PSC WORKSHOP ON HATCHERY CWT METHODOLOGY

JANUARY 10-12, 1995

SEATTLE, WA

a preliminary summary edited and condensed by

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for the 1995 Mark Meeting in Portland, OR, February 16, 1995

Regional Information Report[1] No. 1J95-12

Alaska Department of Fish and Game
Commercial Fisheries Management and Development Division
Southeast Region
Juneau, Alaska

February 1995

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PSC WORKSHOP ON HATCHERY CWT METHODOLOGY

This workshop on hatchery coded-wire-tag (CWT) methodology was sponsored by the Pacific Salmon Commission (PSC); its purpose was to compare methods currently used in producing CWT data, to review uses of the data, and to make recommendations for standardizing and improving technologies where possible. The workshop was attended by 40-60 people each day with almost 100 different people in total, coming from Alaska, the Yukon, B.C., Washington, Oregon, Idaho, and California. A schedule of the meeting is attached.

The last half of the third day consisted of panel workgroups with participation by interested audience members as well as panel participants. There were spirited discussions in all workgroups and each workgroup put together a summary of findings, discussions, and recommendations. These summaries, along with summaries of each panel talk, will be will be compiled in a workshop proceeding which will be published through the PSC. A preliminary summary of each workgroup discussion follows.

A. Mark and Release Estimation Procedures; Moderator: Gary Freitag

1. Communication between the analytical users of the CWT data and those responsible for developing tagging and release procedures at the hatcheries has been poor coastwide. It is recommended that definite lines of communication between all parties involved with the CWT programs be developed through the use of regional teams that should include representation by individuals from the region familiar with biometrics, local fishery management, fish culture and PSC data usage. The team should be responsible for identifying: a) hatchery requirement and restraints relative to tagging, b) regional fishery management requirements and restraints, and c) data quality needs of the PSC with respect to numbers of fish marked for index stocks. The teams should provide biometric and technical support for hatchery operators, taking into account that each hatchery will have its own set of logistical problems that will require its own specific procedures.

2. Specific procedures to help resolve problems in tagging programs were identified:

a) tag retention estimates should be made from a minimum sample size of 500 fish held for at least 30 days;

b) fish in the tag retention samples need to be representative of the entire tagged population;

c) procedures using weight sampling methods to estimate average fish or egg counts should be based on statistical analyses that take population variability and representation into account;

d) agencies should review tagging programs to determine if tagged fish represent the reported released population;

e) agencies should review the effects of the quality of the adipose clip marks on the accuracy of estimates based on CWT data; and

f) tagging programs should consider the environmental conditions that fish are being exposed to at the time of tagging with respect to reducing stress related tagging mortality.

B. Experimental Design and Data Analysis; Moderator: Rich Comstock

1. There is a need for improved consistency in indicator stock tagging programs. While such changes as broodstock source and time of release may be necessary for maintaining or improving hatchery production, they greatly compromise the data for management purposes. Compromise between fisheries management needs and hatchery programming may be instigated through enhanced communication between the two groups. To facilitate communication, the workgroup recommends:

a) that the PSC Standing Committee for Research and Statistics (R&S) should provide consistency requirements required by PSC analyses and provide them to evaluators and hatchery managers;

b) agencies responsible for indictor stock tagging should submit to the R&S annual program plans for each indicator stock that include information on tagging levels, broodstock selection, pond replication, time of release, size of release, etc.;

c) PSC technical committees should review the program plans and discuss any concerns with the appropriate agency and hatchery programmer; and

d) PSC technical committees should provide an annual report of adequacy of indictor stock tagging programs.

2. Provision of accurate chinook escapement data was identified as a critical need of analysts for fishery exploitation rate estimation. The need for improved escapement estimates has been discussed numerous times by PSC technical committees during the past few years. The principal limitation in acquiring escapement data appears to be funding since essential estimation methodology is available. In times of current mass-marking scenarios calling for increased expenditures on CWT and sampling programs, the current lack of accurate and precise escapement data may imply that agencies are already underfunded for fisheries management.

