

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON  
FINAL METHODOLOGY REVIEW

The Scientific and Statistical Committee (SSC) reviewed the document “Report of the Scientific and Statistical Salmon Subcommittee on Salmon Methodology Topics” that addressed four topics presented during a webinar on October 22, 2019 including 1) proposed 40° 10’ N. lat. Salmon Management Boundary Line change, 2) Upper Columbia Summer Chinook Exploitation Rate, 3) Willapa Bay Natural Coho Forecast Method, and 4) Fishery Regulation Assessment Model (FRAM) User Manual. The Subcommittee report is appended to this statement.

The SSC endorses the methodology used to assess the likely impacts of a proposed change in the salmon management boundary line from 40° 05’ N. lat. to 40° 10’ N. lat. This change in the boundary line may have impacts to Endangered Species Act-listed California coastal Chinook and Southern Oregon/Northern California coast coho salmon which may be contacted in the recreational and commercial Chinook fishery, but little data exists to assess those impacts.

The exploitation rate for Upper Columbia River summer Chinook were potentially over-estimated relative to a historic perspective and from coded wire tag expansions. The SSC considered this to be a data issue because no FRAM algorithm changes were proposed. The SSC highlights that problems such as this in FRAM may be wider than this specific issue, because changes in exploitation rates to one stock will cause changes to exploitation rates in other stocks.

As noted in the SSC Salmon Subcommittee report, insufficient information was presented to allow an evaluation of the Willapa Bay natural coho forecast methodology. Washington Department of Fish and Wildlife staff indicated that complete documentation could be available by December 20, 2019, and could be reviewed in a webinar prior to the March Council meeting. The SSC will need to review the Willapa Bay natural coho forecast methodology prior to endorsing this forecast before the March briefing book deadline.

An online version of a FRAM user manual has been completed and will soon be made publically available. The user manual does not document the technical details of the model structure and implementation, including algorithms behind FRAM that the SSC has repeatedly requested to review.

## **REPORT OF THE SCIENTIFIC AND STATISTICAL SALMON SUBCOMMITTEE ON SALMON METHODOLOGY TOPICS**

The Scientific and Statistical Committee's Salmon Subcommittee (SSCSC) and the Salmon Technical Team held a webinar on October 22, 2019 to do a methodology review of four topics requested by the Council during the September 2019 meeting.

### **1. 40.10 Salmon Management Boundary Line proposed change**

Dr. Mike O'Farrell (SWFSC) and Alex Letvin (CDFW) presented a technical analysis needed to inform a potential change of the salmon management boundary line between the Fort Bragg (FB) and California Klamath (KC) Management zones. (Agenda Item E2, Attachment 1). Presently the management boundary line is Horse Mountain. This document analyzed the potential consequences for Chinook salmon management of moving the boundary five nautical miles (nm) north from latitude 40.05 N to 40.10 N. The current management boundary at 40.05 N has been used exclusively since 1992, though a range of other boundary lines, both north and south, were used before 1992. The commercial salmon troll fishery in the KC has been closed from Humboldt South Jetty to Horse Mountain since 1992 (between 40.7 N and 40.05 N). A shift of management line boundary would result in opening five nm of latitude to commercial fisheries in the FB zone that has been closed. Recreational salmon fishing is allowed south to Horse Mountain when the KC area is open.

The authors investigated the consequences of the proposed management boundary change using the Klamath Ocean Harvest Model (KOHM) and the Sacramento Harvest Model (SHM) salmon harvest models that are used for ocean fishery planning in this area. They identified three model inputs which could be affected by the proposed boundary change: 1) fishing effort, 2) contact rates per unit effort, and 3) stock proportions.

Moving the boundary was assumed to have no effect on fishing effort. There are less than 10 commercial salmon boats that operate out of the nearest port of Shelter Cove, CA, and their contribution to overall effort within the KC and FB districts is relatively small. Additionally, due to rough ocean conditions in this area, it was deemed unlikely that many boats would transit to the newly opened area from other ports. Change to recreational fishing effort was deemed unlikely.

