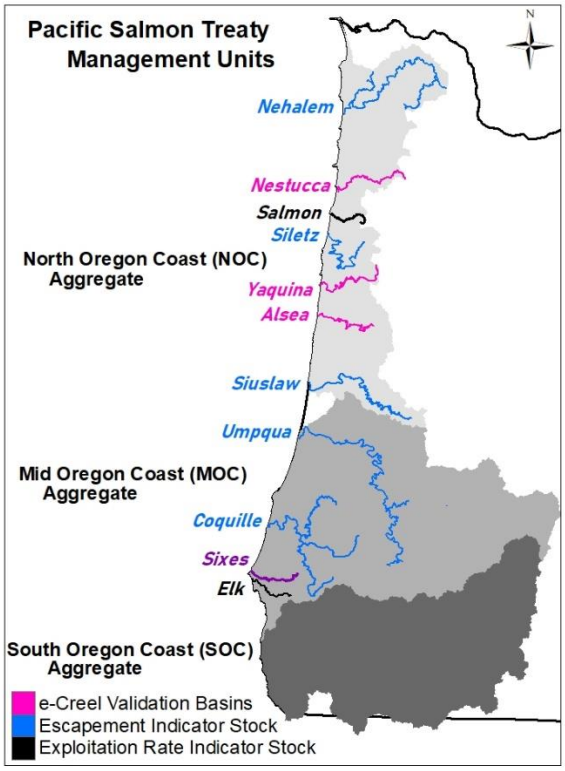


Figure 1. Pacific Salmon Treaty Management Units

Calendar Year Exploitation Rate

On May 3, 2019, the Parties ratified a new 10-year Treaty for managing these fisheries; this agreement will be in force through 2028. Modifications to Chapter 3 further address conservation concerns from both countries. Most notable was the revised language describing calendar year exploitation rate (CYER) monitoring introduced as a new metric to meet PST harvest constraint requirements for ISBM management regimes. To comply with the Treaty the Parties use the CYER metric to limit the total adult equivalent mortality in all impacting ISBM fisheries of EISs that are not meeting goals. For each EIS basin that has not met goal in a three-consecutive-year period, a reduction to 85% of the average CYER observed from 1995 to 2015 is required. A CYER that exceeds the established limit by more than 10% triggers management actions by Oregon and oversight by both the CTC and PSC intended to bring the CYER back within compliance. Oregon is obligated to manage exploitation rates of ISBM fisheries to maintain the 3-year average or more conservative management. More specifics about the Treaty and its implementation are available online (http://www.psc.org/about_treaty.htm).

Effective implementation of the CYER metric is dependent on each Party of the Treaty maintaining a coded wire tag (CWT) program designed to provide statistically reliable data for stock assessment and fishery evaluations. Collaborative planning and implementation of tagging and fishery sampling is essential to identify cost-effective solutions to increase the precision of CYERs. Identifying methods to increase sampling rates and improve operational efficiencies and expanding harvest estimation into ISBM fisheries is essential for CYER management compliance.

ODFW Electronic Licensing System

In December 2018, the Oregon Department of Fish and Wildlife (ODFW) implemented an Electronic Licensing System (ELS) to administer hunting and fishing licenses and harvest tags, enhance regulatory enforcement, and increase managerial and process efficiencies. With this modernization, ODFW

anticipates an annual $2 million cost savings once all functionalities are realized (https://myodfw.com/ELS).

Advantages of ELS include:

- Customers can choose either electronic or paper license at the time of purchase.
- Customers can store their licenses, tags, and validations online on their smart phone or tablet.
- Customers can choose to carry paper documents, printed from home.
- Electronic validation of harvested fish and game using an app that will work even when offline.
- Better service to customers, reduced operating costs, and modernization of our licensing system.
- The ability for ODFW and Oregon State Police to look up licensing information while in the field and offline.
- Efficient, effective enforcement.

e-Creel Introduction

The option to use an electronic angler license effectively creates compulsory reporting and the subsequent opportunity to explore innovative new methods for estimating salmon harvest.

In 2019, ODFW's Coastal Chinook Research and Monitoring Program (CCRMP) conducted a post-hoc validation assessment of a hybrid creel design in four coastal basins (Nehalem, Salmon, Siletz, and Elk) to estimate recreational harvest of fall Chinook Salmon. CCRMP compared traditional creel harvest estimates from roving, access creels to harvest estimates generated from an experimental e-Creel. An e-Creel is a novel method of conducting creel that combines in-person interviews with harvest data reported through ELS. The e-Creel eliminates costly, complex, and labor-intensive effort counts allowing for increased collection of scales from harvested Chinook for age estimates. In other words, the increased efficiency of the e-Creel enables CCRMP to interview a greater number of anglers which results in more precise age specific harvest estimates. The ability to report annual estimates of age specific harvest by population supports CYER management obligations for Oregon's ERIS stocks documented in the revised Chinook Chapter 3 of the PST. The analysis utilizes a Petersen or Chapman estimator and can derive precise, bias free, cost effective, and expeditious harvest estimates with a high degree of confidence.

Using these methods in future years will likely improve precision in estimates due to the anticipated growth in ELS use and sample sizes from efficiencies gained through eliminating effort counts. An additional approach is under investigation that, when implemented, will provide estimates of harvest from coastal basins where an e-Creel is not being conducted. This entails an average expansion technique calibrating an index of harvest (ELS harvest data) to a relatively precise estimate of harvest derived through e-Creels. This average expansion and its associated variance can be applied to proximate coastal populations that e-Creels are not present, and at very little (if any) additional cost.

Summary of e-Creel methods and benefits (Riggers and Jones 2022):

- Integrated approach utilizing angler reported harvest from the ELS (m) and in-person interviews of completed angler trips.
- Capture and Recapture Techniques to Estimate Harvest
  - H=(m*c)/r
  - Harvest (H)
  - Electronically marked harvest from ELS database (m)
  - Total Chinook harvest sampled in creel (c)
  - Electronically validated harvest sampled during in-person interviews (r)
- Scales collected to determine age structure.
- Assumptions:
  - All anglers using electronic license validate harvest on ELS mobile application's e-harvest card.
  - Appropriate harvest location (marine, freshwater) assigned to e-harvest card.

