

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON 2016 SALMON METHODOLOGY REVIEW

The SSC Salmon Subcommittee (SSCSS) held a joint Salmon Methodology Review meeting with the Salmon Technical Team (STT) and the Model Evaluation Workgroup (MEW) in Portland, Oregon, on October 20-22, 2015. Topics reviewed included proposed additional management area boundaries in harvest models used for California Chinook salmon stocks, an updated base period for the Chinook Fishery Regulation and Assessment Model (FRAM), and changes in the algorithms used in Chinook FRAM to calculate growth and proportion legal. The SSCSS also discussed a proposed forecast methodology for Sacramento River winter Chinook and a test fishery proposal for the Klamath Management Zone.

Evaluation of Management Lines at Point Reyes and Point Sur in the Klamath Ocean Harvest Model, Sacramento Harvest Model, and the Winter Run Harvest Model

Dr. Mike O'Farrell (Southwest Fisheries Science Center) presented an analysis of the potential for subdividing the current San Francisco management area (SF) at Point Reyes and the existing Monterey management area (MO) at Point Sur (Agenda Item D.2, Attachment 4). The analysis assessed whether the coded-wire tag (CWT) recovery data were sufficient to maintain acceptable precision in the face of increased stratification for three stocks: Sacramento River winter Chinook (SRWC), Klamath River fall Chinook (KRFC), and Sacramento River fall Chinook (SRFC). The authors examined the historical number of CWT recoveries across time, area, and fishery (commercial and recreational) strata. They also compared stock-specific relative density within the existing management areas using Genetic Stock Identification (GSI) data from published studies and original analysis of more recent GSI data. The analysts recommended that the existing management areas remain in place with no further stratification.

The SSC agrees that the existing management areas should not be further subdivided in the salmon harvest models. In the case of SRWC and KRFC stocks there were too few CWTs recovered in the proposed strata to provide acceptable stratum-specific precision as defined by the Pacific Salmon Commission (PSC). These standards are not met in many current strata; adding additional boundaries in the SRWC and KRFC models' management areas would mean that these guidelines would be met in an even smaller proportion of strata. If anything, the existing models may already be more finely stratified than the available data can support, especially for SRWC. It should also be noted that, in strata where density is very low or fishing effort minimal, the PSC guidelines may be unachievable.

In the case of SRFC, CWT recoveries were sufficient to allow the proposed increase in stratification. However, constructing the three harvest models with different area stratifications could lead to inconsistencies among the models. The benefits of increasing the stratification of the SRFC harvest model alone are unclear.

The SSC notes that the GSI data are suggestive of differences in stock distributions within the SF and MO management areas at certain times. The GSI data are currently not sufficient to quantify

these differences for management purposes, and these differential stock distributions appear to vary by month and year. Examination of catch per unit effort for CWT recoveries may provide a complementary metric for examining the distribution of stocks across proposed management lines. The SSC supports further data collection and analysis to provide information on fine-scale spatial distribution of managed stocks.

Chinook FRAM Base Period Update

The SSC found the proposed update to the Chinook FRAM base period (Agenda Item D.2. Attachment 1) and the modified methodologies for growth and sublegal contacts presented in Agenda Item D.2, Attachments 2 and 3, respectively, to be technically sound and improvements over current practices. The SSC found no technical obstacles to use of the updated base period in 2016. Full documentation is essential, but not yet available. The SSC anticipates reviewing FRAM documentation at the 2016 Salmon Methodology Review.

Mr. Larrie LaVoy (National Marine Fisheries Service) gave a presentation of the FRAM Base Period update that began in 2013. The current base dataset in the Chinook FRAM was derived from CWT recoveries and fishery information using catches from 1979 to 1982 (brood years 1974 to 1979). The proposed new base period was derived from catches from 2007 to 2013 (brood years 2005 to 2008). The new data should more accurately reflect current Chinook salmon stock distribution, abundance, and fisheries, and thus the SSC supports using more recent data to derive an updated base period. The existing FRAM structure, algorithms, data processing, and inputs and outputs are unchanged with the exception of estimates of stock specific fishing mortality for sublegal fish and derivation of growth functions. The implementation of the new base period should be expected to change base period exploitation rates of stocks and modeled stock proportions (proportion of the total catch accounted for by FRAM stocks) in fisheries.

Growth function: Dr. Pete McHugh (Eco Logical Research) presented a proposed new growth function for use in the FRAM model (Agenda Item D.2. Attachment 2). The proposed method for modeling growth is an improvement on the existing method because it accounts for the truncated size distributions provided by fisheries with minimum size limits, increases the coverage of stock aggregates, and fits empirical data better than the values provided by the old model. The methodology is clearly documented along with the algorithm code. The SSC supports adoption of this method as an improvement over the existing model. Future refinements could explore seasonal variability in size/growth, effects of years or other covariates, and more efficient (single-step) estimation procedures.

Sublegal contacts: Dr. Galen Johnson (Northwest Indian Fisheries Commission) presented updated algorithms for apportioning sublegal contacts among stocks and ages (Agenda Item D.2. Attachment 3). Total sublegal catch (all stocks combined) is estimated based on empirical estimates of the legal:sublegal catch ratio in particular fishery strata. Sublegal catch is then apportioned among stocks and ages based on assumptions of equal contact rates and distributions. The method is appropriate mechanistically and an improvement on the approach used previously. Therefore the SSC supports adoption of this method. Future work should compare model outputs with empirical data on the stock and age composition of sublegal catch whenever such data are available.

Mr. Jon Carey (Washington Department of Fish and Wildlife) presented comparisons of stock composition estimates for the old base period, the proposed new base period, and recent GSI results from select fishery strata. Such comparisons are useful for identifying extreme discrepancies, but it should be realized that the base period is meant to represent an average over multiple years whereas the GSI results shown were year-specific. Regional expert review may also help explain or resolve particular discrepancies, such as generally lower Central Valley stock proportions output from the new base period compared to GSI results.

Sacramento Winter Chinook Stock Projections from Jack Returns

Mr. Brett Kormos (California Department of Fish and Wildlife, CDFW) briefed the SSCSS on a proposed forecast method for SRWC escapement based on jack returns from the previous year. A general description of the proposal was available in a letter dated April 1, 2015 from Charlton H. Bonham (CDFW) to Ms. Dorothy Lowman (Council) (Agenda Item D.2, Attachment 6). The letter contained insufficient detail for a technical review.

For a full review, details on the specific fitting algorithm used must be provided, along with goodness of fit measures, and consideration of alternate model formulations (such as ratio estimator, non-zero intercept, log transformation, and an autoregressive error term as used in the current SRFC forecast). Details regarding how jacks were identified and how or if age-3 and age-4 adults were distinguished should be presented. The data sources used should be clearly identified. A useful analysis would include a management strategy evaluation (MSE) of the relative costs and benefits of various forecasting methodologies.

Test Fishery

Mr. Brett Kormos (CDFW) briefed the SSCSS on a proposed test fishery, based on CWTs, to evaluate potential differences in KRFC and SRFC contribution rates north and south of the Klamath River mouth. The proposed sampling design was not developed sufficiently for the SSC to evaluate if it would achieve its goals. CWT sampling should be coordinated with GSI sampling proposed for the same area and genetic samples should be collected from both clipped and unclipped fish for straight-forward estimation of total stock proportions from GSI and to provide measures of genetic stock assignment accuracy. A more specific sampling plan will be needed for review by the SSC in March.

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