

Taku River Sockeye Stock Assessment and Escapement Goal Review 2018

Alaska Department of Fish and Game - Final Report

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Executive Summary

The Taku River sockeye stock assessment and escapement goal review project is well under way. A bilateral working group was formed in early 2018, has been meeting regularly, and making steady progress. Significant amounts of data and literature have been compiled, reviewed, discussed, and preliminary analyses are occurring. Assumptions and biases of the current mark-recapture program are being addressed, and all historical sockeye return data has been reanalyzed as of June 2019. The current Taku River sockeye escapement goal will be reviewed using this updated data run through state-space spawner-recruit models beginning in June 2019. A draft project report will be prepared for review by experts as well as the Canadian CSAS peer review process through fall 2019. A final report will be presented to the Transboundary Panel in late 2019, for recommendation by February 2020. This is anticipated to meet the deadline set out in the Pacific Salmon Treaty for implementation by the 2020 fishing season.

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1.0 Introduction

This project is intended to complete a task identified in the Pacific Salmon Treaty (PST) (PSC 2019), Chapter 1, Item 3.b.i.C., which states:

“The Taku River sockeye salmon assessment program will be reviewed by two experts (one selected by each Party) in mark-recovery estimation techniques. The Parties shall instruct these experts to make a joint recommendation to the Parties concerning improvements to the existing program including how to address inherent mark-recovery assumptions with an aim to minimize potential bias prior to the 2020 fishing season.”

In early 2018, Transboundary Technical Committee (TTC) of the Transboundary Panel recommended that a bilateral working group be formed to address the task and provide support to the “two experts”. In recognition of the workload and expense this task would incur upon both Canada and the U.S., a joint proposal to the Northern Endowment Fund (NEF) was submitted for 2018-19 and subsequently approved by the NEF.

Since this time, it has been recognized that the project will not be completed within one fiscal cycle of either Party, and a second supporting joint proposal has been submitted to the NEF for the coming year to allow the project to be completed within the PST prescribed timeline.

This report presents a summary of progress to date, the anticipated path forward, and presents the U.S. budget accountability to the NEF for the 2018-19 fiscal year.

Background

The Taku River is a transboundary river system that originates in the Stikine plateau of northwestern British Columbia and terminates in Taku Inlet in Southeast Alaska. Approximately 95% of the Taku River watershed lies within Canada and it produces a large run of sockeye salmon that is jointly managed by the Alaska Department of Fish and Game (ADF&G) and the Department of Fisheries and Oceans Canada (DFO). The U.S./Canada Pacific Salmon Treaty of 1985, and subsequent additions to the original treaty, established conservation (71,000 to 80,000 escapement goal) and harvest sharing (percentage sharing of the allowable catch) objectives for the Taku River sockeye salmon run. Inseason estimates of the spawning escapement of Taku River sockeye salmon, obtained through a mark-recapture program, are needed to fulfill the escapement goal and international harvest sharing requirements specified by the Pacific Salmon Treaty.

The Taku River mark-recapture project has been conducted annually since 1984 (Clark et al. 1986; McGregor and Clark 1987, 1988, 1989; McGregor et al. 1991; Boyce and Andel 2012, 2014) and operates as a joint U.S./Canada program involving ADF&G, DFO, and the Taku River Tlingit First Nations (TRTFN) to provide weekly estimates of the Taku River salmon escapement past Canyon Island, Alaska. U.S. and Canadian fishery managers use CPUE and stock composition data from the U.S. District 111 and Canadian Taku River commercial gillnet fisheries and escapement estimates from this project to adjust fishing times, catches, and escapements. The recently renegotiated Chapter 1 of the Pacific Salmon Treaty (2019) includes a bilaterally endorsed task to review the stock assessment program and make recommendations for improvements to be implemented during the next agreement period.