    - Paper license-electronic license ratio remains constant in time and space throughout the fishery.
- Eliminates effort counts and multistage stratified creels.
- Simplifies scheduling.
- Analysis using Petersen estimator or Chapman version.
- Can post stratify temporally or spatially as necessary.
- Improved sampling rate over traditional creel.

CCRMP expanded e-Creel studies to five Oregon coastal river basins in 2020 including the Salmon, Siletz, Siuslaw, Sixes, and Elk rivers, and added the Nehalem River in 2021. The Umpqua River was added in 2022. Three new systems including the Nestucca, Yaquina, and Alsea rivers will be added to our suite of e-Creel investigations for 2023 and 2024 – these systems are part of a validation study evaluating the effectiveness of using an expansion factor (calibrated index approach) to derive harvest estimates for basins in which e-Creels are not routinely funded or conducted.

References

Riggers, B.L. and M.L. Jones. 2022. Paradigm Shift: Applying Capture-Recapture Techniques to Electronic Licensing System Data to Estimate Chinook Salmon Harvest. North American Journal of Fisheries Management. 1548-8675 online. http://doi.org/10.1002/nafm.10778

Project Objectives

The primary objective in an Exploitation Rate Indicator Stock (ERIS) basin is to estimate the number of adult CWT Chinook Salmon that escape ocean fisheries and return to freshwater, by tag code (brood year), each year. Creels in all basins are used to determine inland harvest and release of fall Chinook Salmon and Coho Salmon.

Juvenile fall Chinook Salmon are raised at and released from two of Oregon's hatcheries each year to serve as the ERIS for the NOC and MOC aggregates. Prior to release, these juvenile fish have CWTs implanted in their snouts (Figure 2). These tiny stainless micro tags contain a unique batch code that identifies the brood year and hatchery of origin for each release group. In addition to implanting CWTs, each fish is visually marked by removing (clipping) the adipose fin so adult fish can be identified as originating from a hatchery stock. The overall goal for CCRMP is to estimate escapement of both hatchery and naturally produced Chinook Salmon to their respective rivers of origin. CCRMP accomplishes this by sampling the freshwater harvest, the returns to the spawning grounds, and the hatchery take. Chinook Salmon recovered from each sampling event are examined for fin marks, and the snouts of hatchery origin (i.e., adipose-clipped) fish are scanned with a CWT wand to detect the presence of a tag. When a tag is detected, the snout is removed, placed in a plastic bag with a uniquely numbered Snout ID tag (SNID), and stored in a freezer for later tag recovery and identification at ODFW's CWT lab in Clackamas.

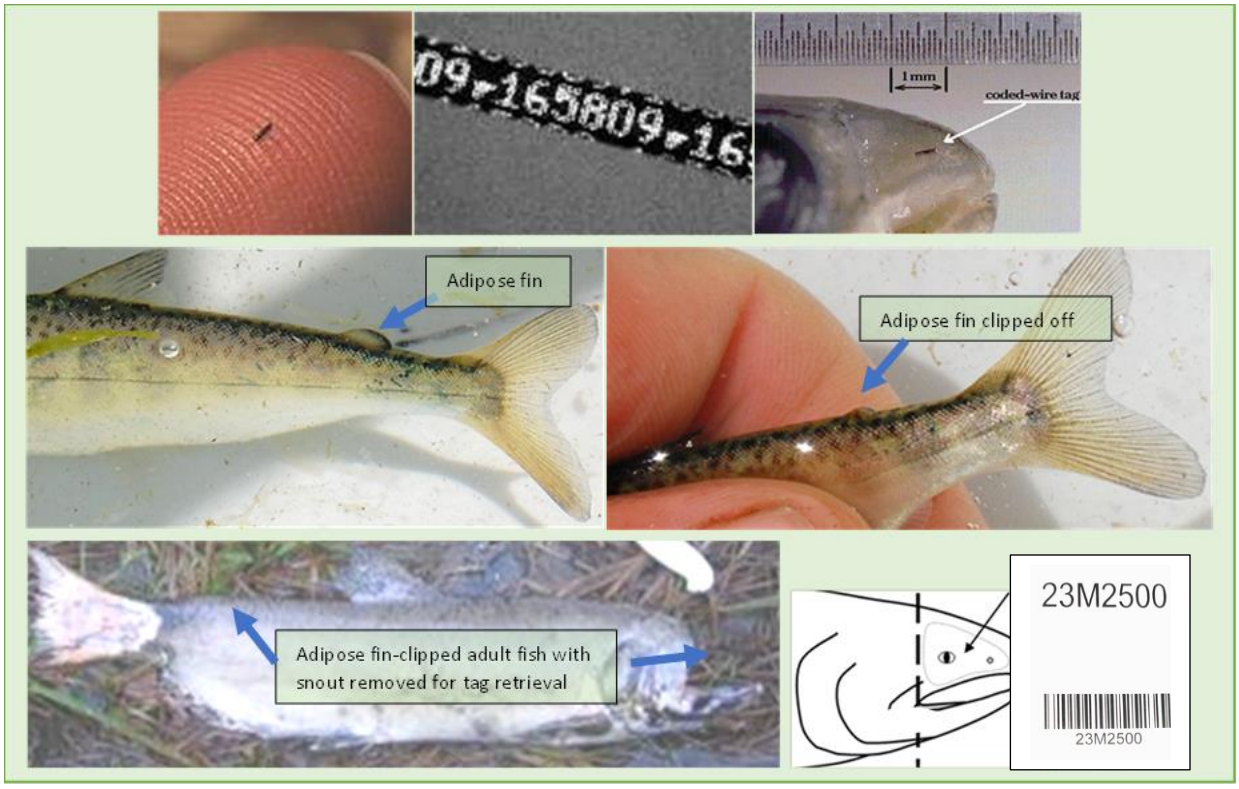


Figure 1. Coded wire tag showing actual size, tag code that identifies the hatchery of origin, and position inserted into the snout of juvenile salmon. The adipose fin is clipped, and snout of returning adult hatchery fish are identified by the healed missing adipose.

