

FISH LIFE HISTORY ANALYSIS PROJECT



STANDARD OPERATING PROCEDURES FOR COLLECTION & PREPARATION OF FISH SCALES & DATA MANAGEMENT

August 2013

Ben Clemens, Kanani Bowden, Lisa Borgerson

MANUAL OUTLINE

- Purpose
- Standard Operating Procedures
 - Data management
 - Scale collection
 - Scale mounting
 - Data codes for scales
- References
- Appendix 1: Intake form
- Appendix 2: Basin codes

PURPOSE

The purpose of this manual is to provide guidelines for scale collection, preparation, and data management for new, supporting and collaborating staff. Information on a description of the work performed by the Fish Life History Analysis Project can be found in Clemens et al. 2013a, and information on methods of scale analysis can be found in Clemens et al. 2013b.

The project maintains high standards of quality in estimation of life history parameters, based on reads of fish scales, including accuracy, precision and efficiency from sample and data handling through age estimations and other life history analyses and data dissemination.

STANDARD OPERATING PROCEDURES

Data Management

A critical aspect in the process of collecting, processing, analyzing and reporting data from fish scales is the management of the data associated with the scales. For example, information on **basin, location, survey date, fin clip type, origin, Snout ID #, survey type (e.g., creel, hatchery broodstock, spawning ground survey, seine, etc.), fish length (metric or English units; MEPS or FL?) is essential**. Larger projects such as CCRMP and OASIS have established data collection procedures that usually include all of this information along with the fish scales.

*New for 2012 on: Please use the fish scale “in-take” form
(Appendix 1) when submitting scale samples.*

Because data management is critical, it is imperative that protocols be in place for data collection before the scale samples are collected. The protocols must include a method to keep data for each fish clearly associated with its scale sample, from collection in the field through scale analyses and data dissemination.

- ❖ Assign a **Scale ID Number** to each sample prior to OR at the time of scale collection. The Scale ID Number should be written on the scale sample envelope and be included in any field data collected at the time the scale is taken. **Follow the protocol of your project.**
- ❖ Data for each scale sample includes associated location and biological data. **Follow the protocol manuals of our project (e.g., OASIS or CCRMP training manuals or other).**

Scale Collection

Scale collection is often done in less than ideal field conditions. Most salmon species are coming in river during cold and wet weather. Even with difficult conditions, the FLHAP is better able to serve the needs of the project providing the scales if care is taken in collecting scales.

- ❖ The “key area” or anatomical location for cool water fish like salmonids is based upon where sockeye 1st generate their scales during development (Figure 1).
- ❖ The correct 5-step procedure for obtaining scale samples is as follows:
 1. **Locate key area (Figure 1).**
 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 not stack scales.**
 4. **Repeat on other side of fish.**
 5. **Allow scale envelopes to dry and organize in a well-ventilated container**

