COLUMBIA RIVER SALMON STOCK IDENTIFICATION PROJECT FOR STOCKS ORIGINATING ABOVE BONNEVILLE DAM

FIELD OPERATIONS GUIDE

Technical Report 87-1

Matthew Schwartzberg

December 28, 1987

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
975 S.E. Sandy, #202, Portland, OR 97214, (503) 238-0667

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CONTENTS

I. PROJECT DESCRIPTION

The United States - Canada Pacific Salmon Treaty (Pacific Salmon Treaty 1985) was designed to conserve and rebuild salmon stocks through ocean fishery restrictions. In order to monitor the impacts of ocean harvest controls, the treaty has established research programs to identify, categorize, and determine population sizes of many Pacific Northwest salmon stocks.

The Columbia River Inter-Tribal Fish Commission (CRITFC) and its member tribes will conduct fieldwork to help implement the Pacific Salmon Treaty monitoring programs. The research will consist of two separate but related projects: stock identification and stock monitoring. This field operations report applies to the stock identification project. A separate document has been created for the stock monitoring project (Heindl 1987). These reports are intended to insure standardization in the various sampling and field data collection aspects of the research.

The objective of the stock identification project is to estimate the relative sub-stock composition of runs of Columbia basin sockeye, Oncorhynchus nerka (Walbaum), and spring chinook, Oncorhynchus tshawytscha (Walbaum), salmon originating above Bonneville Dam. Stocks will be identified through a coordinated program of inter-agency field bio-sampling and CRITFC laboratory analyses. Intermingled stocks will be sampled at Bonneville Dam in the mainstem Columbia River, while individual unit stocks will be sampled at selected dams, tributaries, fisheries, and hatcheries. Estimates will be made of age, length, and sex

composition of sampled component stocks.

Scale pattern analysis will be used to differentiate stocks of unknown origin by comparing scale characteristics or sets of characteristics from these fish to scale characteristics of known-origin hatchery or naturally spawning stocks. A computerized digital scale-reading system will be used to record data from collected scales. Statistical procedures will be used to identify stocks by separating and categorizing sample groups.

II. DATA COLLECTION

A. Dam Sampling Program

1. TYPES OF DATA AND SAMPLES COLLECTED

a. Scales will be collected for estimation of age and stock composition.

b. Length (from tip of snout to fork of tail and from mid-eye to hypural plate), marks observed (including adipose or other fin clips, freeze brands, and jaw or other tags), and date will be recorded on data sheets.

2. SAMPLE COLLECTION METHODS

a. Bonneville Dam

Bonneville mainstem sampling is done at the U.S. Army Corps of Engineers (Corps) Fisheries Engineering and Research Laboratory (FERL) on the Washington side of the Bonneville Dam complex. The trap, located beside the North Shore Visitors Center, is a modern facility designed for adult salmonid capture and sampling.

Use of the FERL requires a written request and authorization (see Appendix D, KEY AGENCY CONTACTS) from the Corps. Requests for use of the trap should be made during the winter preceeding the intended spring/summer sampling project. A safety report pertaining to proposed use of the trap is also required by the Corps.

Several agencies cooperate in use of the FERL.

More than one research project may be operating at any one time, and so it is essential that scheduling and use be coordinated with these agencies as well as with the Corps. Presently, the National Marine Fisheries Service (NMFS) and the Oregon Department of Fish and Wildlife (ODFW) are conducting research at the facility.

The FERL is designed to divert adult salmonids from one of the main fish ladders up an entrance fishway ladder and into a holding area within the facility structure. From there fish are attracted to one of two false weirs connected to chutes running the length of the building. Once in the chutes, fish are diverted either into a sampling tank or an exit fishway that leads back to the main ladder. Determination of whether or not a fish is routed to the sampling tank is made by an individual stationed on a bridge above the chutes. The chutes contain hydraulically operated gates that are activated by controls on the bridge. In this way, only desired specimens enter the sampling tank. The sampling objective is to randomly capture and sample fish of the desired species as they pass through the facility.

Coded-wire tag detectors attached to the chutes also activate the hydraulic gates. If these automatic detectors are operating, they may bias the random sample by introducing a disproportionate number of coded-wire tagged fish that are most likely of hatchery

origin. Fish entering the tank in this way should not be sampled unless they would otherwise have been selected manually by the gate operator.