CCRMP has designed the novel e-Creel studies to improve Oregon's ability to provide a cost effective, timely, consistent, reliable estimate of harvest. Successful implementation of an e-Creel will provide the opportunity to sample each fishery at a greater rate than that of a traditional creel design. Staff will have the opportunity to augment our terminal scale collection of returning Chinook Salmon that will serve to assist in the age-specific run reconstruction of our escapement for each basin and allow for greater precision and accuracy in our forecasts that will be built from this information.

The primary task for the e-Creel is **to precisely estimate the terminal freshwater harvest at age of naturally produced fall-run Chinook Salmon.** Specific objectives include:

1. Conduct angler e-Creel interviews to attain license type information necessary for estimating harvest employing capture-recapture techniques.

2. Sample as many Chinook Salmon harvested from the fishery as possible and collect scales with associated biological data sufficient to derive a precise age structure of the harvest estimate.

Our priority is to conduct a user-friendly creel and produce precise, non-biased estimates of harvest.
Our main sampling objective is to intercept and sample as many *Chinook Salmon harvested (retained) from the river)* as possible.

Although not sampling ocean-harvested Chinook Salmon for biological data, CCRMP are collecting ocean data to generate an error rate for location codes used by anglers on their harvest tags.

The surveyors' work schedule is defined as "flexible", meaning that their schedule may vary in the number of hours worked on a daily basis, but not necessarily each day, or a work schedule in which the starting and stopping times vary on a daily basis, but not necessarily each day. The surveyor (typically a Biological

Science Assistant (BSA)) may be asked to work a normally scheduled day off (i.e., following a storm event that prevented sampling earlier in the week). Their start and end times may vary; this could be a shift in times related to daylight hours or the BSA and crew lead may notice when boats are returning in the morning that will allow for additional interviews and scale samples. The surveyor may also work later in the day if a group of boats all returns to the ramp or docks at the same time. The crew leader is responsible for setting individual daily shift hours and may modify schedules based on factors influencing the fishery. CCRMP does require sampling on Fridays and the weekends for creel surveyors; CCRMP would like to capture as many interviews and samples from harvested Chinook Salmon as possible and more anglers go fishing on these days. The crew leader will assist with organization and logistics planning to ensure surveyors are able to complete daily tasks efficiently and safely.

The surveyor will also have an employee journal to write any additional daily field notes. The journal (diary) and report of operations will assist in writing an end of season report. End of season reports are helpful for permanent staff to review prior to the beginning of a new season. End of season reports are also helpful for new employees to review and include basin and project specific information.

Orientation and Training

During the first workweek, the surveyor will participate in a variety of training activities intended to provide knowledge and skills necessary to perform creel survey duties in a competent, efficient, and safe manner. Training formats include slide presentations, written operations manuals, data program instructions, and hands-on training with interview scenarios and salmon identification. Surveyors will be exposed to a large amount of information. Questions are encouraged to help provide clarity and full understanding of the protocols and procedures.

Methods

Interviews

Our priority is to conduct a user-friendly creel with the goal of producing a precise, non-biased estimate of the terminal freshwater harvest of fall Chinook Salmon by age and origin. Secondary goals include determining numbers of released Chinook Salmon followed by producing estimates of harvest and release of Coho Salmon. Additional goals may include human dimensions research. To estimate harvest, CCRMP needs to sample as many Chinook Salmon harvested from the river (bay/estuary/freshwater) each day as possible. This goal is accomplished by intercepting anglers at primary access locations to determine the nature of their trip and to gather release and harvest data and sample harvested fish for biodata (sex, fork length, fin mark, scale samples, CWT snout recoveries) for salmon, primarily Chinook and Coho Salmon.

A few questions need to be asked at the beginning of each encounter to identify salmon trips before entering CCRMP data. The flow chart below outlines the progression of interview questions and recording of release, harvest, and biological sampling data:

1. **Did you spend any portion of your trip fishing for salmon? / Did you catch or release any salmon today?**
    - **a.** If yes, proceed with survey.
    - **b.** If no, end the interview, thank them for their time, and move onto the next boat or angler.
2. **Did you fish in the river, ocean, or both?**
    - **a. Ocean anglers**
        - **i. Interview location**
        - **ii. Did you harvest any Chinook?**
            1. If yes:
                a. How many wild Chinook did you harvest?
                b. How many hatchery Chinook did you harvest?

c. Did you tag your fish with:
    i. An electronic ODFW tag
    ii. A paper ODFW tag
    iii. Other harvest tag
d. What location code did you use?
e. If fished both ocean and river, proceed with Inland questions.

2. If No: End ocean interview, proceed with Inland questions.

b. Inland anglers (includes bay/estuary/river beginning at mouth [Jaws])

i. Interview Location

ii. Angler Type (Private Boat, Guide Boat, Shore)

iii. Do you possess an ODFW electronic harvest tag, an ODFW paper tag, or another type of harvest tag?

1. Electronic ODFW
2. Paper ODFW
3. **Other (Creelers could provide examples if asked: Tribal harvest tag, federal take permit)**

iv. Salmon anglers (defaulted to 1). Enter multiple anglers ONLY IF all anglers in group DID NOT release or harvest any salmon.

v. Did you Release any Chinook?

1. If yes:
    a. How many wild Chinook released?
    b. How many hatchery Chinook released?
    c. How many unknown origin Chinook released?
2. All Basins: If yes, why did you release most of your Chinook?
    a. Regulations (mark-selective)
    b. Small size
    c. Coloration or quality of fish
    d. Other: Comments box if they provide more info

vi. Did you release any Coho?

1. If yes, how many wild?
2. If yes, how many hatchery?
3. If yes, how any unknown origin?

vii. Did you Harvest any Chinook?

