SCIENTIFC AND STATISTICAL COMMITTEE REPORT ON
2012 SALMON METHODOLOGY REVIEW

The Scientific and Statistical Committee (SSC) reviewed the five salmon methodology topics identified at the September Council meeting. Presentations were made to the Salmon Subcommittee in a joint meeting with the Salmon Technical Team and the Model Evaluation Workgroup on October 10 and 11.

Implementation and assessment of proposed bias-correction methods for mark-selective fisheries into the Fishery Regulation and Assessment Model (FRAM) for coho

Ms. Angelika Hagen-Breaux presented an analysis of the effects of implementing bias-correction methods for mark-selective fisheries into Coho FRAM (Agenda Item C.3.a, Attachment 1). She demonstrated the degree of bias reduction achieved by implementing bias-corrected methods and discussed additional potential improvements.

The most difficult technical obstacle encountered while developing bias-correction algorithms in Coho FRAM was the need for a way to model multiple simultaneous fisheries. This has been resolved with algorithms that correctly account for multiple encounters of unmarked fish in mark-selective fisheries. Effects of these improved algorithms are relatively small but potentially significant; a few fisheries showed unbiased total exploitation rate increases of about 1.5 percent compared to the biased calculation.

Mark-recognition error is another source of bias in FRAM modeling of mark-selective fisheries. Although the magnitude of this bias is small, a method has been developed and implemented to properly account for its effects. Two other sources of bias -- drop-off mortality and mortality in non-retention fisheries -- are not easily addressed in FRAM, but have effects that will be very small compared with other sources of uncertainty in the modeling. Efforts to further improve Coho FRAM would more usefully be directed to improving base-period data and run-size forecasts.

The bias testing reported to the SSC was done using simplified FRAM runs. A test with the final 2012 run comparing results with and without bias correction will provide a realistic assessment of the effects of this adjustment and help to verify that the model is running correctly. Pending the results of this comparison, the SSC recommends implementation of bias correction for multiple encounters and mark-recognition error in Coho FRAM for modeling 2013 fisheries.

Impacts of mark-selective ocean recreational fisheries on Washington Coast coho stocks

Dr. Robert Kope reported on the results of his examination of the impacts of mark-selective recreational fisheries in Washington Marine Catch Areas 1, 2, 3, and 4 on Washington Coastal natural coho salmon stocks (Agenda Item C.3.a, Attachment 2). Data from fishery years 2006 through 2010 were used for these analyses. Coded wire tag (CWT) recovery data from all ocean fisheries, pre-terminal fisheries, and escapement were available for hatchery coho stocks in the

Gray's Harbor, Queets, and Quillayute watersheds and were used to estimate stock-specific fishery impacts. Exploitation rates for Hoh River natural coho were estimated as the average of the rates for the Queets and Quillayute stocks that were based on CWTs. This is a reasonable approach for estimating exploitation rates for the Hoh natural stock for which there are no hatchery CWT data.

Anglers intentionally release legal-size marked coho salmon in these recreational fisheries. Differences in the incentives for the charter and private boat sectors lead to differences in the release rates of legal-size marked coho, with private boat anglers releasing legal-size marked coho at a higher rate than charter boat anglers. Information from observer programs and voluntary trip reports were used to estimate these rates for the charter and private boat sectors, respectively. On average, charter boat anglers released fewer legal-size marked coho than private boat anglers. The impact analyses conducted properly accounted for these differences between the fleets plus the difference in angling success between the charter and private boat fleets.

The analyses estimated relatively small impacts on Washington Coastal natural coho salmon stocks by ocean mark-selective fisheries. Annual stock-specific impact rates ranged from 0.4 percent to 3.7 percent of the total impacts on the unmarked stocks. Average impacts across years for each stock were between 0.8 percent (Quillayute) to 1.7 percent (Queets). FRAM preseason predictions of impacts by the ocean recreational fisheries have been, on average, very close to the estimates based on CWTs for Grays Harbor and Quillayute coho stocks. Impacts by these fisheries on Queets natural coho have been consistently over-predicted by FRAM and impacts on Hoh natural coho have been over-predicted on average.

The SSC endorses the methods used for these analyses and the conclusions drawn in the report.

Technical revision to the Oregon Coastal Natural (OCN) coho work group harvest matrix

Mr. Erik Suring and Mr. Mark Lewis reported on the analyses supporting the document "2012 Technical Revision to the OCN [Oregon Coastal Natural] Coho Work Group Harvest Matrix" (Agenda Item C.3.a, Attachment 3). Maximum allowable harvest rates for OCN coho are annually specified using a two-dimensional matrix with five levels of Parent Spawner Status (spawning density relative to full seeding) and four levels of a Marine Survival Index. Currently, the Oregon Production Index Hatchery (OPIH) jack/smolt ratio is used as a proxy for predicting OCN coho marine survival since data on wild adult coho salmon marine survival were unavailable when the matrix was developed. The authors of Amendment 13 to the PFMC Pacific Coast Salmon FMP recognized that this marine survival predictor was less than ideal and therefore stated explicitly that the methods for estimating the technical parameters of the matrix could be changed without plan amendment. The Council is currently using a modified matrix developed by Sharr et al. (2000) in their 2000 Review of Amendment 13 to the Pacific Coast Salmon Plan.