A sample size for the season is first determined based on the species and type of stock identification experiment (see Appendix B, SAMPLING LOCATIONS AND RESPECTIVE SAMPLE SIZES [1987] and Matylewich 1986). Sample sizes differ from week to week and are based on the weekly proportion of the 10 year average of previous runs over Bonneville Dam (see Appendix B, BONNEVILLE SAMPLING PROGRAM, CUMULATIVE AND WEEKLY SAMPLE SIZES). If the weekly sample cannot be collected in one day, the crew will return the following day to obtain the remainder of the required sample.

Generally, a three- person team is required to carry out the Bonneville sampling program. One person operates the chute controls, the second handles fish, and the third records data, orients scales on gummed cards, and monitors the recovery of anesthetized fish. When sample sizes are quite small (i.e., less than 30 fish), it is possible for two people to manage the sampling process. Refer to Appendix D for a list of equipment needed for the Bonneville Dam sampling project.

The sampling tanks should be prepared with a fresh anesthetic solution (about 55g of MS222 per tankful) and should be emptied and cleaned after sampling

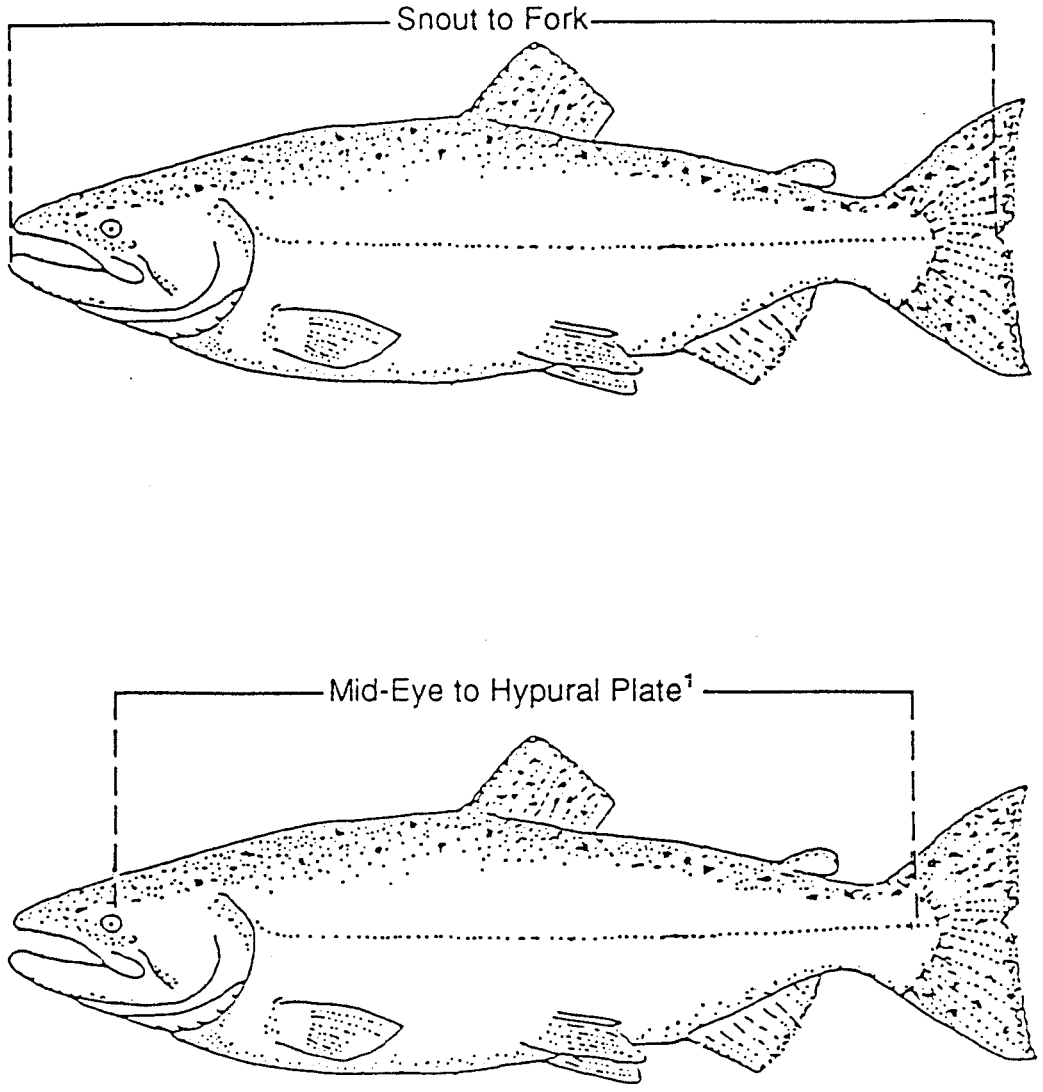
approximately 75 fish. Four fish are placed in the tank at a time. It takes three to five minutes before the anesthetic takes effect. Each fish is quickly inspected for marks and measured by holding it against the ruler attached to the side of the tank. A fish's length is determined by measurement from the tip of the snout to the fork of the tail. A second measurement from the mid-eye to hypural plate is made on a sub-sample of fish and is recorded in the "remarks" column of the data form. Both measurements are made and recorded to the nearest Ø.5 cm (see Figure 1, FISH LENGTH MEASUREMENTS).