1. If yes, how many wild adults?
2. If yes, how many hatchery adults?
3. What location code did you use to tag your harvested Chinook?
4. If yes, how many wild jacks? How hatchery jacks?
    a. Did you tag your jack(s)? Yes or No
5. Enter Biodata
    a. Area Harvested
    b. Sex of fish (male, female, jack, unknown; jacks are as defined by angler)
    c. Fork Length
    d. Scales Taken (Yes or No). If yes, enter scale envelope ID
    e. Fin marks (no clips, ad clip, right ventral, left ventral, other)
    f. Wand/CWT/Snout Taken/Snout ID
    g. Comments – for this individual fish

viii. Did you harvest any Coho?

1. If yes, how many wild?
2. If yes, how many hatchery?
3. Enter location code used.
4. Enter biodata for Coho harvested (sex, length, mark).

e-Data Program Instructions

Surveyors will receive hands-on instructions for the Pendragon® software data entry program during their initial week of training. Release and harvest data for Chinook and Coho Salmon shown in the flow chart above are recorded directly into electronic data forms on smart phones (aka Personal Data Assistants or PDAs). Data entry instructions are provided in a separate document.

Sampling Harvested Fish

All Chinook Salmon and Coho Salmon harvested from the river (inland waters including the bay, estuary, and freshwater areas) that are sampled will have the harvest location code recorded and biodata including sex, fork length, and fin marks recorded; and scales collected (Chinook only).

Location Codes

Upon taking an adult salmon, steelhead, legal size sturgeon, or Pacific halibut, the angler must immediately enter the codes for the species caught, location code where the fish was taken, and the month and day of catch on their Combined Angling Tag (ELS or paper).

Location Codes distinguish Ocean from Coastal River Systems (Bay/Estuary/River). Ocean codes use 'Coastal Port of Departure' to describe the location associated with each Code, and Coastal River Systems use Waterbody (Oregon Sport Fishing Regulations Book). When anglers try to select the proper location code, the nomenclature can often be confusing. It is also easy to tap the incorrect selection when using an electronic tag. For example, per 2024 regulations, the proper location codes for the Salmon River are:

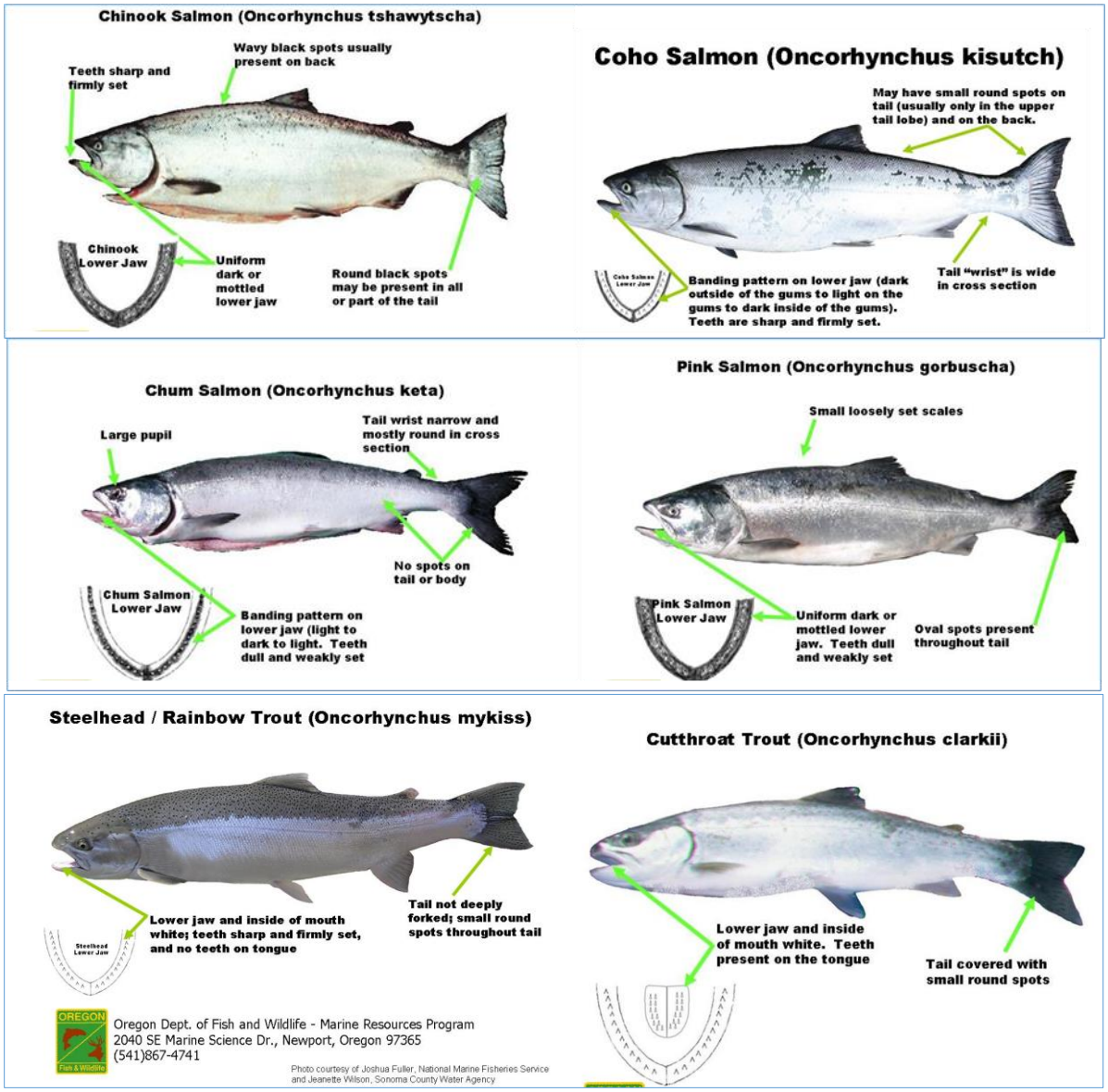
Ocean	Code 6	Salmon River (Port of Departure)
Salmon R (coast)	Code 77	Salmon R. and Bay (Coastal River Systems - Waterbody)

Samplers must differentiate where Chinook Salmon were harvested to generate an accurate **freshwater terminal harvest estimate**. CCRMP does not sample any ocean-harvested salmon for biodata, but surveyors need to conduct a short interview with anglers who fished for Chinook in the ocean. Samplers ask all anglers who harvested a Chinook (from the ocean or river) or a Coho (from the river) what Location Code they entered.