The Taku River is a large and complex system, with multiple tributaries and lake systems, as well as inriver indigenous, personal use, subsistence, and commercial sockeye salmon fisheries, which create special challenges for mark-recapture work in the drainage and for escapement goal analysis. Improvements to inseason and total escapement estimates of sockeye salmon on the Taku River will affect all aspects of fisheries management and lead to more efficient and sustainable utilization of the resource by the U.S. and Canada. Among the stock assessment challenges that will be examined by the review team includes issues with tag loss, tag-induced mortality, and tag misidentification or non-reporting in the mark-recapture project, fish sampling protocols at the Canyon Island fish wheels, improving estimates of the distribution of mainstem and tributary spawners in the drainage, and assessing weir projects on Canadian tributaries. Additionally, methodologies to compliment the current program will be explored with the intention of strengthening both inseason and post season estimates of Taku River sockeye salmon.

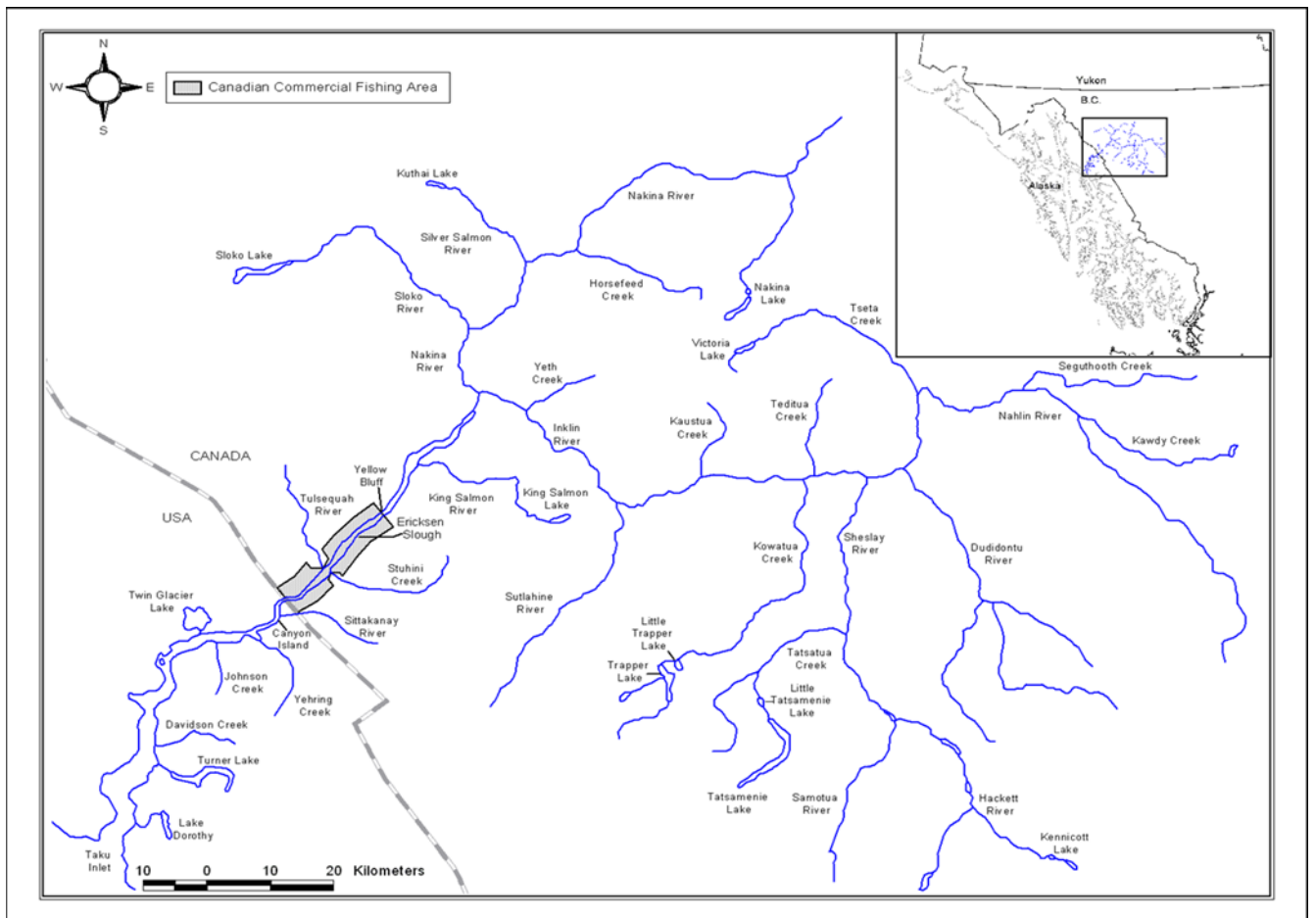


Figure 1. The Taku River drainage and major tributaries showing Canadian commercial fishing areas.