Marks observed, such as adipose or other fin clips, freeze brands, or tags, are noted. Sex is determined based on external morphological features. Scales are then removed from the fish and mounted according to the procedure outlined in Clutter and Whitsel (1956), INPFC (1963), and in Section III (SCALE SAMPLING) of this document. During these sampling operations, the fish is allowed to remain partially submerged in the anesthetic tank water.

Data are recorded on data sheets designed for the stock identification sampling project. An example of this data form, including a description of each data field, is included in Section IV, DATA FORMS.

When sampling of an individual fish is complete, it is gently removed from the anesthetic tank and placed in an adjacent recovery tank. Generally, after

Figure 1. Fish Length Measurements



1. The hypural plate forms the last and largest vertebra in the spinal column and is located in the caudal peduncle. The obvious flexpoint of the tail at the posterior edge of the hypural plate is the point to which measurements are made.

about five minutes in the recovery tank, a fish is ready to be passed into the exit fishway. However, some fish will need longer to recover from anesthetic than others. Because a partially anesthetized fish is likely to die in the exit fishway, a fish should not be released until it has completely recovered. Upon completion of a day's sampling, the anesthetic tank is emptied and cleaned.

b. Other Dams

Other dams may be used as future sampling sites for the stock identification project. At such time, appropriate sample collection methods will be established and included in this manual.

II. DATA COLLECTION (continued)

B. Tributary Sampling Program

1. TYPES OF DATA AND SAMPLES COLLECTED

a. Scales will be collected for estimation of age and stock composition.

b. Length (from tip of snout to fork of tail and from mid-eye to hypural plate), marks observed (including adipose or other fin clips, freeze brands, and jawor other tags), and date will be recorded on data sheets.

c. Tissue samples (e.g., fin rays, vertebrae, or otoliths) may be collected for age determination. Other samples may be collected for genetic stock identification (GSI) analysis.

2. SAMPLE COLLECTION METHODS

The purpose of tributary sampling is to acquire scales, tissue samples, and other biological data from known stocks of fish to be used in stock composition analyses. Often, tributary carcass sampling will be combined and coordinated with redd and live-fish counts for stock monitoring studies.

Carcass recovery surveys should be designed to take a random and representative sample of fish present in a spawning population. Because theywill change annually, geographic distribution, sexual composition, and duration of post-spawning

survival must first be estimated to insure accurate and unbiased surveys. Therefore, short test surveys should be made yearly prior to peak spawner die-off to establish survey locations and schedules. Sample sizes and sampling locations for the current year are detailed in Appendix A of this document.

It is essential that field surveyors receive pre-survey training in carcass recognition and recovery. Surveyors must be thoroughly familiar with scale and tissue sampling techniques (see Section III, SCALE SAMPLING). While many different- sized survey crews may be efficiently organized and fielded, two-person teams should be established for actual carcass sampling procedures.

Carcass recovery surveys are either made completely on foot or, if the stream is large enough, with the help of rafts. They are conducted most frequently from upstream to downstream points, and streams are usually divided into reaches with convenient access points.

During the survey, team members must spread out and make sure to search for carcasses along all banks and within side channels. Carcasses will generally be found in slack- water areas close to spawning riffles and along the banks.

If large numbers of fish are present in a

reach, the most effective sampling technique is to collect carcasses and hold them for later processing. By collecting carcasses for later sampling, up to 100 carcasses may be sampled at one time. Sample quality has been proven to be of much higher quality when this technique is used. The bottom of a raft is a good, although occasionally unpleasant, storage area. If rafts are not used, a foot surveyor may find large plastic bags useful. If few carcasses are present in a reach, they may be sampled individually as they are encountered.