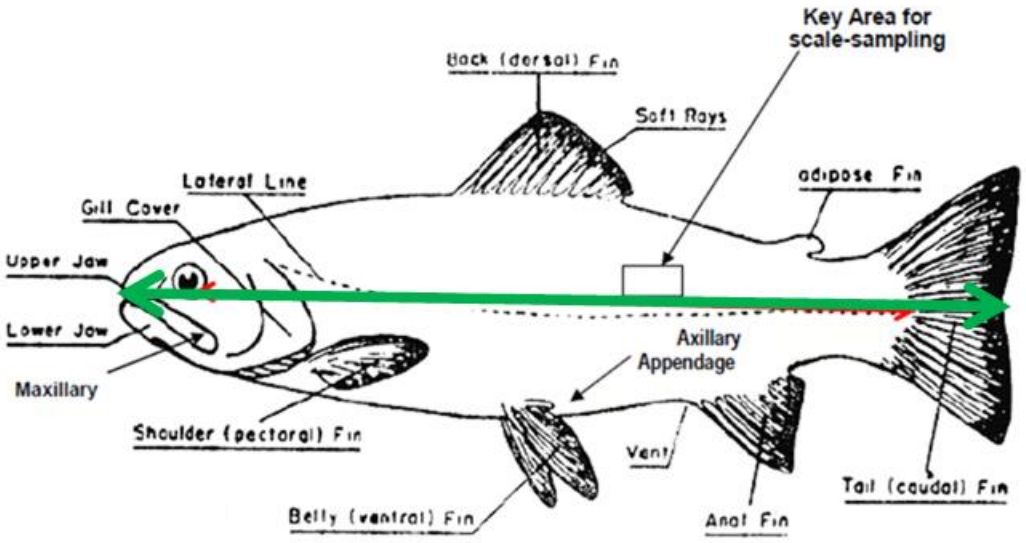
During each interview, **be sure to ask for the code they entered on their tag, not what the proper code should be.** After samplers record the code they used, samplers can then show anglers where the list is in the regulations book and which code they should use in the future. By asking anglers what Location Code they entered on their tag, CCRMP track errors by ocean anglers that used the river codes and river anglers that used the ocean code by mistake. Post-season, CCRMP can generate an error rate to adjust the terminal harvest estimate accordingly.

Salmon Species Identification

It is very important for samplers to understand the difference between harvested salmon species. During the ocean phase, most Pacific salmon are silvery in color, and the majority of fish encountered early in the run in the lower section of survey rivers will be in the 'silver' ocean phase. It will be more difficult to identify the species and sex of fish seen so attention to detail is paramount.



Samplers will be expected to identify the species of all harvested salmon and steelhead which may constitute an angler's daily bag limit. To accomplish this, characteristics including size, run timing, geographic location, coloration, body morphology, and markings are used. It is prudent to use as many characteristics as possible when determining species and gender. Salmon first entering freshwater from the ocean may look considerably different than those fish who have been in the river for a longer period and have begun to develop spawning traits. A basic understanding of salmon morphology and nomenclature will help in understanding the varying characteristics between species. Below is schematic diagram of a generic salmon identifying fin names, location of the Key Area for scale sampling, and start and end points for measuring the Fork Length (tip of snout to fork in tail, green line) for creel surveys.



Sex

Determining sex of some fish can be difficult during creel surveys prior to fish developing typical spawning traits. During the salt to freshwater transition, most Chinook Salmon males develop a kype (hooked appearance of the snout) with enlarged teeth. Males also develop more coloration, and have larger, fleshier adipose fins compared to females of similar body size.

Most Chinook Salmon males develop a hooked kype with enlarged teeth, have large fleshy adipose fins, and display a variety of spawning colors.

The picture below shows a Chinook Salmon male with developing kype, mostly bright chrome color with some bronze on back and blush along belly, large black spots on back and both lobes of tail.

The Chinook Salmon male in the picture below has a small kype, black spawning colors along the head and back, and red on belly from dorsal fin to caudal peduncle. Note uniform black gums beneath teeth on lower jaw.

Most Chinook Salmon females retain an overall rounded appearance of the snout even as their heads enlarge, with smaller teeth. The female in the photo below illustrates a fish with ocean characteristics of chrome colorations and rounded disc-shaped snout prior to elongation of top and bottom jaws.

The Chinook Salmon female below has large irregular spots and a mottled grayish-bronze spawning coloration with pinkish-white belly. Top and bottom jaws have elongated with the upper jaw slightly longer.

The Chinook Salmon male below has similar coloration and spotting plus the hooked kype (top jaw).

The Chinook Salmon female below has an elongated snout rounded at the tip. Note the much fatter belly girth where her skeins of eggs are maturing. The lower jaws of both these fish have a uniform mottled gray coloring under the teeth.

Surveyors may also identify a female by the presence of a distended ovipositor. When females start to sexually mature the ovipositor may be seen by gently squeezing the abdomen of the fish and allowing the ovipositor to emerge.

Coho Salmon males first entering the river are often still in their ocean 'silver' phase. As they move further upstream, spawning coloration becomes more intense turning dark red from head to tail with pronounced kype development. The gumline below the teeth is white with black or gray bands outside of the gumline (similar to the side view of an Oreo cookie).

Male Coho Salmon illustrating the hooked kype.

Coho Salmon females also develop significant spawning coloration after entering freshwater. As with Chinook Salmon females, there is little kype formation.

The most reliable method to determine sex is through observation of the gonads or egg sacs when a fish is cleaned. When sampling fish at a cleaning station, samplers will be able to identify sex easily.

Male's testes displayed running dorsally in abdomen.

Female's eggs and ovaries displayed running dorsally in abdomen.