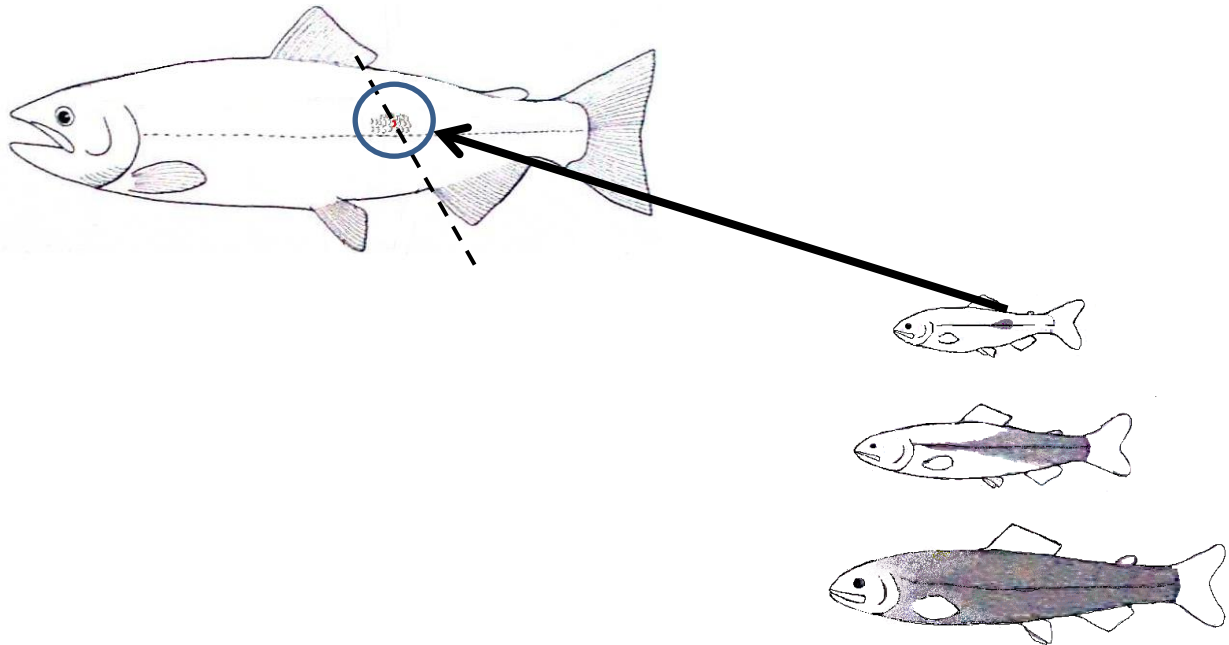


Figure 1. The key area is where scales first form on juvenile fish. These scales contain the most complete life history information. The key area is located above the lateral line, on a trajectory transcribed by an imaginary line passing between the posterior insertion of the dorsal fin and the anterior insertion of the anal fin.

Variations:

- **If scales are absent from the key area on one side of the fish, sample from twice as many scales from the key area on the other side of the fish.**
- **Live fish: If you want to be able to sample the fish again at an older age, only sample from one side of the body, so that key area scales will be available if the fish is encountered at a later date.**
- **Steelhead and cutthroat: Tend to have high scale regeneration rates, so a few more scales should be taken.**
- **Warm water fish: Key area is just under the tip of the pectoral fin.**
- ❖ Make sure that the biological data associated with the fish scales is clearly written down on the scale envelope and on data sheets or entered into a data entry device. There must be a scale ID # written on the envelope and contained in the data that is collected for the scale sample.
- ❖ Scale samples are most easily processed by the FLHAP if there is a scale ID # and an electronic data file.
- ❖ Allow scale envelopes to dry and store them in a well-ventilated container.
 - Scale envelopes will develop mold and mildew if stored in closed containers.

Scale Mounting

Scales are mounted onto gum cards that contain 20 cells for scale samples from 20 fish. Mounting requires that the scale samples are sorted, cleaned and oriented on the gum card in a specific way. The scale samples need to be linked to the data by a particular numbering scheme. Scales that are collected in the same year, by the same method, from the same basin and from the same species are considered one collection and are mounted within the same numbering scheme.

- ❖ **If there is any uncertainty or inability to mount an average of 3 or more intact, non-regenerated¹ scales per cell accurately and consistently right-side up (rough edges) in the field, then we ask that scale collectors simply collect the scales and place them into labeled scale envelopes.**
- ❖ Sort the scale envelopes by year, method, basin and species.
- ❖ If there is a scale ID # and a spreadsheet for the data associated with the scale samples, the envelopes should be sorted by the scale ID #.
- ❖ If there is no electronic data file with a corresponding scale ID # for the scale envelopes, then sort them by a data point that will make it easier to enter the data for each envelope. Date is often a good choice.
- ❖ **Any handling of computer files is to be done ONLY by lead staff from the project providing scales OR staff from FLHAP (i.e., Kanani or Ben). This is to prevent potential data mix-ups.**
- ❖ **Data cells should NOT contain formulae that are affected by sorting in an Excel spreadsheet (e.g., =A1+1).**
- ❖ Mounting supplies:
 - Fine point forceps
 - Small dish of water
 - 3" X 5" piece of card board
 - Dissecting microscope
 - Gum cards
 - Pen
 - Paper towels
- ❖ Attach the gum card to the card board to keep it flat.
- ❖ Fill out the data requested on the top of the gum card.
 - Location should include the basin name.
 - The FLHAP uses a systematic numbering system for the gum cards. It includes the year, basin code, and cell numbers.
 - The gum card number includes a range of cell numbers. The envelopes of scale samples mounted on that gum card will have numbers that fall within that number range and indicate the exact cell where the sample is mounted. Along with the year and basin code, those cell numbers are the Mount ID#.
 - A Mount ID # is not a random number like a scale ID #. A Mount ID # refers to a specific cell and gum card where a scale sample is mounted.
 - The first number of the range of cell numbers on a gum card always have a one as the last integer and are multiples of 20. For example, -1, 21, 41, 61.....181.....2421.