3. Replication of tag codes between ponds was shown to vastly increase the power of simple hatchery evaluation experiments. The use of at least four tag code replicates is recommended and these should be assigned to different ponds or pond groups.

4. Determining appropriate tagging levels for hatchery evaluation experiments is often quite difficult; the wide variety in types of analyses adds to the complexity. A general guideline for a wide variety of experiments that has been accepted by a number of PSC technical committees suggests that tagging levels should be adjusted so that at least 30 tags from each group will be recovered in the minimum recovery strata of interest. This workgroup recommends that R&S take on the further task of enumerating and clarifying methodologies available for aiding in the design and analysis of CWT experiments.

5. This workgroup emphasizes the need to publish confidence intervals associated with parameter estimates and hypothesis test results along with parameter comparisons. Although this recommendation has long been acknowledged, many reports still contain only point estimates.

6. If selective fisheries are implemented, double index tagging should be utilized to preserve as much usability of the CWT database as possible.

7. The existing PSC database, used in PSC analyses, should be evaluated by the R&S and, if deficiencies are found, the PSC commissioners should be notified of the problem and its impact on PSC activities.

8. PSC analysts have long expressed concerns about bias in estimates generated from the PSC database. For example, the "book method" of estimating hatchery releases is thought to have overestimated the actual number released. This workgroup believes that a thorough analysis of bias is over and recommend that the R&S begin a project to assess the overall bias within PSC database.

9. Many of the problems identified here are the result of underfunding of data acquisition and analysis programs. The workgroup recommends that the PSC commissioners inform member PSC agencies that funding increases are needed to complete, update, and improve the PSC CWT database.

C. Adult Sampling; Moderator: Ron Olson

1. The scope of this panel and workgroup discussion was limited to hatchery rack sampling and escapement sampling. The inclusion of spawning ground sampling was to account for hatchery strays, i.e., those hatchery fish that spawn naturally rather than returning to their release facility. While sampling of fisheries was considered beyond the scope of this workshop, for many Alaskan enhancement facilities, fish caught in the terminal area harvest are included in their hatchery sampling process.

2. The recovery data generated from hatchery rack sampling is relatively straight forward. The total population being sampled and expansion factors for the recoveries generally do not have to be estimated. In summary it was found that:

a) hatchery rack sampling for tagged fish is routine and comprehensive for all agencies throughout the region;

b) for the vast majority of hatcheries, sampling is conducted at the 100% level when tagged fish are expected (subsampling occurs at some facilities that handle large numbers of returning fish);

c) sampling accuracy is an issue of concern (the Canadian Department of Fisheries and Oceans, CDFO, has found that the mean undetected mark rate exceeds 10% at some of their facilities) and needs to be reviewed by all agencies; and

d) undetected marks lead to underestimation of survival rates and production and to overestimation of exploitation rates of the fish represented by the tag code.

Recommendations for improving sampling quality at hatchery facilities includes:

a) define the sampling responsibility for the facility and simplify the sampling tasks wherever possible;

b) sample all ad-clipped fish whenever possible; if subsampling is necessary, incorporate a statistically sound design;

c) double check every batch of fish for undetected marks and double check mark tallies at the end of each activity period, i.e., incorporate formal re-examination into sampling procedures;

d) monitor the sampling efficiency of personnel, i.e., conduct spot checks on accuracy;

e) in regards to questionable fin marks - "when in doubt, take the snout;" and

f) review the counting accuracy of escapements at facilities.