Other salmon species have similar differences between the sexes and additional details are presented in the Salmon Identification section of the complete operations binder.

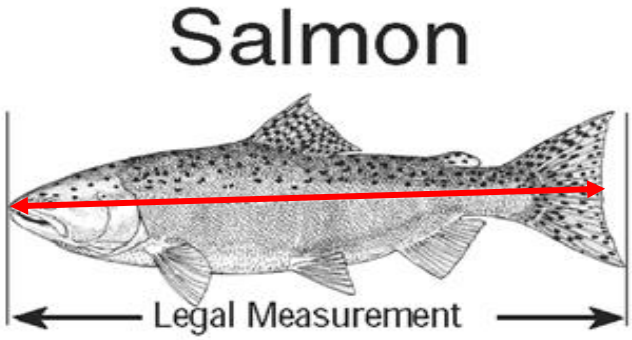
Jacks

- *Age 2 fish - Smaller (under a certain total length limit)*
- *Per 2024 regulations Chinook Salmon jacks are legally defined as 15-24 inches*
- *Per 2024 regulations, Coho Salmon jacks are legally defined as 15-20 inches*
- *Per 2024 regulations, anglers are not required to tag jacks.*
- ***NOTE: Ocean fishing regulations (season, bag limits, and legal sizes) differ from inland fishing regulations.***

The photo below is a small Chinook jack; right photo, top to bottom, are Coho female, male, and jack.

Fork Length

Samplers collect fork length (tip of snout to fork in tail, red line below) from harvested fish sampled in the creel. Record length in millimeters (mm), round to nearest 5 mm increment. Fork length is shorter than the legal length measurement. If a measured fish seems on the small side, verify the legal length prior to remarking that a fish is under the legal length. The legal length for salmon is measured from the tip of snout to the longest point on the tail as shown in the picture below. Fork length is shown in red.



Inland Fishery (area loosely defined as the river, estuary, bay, and from breakers or tips of jetties inland; differs from the ocean or Columbia River fishery)

- Adult Chinook Salmon >24 inches Jack Chinook Salmon = 15 to 24 inches
- Adult Coho Salmon > 20 inches Jack Coho Salmon = 15 to 20 inches
- Steelhead > 16 inches in Northwest and Southwest zones.
- Sockeye Salmon are all considered adults (where legal to harvest).

- Adult Pink or Chum Salmon >24 inches Jack Pink or Chum Salmon = 15 to 24 inches (where legal to harvest)

In the ocean, harvested salmon must meet a minimum length requirement and all legal-size salmon are considered adult salmon. There are **no 'jacks' in the ocean**, just age-2 salmon.

Ocean Fishery (outside of the breakers or jetty tips)

- Minimum lengths:

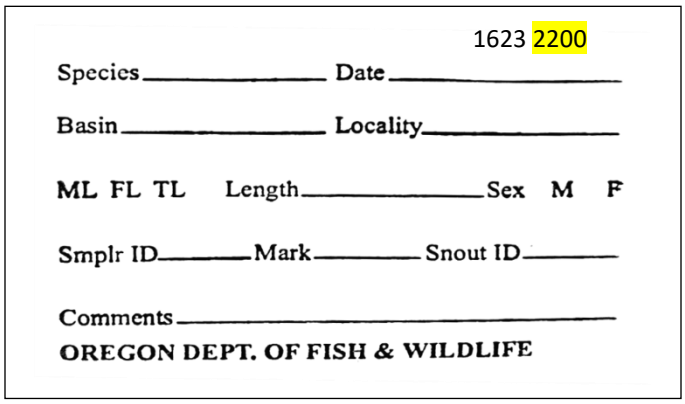
  Chinook Salmon = 24-inches, Coho Salmon = 16 inches, Steelhead = 20 inches
- No minimum length for Pink, Chum, or Sockeye Salmon **in the ocean fishery** (where legal).

Scales

Samplers attempt to collect scales from every wild Chinook Salmon harvested and a random sampling of hatchery Chinook harvested from the river that encounter. **Scale samples should also be taken from a random sample of approximately 50 hatchery fish that test positive for a CWT for scale age validation; these scale samples should be collected from hatchery fish used for production as well as hatchery fish encountered during the creel and during spawning ground surveys.**

Using forceps, pull the paper insert halfway out, fold down one side and place scales individually on the insert. Flatten the folded side over the scales and push the insert back inside the envelope and lightly seal the flap. Data can be entered on the envelope for a backup copy. Please ensure scales are not double stacked or haphazardly thrown into the scale card. Also take care not to get too much slime, fish blood, or other environmental things into the scale card. It makes it much easier for our Scale Lab technicians to mount and read the scales. At the office, lay scale envelopes out to dry for a few days. At season's end, scales will be cleaned, sorted, and mounted on gum cards for processing and aging at CRL.

It is important to number scale envelopes neatly and legibly so that our scale staff can read them and appropriately process them. The first set of 4 digits represents the BASIN + YEAR. The second set of 4 digits are uniquely sequenced by basin and project (i.e., creel, spawning ground surveys, hatchery). Record the unique scale envelope identification # (highlighted below) in the appropriate location on the PDA. The example provided below was for the Salmon River Creel in 2023.



Samplers will record the following data on creel scale envelopes to serve as backup for electronically entered data:

Date
Length Unit (Circle: ML = MEPS, FL = Fork, TL = Total) Length (nearest 5 mm)
Sex (Circle)
Mark
Snout ID
Interview ID (Creel) – record on Comments line

When entering data into the PDA from scale envelopes, double-check entries to ensure data is accurate.

Fish Life History and Analysis Project - Standard Procedure for Collecting Scales

Scales should be sampled from the "key scale area". Because these scales are the first to generate in very young fish (Figure 3), they record the most complete information. Non-key area scales can be very elongated and sampling scales from areas on the carcass outside of the key area can yield less complete annuli. Consequently, non-key scales can be difficult to read and yield inaccurate age estimations.