Each two-person field team splits the sampling tasks so that one person handles the scale cards and data forms, records data, and assists in scale mounting and tissue sample labeling. The other person handles, measures, and removes samples from the carcass. A carcass is first examined for marks, fin clips, and tags. Any noted are recorded on the data sheet. Measurements are then made from both tip of snout to fork of tail and from mid-eye to hypural plate (see Figure 1, FISH LENGTH MEASUREMENTS). Sex is determined and recorded. If necessary, the fish's body cavity is cut open to ascertain its sex.

Biological samples such as scales and otoliths are removed next. Scale sampling

techniques are described in Section III. If the carcass carries a coded-wire tag (indicated by a clipped adipose fin), its snout is removed and collected by cutting across the head straight down behind the eyes until a point even with the line of the mouth is reached. The knife is then placed in the fish's mouth, and a cut is made back toward the first incision until the snout is cut free. The snout is put in a plastic bag with a tag identifying the carcass from which it was taken, and the same number is also entered on the data form to enable cross referencing. When sampling is completed, the tail of the carcass is cut off to identify it as having been previously sampled.

II. DATA COLLECTION (continued)

C. Hatchery Sampling Program

1. TYPES OF DATA AND SAMPLES COLLECTED

a. Scales will be collected for estimation of age and stock composition.

b. Length (from tip of snout to fork of tail and from mid-eye to hypural plate), marks observed (including adipose or other fin clips, freeze brands, and jaw or other tags), and date will be recorded on data sheets.

c. Tissue samples (e.g., fin rays, vertebrae, or otoliths) may be collected for age determination. Other samples may be collected for GSI (Genetic Stock Identification) analysis.

2. SAMPLE COLLECTION METHODS

Scales and biological information collected at several Columbia Basin fish hatcheries will also provide data on known stocks of fish for stock composition studies. Because all Columbia basin sockeye stocks are naturally spawning, hatchery sampling will only apply to upriver spring chinook. A list of spring chinook hatcheries participating in the stock identification project and respective sample sizes required from each is included in Appendix A of this report.

Arrangements for sampling at particular

hatcheries should be made well in advance of the middle-to-late summer hatchery spawning period. Columbia upriver spring chinook hatcheries are operated by several different state and federal agencies. Inter-agency coordination is therefore essential for consistency in sampling techniques and reporting conventions. Appendix D, KEY AGENCY CONTACTS, includes a list of personnel responsible for implementation of the hatchery-sampling aspect of the stock identification project.

As in all aspects of the stock identification sampling program, a critical element of the hatchery sampling portion of this project is the need to obtain a proportionally representative sample of the entire hatchery stock population. Fish must be randomly selected for sampling with regard to sex, size, and spawner timing. One way to achieve this aim is to randomly select fish for sampling from hatchery holding ponds. Fish are captured and anesthetized according to respective hatchery practices and then returned to the ponds for later spawning.

If it is necessary, however, to sample fish during hatchery spawning operations, a method must be devised to insure randomization of the sample. In this case, a simple ratio procedure is sufficient. For example, the total number of fish

to be spawned is divided by the total sample size, and this number is then used as the interval between sampled specimens. This method assumes that the fish spawned represent a random sample of the hatchery stock population. Fortunately, modern hatchery practices frequently uphold this assumption. Because hatcheries have different operational procedures, a specific sampling method will have to be determined for each one.

Live fish or carcasses are sampled by two-person teams. One person handles fish and removes biological samples, while the other person records data and assists in mounting scales and labeling other tissue samples. Fish are sampled first for length. Both snout to fork length and mid-eye to hypural plate measurements are made (see Figure 1, FISH LENGTH MEASUREMENTS). All measurements are made to the nearest 0.5 cm and recorded on the data form described in Section IV. Next, the sex of the fish is determined and recorded. If necessary, the body cavity of a carcass is opened to positively identify the sex of a fish. Any marks observed, such as adipose or other fin clips, freeze brands, or tags, are noted. Scales are removed according to the procedure outlined in Section III, SCALE SAMPLING. Other tissue samples required are collected, and snouts from coded-wire tagged fish are removed and labeled.

