

## AD HOC SACRAMENTO RIVER WINTER CHINOOK WORKGROUP REPORT ON THE SACRAMENTO RIVER WINTER CHINOOK HARVEST CONTROL RULE UPDATE

The Ad Hoc Sacramento River Winter Chinook Workgroup (SRWCW, Workgroup) met at the Southwest Fisheries Science Center (SWFSC) in Santa Cruz, California, August 16-17, to discuss progress and future work toward the development of a new fishery management framework for Sacramento River winter Chinook salmon (SRWC). Discussions at the meeting were divided into four categories: (1) abundance forecasting, (2) initial control rule development, (3) control rule evaluation, and (4) timelines and future meetings.

### Abundance forecasting

A presentation of the current status of the SRWC abundance forecast was given by Michael O'Farrell. Based on feedback from the previous Workgroup meeting in June, the abundance forecast was modified to be in terms of age-3 winter Chinook escapement absent fishing instead of pre-fishery ocean abundance. Expressing abundance in these terms is easily interpretable and is consistent with how abundance is expressed for Klamath River fall Chinook and Sacramento River fall Chinook when applying their respective control rules. Furthermore, since the last meeting in June, new data were provided by Workgroup members representing the United States Fish and Wildlife Service and California Department of Fish and Wildlife to aid in abundance forecasting.

The basic principles of the SRWC abundance forecast include obtaining brood year-specific estimates of juvenile abundance on which a juvenile survival rate is applied. The juvenile survival rate accounts for mortality occurring between outmigration from the upper Sacramento River and early ocean entry. Following application of the juvenile survival rate, ocean natural mortality and maturation rates are applied, yielding a prediction of SRWC age-3 escapement in the absence of fishing.

While the basic framework for forecasting SRWC abundance is relatively well-resolved, technical challenges remain. The Workgroup's discussion focused on these matters and several potential approaches aimed at resolving technical issues were offered. Work toward a complete abundance forecasting approach continues, with a goal of having a product ready to review at the October 2016 Methodology Review. However, it is unknown at this time whether a final forecast model will be fully developed and documented in time for this review.

### Control rules

The Workgroup formulated an initial set of control rules for Council consideration (Figure 1). Each of the control rules, with exception of control rule 7, specifies the maximum allowable age-3 impact rate as a function of the age-3 escapement absent fishing.

Control rules 0-5 have the same shape and location of break points as the set of control rules considered in the original management strategy evaluation (MSE; Winship et al. 2012), with one exception. Control rule 1 is meant to represent impact rate levels prior to the implementation of SRWC-specific ocean fishery constraints. The rate of 0.34 depicted in control rule 1 was determined by taking the mean of impact rate hindcasts for years 1978-1989 (O'Farrell and

Satterthwaite 2015). Prior to the hindcasting analysis, historical SRWC impact rates were assumed to average 0.25, which was based on preliminary work available at the time.

Control rules 6 and 7 have the same shape as the current control rule, but control rule 7 specifies the impact rate as a function of the three-year geometric mean of escapement to exactly match the current management framework. Control rule 8 was developed by the Workgroup and is similar in form as control rules 6 and 7, except that between age-3 escapement absent fishing levels of zero and 500 fish, the allowable impact rate is 0.10.

### Management strategy evaluation

A MSE approach will be used to evaluate the suite of alternative control rules with regard to conservation benefits and fishery costs. The MSE will be based on the existing model used for the initial evaluation (Winship et al. 2012) with some modification to account for the new abundance forecasting approach. The MSE is not currently ready to evaluate alternative control rules. Work on the MSE will begin once development of the abundance forecasting procedure is complete.

### Summary

Given the level of progress to date, the Workgroup does not believe that it will be feasible to implement a new SRWC control rule in time for 2017 ocean fishery management. As a result, the existing control rule would be used in 2017 to set an upper limit to the allowable age-3 impact rate.

A preliminary 2016 SRWC escapement estimate is not yet available, but current information suggests that escapement could fall within a range of 600 to 800 spawners. Based on estimated escapement in 2014 and 2015, and the early indicators of 2016 escapement, the maximum allowable impact rate under the current control rule will likely be between 0.13 and 0.15. During the 2017 preseason management process, the Council will have access to the same qualitative indicators of SRWC year class strength that were considered the last two years, including estimates of juvenile production for recent brood years and recent egg-to-fry survival rates. If the Workgroup is able to develop additional indicators regarding the status of SRWC broods that will be contacted by 2017 fisheries, this information would be shared with the Council as well.

