

CWT Workgroup Report

January 2008, PSC meeting
Marianna Alexandersdottir

Pacific Salmon Treaty Memorandum of Understanding

“The Parties agree to maintain a coded-wire tagging and recapture program designed to provide statistically reliable data for stock assessments and fishery evaluations.”

Uses of CWTs

- Survival and patterns of exploitation
- Regional Planning Models
- Abundance Forecasting
- Stock Productivity
- Monitoring and Post-Season Reviews
- Hatchery evaluation
- Many other

CWT Program provides vital data

- **Only historic record of stock-specific impacts over time, since 1970's**
- **Fully integrated tagging, sampling and recovery programs coast wide**
- **Cohort analysis provides estimates of exploitation rates and survival**
- **Evaluation of fishery impacts**
- **Fundamental management tool**

Coastwide assessments

- Ability to assess and manage harvest of coho and Chinook salmon in multi-stock fisheries coast wide from Alaska to California
 - Coho - Predominantly harvested as maturing fish during second year of marine residence
 - Chinook - Harvested as mature and immature fish over several years

Emerging problems with CWT program

- Decrease in survival
 - Decrease in fishery harvest
 - Redistribution of CWTs to fisheries where CWT recoveries and accurate estimates of total catch are more difficult to obtain
 - Increase in escapement including strays to natural spawning grounds
 - Complications from mass marking and mark-selective fishing
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- ➔ Decrease in number of CWTs recovered
 - ➔ Increase in statistical uncertainty

Expert Panel

- 2004 - PSC convened an eight member Expert Panel of scientists to examine the CWT program, consider new and emerging technologies, and provide recommendations to the PSC
- 2006 - Panel Report (Hankin et.al. 2005) published
- 2006 - PSC appoints CWT Workgroup

CWT workgroup

- 8-10 members
- Define tasks to address short-term recommendations of the Expert Panel Report, especially those which require immediate attention for the CWT program.

Representation on the CWT work group

- Marianna Alexandersdottir (NWIFC, Chair)
- Ethan Clemons (ODFW)
- Carrie Cook-Tabor (USFWS)
- Allen Grover (CDFG)
- Annette Hoffmann (WDFW)
- Ron Josephson (ADFG)
- Scott McPherson (ADFG)
- Mike Matelywich (CRITFC)
- Gary Morishima (QIN)
- George Nandor (PSMFC)
- Chuck Parken (CDFO)
- Patrick Pattillo (WDFW)
- Brian Riddell (CDFO)
- Norma Jean Sands (NMFS)

Viability of the CWT System

- Defined by the ASFEC (1995) as:

(1) *“the ability to use CWT data for assessment and management of wild stocks of coho and Chinook salmon”* – **review of indicator stocks**

(2) *“Maintaining the program such that the uncertainty in stock and fishery assessments and their applications does not unacceptably increase management risk.”* – **evaluation of uncertainty & QA/QC**

(3) *“the ability to estimate stock-specific **exploitation rates** by fishery and age.”* – **review of tagging and sampling programs**