- ❖ An example of a Mount ID # range to be labeled at the top of a gum card would be: 1149/1-20, where “1149” is the year and basin number and the number range is the samples. Specifically, the “11” is the last two digits of the year, 2011, and “49” is the basin code for Coquille (in this example). See Appendix 2 for a list of basin numbers.
 - To help prevent duplication of the Mount ID#, common survey types are assigned Mount ID#s within a specific range of numbers. New for 2012 (and some 2011 samples), samples from the Willamette RM&E and from District Biologists will be fit into this system.

<u>Sample # range</u>	<u>Survey or other use</u>
1, 2, 3,.....1000	CREEL
1001-2000	<u>Adults:</u> TAGGING/TRAPPING/SEINING/TRAP & HAUL/DAM OR WEIR COLLECTION/ELECTROFISHING/PEDIGREE
2001-4000	SPAWNING GROUND SURVEYS
4001-5000	HATCHERY BROODSTOCK & WILD FISH USED FOR BROODSTOCK AT THE HATCHERY
5001-?*	<u>Juveniles:</u> TAGGING/TRAPPING/SEINING/TRAP & HAUL/DAM OR WEIR COLLECTION/ELECTROFISHING/PEDIGREE
9001-?	Scales mounted offsite by others

- ❖ To help the person mounting keep the data organized it is best to have a printout of the data sorted by the scale ID #.
- ❖ To begin mounting, select the scale envelope you are going to mount and write the Mount ID # on the top of the envelope and on the data sheet next to the corresponding data for that envelope.
- ❖ Using the dissecting microscope and forceps, select the 3 best scales and drop them into the small water dish.
 - The best scales are the largest and roundest and are the least regenerated or resorbed ¹.
 - If the scales are in poor condition, select up to 5 scales.
 - If the largest scales are all regenerated then include in the 3-5 scales a few smaller scales that are not regenerated when possible.

¹ *Regenerated:* New scales are grown quickly when lost. When the new “blank” scale reaches the size of surrounding scales, it starts growing circuli again. *Resorbed:* When a fish is stressed, it pulls calcium out of the scales. The scales look dissolved from the edge inward and the posterior field will wear off (Figure 3).

* Without prior planning, different projects working in the same basin could end up with the same basin codes *and* sample number ranges. This could lead to confusion over duplicity of mount ID #s. To avoid this, the Fish Life History Analysis Project will block a range of numbers for samples for each project working within the same basin. For example, if the Willamette spring Chinook Project collects samples from the North Santiam and submits those first, and the Willamette Reservoir Project collects samples from Detroit Reservoir (same basin) and submits those, then the numbering scheme would be:

12116/5001-6000: Juvenile samples 5001-6000 for the 2012 sample year, from the North Santiam (basin "116") from the Willamette spring Chinook Project

12116/6001-7000: Juvenile samples 6,000-6,999 for the same year and basin, from the Willamette Reservoir Project

The above system is tailored to scale samples from CCRMP, OASIS, and new for 2012, Willamette RM&E and District Biologists.

Caveats include samples from the Hood River, juvenile scales mounted on glass slides from the Deschutes River and Project CROOS. Samples from Hood River and juvenile scales mounted on slides from the Deschutes River already have particular numbering practices that are easier to adopt than to change. And, for Project CROOS samples, it is easiest and most intuitive to label these samples directly by name, location and year.