2.0 Objectives

The specific objectives expected to be achieved by the end of this project are:

1. Review the current sockeye salmon stock assessment program on the Taku River and make recommendations that will improve escapement estimates to the drainage;
2. Produce an updated bilaterally accepted escapement goal;
3. Document results of the stock assessment review and escapement goal analysis in a report published through the Pacific Salmon Commission.

The approach identified in the 2018 detailed proposal to the Northern Endowment Fund (NEF) was:

1. Review of Current Assessment Program
2. Exploration of Alternative Assessment Techniques
3. Escapement Goal Review

3.0 Progress to Date

A working group was formed in April of 2018, that included task relevant biologists, biostatisticians, and subject matter experts. There have been a few minor membership changes over the year, but the current working group consists of:

Julie Bednarski – ADF&G – Fisheries Biologist - Co-chair
Aaron Foos – DFO – Sr. Aquatic Science Biologist - Co-chair
Dr. Robert Clark – ADF&G – Fisheries Scientist
Dr. Carl Schwarz – DFO – Consulting Biometrician
Ian Boyce – DFO – Sr. Aquatic Science Biologist
Sara Miller – ADF&G – Biometrician
Dr. Paul Vecsei – DFO – Sr. Aquatic Science Biologist
Rich Brenner – ADF&G – Sockeye Research Biologist
Bonnie Huebschwerlen – DFO – Aquatic Science Biologist
Richard Erhardt – TRTFN – Consulting Biologist
Dr. Dave Bernard – ADF&G – Consulting Biometrician
Gottfried Pestal – DFO – Consulting Biometrician
Andrew Piston – ADF&G – Fisheries Biologist
Jeff Williams – ADF&G – Fisheries Biologist

The detailed approach adopted by the working group was to compile all relevant data, information and literature, then fully review the current mark-recapture assessment program in order to identify assumptions and biases, identify areas of improvement, and make recommendations on changes and improvements. Those recommendations would then be applied to generate more robust annual estimates of historical Taku sockeye run sizes based on the original data, and these improved run size estimates will be used to inform the escapement goal review. A concurrent review of alternative and/or supporting assessment techniques will occur, and recommendations incorporated where appropriate. Once the working group has completed its recommendations on the assessment program and reviewed the escapement goal, their report will be formally reviewed by the “two experts” and final outcomes will be subjected to domestic science reviews in each country. The formal Canadian process (Canadian Science Advisory Secretariat (CSAS)) will be the primary peer science review and involve representation throughout the process by relevant members of the working group including the “two experts”.

To date the working group has held eleven teleconferences and two in person meetings. The collaboration and cooperation of the Parties to date has been excellent and progress has been steady. Updates on progress to date follow.

Taku Sockeye Stock Assessment Program Review

The review began with both parties investing significant time and resources into identifying, organizing, compiling, and verifying all available relevant data (Appendix 1). The volume of data are significant as fisheries and assessment of sockeye has been ongoing in the Taku watershed for nearly 40 years. Data were in disparate levels of organization, storage formats, and accessibility, so much work has gone into this aspect of the task to ensure that all data can integrate. Cleaned data are being shared bilaterally among the working group using a SharePoint site which all working group members have access to.

Concurrent with the data preparation has been an extensive literature review compiling all relevant scientific and technical publications relevant to Taku River sockeye. This has included data reports, stock assessment techniques, published assessment methodologies, etc. All reports have been catalogued and summarized for relevance to the Taku project and are uploaded to the shared bibliography website Mendeley.com. All members of the working group have access to this site.