III SCALE SAMPLING

A. Introduction

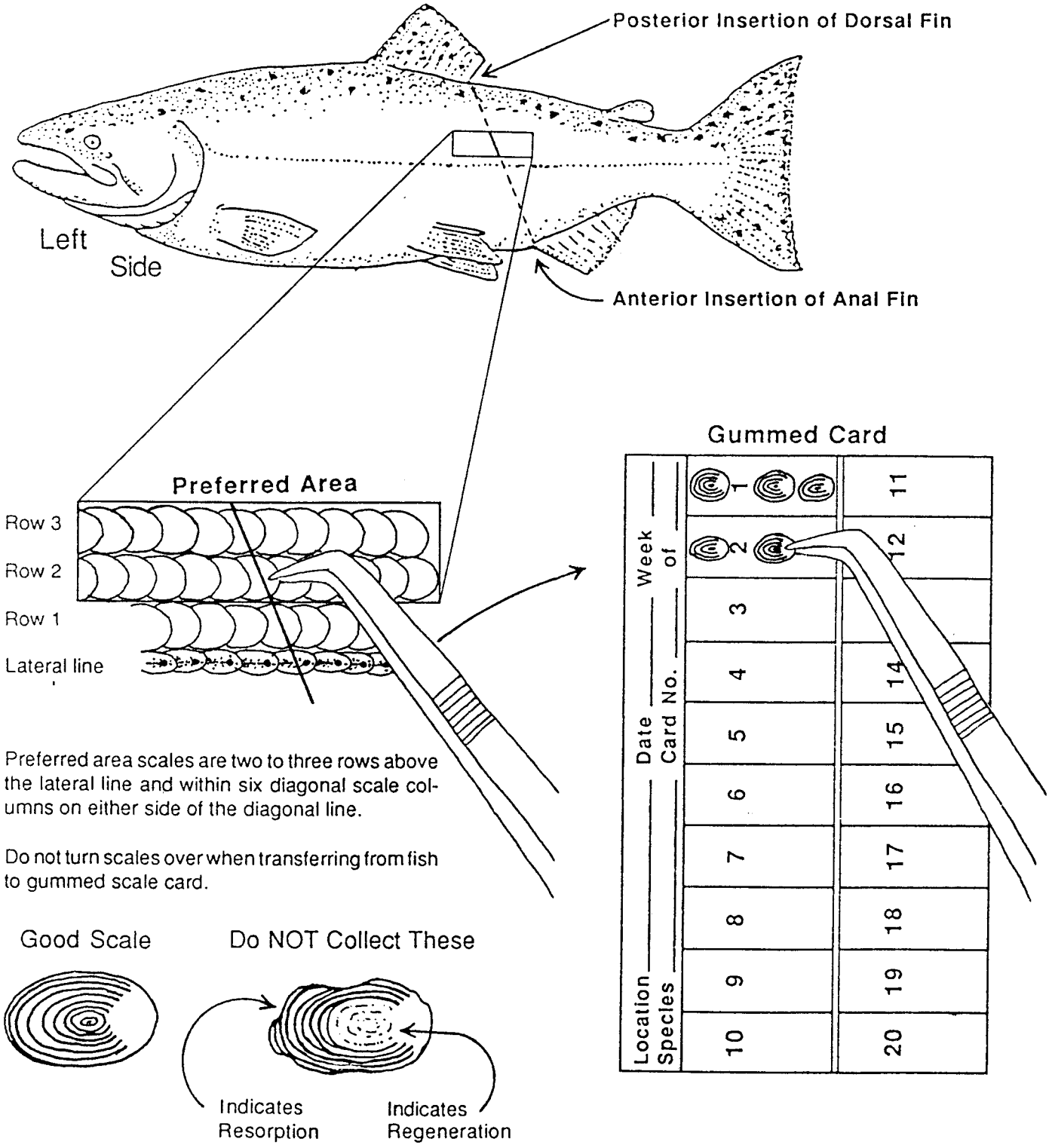
Because scale growth corresponds to overall fish growth, it is possible to establish a record of the life history of an individual fish from examination and interpretation of its scale characteristics. Age of a fish may be determined from its scale features, and thus a particular run may be apportioned into age class groupings.

Natal-stream conditions may vary among different races of anadromous salmonid species and will be reflected in the scale freshwater growth zones of individuals. Differences in the freshwater growth of hatchery and naturally spawned and reared fish may be indicated and detected in scale patterns. Studies of the racial composition of fish runs-- the classification of individual adult spawners to groups of different origin-- are also made possible through scale pattern analysis.

