

Interim report for SEF Project:

“Evaluation and coordination of information useful for predicting en-route loss in Fraser sockeye”

Investigators:

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The following is an update on the progress to date regarding this project. The progress is based on the 4 primary objectives. The main focus in the first year was to review the format of fish condition and environmental information currently provided by 4 main groups to the Fraser Panel (DFO-Science Environmental Watch program, DFO-Resource Management, DFO-Science Stock Assessment, and other research groups in the Fraser River basin), explore the strength of evidence of fish condition parameters to predict survival, prepare a literature review on how condition and injury have been assessed and/or considered in mortality estimates in other fisheries, and compare the collection formats of this data by various groups in the Fraser River basin. Overall, we have made considerable progress on most objectives and are confident we will complete the project on time.

OUTCOME 1) Standardize contextual information (e.g. current value, historic values, sample size, & variance) for each available source of information in a user friendly format.

Standardized contextual information

The following 4 groups provide fish condition and environmental information to the Fraser Panel. Within each of these groups, the format in which this information is provided has been reviewed to improve user-friendliness and compatibility with other data collection platforms. Each group is currently undertaking activities and has future tasks lined up to support the standardization of contextual information. A task to coordinate between all groups working on the river is to summarize information on an annual basis and evaluate to determine their potential utility (i.e. are the observations from opportunistic platforms consistent with more structured collection information?).

1. DFO-Science Environmental Watch program
 - Exploring how to present the cumulative exposure of environmental conditions to specific stocks or stock aggregates (Kaitlyn Dionne)
 - Evaluating the relationship between discrepancy mistakes (difference between estimates = DBE) and multi-site environmental data in a quantitative model (Kaitlyn Dionne)
 - Compilation of historical data of flow conditions for each site (max 4 years of data at 15 locations) and reports historical median and range of values completed
2. DFO-Resource Management
 - Exploring how to update the bio information file to make it more user-friendly for creating reports (Jamie Scroggie)
 - Will identify how to improve the information collected and how to improve how the information is being presented (e.g. racial information on catch; historic context for observations for a given location and date)
 - Will provide estimates of the number of fish released in for in-river catches; with the assumption that the majority are not retained due to poor fish condition (e.g. marks, lesions)
 - Examined the utility of applying catch monitoring reports on fish condition and carcass observations to the Qualark test fishery and the Thompson Index fishery to have a more systematic spatial coverage of the watershed and allow better synchrony of stock ID and fish condition
3. DFO-Science Stock Assessment
 - Compilation of historical information such as normal PSM – range for early component, historical arrival periods
 - Will coordinate with Environmental Watch program to report historic information (in a useable format) on water temperature and flow conditions

for spawning ground locations with the weekly in-season fish condition updates

4. Other research groups in the Fraser River basin
 - Have collated information for the purpose of standardizing the output of information provided by other research groups (e.g. UBC telemetry projects, fish wheels) with standard collection forms (see Outcome 3)

Deliverables timeline

By June 2017 we anticipate that all data collection forms and methods will have been reviewed and optimized to be more user-friendly and translatable to report preparation. Historical flow conditions will be compiled and presented to the Fraser Panel for consideration in the 2017 Fraser River sockeye salmon spawning migration. Communication between groups will continue to coordinate reporting.

OUTCOME 2) A summary of the strength of evidence behind each of alternatives sources of information presented to the Fraser Panel.

Summary of evidence

Fish condition information with associated survival estimates (telemetry results) has been explored to determine the utility of this data for managing fisheries. There have been at least 10 major tagging studies (radio and pit-tagging) conducted within the Fraser River watershed in the past 4 years (representing several thousands of tagged fish) that have recorded detailed information on fish condition and migration survival. Analysis has been done to determine the strength of evidence connecting a specific observation, such as nets mark or open wounds, to actual probability of survival. These analyses must be refined to further determine the strength of evidence connecting fish condition to probability of survival given the differences between data sets and projects. A literature review summarizing research that has connected observations of fish condition to overall survival estimates at the population level in Pacific salmon and other fish species has been prepared. This summary will describe the strength of evidence behind each alternative sources of information.