### References

O'Farrell, M.R., and Satterthwaite, W.H. 2015. Inferred historical fishing mortality rates for an endangered population of Chinook salmon (*Oncorhynchus tshawytscha*). Fishery Bulletin 113:341-351.

Winship, A.J., O'Farrell, M.R., and Mohr, M.S. 2012. Management strategy evaluation for Sacramento River winter Chinook salmon. Report to the NMFS Southwest Region. Available at: [http://www.pcouncil.org/wp-content/uploads/SRWC\\_MSE\\_2012\\_02\\_28.pdf](http://www.pcouncil.org/wp-content/uploads/SRWC_MSE_2012_02_28.pdf)

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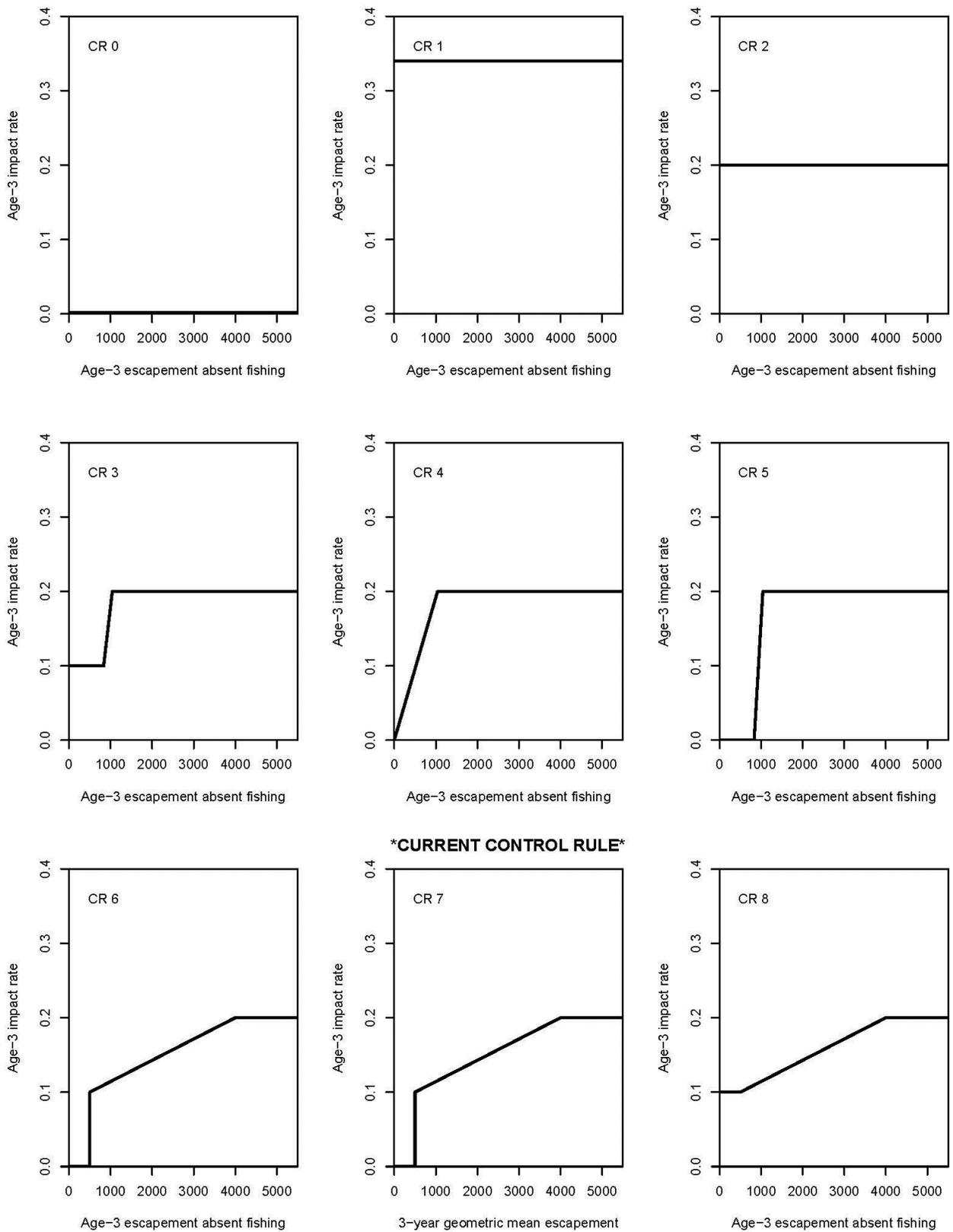


FIGURE 1. Alternative control rules for Council consideration.