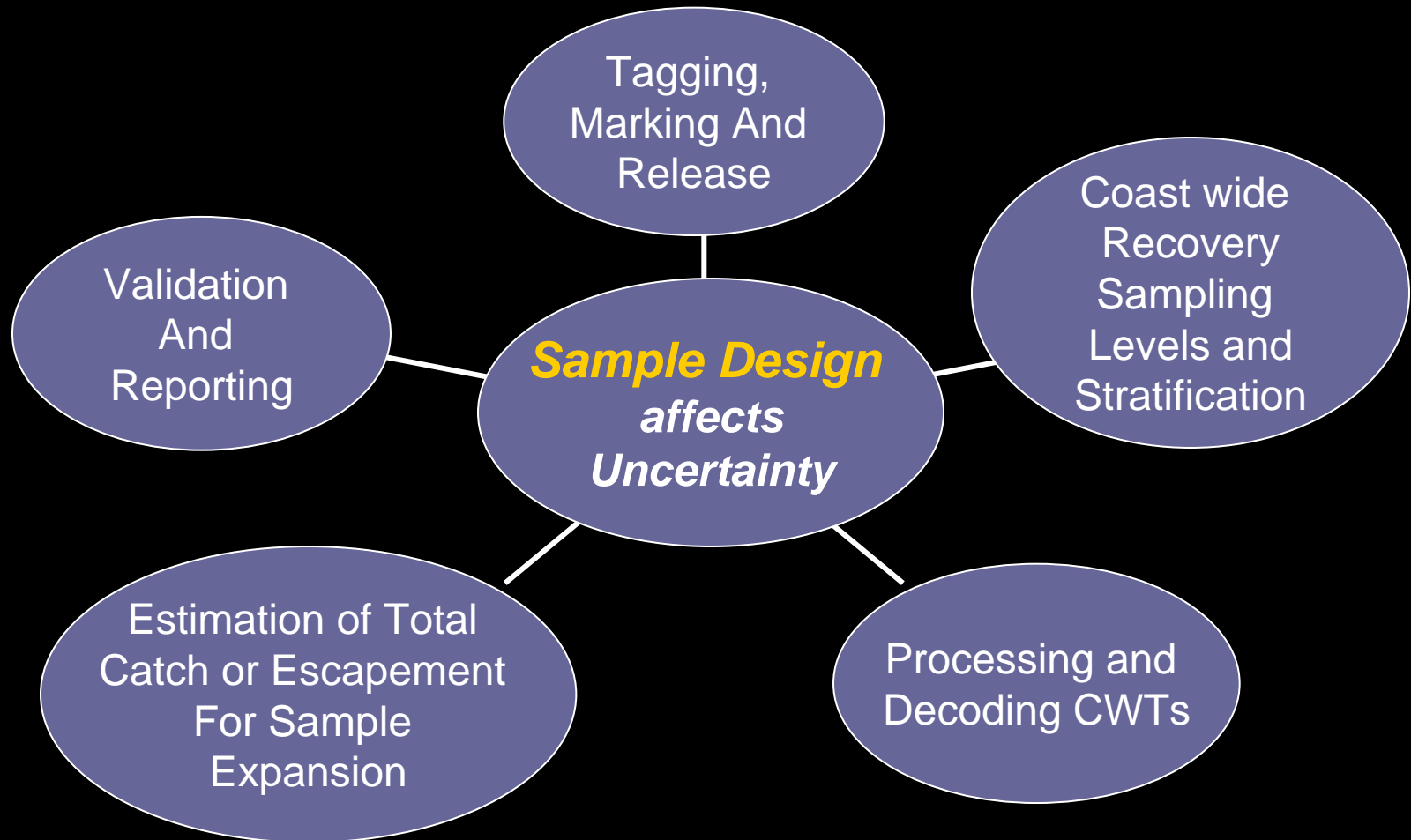
Workgroup Focus Areas

- **Indicator stocks (Chinook) and regional tagging (coho)– representing natural stocks**
- **Quality control and assurance**
- **Uncertainty and Experimental Design – tagging and sampling programs**
 - **Planning tool**

Organization of CWT Workgroup Report (in preparation)

- Four primary chapters plus extensive appendices to support summary tables and recommendations.
 - Chapters 1-3 Introduction & Context
 - **Chapter 4, Current Status of the CWT Program**
 - **Chapter 5, Criteria for Precision and Accuracy.**
 - **Chapter 6, Decision Theoretic Model**
 - **Chapter 7, Conclusions and Recommendations**
 - **Appendix containing Agency-specific recommendations for addressing issues**

Components of the CWT Program



Components of Uncertainty

- Precision (random sampling error)
 - Tags Recovered
 - Number of fished tagged,
 - Sample rates for fisheries and escapements.
 - Precision of estimates of total harvest or escapement used to calculate sample expansion.
- Bias (non-random error)
 - Sample coverage for fisheries and escapements,
 - Non-representative sampling, and
 - Bias in catch or escapement estimates.