The correct 5-step procedure for obtaining scale samples is as follows:

1. Locate key area (Figures 3 and 4).
2. Scrape slime off with non-serrated portion of knife.
3. Pluck 4-5 scales **with forceps** and place in scale envelope, using care to separate each scale from the others.
4. Repeat on other side of fish.
5. Allow scale envelopes to dry and store them in a well-ventilated container.

NOTE: The key area scales do NOT include lateral line scales.

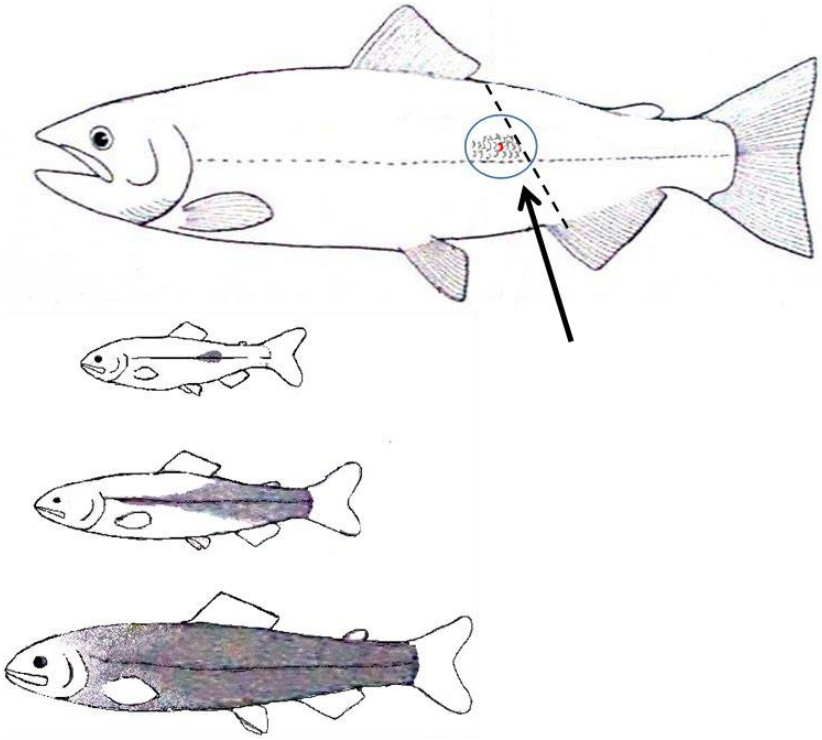


Figure 3. The key area is where scales first form on juvenile fish (enclosed in the circle on the drawing of the adult fish). Key area scales contain the most complete life history information. The key area can be defined as the area above the lateral line, as transcribed by an imaginary line passing between the posterior insertion of the dorsal fin and the anterior insertion of the anal fin.

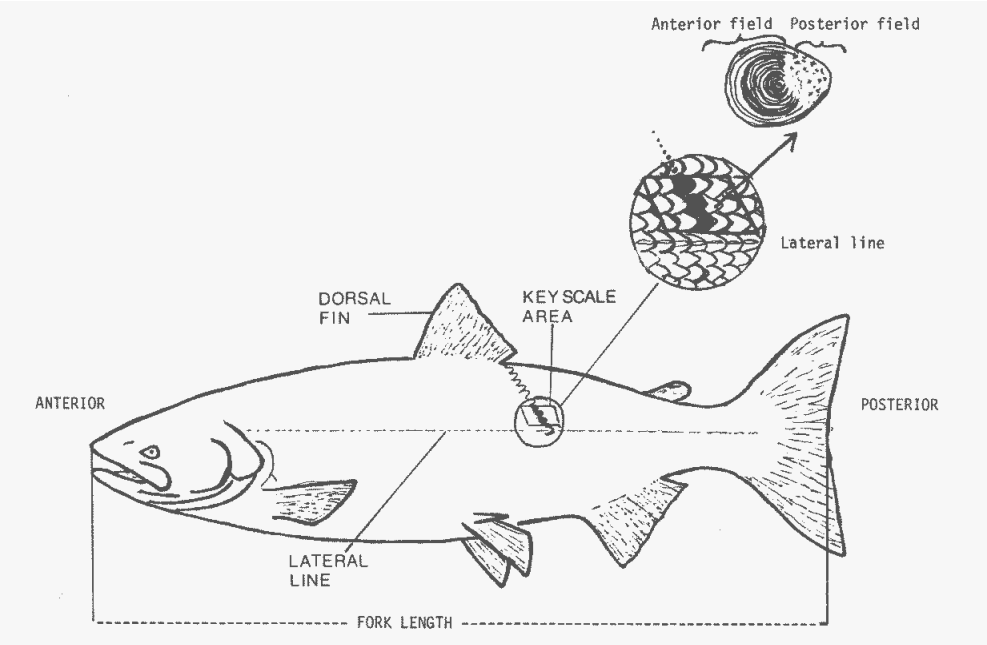


Figure 4. Another schematic of a salmonid, showing the location of the key area for scales, the orientation of the scales on the body, various anatomical parts, and measurements.

Fin Marks

For CCRMP purposes, ***Mark*** refers to the presence or absence of the adipose fin (located between the dorsal and caudal fins) or ventral fins. This is not to be confused with references OSP may make about anglers 'marking' their harvest tags, nor to any reference to a mark–recapture study. When sampling harvested Chinook or Coho Salmon, check to see if the adipose-fin is present or absent (Figure 5 – left photo = wild fish, right photo = hatchery fish).

Figure 2. An intact adipose fin indicates a wild or naturally produce fish (left) and a healed clipped-fin indicates a fish of hatchery origin.

The adipose fin is 'clipped' or removed from juvenile salmon to 'mark' them as being a hatchery-raised fish. Depending on the Zone (i.e., Northwest), aggregate (i.e., Nehalem to Salmon River), and basin-specific regulations, salmon anglers may be allowed to retain adipose-intact as well as adipose-removed Chinook Salmon. Some hatcheries use different fin marks that indicate their hatchery origin, such as left or right ventral fin clips. Check all fins on each fish sampled; if a different type of fin mark is encountered, make a note in the Comments field.