The document describes a proposed change in the basis for estimating the Marine Survival Index. A change is warranted due to the low correlation between the OPIH jack/smolt ratio and the observed OCN adult marine survival index measured at the Life Cycle Monitoring (LCM)

sites from 1999 through 2011. The predicted Marine Survival Index category (i.e., the one used for management) has been different than the subsequent observed category in 10 of these 13 years (under-predicting nine times and over-predicting once).

The LCM adult trap on Mill Creek (Yaquina River) is the only LCM trap that currently captures all upstream migrating fish, including jacks. Thus Mill Creek provides the only natural jack/smolt ratio that could be used as a predictor of OCN marine survival. The LCM Mill Creek jack/smolt index has been a far better predictor of OCN marine survival over the past 13 years than the OPIH jack/smolt ratio. Had the Mill Creek index been in use, the predicted marine survival category would have been incorrect in only five of the 13 years (under-predicting four times and over-predicting once).

The SSC supports the proposed change to the OCN Harvest Matrix. However, the SSC notes that the use of a single site could be problematic if there is an event that causes this site to no longer be representative of OCN coho during a particular year. There should be a provision to revert to the OPIH jacks/smolt predictor if there are indications that the Mill Creek site might be unrepresentative in any particular year (for example, no jacks return). ODFW will investigate using other LCM sites to provide additional natural jack/smolt ratios.

In addition to Yaquina Mill Creek jacks there are other indexes that potentially could serve as marine survival estimates. In particular, the OCN abundance predictor adopted in 2011, while not a survival index, is based on a wide variety of environmental indices and is more representative of the entire stock. The SSC requests an analysis of methods that include the current OCN abundance predictor and other potential broad-scale indicators for review in October 2013. In the interim, the Yaquina Mill Creek jack/smolt ratio appears to perform substantially better than the OPIH jack/smolt ratio. The SSC approves the use of this index for setting OCN exploitation rates in 2013.

<u>Comparison of two methods for estimating coho salmon encounters and release mortalities in the ocean mark-selective fishery</u>

Mr. Robert Conrad presented an evaluation of two methods for estimating total encounters of legal-size coho salmon and release mortalities for legal-size marked and unmarked coho salmon in the ocean mark-selective recreational fisheries off the Washington coast (Washington Department of Fish and Wildlife [WDFW] Marine Catch Areas 1, 2, 3, and 4) (Agenda Item C.3.a, Attachment 4).

For estimating total encounters with legal-size coho salmon, the current method of estimation assumes:
- there is no release of legal-size marked coho salmon by anglers, and
- the proportion of marked and unmarked coho salmon in all legal-size encounters is the same for the charter boat and private boat fleets.

Data collected during the 2009, 2010, and 2011 charter boat observer and voluntary-trip report programs do not support these two key assumptions.

The proposed alternate method incorporates fleet-specific estimates of the release rate of legal-size marked coho salmon and estimates total encounters of legal-size marked and unmarked coho salmon separately for each fleet, and does not rely on either of these assumptions.

The evaluation indicated that the current methods consistently underestimate both the total encounters with legal-size coho salmon and the number of encounters with unmarked legal-size coho salmon. As a result, release mortalities for unmarked legal-size coho salmon were underestimated by about 10 percent to 15 percent in these fisheries during the years 2009 to 2011.

The SSC recommends using the proposed alternate method in 2013 to estimate total encounters of legal-size coho salmon, and release mortalities for legal-size marked and unmarked coho salmon by the ocean mark-selective recreational fisheries in WDFW Marine Catch Areas 1, 2, 3, and 4.

<u>Review of modifications to Chinook FRAM size limit algorithms implemented to allow evaluation of size limit changes</u>

Mr. Jim Packer presented a proposal for modifying the current size-limit algorithms in Chinook FRAM that are used to predict the number of sub-legal and legal encounters in a fishery (Agenda Item C.3.a, Attachment 5). A previous assessment evaluated a proposed change to a size limit in a recreational fishery and identified a serious problem with the way Chinook FRAM deals with size limit changes and subsequently projects total encounters. Specifically, it was determined that when a size limit different from the base period limit was entered for a FRAM fishery, the total number of encounters with a stock by the fishery with the changed size limit would increase or decrease - sometimes by a substantial amount. Obviously, this is not expected, as the total number of encounters should remain the same regardless of size limit. Only the proportion of total encounters classified as sublegal and legal should change.

The proposed modification to FRAM simply scales encounter rates to keep total encounters equal regardless of size limit. This propagates through the model to change exploitation rates in historical fisheries where size limits have changed. The changed exploitation rates are no more correct than the current rates. The fundamental problem is the lack of a valid method in the Chinook FRAM to model size at age. The SSC recommends no change to the current method until an acceptable alternative is developed. Effects of size limit changes should be evaluated outside of the FRAM model.

PFMC
11/03/12