3. Spawning ground data involve more complexities in sampling and reporting of the recoveries. Estimating the population size, calculating the appropriate sampling expansions, and physically obtaining the carcasses for sampling will involve statistical and logistical challenges. The importance of accounting for this component will vary greatly between facilities and will depend on such things as the release strategy. In summary:

a) it is recognized that accurate estimates of escapement are needed for PSC indicator stocks as incomplete estimates of escapement will lead to biased estimates of exploitation and survival rates for the CWT stocks;

b) in Southeast Alaska, hatchery straying has not been found to be significant where it has been investigated;

c) in British Columbia, most PSC chinook indicator stocks have associated stream sampling and/or test fishery programs to estimate the escapement of the CWT group, expanded estimates are maintained in an internal database; however, because of questions with the precision of these estimates, recoveries are not reported in an expanded manner;

d) in Washington, most PSC chinook indicator stocks have associated stream sampling and escapement estimation programs and the reported recoveries are expanded based on the escapement estimate; however, a variety of escapement estimation methods are used and many do not have estimates of precision;

e) coho salmon present difficult sampling problems with spawning occurring in small tributaries dispersed throughout the watershed, the spawning season being protracted in duration, stream conditions not being conducive to recovering carcasses, and water conditions affecting visual methods of escapement estimation throughout the spawning period; and

f) most agencies do not report expanded estimates of natural escapement for coho CWT groups and most PSC hatchery coho indicator stocks do not have adequate escapement estimation programs.

To address these problems, the following recommendations are made:

a) hatcheries should consider a thorough investigation of straying to see if they have a problem;

b) escapement estimation and sampling programs for CWT stock groups should be statistically designed, preferably allowing for estimation of variance; escapement estimation and CWT recovery involve different sampling considerations and it may not be appropriate to incorporate the two types of data gathering into one spawning ground sampling program;

c) possible biological biases in the sampling design should be considered;

d) for coho, test fisheries should be considered as a potential method of obtaining random samples from the escapement for estimating tagged/untagged and/or hatchery/wild ratios;

e) the R&S or its Data Sharing Committee should develop guidelines on methods/standards for reporting escapement data (e.g., when to report expanded versus nonexpanded data and should there be a maximum acceptable expansion factor); and

f) the PSC should sponsor a workshop on escapement estimation for indictor stocks.

4. The proposed electronic detection of coded-wire tags by the selective fisheries program could solve some of the ambiguity currently found in mark recognition and could also improve general sampling quality.

5. The PSC indicator stock program is recognized to need high quality escapement data for its indicator stocks; however, communication between the PSC analysts and hatchery managers has apparently been poor. Recommendations to improve communications include:

a) specific data needs by the PSC from the hatcheries need to be clearly defined by the PSC technical committees;

b) R&S should develop PSC guidelines on acceptable levels of data precision for spawning escapement estimation; and

c) a suggested method of increasing the communication flow is development of video presentations such as of the presentation given by Brian Riddell at this workshop that can be circulated to hatcheries.

D. Utilizing and Sharing Hatchery Data; Moderator: Dick O'Connor

1. Users of the Pacific States Marine Fisheries Commission's (PSMFC') regional Mark Processing Center are impressed with its services but expressed the need for several additional pieces of information, including age of CWT recoveries, tag codes with zero recoveries, and basin-region-hatchery codes for easy grouping of results. Although this last idea is "coming soon" to RMIS (Regional Mark Information System), it is available now through CRAS (Coded-Wire-Tag Recovery Analysis System) which is maintained by the Northwest Indian Fisheries Commission (NWIFC). CRAS also contains standard routines for performing cohort analyses that were derived from PSC technical committee work, but a version of CRAS absent these routines could be made available to PSMFC. NWIFC apparently would be happy to let PSMFC take over maintenance of this system, including the useful basin and region identifiers they have added to the standard PSC exchange format. One advantage to such an enhancement to RMIS is the ability of PSMFC to make its system widely available to data users coastwide due to its dialup and Internet accessibility. A recommendation was made:

that the Data Sharing Committee pool its members to see if the CRAS enhancements are useful enough to warrant their official adoption by PSMFC's Regional Mark Processing Center.