The authors compared contacts per unit effort for Klamath River fall Chinook (KRFC; the focus of the KOHM) and Sacramento River fall Chinook (SRFC; the focus of the SHM) under the current management boundaries and proposed management boundaries. As there are no data available for the area between 40.05 and 40.10, they projected the contact rate in the new area as a weighted average of the contact rates in the current KC and FB management areas.

The authors then calculated the proportion of harvested Chinook expected to be KRFC (for the KOHM) or SRFC (for the SHM) in FB and KC under the current and proposed management boundaries. As with the contact rates, for the proposed boundaries these "stock proportions" were calculated as weighted average of the current FB and KC proportions.

To investigate the likely consequences of the management boundary change, the authors compared the output of the KOHM and SHM for recent five years (2014-2019; excluding 2017) using the contact rates and stock proportions for the current and proposed boundary lines. They assessed the consequences for commercial and recreational harvest (in numbers), harvest rates, and river returns. For the KOHM, the proposed boundary change generally resulted in a minor increase in

harvest and harvest rate in most years (between 0% and 2%) and a very minor decrease in KRFC river returns (range: -0.16% to 0%). For SHM, the converse occurred, with very minor decreases in SRFC harvest and harvest rate (range: -0.76% to -0.18%) and a minor increase in river return (range: 0.11% to 0.37%). Overall the predicted consequences of this boundary line change for Chinook management were minor.

The methods for assessing the effects of the boundary line change were simple and straightforward, and, in the absence of more detailed spatial information, a reasonable and appropriate exploration of the consequences of the management line change. However, the analysts did not recommend using the weighted average approach in preseason planning if a change in the management line is made. The weighted average approach relies on untested assumptions and the SHM and KOHM are continuously updated with new data., Applying the weighted average approach and also using old (pre boundary change) and new (post boundary change) data would pose numerous problems. The SSCSC agreed that it would not be advisable to use the weighted average approach in preseason planning if the boundary is moved.

The authors noted two other issues that should be considered in the context of the boundary line change. First, this area is known to be habitat for the ESA-listed California coastal Chinook and Southern Oregon/Northern California coast coho salmon which may be contacted in the recreational and commercial Chinook fishery. No data was available to inform how the boundary line might affect these stocks. Second, the area is also near the core of the distribution for the threatened California coastal Chinook ESU. There is limited data for California coastal Chinook and, it is uncertain how it would be affected by a boundary line change.

## **2. Upper Columbia Summer Chinook Exploitation Rate**

Angelika Hagen-Breaux (WDFW) presented a technical analysis, done by members of the base period workgroup, of the Fishery Regulation Assessment Model (FRAM) exploitation rates (ER) of the upper Columbia River summer Chinook (U\_CR\_Sum) stock (Agenda Item E2, Attachment 2). Starting in 2017, a new base period was used in FRAM modeling of ocean fisheries. There is concern that the U\_CR\_Sum ER using the new FRAM base period have been over-estimated, particularly in the Central Oregon troll fishery.

FRAM exploitation rates were compared to those derived from CWT-based cohort analysis from 2010 to 2013 in the Central Oregon Troll fishery. The ER average was 8.6% and 23.9% using CWT analysis and FRAM, respectively. Members of the base period workgroup examined over a dozen different sources of error with the potential to result in biased FRAM exploitation rates. They also collaborated with stakeholders and shared progress during several base period meetings. Three issues were discovered that could affect the U\_CR\_Sum ER analysis: (1) Missing Escapement Expansions: In 2018, updates were made to Catch/Sample data in RMIS database that resulted in an increase of the number of escapement CWT recoveries of Wells Hatchery tag codes. Incorporating these additional CWT recoveries into the base period calibration will result in an approximate 8% decrease (average 2012–2016) in exploitation rates, (2) Inter-Dam Loss (IDL): During their migration upstream, U\_CR\_Sum pass several dams, resulting in passage related mortality.. IDL is calculated as the ratio of the upstream dam count divided by the Bonneville dam count minus known removals due to harvest, escapement to tributaries, and broodstock collection. The base period calibration does not expand escapements to account for IDL. Including auxiliary CWT recoveries in the base period CWT data set to account for IDL would result in an approximate 3% exploitation rate reduction (average 2012-2016) for the

