SALMON TECHNICAL TEAM AND MODEL EVALUATION WORKGROUP REPORT
(This report was originally provided to the Council under Agenda Item C.8 in September 2022)

SCOPING POTENTIAL IMPROVEMENTS TO FORECAST OCEAN FISHERY EXPLOITATION RATES ON SOUTHERN OREGON/NORTHERN CALIFORNIA COAST COHO

At the January 2022 Council meeting, the Council assigned the Salmon Technical Team (STT) and the Model Evaluation Workgroup (MEW) a task to develop a report on the work required to investigate the potential for improvements to forecasts of Southern Oregon/Northern California Coast (SONCC) coho salmon ocean exploitation rates (ERs), consistent with the recommendation of the SONCC Coho Workgroup (Workgroup) in Section 8 of its Risk Assessment. The Council asked the STT and MEW to provide their report at the September 2022 Council meeting.

In their Risk Assessment, the Workgroup acknowledged that the methods used to estimate ocean harvest impacts on SONCC coho are based on hatchery releases (from the Rogue/Klamath basins) and do not directly account for the abundance of wild fish from the ESU. The Workgroup recommended an investigation be conducted to "determine if the methods used to estimate ocean fishery exploitation rates for both hatchery and naturally produced SONCC Coho Salmon could be improved upon. This investigation should initially be focused on analyses that can be conducted using existing data. The investigation should also identify whether new methods could improve the estimates of marine exploitation rates on SONCC Coho Salmon if additional data were available." As part of their request at the January 2022 meeting, the Council also noted that the report should include an evaluation of the work required to assess potential bias in preseason versus postseason ERs.

The STT and MEW met on May 24, 2022, and again on July 20, 2022, to scope this task and determined that it might best be characterized as a two-part assignment, with initial efforts focusing on:

1. *An evaluation of the performance of preseason ocean ER projections relative to postseason estimates.* As detailed in Appendix B of the Workgroup's Risk Assessment, the coho Fishery Regulation Assessment Model (FRAM) is used to estimate SONCC coho ERs in both a preseason and postseason context. Unfortunately, there are no suitable contemporary data [coded-wire tag (CWT) or otherwise] with which independent postseason ERs can be estimated and used for model validation. Thus, this performance evaluation would be limited to a comparison of FRAM-based pre- and postseason ER estimates. Any differences between pre- and post-season ER values would be a function of updated abundances and/or fishery mortalities.
    - Priority: High (this was specifically requested in the Council Action)
    - Agencies: Washington Department of Fish and Wildlife (WDFW), Northwest Indian Fisheries Commission (NWIFC), National Marine Fisheries Service (NMFS), (maybe other groups as well)
    - Timeframe: 2 weeks without workload considerations

2. *Sensitivity analyses to determine the extent to which various model inputs affect FRAM estimates of exploitation rates.* Careful thought would be needed in designing this assessment to ensure that it is as informative as possible, but it would likely involve scaling various inputs (e.g., abundances, non-retention mortalities, release mortality rates) up and down to assess the impact that each has on the resulting ERs given empirical levels of input variability. Results from these initial assessments could then be used to inform and prioritize further investigations aimed at improving the forecasts of SONCC coho ocean ERs.

    - Priority: High (this would help inform prioritization of further work)
    - Agencies: WDFW, NWIFC, NMFS, (maybe other groups as well)
    - Timeframe: 2-4 weeks without workload considerations

Pending the outcome of the above evaluations, further work using existing data could involve:

1. *Improvements to estimation of coho encounters in non-retention fisheries.* This could involve improving the accuracy of preseason effort projections derived using the Klamath Ocean Harvest Model (KOHM), which are currently used to estimate coho encounters, or developing an alternative approach to projecting coho encounters (e.g., using existing dockside sampling/interview data). The STT is currently investigating potential improvements to KOHM effort projections, with the intent of identifying and implementing recommended changes prior to the 2023 preseason process. Ideally, however, rather than model estimated coho encounters, empirically derived estimates would be available based on sampling information. As an initial step towards achieving this, the California and Oregon Departments of Fish and Wildlife (CDFW, ODFW) could conduct an inventory of existing sampling data to determine if and where preliminary estimates of coho encounters could be produced. In addition, a list of limitations, potential biases, and additional information that could improve estimates would be of value.