Since early 2019, preliminary data exploration and analysis have been occurring on various aspects as the data are available. As the working group progressed into working with the clean Taku sockeye data; summarizing, exploring, and analyzing the data and trends, answering questions, investigating biases, etc, we have been using a shared GitHub repository to share data files, R code, issues, and work plan updates.

Up to this point, the working group has thoroughly discussed and identified assumptions and biases of mark-recapture, has been testing these assumptions, and proposing and testing means of addressing identified issues.

Preliminary discussions have occurred around assessment tools and data sources additional to mark-recapture (i.e. genetic tools) that may have potential for supporting or providing alternative techniques for Taku sockeye stock assessment moving forward.

4.0 Ongoing and Future Work

The 2018 NEF project funding to Canada for this project ended March 31, 2019 following the Canadian fiscal year. The 2018 funding to U.S. under the same proposal extended until June 30, 2019, the U.S. fiscal year end. The NEF has supported a bilateral 2019 proposal and provided an additional year of funding to the project. This funding will support the project through to an on-schedule completion by “the 2020 fishing season” as identified in Chapter 1 of the PST (PSC 2018).

Taku Sockeye Stock Assessment Program Review

The working group will continue to complete its review of Taku sockeye stock assessment and exploration of alternative techniques, and will meet regularly by teleconference, supported by in-person meetings as required. Finalization of mark-recapture recommendations and the reanalysis of historical run sizes was completed in May 2019, and escapement goal analysis has begun.

Taku Sockeye Escapement Goal Review

The working group has recommended the escapement goal review be conducted using state-space spawner-recruit models following methodology described in Fleischman and Reimer (2017). These analyses began in June 2019.

Reporting and Expert Review

The working group will prepare a draft report on the review, recommendations, results, and proposed escapement goal for formal review by the “two experts” by end of September 2019. The experts have been identified as Dr. Robert Clark for the U.S. and Dr. Carl Schwarz for Canada, both of whom are participants in the working group.

Peer Science Review Process

The final report is scheduled to enter the Canadian CSAS peer review process beginning in October 2019. This process will require support from the two experts as well as other key members of the working group.

PSC Endorsement

The working group will present an update to the TTC in December 2019, and the final peer reviewed report will be presented to the Transboundary Panel at the 2019 postseason meeting in January 2020. The Panel will provide its recommendations or endorsement of the report by its Annual meeting in February 2020. The TTC will implement Panel recommendations for the 2020 fishing season at the TTC preseason meeting in February 2020.

5.0 Budget Summary

The Northern Endowment Fund allocation to ADF&G of \$20,000.00 was not fully expended. Total expenditures of NEF funds amounted to \$7,450.09 which is \$12,549.91 under budget. This is due to ADF&G not requiring the full amount budgeted for contract services, and reduced travel costs due to having in-person meetings coincide as much as possible with existing PSC meetings. All expenditures related to the cost of travel for Working Group members to attend in-person meetings. A budget summary of expenditures can be referenced in Appendix 2.

6.0 Acknowledgements

The primary author would like to acknowledge the contributions to date on this process from Aaron Foos of DFO. His participation and assistance was fundamental to getting the project underway and he took on the bulk of the effort to keep the project moving forward on schedule early in the project, and has continued to take on a significant amount of work to keep the process on track. Working group co-chair Julie Bednarski has also provided extensive advice, information and support to the process while being invaluable in helping keeping us all on task and schedule. The support of Bill Waugh (DFO) and Ed Jones (ADF&G) as co-chairs of the TTC has also been very appreciated. Teresa Bachynski, Adam Brennan, and Ian Boyce of DFO invested months of work into meticulous data organization and preparation, their dedication to this tedious task was exemplary. Sara Miller and Ray Vinzant have provided similar data support from ADF&G, many thanks to them as well. Paul Vecsei of DFO spent countless hours compiling relevant literature for the review. Gottfried Pestal of SOLV Consulting has been invaluable support in assisting with data compilations, coding analysis scripts, and generating numerous exploratory data analyses to date, we would be hopelessly behind schedule without his assistance and coordination. Angus Mackay of the PSC has been very supportive with contract administration that has greatly

streamlined contract delivery. And finally, thank you to all working group members and contributors for your active and engaged participation in this project!