2. Data providers within this workgroup wanted to convey a message to the Data Sharing Committee abound the tendency for new fields of data to be "requested" of agencies from the Data Standards Work Group. Such fields are often called "optional," but peer pressure and the desirability for standardized data make "optional" a misnomer. A recommendation was made:

that the Data Sharing Committee require specific benefit statements from those who wish to add fields to existing exchange data files and that the cost of such new initiatives be examined.

3. Access to CWT data by hatchery managers was a concern. Questions arose about the systems we use to provide data to hatchery mangers; are they too cumbersome? Is there adequate access, especially to centralized collections of data. Is this really the information hatchery managers want, or do they want biological and analytical results from work on their CWT fish? A recommendation, again relating to communication between hatchery managers and analysts, was made:

that the Data Sharing Committee take the lead in identifying what hatchery mangers and regional hatchery operations managers need to know about their fish; the results can be referred to the Data Standards Work Group for further recommendations on how to provide for such needs.

4. A topic that generated a lot of discussion was that of data "ownership." PSMFC has been asked to provide copies of their entire CWT database to other parties, who then add capabilities or additional data and distribute it to others. The concerns expressed arose not so much from tight-fisted "ownership" of the data but from issues such as change control, adequate documentation of caveats, and user training. A lot of frustration was expressed by data managers in the workgroup, but all agreed that little can or should be done to stifle the free flow of exchanged CWT data. Some proposed that other parties who "add value" to such data sets be encouraged to share copies of their "enhancements" as a good-will gesture, thus extending the availability of their work to users coastwide. Others felt that coastwide users should always use the two official data exchange points (CDFO-Nanaimo and PSMFC-Gladstone). One way to encourage would be to implement electronic notification of database changes for all "subscribers" to these data exchange points. It was recommended:

that the Data Sharing Committee continue to publicize the data and services available at the two official PSC data exchange points at every opportunity and that it should encourage all PSC committees, work groups and teams to obtain their data from one of these two official sources to ensure that analyses are performed with the most current, official, validated data.

The workshop was successful at bringing together people working in hatcheries and those working in agencies analyzing the CWT data produced by the hatcheries. A common concern was lack of communication between hatchery folks and analysts about data needs and analytical results and it was felt that workshops such as this were productive. A recommendation heard in several of the discussions was the formation of some kind of team to facilitate communication on identification of indicator stocks, tagging and sampling requirements, and analytical results between hatcheries and PSC technical analysts. Another was the utilization of R&S to develop and convey sampling and data standards need for PSC analyses to agencies and hatcheries.

PSC Workshop on Hatchery CWT Methodology
January 10-12, 1995
NMFS Sand Point Auditorium (BLDG 9)
Seattle, WA
telef. 206-526-6632

SCHEDULE

Tuesday, January 10

9:30 - 11:30 am — **Opening Session**

A. Welcome	**Don Bailey & Norma Jean Sands, workshop coordinators**
B. Keynote Talk	**Kathryn Brigham, PSC Commissioner**
C. Producing hatchery data	**Don Buxton, Chilliwack Hatchery, BC** **Bruce Bachan, Medvejie Hatchery, AK** **Darrell Mills, Garrison Springs Hatchery, WA**
D. Using hatchery data	**Brian Riddell, cochair of Chinook Technical Committee**

1:00 - 5:00 pm — **Panel Session I - Mark and Release Estimation Procedures**

- **A. Moderator: Gary Freitag (SSRAA)**
- **B. Panel**
  1. **Mark Lewis (ODFW) - Estimation of the number of fish per raceway using truck displacement methods.**
  2. **Frank Thrower (NMFS, AK) - Survey of hatchery estimation techniques used in southeast Alaska enhancement programs.**
  3. **Chris Beggs (SEP) - Survey of hatchery estimation techniques used in Canadian enhancement programs.**
  4. **Don Bailey (SEP) - How SEP came to use book counts for juvenile enumeration.**
  5. **Andy Appleby (WDFW) - Survey of hatchery estimation techniques used in Washington enhancement programs.**
- **C. Discussion**