Bias a greater concern than precision

Status Review

- Release size
- Recoveries in Escapements
 - Sample Rate
 - Precision of Total Escapement Estimate
- Recoveries in Fisheries
 - Sample Rate
 - Precision of Total Harvest Estimate
- Minimum Recoveries

Snapshot Tables

Consolidated information coastwide for Chinook and coho

- Rows – individual indicator stocks
- Columns – stock-specific and mixed-stock fisheries
- **Red-Yellow-Green** ~ degrees of concern
- Blank means fishery impact does not meet criteria (>2.5% of total estimated recoveries) for a given stock

Chinook Indicator Stock Summary

Stock Information			Regional Marine Fisheries																										
Region	Stock	Key Issues						Fishery Specific Key Issues																					
		Release	Escapement (Hatchery)	Escapement (Sp Group)	Term Com	Term Native	Term Sport	SEAK TR	SEAK Sport	SEAK Net	NCBC Troll	NCBC Sport	NCBC Net	WCVI Troll	WCVI Sport	Geo Strait Troll	Geo Strait Sport	SBC Net	WAOcn Troll	WA Ocn Sport	PS Sport	WA Net	Col Riv Sport	Col Riv Net	OR Coast Troll	OR Coastal Sport	CA Troll	CA Sport	
Alaska	Alaska Central Inside	1	1	1				1	2																				
	Little Port Walter	1	1	1				1																					
	Alaska Southern Inside	1	1	1	1			1	2																				
Canada	Big Qualicum	1	1		3	3	3	2				3					3												
	Chilliwack (Harrison Fall Stock)	2		2										1	3		2		1										
	Cowichan	1	1			3	3							2	3						2								
	Kitsumkalum	1				3	3	1				3	3																
	Puntledge	2	1		3	3	3	2									3												
	Quinsam	1	1	1	3	3	3	1																					
	Robertson Creek	2	1	1	1	2	3	1																					
	Snootli	3			3	3	3	2			2	3	2																
Washington	George Adams Fall Fingerling	1	1	3	2		3							1	3				1		1	2							
	Green River Fall Fingerling	1	1	2	1										1	3		3		2		1	1						
	Grovers Creek Fall Fingerling	1	1												1	3													
	Hoko Fall Fingerling	3	1	2				1			2									1		1	1						
	Nisqually Fall Fingerling	1	1		1		3								1						1								
	Nooksack Spring Yearling	1	1											2			3												
	Nooksack Spring Fingerling	2	1	2				2						1	3		3												
	Queets Fall Fingerling	2		3	1			1			1	3																	
	Samish Fall Fingerling	1	1				3								1	3		3		2		2	1						
	Skagit Spring Fingerling	1	1												1	3					2								
	Skagit Spring Yearling	2	1												1	3					1								
	Sooes Fall Fingerling	2	1		2			2			2	3																	
	South Puget Sound Fall Yearling	1	2		2											3					2	2							
	Squaxin Pens Fall Yearling	3			2										2						1	2							
	Skagit Summer Fingerling	3						1				3			2	3		3											
	Stillaguamish Fall Fingerling	3	1	2											2	3		3			2								
	White River Hatchery Fingerling	1	1	3																	2								
	White River Hatchery Yearling	1	1																		2								
	White River Fall Fingerling	3	1											2							2								
	White River Spring Yearling	3	1																		2								
Oregon	Salmon River	2		1			2	1			1																		
Columbia River	Cowlitz Tule	1	1	3				2						2	3				2	2				2	2				
	Hanford Wild	1		2				1			2													1					
	Columbia Lower River Hatchery	1	1											1	3				1	2				1	1				
	Lewis River Wild	3						2			2				2	3							2	2					
	Lyons Ferry	3												2										1	2				
	Spring Creek Tule	1	1												1	3								1	1				
	Columbia Summers	1	1					1			1	3		1	3				1						1				
	Upriver Bright	1	1					1															1						
	Willamette Spring	1	1				2	1															1						
California	Sacramento falls	1	1	3			3																		1		1	2	
	Sacramento winters	3	1	1			3																				3		
	central valley spring	1	1	3			3																		1		1	2	
	Klamath-Trinity falls	1	1	1		1																				1			
	California coast	3	3	3																							2	3	
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5/1/2008

