Review of Fraser Chinook In-season Run Size Estimation Scoping

Results/Current Information

1. The potential benefits of having in-season run size estimates for each Fraser Chinook MU are:
    a. Adjusting harvest allocations in-season, based on in-season forecasts, helps managers attain management objectives, reducing the occurrence of over-harvest and under-harvest, and increasing harvests overall (Claytor 1996). This may be particularly useful in the case of the Summer 4_1 management unit, where potential harvesting opportunities are available, though the ability to formally plan for them is constrained by the lack of run size predictions (DFO 2015a).
    b. In-season information on the returning Summer 4_1 run size would allow managers to refine target harvests of Summer 4_1 Chinook in terminal fisheries. Terminal harvest rates could be tailored to returns, and harvesting opportunities would not risk being under-utilized in these areas. Having more accurate and timely information to better manage terminal fisheries is beneficial both in terms of potentially increasing harvest, and reducing impacts on non-target stocks and species.
~~2.~~ Chamberlain and Parken (2012) developed a model using the test fishery abundance indices (cumulative weekly catch-per-unit-effort, or CPUE) to predict the run size of the aggregate of the Spring and Summer age 5_2 populations in-season.
    a. The model does not predict in-season abundance estimates for any of the other three Fraser Chinook MUs (i.e., Spring 4_2, Summer 4_1, Fall 4_1).
3. The Albion Chinook test fishery uses two nets: multi-panel (MP) of 6”, 7”, 8”, and 9” mesh panels and the single panel (SP) net of 8” mesh. The MP net has been operational since 1997 and the 8” mesh net since 1980. MP net configuration varied in the first few years but has been consistent since 2003.
    a. Two versions of the model have been run annually since 2021 (only one version, using the SP data, from 2012-2020). The SP model uses the CPUE test fishing data from 1995-2023 (or the most recent year), excluding 2007, and post-season run size estimates from the Fraser Chinook Run Reconstruction in the same years. The combo model, which uses data from the SP and MP nets, includes SP and MP CPUE data from 2003-2023, excluding 2007.
4. Fraser Chinook fishery management is limited to using projections of potential impacts based on past data and pre-season forecasts, and currently doesn’t use in-season information for adjusting fishery management actions.
    a. Currently, there is no ability to manage for in-season divergence from projected assumption. This can both reduce the likelihood of meeting conservation requirements and result in forgone fishing opportunity, depending on in-season returns, which are inherently variable.
5. In-season escapement and migration monitoring programs for Fraser sockeye are substantial and overlap in run timing for multiple Fraser Chinook MUs.
6. Recent technical work at Big Bar (2019-2022) to estimate stock identification, passage rates, run timing, river conditions and fish health provided important information for fishery considerations when available.

7. Genetic Stock Identification (GSI) for Fraser Chinook in-river is fairly robust at assigning individuals to a Management Unit. Using Chinook GSI samples could inform in-season stock proportions if a program was developed to submit and report samples in-season.

Uncertainties

1. Current Fraser Chinook in-season estimation techniques are uncertain, particularly in years when environmental conditions differ from historic medians and impact test fishery operations (e.g., high water). Model input values outside the historical range, like that observed in recent years, typically result in higher uncertainty in the run size estimate produced. Additionally, low variability in model outputs suggests the model is not suitable for detecting variability in the terminal return based solely on cumulative weekly CPUE.
2. No marine Chinook test fisheries are available to use for early identification of Fraser Chinook run size in marine approach areas. Programs to detect early marine abundance would need to be developed, if that was of interest.
3. Escapement monitoring coverage and data quality affects the relationship between test fishery catch and run size estimation.
    a. The current Spring and Summer 5_2 models use Run Reconstruction outputs of terminal return to the Fraser River to produce in-season estimates, which also has its own limitations/uncertainties. The model does not perform as well when using escapement estimates instead of the terminal return.

JTC Review and Recommendations

1. JTC to develop a compilation of technical information for Fraser Chinook MUs, including:
    a. Investigation of potential use of the 8” mesh net and the multi-panel net for statistical predictive relationship between the Albion test fishery and run size estimation of all five Fraser Chinook Management Units. Previous Master’s work by Bronwyn MacDonald offers a strong starting point for this investigation.
    b. Investigate potential use of Fraser sockeye in-season estimation programs, in particular hydroacoustic programs (Mission, Qualark and Big Bar hydroacoustic), in addition to the Albion Chinook test fishery data to inform a Chinook run-size model.
    c. Scope requirements for an in-season Fraser Chinook GSI program, intended to inform the mid-point of migration for in-season run size estimation.
2. JTC to explore the development of a mid-Fraser stock assessment site similar to the program that was operational at Big Bar. This program would be beneficial to validate Lower Fraser estimates and can provide in-season migratory rate information. Initial discussions indicate annual operation could be in the range of $300,000-$500,000 for a mid-Fraser sonar site, but could be variable.
3. JTC to develop recommendations on potential alternative methods for assessment that could reduce harm to fish while still providing in-season run size estimates.

Feedback requested from the FSMB

1. Do you approve of the recommendations proposed by the JTC? Note that this review is a scoping exercise; complete development of a Fraser Chinook run-size model and in-season fishery management framework would require a much larger process.
2. Should the review proceed, there are two options for documentation:
    a. Canadian Technical Report of Fisheries and Aquatic Sciences, authored by the JTC members. This process has little to no support in the publication process, compared to a process supported by the Canadian Science Advisory Secretariat (CSAS). JTC members feel the expert knowledge required is held within the JTC< or closely associated, and this 3approach would expedite the consolidation of the relevant data.
    ~~b.~~ CSAS Science Response authored by the JTC, under a process led by the CSAS office. More support is provided from the CSAS office, but it involves a more formal process that would potentially take longer, including the submission of a Request for Science Advice through DFO, writing a Terms of Reference, formation of a steering committee, etc.