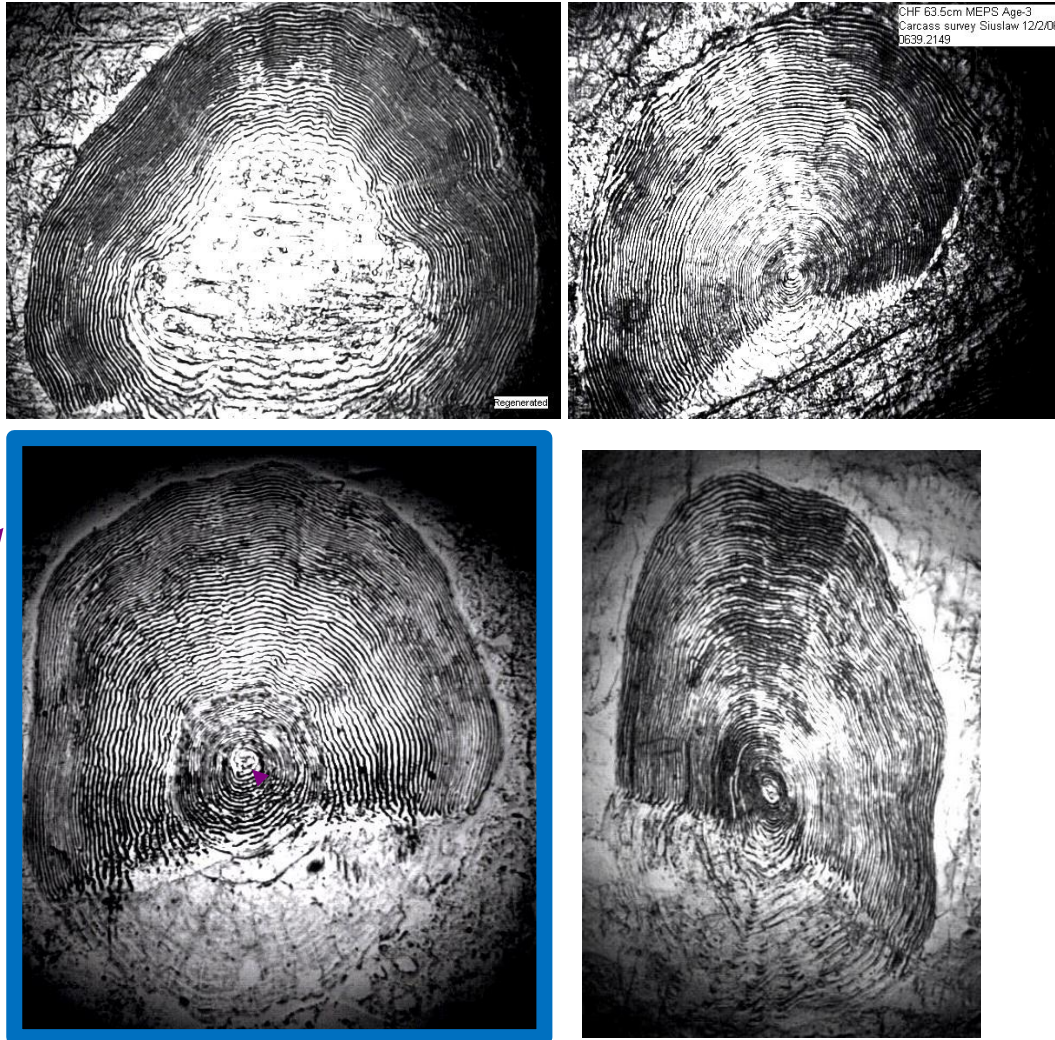


Figure 3. Images of scales taken from a camera mounted onto a light microscope (they won't be this magnified in a dissecting microscope). Clockwise, from top left: regenerated scale; resorbed scale; scale from the non-key area (non-key scale); textbook example of a scale that should be mounted. Regenerated, resorbed and non-key scales should be the last choices for scales to mount. Note the clearly visible posterior field in the textbook example.

- ❖ Use the forceps to remove 1 of the selected scales from the water dish and rub it between your thumb and forefinger to clean it.
- ❖ Use your thumb nail to feel both sides of the scale after it is clean. The side that feels rough, like fine sandpaper, should face up when you press the scale onto the gum card. This is the side with the circuli and annuli features that enables the scales to be “read” for life history characteristics (age, origin, life history diversity). If the scale is mounted with this rough side facing down, then the scale cannot be read.
- ❖ Dip the scale in water once more, touch it to a paper towel to remove excess water, and orient the scale with the posterior field (Figure 3) toward the bottom of

the gum card and the rough side up. Press the scale into the cell to which you assigned it when you gave it a Mount ID #.

- ❖ Repeat the cleaning, orienting and pressing until all of the selected scales are mounted into that cell.
 - The cells on the gum card are numbered with 2 rows of 1-10, from left to right.
 - The first cell will be in the upper right hand side of the gum card.
 - Fill the top row first, working *right* → *left*, and then begin the bottom row, working *right* → *left*.
 - There should never be > 20 scale samples on a gum card. Often < 20 scale samples are on a card.
- ❖ Continue to the next sample and repeat the mounting process with each of the samples. Keep the Mount ID #s running consecutively as you mount all of the scales in the collection.
 - If there are no scales in an envelope, write “*No scales*” on the envelope, the data sheet, and in the assigned cell of the gum card.
 - If there is scale sample listed on the data sheet, but no scale is found, write “*No sample*” on the data sheet and skip it. Do not assign it a cell on the gum card.
 - If there is a scale sample, but no data found for it, place this sample at the end of the collection, and mount it last. Write down any data form the envelope onto the data sheet and include the Mount ID# that sample is assigned.
- ❖ A hydraulic heat press is used to transfer the scale impressions from the gum card to a plastic “Vivak” card. See FLHAP staff for training.
- ❖ After pressing, the plastic cards with the scale impressions should be labeled with a **black or blue** permanent marker (red and green have been found to fade rapidly). And ***the labeling should be redundant to minimize chances of a single label fading with time to the point of becoming unreadable.***