Workgroup Review of CWT Program

■ General Categories

- Tagging Issues
- Sampling Issues
- Estimation of total harvest and escapement
- Bias Issues
- Reporting and validation

Workgroup Review of CWT Program

- Identified Individual Issue
 - Problem
 - Consequence
 - Solutions

Review (example)

ISSUE 10 (Bias): Incomplete Coverage of Fisheries or Escapement Areas

Problem	Consequences	Solution
All fishery or escapement locations where tagged fish are present are not sampled.	Estimates of tagged fish are missing for unsampled fishery or escapement strata. Therefore, estimates of cohort size and ERs are biased, generally overestimated or zero. This could result in over fishing or in unnecessary fishery closures.	All locations where tagged fish for indicator or regional stock groups are present should be reviewed for importance to estimation of total cohort size. If presence of tagged fish is substantial these locations should be sampled.

Regional Reviews

- Regional representatives reviewed programs within their agencies, identified issues, and proposed solutions.
- Assigned priorities and, where possible, estimated costs

Regional Reviews (example)

ISSUE 10 (Bias): Incomplete Coverage of Fisheries or Escapement Areas

	Chinook		Coho	
Region	Priority	Reason for priority	Priority	Reason for priority
British Columbia	Low to Medium	Unsampled commercial fisheries are small and past sampling indicated few, if any, indicator stock CWTs. Some sport and Native fisheries are unsampled.	Low to Medium	Same comment as Chinook.
Columbia River	High	Increase sampling of summer sport fisheries in the Columbia River given appropriate funding.	Low	Escapement sampling is currently occurring to meet management objectives at ESU levels. Additional funding would be needed to implement directed fishery sampling programs beyond those that are currently prosecuted
	High	Modify sampling in lower Columbia River to allow for recoveries of DIT fish		
	High	Equip samplers with appropriate gear to collect tags in escapement.		

Results of status review

- Increased investment will be required to maintain the viability of the CWT program, but corrective actions can be taken at reasonable cost so that agreed objectives can be met
- CWT program must be dynamic, capable of responding to changes in fisheries and environment ➡ Planning tool.

Design Elements for a Planning Tool

- Management and statistical objectives
- Number of tags released
- Sampling rates and resolution
- Coverage
- Estimation of catches or escapements
- Survival rates

How can we get the most improvement for the least cost by addressing the factors we can control?

Recommendations - Coverage

The workgroup identified gaps in geographic and stock-type tag representation (Section 7.1 and 7.3) which should be addressed by the PSC and agencies.