Ongoing activities to support the summary of evidence include:

- Assessing whether prespaw mortality of early stock aggregates is indicative of prespaw mortality of later MA groups (Melissa Dick)
- Assessing whether there is a correlation between PSM and DBE of stock aggregates in the historical data (Melissa Dick)
- Exploring the utility of fish carcass information collected at Seton Dam (Art Bass)
- Analyzing survival data from Chilko 2015 and Stellako 2016 tagging studies (Kendra Robinson, Melissa Dick)
- Reviewing historical carcass information (e.g. Mission hydroacoustic site) to revisit the utility of this information of given that the vast majority of carcasses are not available to be observed in most locations (David Patterson, Melissa Dick)
- Evaluating shifts in proportional changes in indices of fish condition (e.g. injuries) across different sampling platforms (river mouth to spawning grounds) (Madison Phillip)

Future tasks include:

- Summarize information on the relationship of where stocks go and the time of year they enter the river on whether they will experience warmer upstream temperatures or cooler temperatures than when they migrate past Hope and determine under what scenarios (e.g. stock-composition w/in management group, or later river entry dates) the conditions at Hope either over or under-represent the upstream exposure risk to high temperatures.

- Explore the utility of using real time tagging information to infer en route loss by looking at the historic relationship between telemetry projects and population level en route loss estimates. Pilot testing on Seton Dam passage.
- Explore more recent research to see whether we can better define these combinations of temperature and duration for sockeye salmon. Work will build on recent risk assessments for fishing-related incidental mortality.
- Explore the evidence that specific stocks have different thermal tolerances (Eliason et al. 2011; Martins et al. 2011) given that the relative proportion of different stocks that make up a management groups varies on annual basis
- Explore whether there is evidence that the sensitivity to high temperatures varies depending on location in river (e.g. lower river vs. near terminal)

Deliverables timeline

It is anticipated that the summary of evidence piece including a review of the strength of evidence of fish condition parameters and the thermal biology review will follow the timetable of key activities for this project and be completed in Spring 2017, with review/editing in Fall 2017.

OUTCOME 3) A common tabulated output of available environmental and fish condition information will be created to aid in making decision on en-route loss.

Coordination of data collection

A web figure has been compiled to show similarities and differences in the various data collection platforms from groups working throughout the Fraser basin (see Figure 1).