Data Codes for Scales

Sometimes the status of the scales to be analyzed is extremely subjective at best. These codes denote particular problems prohibiting age estimations:

94	Other (non-target) species
95	Not mounted
96	No scales
97	Lateral line or other non-key scales
98	Unreadable; damaged
99	Unreadable; regenerated (see Figure 3)

REFERENCES

Clemens, B., K. Bowden, and L. Borgerson. 2013a. Fish life history analysis project: Project description. Oregon Department of Fish and Wildlife.

Clemens, B., K. Bowden, and L. Borgerson. 2013b. Fish life history analysis project: Methods for scale analysis. Oregon Department of Fish and Wildlife.

APPENDIX 1

Fish Life History Analysis Project (FLHAP): Scale “In-take” Form; phone: 541-757-4263

Ben Clemens (Ben.Clemens@oregonstate.edu; ext: 232);

Kanani Bowden (Kanani.Bowden@oregonstate.edu; ext: 262)

**Scales can NOT be processed unless you have made arrangements with us, including filling out this form. This form MUST accompany your samples.*

- Return year (where applicable):
 - Date scales dropped off:
 - Project dropping off scales:
 - Person dropping off scales (& contact info.):
 - *Specific* location in bldg 4 where the scales are being held:
 - Point of contact: Ben or Kanani—whom?
 - Project requiring scale data:
 - Person requiring scale data (& contact info.):
 - Basin?
 - Subbasin?
 - Species?
 - Known hatchery fish? Known wild fish? (circle appropriate)
 - Any of these fish possess CWTs?
 - Survey source (circle appropriate)
 - Spawning ground surveys
 - Mark/Recap
 - Hatchery broodstock
 - Creel
 - Other (*please explain below*)
 - Number of scale envelopes?
 - Scales already mounted?
 - Number of gum cards, if applicable?
 - What kind of information do you wish for us to obtain for you?
 - Hatchery/Wild origin?
 - Age?
 - Species ID?
 - Other (*please explain below*)
 - Range of dates when data needed?
 - Absolute deadline when data needed?
 - **Deadline “doable”/approved by FLHAP staff?**
 - Electronic files for data provided? (*preferred*)
 - Hard copies of the data also provided (not always necessary)?
-

COMMENTS:

APPENDIX 2

LIST OF BASIN CODES

Coastal Basins

(From OASIS basin codes – adopted by FLHAP for run year 2000 and subsequent run years.
See OASIS project codes for more complete listing.)

Basin No.	Basin
1	Necanicum
5	Nehalem
6	Miami
7	Kilchis
8	Wilson
9	Trask
10	Tillamook
13	Nestucca
16	Salmon
20	Siletz
25	Yaquina
28	Alsea
30	Yachats
33	Tenmile
39	Siuslaw
40	Siltcoos
41	Tahkenitch
43	Umpqua
45	Coos
49	Coquille
*53	Floras; New River
54	Sixes
55	Elk
59	Euchre
60	Rogue
62	Pistol
63	Chetco
64	Winchuck

*Different from OASIS coding: 52 New River, 53 Floras.

Columbia, Snake, and Willamette Basins

(Assigned and adopted by FLHAP for run year 2000 and subsequent run years. The SGS Survey Code Manual for FLHAP [black binder] has a more complete listing.)

Basin No.	Basin
101	Columbia River, from mouth to Willamette
102	Columbia River, from Willamette to John Day
103	Columbia River above John Day
105	Youngs Bay
106	Lewis and Clark
107	Youngs River
108	Klaskanine
110	Willamette River, mainstem
111	Clackamas
122	Sandy
116	North Santiam
116	South Santiam
119	McKenzie
120	Middle Fork Willamette, N. Fork Middle Fork
120	Middle Fork Willamette, Fall Creek
121	Coastal Fork Willamette
124	Deschutes, mouth to Round Butte
125	LBC – headwaters
126	John Day, mouth to N. Fork
127	John Day, N. Fork
128	John Day, above N. Fork
129	Willow
130	Umatilla
131	Walla Walla
132	Snake River, mainstem
133	Grand Ronde
134	Imnaha
135	Powder
136	Malhuer