U\_CR\_Sum, and (3) Fishery Model Stock Proportion: Chinook FRAM does not include all Chinook stocks on the North American West Coast. Thus, a model stock proportion (MSP) value is used to designate the proportion of total catch in a fishery that is accounted for by modeled stocks. FRAM uses a MSP of 87.0 % in the Central Oregon troll fishery derived from GSI estimates. San Joaquin fall run, a non-model stock, was not split from the “Central Valley fall” GSI reporting unit in order to match FRAM’s stock definition of “Sacramento only” when the MSP parameter was derived. If the San Joaquin fall run were excluded the MSP would be 85.3% which would reduce the U\_CR\_Sum ER.

If the missing escapement expansions and IDL issues are addressed, the U\_CR\_Sum ER may be reduced by approximately 11–12%. The Central Oregon troll fishery would experience a reduction of slightly larger magnitude, because the model stock proportion reduction is specific to this fishery (i.e. a 5.0% Central Oregon troll ER would decline to ~4.3%). Based on CWT analyses, the potential magnitude of FRAM model bias is significantly higher. This led the group to hypothesize that a sizeable portion of the U\_CR\_Sum freshwater CWT recoveries are not accounted for in RMIS, hence the FRAM exploitation rates are biased high. The workgroup plans to consult regional fishery managers for ideas on possible steps to address this concern.

The three issues that were discussed were deemed by the SSCSC to be data issues that do not require a formal methodology review because no changes to FRAM algorithms are being proposed. However, the SSCSC notes that if the Up\_CR\_Sum ER from FRAM is incorrect using the new base period this could be a “flag” that there may be issues with other fisheries and stocks.

### **3. Willapa Bay Natural Coho Forecast Method**

The SSCSC was prepared to review the methodology used to forecast Willapa Bay natural Coho and received a presentation from WDFW staff including Wendy Beeghley, James Losee, Chad Herring, and Kirt Hughes (Agenda Item E.2 Attachment 3). During the presentation, it became clear that the Willapa Bay natural coho forecast involves multiple inputs and calculations that were not described in the existing documentation, so the SSCSC was unable to review the forecast methodology. It was further noted that the forecast methodology has changed over time and may change in the future.

To facilitate review of the forecast in time to consider endorsing an ABC at the March Council meeting, the SSCSC requested that complete documentation of the forecast methodology be provided as an appendix to Preseason Report 1, and further requested a check-in over email on documentation preparation progress by December 20, 2019 at which time a webinar could be scheduled for more thorough review, if needed, prior to the March Council meeting. The documentation should be sufficiently clear and complete to allow an outside party to identify all of the inputs and perform all of the required calculations, although parts of the documentation may be adequately provided through citations rather than brand new written materials. The SSCSC also emphasized the importance of noting when changes are made to forecast methodology and justifying the changes, and recommended developing formal decision rules for considering and adopting changes to the forecast methods.

### **4. Fishery Regulation Assessment Model User Manual**

Dan Auerbach (WDFW) and Angelika Hagen-Breaux (WDFW) described work that has been done to update the Fishery Regulation Assessment Model (FRAM) user manual (Agenda Item E2, Attachment 4). Since completion of a User Manual in 2007, FRAM has undergone significant

changes and transitioned from a Visual Basic 6 platform to a Visual Studio.Net platform. These changes prompted the development of a new User Manual with descriptions of the model and its operation. Staff from WDFW and the Northwest Indian Fisheries Commission (NWIFC) wrote and have completed the new manual.

The revised and updated FRAM documentation is implemented as an online living document; a code repository of scripts that form the basis for a simple website organized as a “book” of several chapters. This approach provides many features including ease of access and navigation and the ability to update and edit the manual as necessary. An accessible user manual can increase the technical understanding among users of FRAM and its outputs, and thereby increase confidence in and support for decisions based on those outputs.