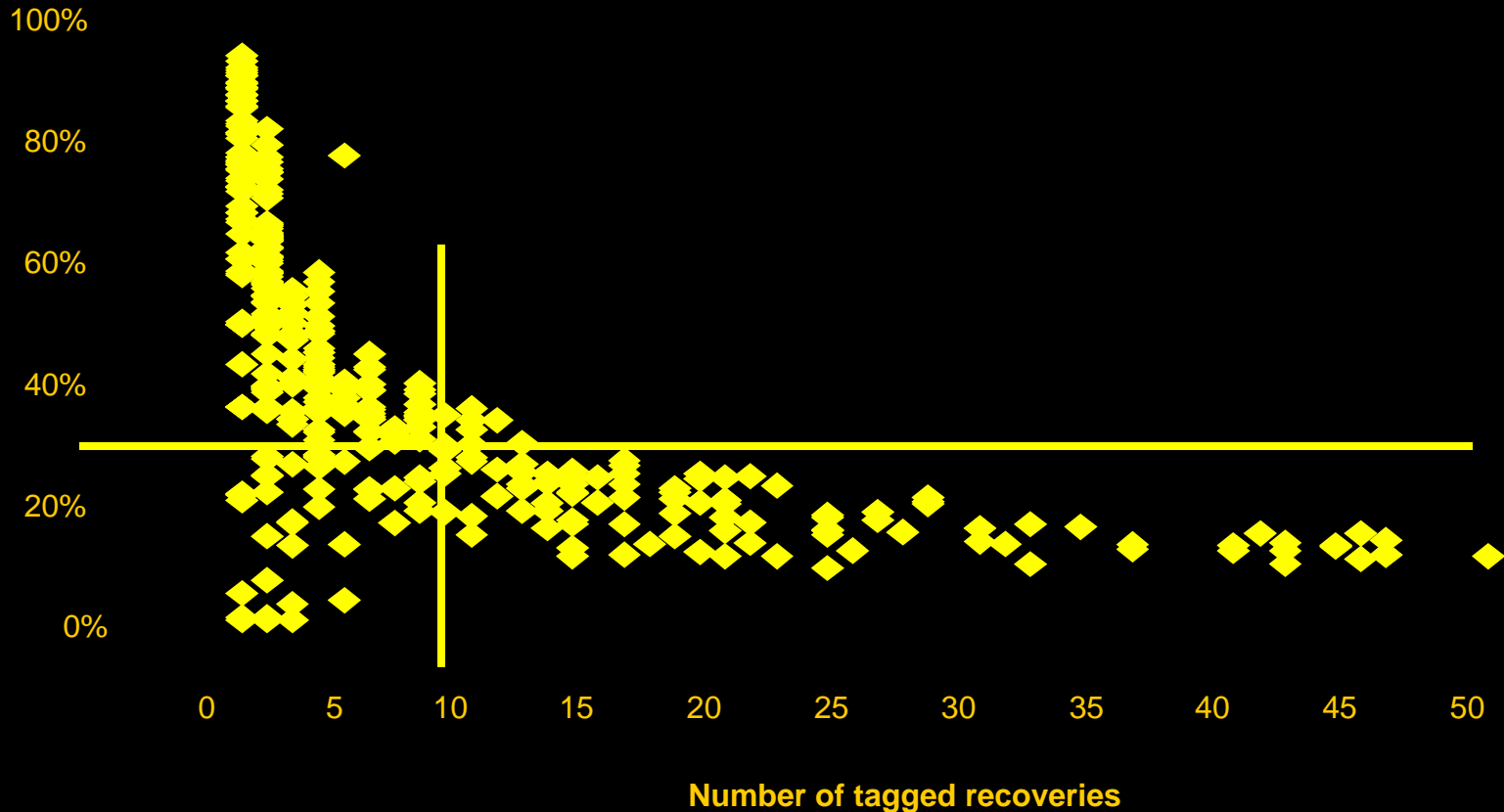
- Coho coverage. There is no formal coho coast-wide indicator stock program, but all tagged releases are used where appropriate. (See Table D-1).

Recommendations - Precision

Guidelines for improving the quality of CWT data for PSC management:

- A minimum of 10 tags per fishery stratum is required to provide estimates of exploitation rates that are of minimally sufficient precision
- In order to achieve the minimum number of tags recovered in fisheries and escapement, sample rates and/or tag release group size should be evaluated on a stock-specific basis.
- Precision of total catch and escapement estimates limits the precision of CWT estimates.

Uncertainty in CWT Estimates of ERs (PSE = % Standard Error)



10 tags \rightarrow PSE(ER) \sim 30% if PSE(N) = 0%

Recommendations - Bias

- All fisheries and escapement locations should be sampled directly (Chapter 5.3 and 7).
- Agencies should evaluate their catch and escapement estimation programs to ensure that they are comprehensive and representative.

Recommendations – QA/QC

Quality control for reporting and validation of CWT data needs to be improved

- A workgroup including members of the CoTC, CTC, Data Sharing, and SFEC should be established to provide recommendations to strengthen the current validation process (Chapter 7.2 and 7.4).
- Agencies should evaluate their sampling programs to ensure that the data required to evaluate the impacts of mark-selective fishing are adequately reported.

Summary

A viable CWT system is needed to support management needs for stock-age-fishery specific exploitation rates and is achievable.

- **Agencies will need to identify specific actions that most effectively and efficiently improve the CWT system (see Appendix A).**
- **Each agency should review its CWT tagging and sampling programs and provide the PSC with a written plan to address Workgroup recommendations by October 1, 2008**
- **The PSC should support the development of a multi-stock, multi-fishery decision theoretic tool to inform decisions regarding information return and costs coastwide.**