B. Collection

To obtain scales containing complete and accurate growth records, scales must be selected from a limited "preferred area"on each fish (Clutter and Whitesel 1956, INPFC 1963). This area lies two to three scale rows above the lateral line and within six scale columns on either side of a diagonal line running from the posterior (rear) base of the dorsal fin to the anterior (forward) base of the anal fin (see Figure 3, SCALE SAMPLING PROCEDURE). Under most circumstances, a total of three scales will be taken from

Figure 3. Scale Sampling Procedure



each fish sampled. Two scales are taken from the left side ofthe fish, and one from the right side. The exception to this rule is to be observed when sampling spring chinook at Bonneville Dam. In this case, six scales will be taken from each fish -- three from each side of the fish-- and a different type of gummed card is used. If one side of the fish is damaged and scales are not present, all scales are taken from the other side of the fish and a note is made in the remarks column of the sampling form.

Using forceps or small hemostats, scales should be removed from the fish. Before mounting them on gummed cards, each scale should be examined for damage or regeneration (a consequence of previous damage to that scale or nearby scales). A good scale will appear oval and well-formed and will, when held up to light, show a distinct central focal pointwith visible concentric markings. The best scales obtainable are selected from <u>within the preferred area</u>. If no acceptable scales can be found on an individual fish, it is rejected (not sampled).

It is frequently difficult to remove scales from spawned- out fish. Scales are often tightly adhered to the scale pocket in spring chinook. Sockeye scales are loosely attached but are often so resorbed that they are well hidden within the scale pocket. In either case, it is very important that care be used to remove and mount only the scale and not parts of the scale pocket or other pieces of flesh.

C. Mounting

Scales are mounted by placing them on 3" x 5" gummed cards (Koo 1955). Impressions in plastic will later be made of the scales mounted on cards. In all instances except for upriver spring chinook sampling at BonnevilleDam, three scales are placed in each of the 20 cells on the card (see Figure 3, SCALE SAMPLING PROCEDURE). One right-side scale is placed above the cell number in the upper area of each cell, and two left-side scales are placed below the number in the lower area of each cell. For spring chinook scales collected at Bonneville Dam, six scales are taken and cards containing 10 cells per card are used. Three right-side scales are placed in the upper area of each cell, and three left-side scales in the lower area.

The card is labeled on the back side with the sampling location, date, and card number. The labeling area on the front side of the card is left unmarked. A corresponding data sheet is to be completed with additional information, such as fish length, sex, and marks observed (see Section IV, DATA FORMS).

Scales should be placed on the gummed card in the manner they grew on the fish (i.e., with their exterior surfaces facing up). If there is doubt whether the scale has been mounted properly, it is tested with a pencil point to see if a mark may be made on the scale's surface. The roughness of the outer surface of the scale will allow the pencil to mark it. If the pencil does not mark the scale, the scale is reversed on the card before the glue dries.

After the scale is positioned on the card, it is firmly pressed into the gummed surface with a dry cloth or fingertip to permanently affix it.

All scales should be oriented in the same angle and direction to facilitate reading and measurements (see Figure 3). If possible, the numbers within the gummed card cells are allowed to remain uncovered. The cards are kept dry to preserve the glue base, inked numbers, and lines. Dissolved glue will fill in scale surface patterns and reduce the quality of subsequent impressions. Finally, the cards are stored flat to prevent curling by placing them between 3" x 5" plastic cards held together with rubber bands.

IV. DATA FORMS

A. Dam and Hatchery Sampling Form

1. EXAMPLE (reduced 50%)

DAM AND HATCHERY SAMPLING FORM

LOCATION _____ SPECIES _____ PAGE ___ OF___

DATE _____ WEEK _____ SAMPLERS _____

Scale Card No.	Position	Sample No.	Fork Length	Sex	Mark	Age	Remarks
	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						
	1						
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	10						
	11						
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	15						
	16						
	17						
	18						
	19						
	20						

Scale Card No.	Position	Sample No.	Fork Length	Sex	Mark	Age	Remarks
	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
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	12						
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	14						
	15						
	16						
	17						
	18						
	19						
	20						

2. EXPLANATION OF DATA FIELDS

a. Location

The sampling site is recorded here.

b. Species

The species sampled, as applicable, is noted.

c. Page

Recorded as 1 of 1, 2 of 3, etc.

d. Date

The date of sampling is entered.

e. Week

The statistical week in which the sample date falls is noted.

f. Samplers

The initials or names of the samplers are recorded.

g. Scale Card No.