    - Agencies: CDFW, ODFW
    - Timeframe: 1-2 months without workload considerations

2. *Improvements to forecasts of natural SONCC coho abundance*. Currently, ocean ER projections are derived using the unclipped SONCC coho hatchery stock in FRAM as a surrogate for the natural component of the stock, since no preseason forecasts are generated for naturally produced SONCC coho abundances. As part of their Risk Assessment, the Workgroup provided an analysis of forecast potential for naturally produced SONCC coho (see Appendix F of the Risk Assessment). Should sensitivity analyses indicate that variability in forecasts notably influences ocean ER projections, additional efforts could be devoted to furthering this work (e.g., consider potential relationships with ecosystem indicators).

    - Agencies: CDFW, ODFW, others?
    - Timeframe: >6 months without workload considerations

3. *Improvement to the coho FRAM base period data set.* As indicated in Appendix B of the Workgroup's Risk Assessment, the current FRAM base period for SONCC coho stocks includes some CWTs that are from outside the SONCC geographic area. An initial investigation could focus on comparing the spatial distribution of recoveries for these CWT

groups with those used in the base period that were from within the SONCC geographic area. If notable differences exist, a subsequent investigation could focus on developing adjustments to the coho FRAM base period data set that better represent SONCC coho.

- Agencies: WDFW, NWIFC, U.S. Fish and Wildlife Service (USFWS), NMFS (maybe other groups as well)
- Timeframe: 1-2 months without workload considerations

Additional improvements to ocean ER forecasts may also be possible if new data become available. Listed below are examples of some information that would be valuable. In many cases, the timeframe associated with collecting these data would be on the order of a year to multiple years, and the costs associated would be high.

1. *Comprehensive contemporary CWT recoveries.* A contemporary CWT data set of multiple consecutive broods from relevant hatcheries could be used to validate postseason FRAM-based ER estimates or to update the existing base period data set for SONCC coho. While a data set of this sort would be useful, producing it is not likely feasible under current ocean fishery regimes, as CWTs would not be recovered in the fisheries that have the largest impact to SONCC coho because retention of coho is prohibited in waters off California. If pursuing this is deemed desirable, an initial assessment could be undertaken to assess minimum CWT recovery sample sizes needed to estimate ERs, however, careful thought would need to be given to how non-landed impacts would be accounted for.

2. *Improved sampling program data for coho non-retention fisheries.* Collection of additional data as part of existing ocean sampling programs may allow for estimation of coho encounters in non-retention fisheries using sampling data. This may be a more accurate alternative to the current approach, which uses FRAM to project encounters based on projected effort as an input. Examples of additional sampling information that could prove useful include additional dockside sampling questions, a voluntary trip reporting system, test fishing, or onboard observer data.

3. *Genetic stock identification (GSI) data.* GSI data on coho encountered in ocean fisheries, particularly those in which retention is prohibited, could be used to validate postseason FRAM-based stock compositions. An initial inventory of existing coho GSI data and relevant sample sizes may help determine whether additional GSI data would be of value. There is at least one existing study that includes a SONCC coho reporting group: https://ir.library.oregonstate.edu/concern.articles/4m90dw029. Should GSI information differ notably from FRAM-derived estimates of stock composition, additional work would be needed to incorporate necessary base period adjustments.

4. *Experimental release mortality study*. Since 2018, postseason FRAM model runs estimate that on average more than 75 percent of the total ocean fishery impacts to SONCC coho have occurred as a result of hook and release mortality, primarily in coho non-retention fisheries and, to a lesser extent, in mark-selective fisheries. Consequently, impact assessments on this stock are particularly dependent on release mortality rate assumptions. Additional studies focused on release mortality rates of coho in ocean sport and troll

fisheries would provide insight into the validity of current release mortality rate assumptions.

PFMC
03/15/23