Some hatchery fish receive both an adipose mark and a coded wire tag, which is inserted into the snouts of some juvenile salmon. In the Salmon River and Elk River, most hatchery Chinook Salmon are marked with an adipose clip and a CWT. All Chinook will be scanned for the presence of the CWT tag, discussed in detail under CWT Snouts.

Coded Wire Tags and Snout Sampling

Coded wire tags (CWTs) are uniquely marked, tiny pieces of wire that are injected into the fleshy part of a salmon's snout prior to being released from a hatchery. These tags are the primary means of identifying groups of salmon released from hatcheries. Recoveries of CWTs and fin marks from salmon encountered on during creel surveys might be used to assess straying of hatchery salmon to other river systems.

CWT salmon are usually recognized by the absence of their adipose fin that is cut off at the time of tagging. During creel surveys, samplers remove the snout from adipose-marked (Ad-marked) fish so the CWT can be sent to the processing lab for reading. **Every fish *that wands positive* must have a snout collected or a comment in the biodata record in the PDA as to why there is no snout.**

Follow these procedures to sample CWT marked salmon and record recovery data:

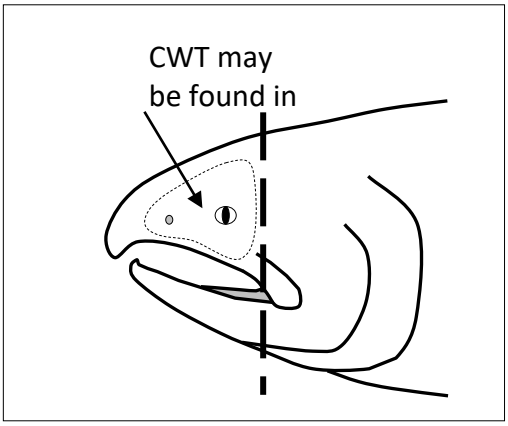
- Use the yellow "T-wand" to detect the presence of the tiny metal tag in the snout. At the beginning of each shift, test the T-Wand on the included standard tag (if wand is not properly detecting the standard tag, contact the crew lead).
- Wand every Chinook sampled. Instructions on proper technique will be given prior to surveys.
- Prior to scanning the snout with the wand, check the mouth of the fish for hooks; if present, remove or ask angler to remove hook. Be sure not to scan nearby metal such as belt buckles, knives, keys, etc.
- If the wand beeps, cut the snout off *as shown on next page*, and place it in a snout bag.

- Wand the bagged snout again.
  - If it beeps again, the CWT is present in the snout.
  - SCAN the snout ID tag# into the biodata record – use the scanning keyboard app on the phone.
- If the snout does not beep once it is in the bag:
  - Wand the fish again. If it beeps, confirm no hook is present and cut another section of the head (only do this once more with angler permission, explaining why another section is needed). CWTs can migrate within the fish's head. If still no beep, proceed with below.
  - Make note of the Snout ID #, Chinook ID #, Interview ID #, and Date.
  - Carry Snout ID Labels and snout bags at all times while creel surveying on basins with CWTs.
  - Snouts collected during creel should be placed in a large bag labeled "CCRMP Creel" and stored in a designated freezer the hatchery. If room is limited, be sure to notify the crew lead so they can make space. Every snout should be associated with an CWT ID (SNID) tag and a biodata record. Additionally, every biodata record with a SNID should have an associated snout in the freezer.
  - The Fish ID lab liaison (or crew lead) will arrange delivery times with Clackamas staff prior to making the trip. They will attach a label to the container of snouts that shows (1) the area of origin, (2) the year, and (3) a statement that they were recovered during creel surveys. Make very sure hatchery snouts are not mixed with creel or spawning survey snouts – they may share freezer space – so label totes and bags clearly!
  - *****EVERY SNOUT retrieved from the freezer MUST TEST POSITIVE FOR CWT BEFORE IT GOES TO CLACKAMAS for processing*****If there is no beep from the bagged head, discard the snout (ask about proper disposal). Crew leads will bring fish to Clackamas.

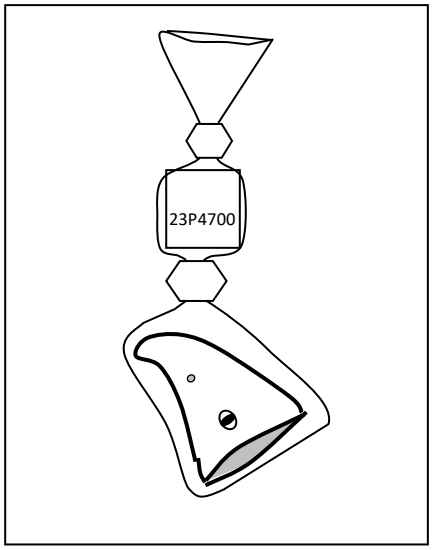
SNOUT SAMPLING INFORMATION SHEET

Please follow these guidelines to allow for continued improvement in data recovery. Samplers' help in this important part of fisheries management is greatly appreciated.

- Cut the snout straight ***behind*** the eye from top to bottom (diagram on right).
- Do not take gill plates or lower jaw.



- Please follow the instructions below regarding bagging the snout ID tag and snouts. Snout ID tags in the past have been destroyed by moisture from being placed next to the snout, resulting in data loss.
- Remove the snout as shown above; place the snout in the bottom of the bag.
- Tie a knot close and tight next to the snout
- Place Snout ID tag in bag above the first tied knot (this keeps the snout ID tag separate and safe from the snout so that data is not lost). Snout ID tags should be used in numerical order.
- Data can be recorded on the back of the snout tag. Include Date, River, Interview ID, Chinook ID, Sex, Length.
- Tie bag securely with a second knot **<u>above the tag</u>** so tag remains legible (diagram on right).



- **Freeze all samples as soon as possible or place in a cooler with ice until they can be frozen**.

This concludes the overview of the interview process, species identification, and sampling protocols for harvested Chinook and Coho salmon. The Data Instructions section of the operations manual has more detailed information on how to record data collected during interviews in CCRMP's electronic data forms using Pendragon software.