The number of the scale card on which corresponding scales are placed is noted. Scale cards are also identified on their back (non-gummed) side with location, date, and scale card number.

h. Position

This refers to the cell of the scale card (1 through 20) in which the three scales are mounted (see Figure 3, SCALE SAMPLING PROCEDURE).

i. Sample No.

A running total of the number of fish sampled on a given date.

j. Length (Fork)

A length measurement made from tip of snout to fork of tail. Measurement is made to nearest 0.5 cm. (see Figure 1, FISH LENGTH MEASUREMENTS).

k. Sex

The sex of the fish is determined and recorded as M or F.

l. Mark

All fin clips, freeze brands, or tags observed are recorded here. If more room is needed to record marks, use the "Remarks" field. The following codes are used:

RP, LP - right, left pectoral

D - dorsal

RV, LV - right, left ventral

AD - adipose (indicates coded-wire tag in snout)

AN - anal

Jaw Tag - enter identifying number; note right or left jaw in "Remarks" column.

m. Age

Age is determined during later scale analysis. Leave this column blank during field sampling.

n. Remarks

Any additional information on individual fish samples is recorded here. This column is used for sub-sample mid-eye to hypural length measurements and also for scale analysis notes.

IV. DATA FORMS (continued)

B. Tributary Sampling Form

1. EXAMPLE (reduced 25%)

RIVER _____ SPECIES _____ SAMPLERS _____

REACH _____ WATER TEMP. ____ to ____ PAGE ____ of ____

DATE _____ SURVEY CONDITIONS _____

Fish Counts			Scale Cd.				Length						
Redds	Live	Dead	Samp. No.	Number	Position	Marks	Fork	Mid-Eye to Hypural	Sex	% Soawned	Other Samp.	Remarks
Total	Total	Total										

2. EXPLANATION OF DATA FIELDS

a. River, Reach

The stream name and section (reach) is recorded. The reach code is included if available.

b. Date

The date of survey is recorded.

c. Species

The species sampled is noted.

d. Water Temperature ____ to ____

Water temperatures are recorded at the beginning and end of the survey. This field is only used when

carcass collection is combined with escapement-estimation surveys for the stock-monitoring project.

e. Survey Conditions

Stream survey conditions-- particularly visability --are described. Another column only for the stock monitoring project.

f. Samplers

Note the initials or names of the samplers.

g. Page ____ to ____

Recorded as 1 of 1, 2 of 3, etc.

h. Redds, Fish Counts - Live and Dead

Columns used for stock monitoring work.

i. Sample No.

This refers to the number of the carcass sampled during a given survey. Sample numbers start at one and are numbered consecutively. Tissue samples collected from each carcass must also be identified with tags bearing survey location, date, and sample no. for cross-referencing.

j. Scale Card No. and Position

Refers to the number of the scale card on which corresponding scales are placed. Scale cards are also identified on their back (non-gummed) side with location, date, and scale card no. If scales are not collected, the columns on the data form are left blank.

k. Mark

All fin clips, jaw tags, and body tags observed on a sampled carcass are recorded here. If more space is

required, use the "Remarks" column. The following codes are used:

RP, LP - right, left pectoral

D - dorsal

RV, LV - right, left ventral

AD - adipose (indicates coded-wire tag in snout; note in "Remarks" column whether snout collected or not).

AN - anal

Jaw Tag - enter identifying number; note right or left jaw in "Remarks" column.

Spaghetti Tag - enter identifying source and number; note color in "Remarks" column.

l. Length (Fork)

A length measurement made from tip of snout to fork of tail. Measurement is made to nearest Ø.5 centimeter. (see Figure 1, FISH LENGTH MEASUREMENTS).

m. Length (Mid-Eye to Hypural)

A length measurement made from the mid-eye to the hypural plate. Measurement is made to nearest Ø.5 centimeter. (see Figure 1, FISH LENGTH MEASUREMENTS).

n. Sex

The sex of the fish is determined and recorded as M or F.

o. % Spawned

This column used for the stock-monitoring project.

p. Other Samp.

This columnis used to indicatewhether other bio-samples, such as otoliths or GSI tissue samples, are collected. On an accompanying label, note the survey location, date, and carcass (sample) no.

q. Remarks

Any additional information on individual fish samples is recorded here.