5:00 - 7:00 pm — **No Host Reception**

Wednesday, January 11

8:00 - 12:00 pm — **Panel Session II - Experimental Design and Data Analysis**

- **A. Moderator: Rich Comstock (USFWS)**
- **B. Panel**
  1. **Rich Comstock (USFWS) - Experimental design and sample size considerations for hatchery evaluation experiments.**
  2. **John E. Clark (ADF&G) - Determining appropriate tagging and sampling rates for management of mixed wild and hatchery stock fishery.**
  3. **-**
  4. **Jim Scott (NWIFC) - Uses of hatchery data by Pacific Salmon Commission Chinook Technical Committee.**
  5. **Marianna Alexandersdottir (WDFW) - Hatchery data needs for indicator stock tagging programs if selective harvest fisheries were implemented.**
- **C. Discussion**

1:00 - 5:00 pm — **Panel Session III - Adult Sampling**

- **A. Moderator: Ron Olson (NWFIC)**
- **B. Panel**
  1. **Ron Josephson (ADF&G) - Overview of adult sampling methods for Southeast Alaska enhancement projects.**

2. Ken Pitre (CDFO) - Overview of escapement sampling for Canadian coded-wire-tag studies.
3. Stan Hammer (WDFW) - Overview of adult coded-wire-tag sampling at Washington Department of Fish and Wildlife hatcheries.
4. Bill Tweit (WDFW) - Overview of spawning ground coded-wire-tag sampling by Washington Department of Fish and Wildlife.
5. Ken Phillipson (NWIFC) - Overview of escapement sampling for Western Washington tribal coded-wire-tag studies.
5. Robert Conrad (NWIFC) - A comparison of the number of hatchery chinook salmon returning with missing adipose fins and no coded-wire tags to the number expected.
6. Lee Blankenship (WDFW) - Electronic sampling technology for adult fish.

C. Discussion

Thursday, January 12

8:00 - 12:00 am — Panel Session IV - Utilizing and Sharing Hatchery Data

A. Moderator: Dick O'Connor (WDFW)

B. Panel:

1. Karen Crandall (ADF&G) - The PC-based CWT ASSIST Program for hatchery managers.
2. Mark Kimbel (WDFW) - "FOOTNOTES" - Setting up a coded-wire-tag database.
3. Ken Johnson (PSMFC) & John E. Clark (ADF&G) - Overview of the Regional Mark Information System (RMIS) with emphasis on coded-wire-tag release data - A case study.
4. Anne Kling (CDFO) - Hatchery Information Databases at CDFO
5. Susan L. Markey (WDFW) - Cleaning the coded-wire-tag recovery data stream.
6. Duane Anderson (PSMFC) - A "Distributed System" of summary information: One handy way to review straying of coded-wire-tagged fish.
7. Jay Delong (NWIFC) - "CRAS" - A standardized method for analyzing coded-wire-tag data.

C. Discussion

1:00 - 4:00 pm — Four Concurrent Workgroup Sessions

The moderator, panel members, and invited audience members from each panel session will meet in workgroup format to continue the discussion from their session and to develop summary statements, conclusions, and recommendations.

4:00 - 5:00 pm — Concluding Remarks

A. Gary Freitag
B. Rich Comstock
C. Ron Olson
D. Dick O'Connor
E. Norma Jean Sands & Don Bailey

ACRONYMS

ADF&G	Alaska Department of Fish and Game
CDFO	Canadian Department of Fisheries and Oceans
CRAS	Coded-wire-tag Recovery Analysis System
CWT	Coded-wire-tag
NMFS	National Marine Fisheries Service
NWIFC	Northwest Indian Fisheries Commission
ODFW	Oregon Department of Fish and Wildlife
PSC	Pacific Salmon Commission
PSMFC	Pacific States Marine Fisheries Commission
R&S	Research and Statistics
RMIS	Regional Mark Information System
SEP	Salmon Enhancement Program (under CDFO)
SSRAA	Southern Southeast Regional Aquaculture Association
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

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