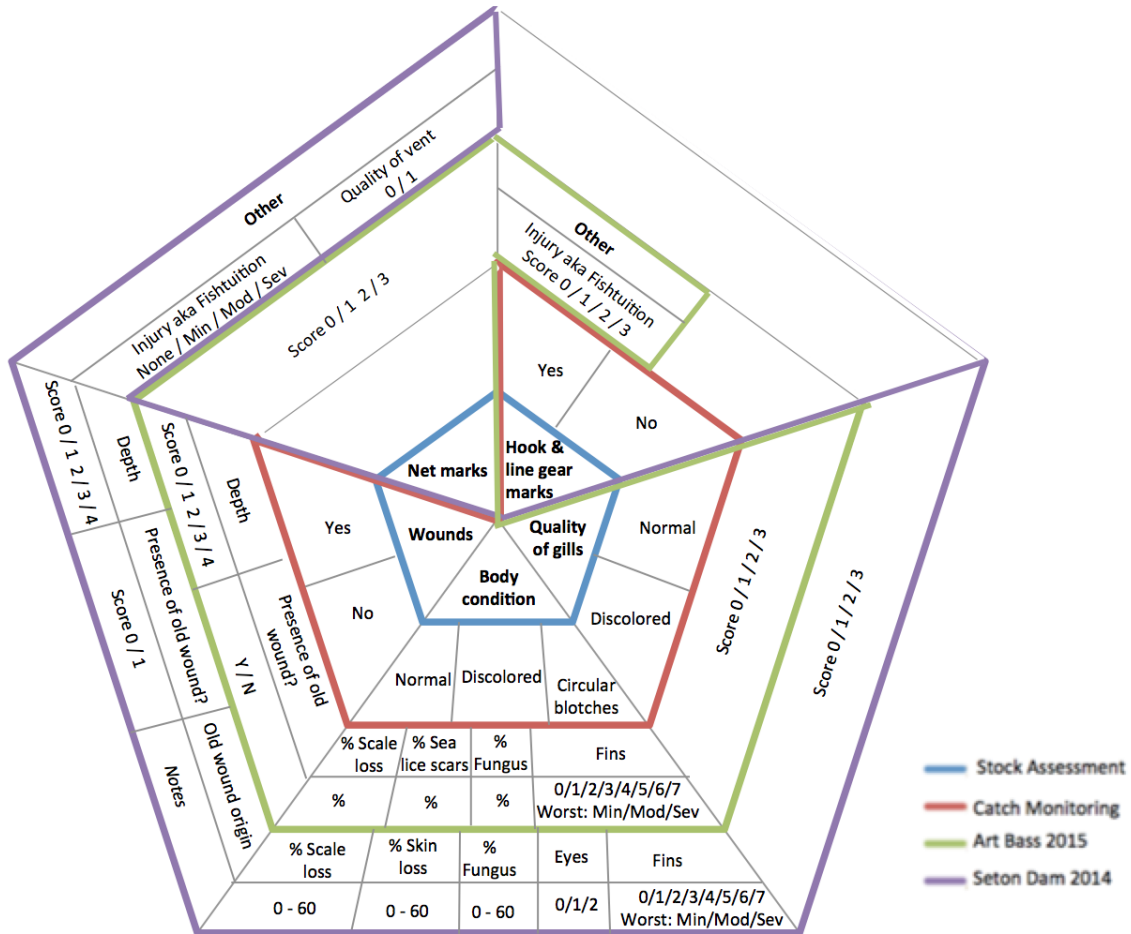


Figure 1. Comparison of various data collection platforms assessing fish condition and injury in the Fraser River basin. This figure includes data collection information from DFO-Stock Assessment, DFO-Science Stock Assessment, Art Bass’ 2015 research (UBC) and Seton Dam 2014 research (UBC). Common to all data collection platforms are the 5 parameters at the center of the web, comprising the most general information-gathering practice conducted by DFO-Stock Assessment: Body condition, Wounds, Net marks, Hook & line gear marks, Quality of gills. The figure shows there is a range in the number and types of indices measured as well as varying degrees of resolution within these indices.

Current investigations to support the coordination of data collection include comparing qualitative studies starting from a fine/detailed level of condition and then working down to more coarse/general qualitative estimates of injury and condition. In other words, a model will be created that will capture as much variation as possible in a dataset using a detailed scoring system, then will be pared down to see how much variation the model still captures when using a more general scoring system. Data from the Seton Dam work conducted by the UBC group will be used to create this model. Ongoing work is taking place to evaluate levels of subjectivity of parameters, i.e. # of fins damaged VS wound severity.

Future tasks that will occur in coordination between all groups collecting fish condition and injury data on the Fraser River basin, as a result of Outcome 3, include:

- Outlining responsibilities for timelines, data management, formats, contextual information, and supporting evidence of common tabulated information on environmental and fish conditions

Deliverables timeline

It is anticipated that a coordinated data collection platform and associated management practices of tabulated information will be proposed by Summer 2017, in accordance with the timetable of key activities.

Outcome 4) A formal, quantitative approach for merging datasets pertaining to en route loss with the management adjustment estimate in order to increase the probability of meeting spawning escapement targets using Bayesian belief networks.

Integration of data sources

The results of Outcomes 1, 2, and 3 will guide the integration of data sources. Information compilation is ongoing. The exercise of merging datasets using Bayesian Belief Network will take place once a good assessment of the strength of this type of information is completed. Experts in this field will be consulted to integrate the qualitative and quantitative information sources.

Deliverables timeline

With deliverables for Outcomes 1, 2, and 3 completed in Spring 2017, the integration of these data sources through the development of Bayesian Belief Networks will be explored from Summer 2017 onward. The scoping of this work will take this spring as part of related meetings on Run Size Adjustments and pre-season environmental forecast planning.

Contacts

- Art Bass (UBC)
- Melissa Dick (Carleton University, Ewatch)
- Matt Casselman (UBC)
- Andrew Lotto (UBC)
- Jamie Scroggie (Resource Management)
- Kaitlyn Dionne (Ewatch)
- David Patterson (Ewatch)
- Kendra Robinson (Ewatch)
- Madison Phillip (Dalhousie University / Carleton University)
- Vivian Nguyen (Carleton University)

Budget:

Bi-02 – 25K planned – 22K currently estimated

EG-03 – 10K planned – 13 K in combination research contracts and casual time.