7.0 Literature Cited

- Boyce, I.M. and J.E. Andel. 2012. Mark–recapture studies of Taku River adult sockeye salmon stocks in 2009. Pacific Salmon Comm. Tech. Rep. No. 29: 52p.
- Boyce, I.M. and J.E. Andel. 2014. Mark–recapture studies of Taku River adult sockeye salmon stocks in 2012 and 2013. Pacific Salmon Comm. Tech. Rep. No. 32: 75p.
- Clark, J. E., A. J. McGregor, and F. E. Bergander. 1986. Migratory timing and escapement of Taku River salmon stocks, 1984-1985. In ADF&G (Alaska Department of Fish and Game) Section Report in 1985 Salmon Research conducted in Southeast Alaska by the Alaska Department of Fish and Game in conjunction with the National Marine Fisheries Service Auke Bay Laboratory for Joint U.S.-Canada Interception Studies. Division of Commercial Fisheries, Final Report, Contract Report WASC-85-ABC-00142 Juneau, Alaska.
- Fleischman, S.J. and A.M. Reimer. 2017. Spawner-recruit analyses and escapement goal recommendations for Kenai River Chinook salmon. Alaska Department of Fish and Game, Fishery Manuscript Series No. 17-02, Anchorage.
- McGregor, A. J., and J. E. Clark. 1987. Migratory timing and escapement of Taku River salmon stocks in 1986. Final Report - 1986 Salmon Research Conducted in Southeast Alaska by the Alaska Department of Fish and Game in Conjunction with the National Marine Fisheries Service Auke Bay Laboratory for Joint U.S.-Canada Interception Studies. Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau.
- McGregor, A. J., and J. E. Clark. 1988. Migratory timing and escapement of Taku River salmon stocks in 1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J88-26, Juneau.
- McGregor, A. J., and J. E. Clark. 1989. Migratory timing and escapement of Taku River salmon stocks in 1988. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 1J89-40, Juneau.
- McGregor, A. J., P. A. Milligan, and J. E. Clark. 1991. Adult mark–recapture studies of Taku River salmon stocks in 1989. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 91-05, Juneau.
- Pacific Salmon Commission. January 2019. Pacific Salmon Treaty.

Appendix 1 - Summary of data sources available to inform Taku River sockeye assessment review and escapement goal revision project.

Summary of data sources				
US Fisheries	Fishwheels	Canadian Fisheries	Escapement (4 lakes)	Enhancement
Catches - 1980 on	Catches – 1980? on	Catches – 1979 on	Counts	Locations
Effort	Effort	Effort		Broodstock data
Age Comp	Age Comp – 1983 on	Age Comp – 1980 on	Age Comps	ASL/oto/egg take
Sex and Length	M/R Event I – 1984 on	M/R Event II – 1984 on	M/R Event II – 1984 on	Egg take data
Stock Comp	Sex and Length Data	Sex and Length Data	Sex and Length Data	Stocking Data
SPA – 1986 - 2011	Stock Comp	Stock Comp	Smolt Data (Tats)	Smolt Data (Tats)
Otolith Marks		SPA – 1981 - 1990	Otolith Marks	Otolith Marks
GSI – 2012 on	Radio Tagging Data	Otolith Marks		
	GSI	GSI – 2007 on	Aerial Surveys	
			Brain parasite data	
Global items – GSI Baseline				

Appendix 2 - Budget Summary of ADF&G Expenditures

Appendix A 1.—Financial statement of expenditures.

Table 5.—Allocated and expended costs for major spending categories in the Northern Fund project Taku River Salmon Stock Assessment Review and Escapement Goal Revision, 2018.

Line Item	Allocations	Expenditures	Balance
Personnel	\$0	\$0	\$0
Travel	\$15,000	\$7,450.09	\$7,549.91
Contractual ^a	\$5,000	\$0	\$5,000.00
Commodities	\$0	\$0	\$0
Equipment	\$0	\$0	\$0
Administrative Overhead	\$0	\$0	\$0
All Lines	\$20,000.00	\$7,450.09	\$12,549.91

^ano subcontractor was used.