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Appendix A. Sampling Locations and Respective Sample Sizes (1987)

Table 1. Bonneville Dam Sampling Program
Species: Spring Chinook and Sockeye

Location	Species	Sample Sizes
Bonneville Trap	Spring Chinook	384
Bonneville Trap	Sockeye	384

Table 2. Hatchery Sampling Program
Species: Spring Chinook

Location	Sample Sizes
Carson NFH (USFWS)	75
Little White Salmon NFH (USFWS)	75
Warm Springs NFH (USFWS)	75
Leavenworth NFH (USFWS)	75
Rapid River Hatchery (IDFG)	75
Sawtooth Hatchery (IDFG)	75

Table 3. Tributary Sampling Program
Species: Spring Chinook

Location	Responsible Agency/Tribe	Sample Sizes
Mid-Columbia		
Deschutes R.	USFWS/CTWSR	75
John Day R.	ODFW/CTWSR	75
Upper Columbia		
Yakima R.		
Yakima Mainstem	CTBYIN	75
Naches R.	CTBYIN	75
Wenatchee R.	CTBYIN	75

Table 3. Tributary Sampling Program (continued)
Species: Spring Chinook

Location	Responsible Agency/Tribe	Sample Sizes
Snake River		
Grande Ronde R.	ODFW/CTUIR	75
Imnaha R.	ODFW/CTUIR	75
Clearwater R.	IDFG/NPT	75
Salmon R.	IDFG/NPT	75

Table 4. Tributary Sampling Program
Species: Sockeye

Location	Responsible Agency/Tribe	Sample Sizes
Wenatchee R.[1]	WDF	500
Okanogan R.[2]	WDF	500

1. In 1987, Wenatchee sockeye samples will come from the Lake Wenatchee sport fishery.
2. In 1987, Okanogan sockeye samples will come from the Okanogan River spawning grounds.

Appendix B. Cumulative and Weekly Sample Sizes in the Bonneville Sampling Program (1987)

Table 1. Spring Chinook Sample Sizes and Sampling Schedule[1]

Date	Week	10yr. Avg.[2] Cum.%	Cum. Sample No.	Weekly Sample No.
4/08,10/87	15	5.9	23	23
4/14/87	16	16.7	64	41
4/21/87	17	32.5	125	61
4/29/87	18	50.6	194	69
5/06/87	19	69.5	267	73
5/13/87	20	83.6	321	54
5/18/87	21	92.4	355	34
5/29/87	22	97.1-100.0	384	29

Table 2. Sockeye Sample Sizes and Sampling Schedule[1]

Date	Week	10yr. Avg.[2] Cum. %	Cum. Sample No.	Weekly Sample No.
6/15/87	25	7.7	30	30
6/22/87	26	34.3	132	102
6/29/87	27	67.8	260	128
7/06/87	28	87.4	336	76
7/13/87	29	95.4	366	30
7/20/87	30	100.0	384	18

1. The 1987 sample size is based on binomial sampling theory and is intended to detect the proportion of wild/hatchery fish to within + or - 5%.
2. The cumulative percentage is a breakdown by week of the ten year average of previous years Bonneville Dam counts for each run.

APPENDIX C. FIELD EQUIPMENT LIST

A. Dam and Hatchery Sampling Programs

DATA FORMS (on waterproof paper)
PENCILS
CLIPBOARD
FORCEPS
SCALE CARDS (with acetate covers)
RUBBER BANDS (to contain scale cards and covers)
MEASURING TAPE (metric)
ANESTHETIC (MS222)
RAIN GEAR
STEEL-TOED RUBBER BOOTS
HARDHAT (worn at all times while on project)

B. Tributary Sampling Program

DATA FORMS (on waterproof paper)
FIELD NOTEBOOKS
PENCILS
FORCEPS
SCALE CARDS (with acetate covers)
RUBBER BANDS (to contain scale cards and covers)
MEASURING TAPE (metric)
TISSUE SAMPLE LABELS
PLASTIC BAGS (for coded wire tagged snouts)
POLARIZED GLASSES
WADING GEAR (chest waders are recommended)
KNIFE
DAYPACK

APPENDIX D. KEY AGENCY CONTACTS

A. Bonneville Dam Sampling Program

Lyle Gilbreath
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Jim Kuskie
Fisheries Management Unit
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Bonneville Dam Project
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B. Tributary Sampling Program

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B. Tributary Sampling Program (continued)

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C. Hatchery Sampling Program

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C. Hatchery Sampling Program (continued)

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