SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON
SALMON METHODOLOGY REVIEW

A joint meeting of the Scientific and Statistical Committee (SSC) Salmon Subcommittee and the Salmon Technical Team (STT) was held on October 12, 2005 in Portland. Presentations were given on the two items identified for review at the Council's September 2005 meeting:

- Documentation of the Coho and Chinook Fishery Regulation Assessment Models (FRAM), and
- Ocean abundance forecasts for Columbia River Fall Chinook salmon.

Coho and Chinook FRAM Documentation

Mr. Andy Rankis, Mr. Jim Packer, and Mr. Larrie LaVoy of the Model Evaluation Workgroup (MEW) gave presentations on the documentation of the Coho and Chinook FRAM models. Currently, the models are described in three documents:

1. Fishery Regulation Assessment Model (FRAM). An Overview for Chinook and Coho (2005 Update).
2. Coho FRAM Base Period Development.
3. Chinook FRAM Base Period Development.

The FRAM models project fishery effects in a given year using stock abundances and fishing efforts "scaled" to stock abundances and fishery exploitation rates (age-specific for Chinook) during a defined base period. The base period development reports were the focus of the meeting discussions.

FRAM Overview for Chinook and Coho - 2005 Update:

The overview document describes the modeling steps used by each FRAM to calculate fishery impacts for 33 Chinook stock groups and 123 coho stock groups. Unless a separate FRAM User's Guide is to be prepared, questions will arise regarding its application. A section describing the process through which FRAM parameter values are established during preseason planning processes would be helpful. The overview documentation also lacks any discussion of the interpretation of FRAM results. This is an extremely important area that should be addressed.

Although the FRAM steps are outlined in flow charts (Figure 1 for coho and Figure 2 for Chinook) and a discussion of some of the algorithms used in the model is included in the report, there is no linkage between these figures and text. If the steps in the figure and the corresponding text were linked a reader could refer to a specific section in the report for details on the methods used at each step.

The FRAM program interacts with two species-specific (Chinook and coho) Terminal Area Management Module (TAMM) spreadsheets that allow users to specify terminal fishery impacts on a finer level of time and area resolution. The Coho TAMM now serves more as a recipient of FRAM output for customized report generation. In contrast, the Chinook TAMM remains a

critical element of pre-season modeling for Puget Sound fisheries, as many populations of management interest need to be "extracted" from the aggregated FRAM stock groupings. The TAMM fishery inputs, in addition to a fixed catch, allow for two fishery control mechanisms that are not used by FRAM: (1) percent of terminal area abundance (TAA) and (2) percent of extreme terminal run size (ETRS). The SSC finds the documentation for the TAMM (section 7 of the overview document) incomplete. The SSC requests that a flow chart and the algorithms used to derive TAA and ETRS, and other TAMM calculations, be included in the overview document.

Coho FRAM Base Period Development:

The Coho FRAM Base Period Development documentation is in draft form. Although Figure 1 provides an overall view of how the data were put together and how the base period was developed, it is difficult to match each step in the figure with the corresponding text that describes the step in the document. The report would benefit if each step in Figure 1 was linked to a section in the document. A reader could then refer to that section in the report for details on the methods used. The text section that is linked to a step in Figure 1 should include all the data input files, data output, the programs used, a brief explanation of what each program does (not the program code), and the algorithms used to manipulate the data. The documentation of the model calibration process provided in the section 3 of the Chinook FRAM Base Period Development report provides an example of this level of documentation. Creating a linkage between the steps in Figures 2 – 9 with text would improve the value of each figure and the report as a whole.

Some of the 123 coho stock groups in the base period do not have coded-wire tag (CWT) data associated with them yet Production Expansion Factors (PEFs) are assigned to them. The report should include a section that describes the methods used to develop PEFs for stock groups without CWT recoveries.

Mr. Packer stated that work on the Coho FRAM is ongoing and the base period will include additional years in the future. The SSC recommends that any changes to the model or the base period be noted in the documentation.

Chinook FRAM Base Period Development:

The documentation for the Chinook FRAM base period was incomplete; consequentially it was difficult to track how the base period calculations were made. It appears that all steps used to develop a base period data set for Chinook are included in Figures 1, 2, 2a, and 3. The SSC suggests that these figures form the basis of the documentation. All steps outlined in these figures should be linked to a section in the report that describes all the data input files, data output, the programs used, a brief explanation of what each program does (not the program code), and the algorithms used to manipulate the data (similarly to the documentation for section 3 of the Chinook report).

A primary point of confusion among the SSC and STT was the derivation of an "all stocks" CWT recovery data set that includes CWT recovery data of stocks tagged during the base period with simulated CWT recoveries of stocks that were not tagged during the base period (Out of Base Stocks or OOB stocks). Because of the importance of stock abundance estimates in the base period for FRAM calculations, this report needs to provide a clearer explanation of the

methods used to bring the OOB stocks into the base period. Providing a simple numerical example of how an OOB stock could be incorporated into the base period would clarify this process.

The documentation for the Chinook FRAM is not yet sufficient to allow SSC review of the model, especially as it applies to mark-selective fisheries. The MEW has indicated that the changes requested could be available for SSC review at the June 2006 Council meeting. If a complete draft document were available in June, the SSC would be able to thoroughly review the documentation and provide additional feedback to the MEW for finalization of the documentation for review during the September/November 2006 PFMC meetings.

To facilitate better understanding of what FRAM does and how it works, the SSC recommends that all programs and data that are used in both the coho and Chinook FRAMs be archived in a single web FTP location and that they be accessible to the public. All changes and modifications to the models, programs, and input data sets should be documented and copies of the documentation should be available from the FTP site.

Ocean Abundance Forecasts for Columbia River Fall Chinook Salmon

Mr. Henry Yuen (U. S. Fish and Wildlife Service) gave a presentation on methods to forecast ocean abundances for four Columbia River Chinook salmon stocks. Currently the Oregon Technical Advisory Committee (TAC) provides forecasts of the return to the mouth of the Columbia River for these stocks. These river-mouth forecasts must then be converted into ocean cohort abundance estimates for use in the Chinook FRAM. The current procedure for making this conversion introduces bias into the preseason planning models and processes. A method which is based on direct forecasts of ocean cohort abundance for these stocks that could be directly entered into Chinook FRAM would address this bias.

A number of the models presented in the report appear promising for forecasting ocean cohort abundance of these four Columbia River Chinook stocks. However, it is unclear how these methods could be utilized in the current management process to establish ocean abundance cohort sizes for Columbia River stocks for use in the Chinook FRAM. Currently, there are no forecast methods that are consistently applied annually to either stocks, age groups, or between years. Each year the TAC evaluates a large number of models and selects a forecast for each stock and age group. The proposed methods will increase the number of forecasts that the TAC evaluates each year and will produce forecasts of ocean cohort abundance estimates rather than Columbia River mouth abundance estimates as is done currently.

Additional work in this area is warranted, and further review is needed, before the SC can endorse the proposed methodologies. Specifically,
- There are several methods that could be used to calculate the ocean abundance of Columbia River Chinook stocks. For this report, a ratio of Columbia River mouth returns (estimated by WDFW) to Columbia River coded wire tag (CWT) recoveries was used to convert the ocean abundance of CWT recoveries to ocean abundance of Columbia River fish. Two other possible methods of estimating ocean abundance use: (1) a run reconstruction algorithm (cohort analysis) or (2) a recursive method which uses estimates of ocean mortality and survival. Before a decision on which forecast models are "best", an analysis of the differences between the estimates of ocean cohort size provided by the

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different methods and an examination of the advantages and disadvantages of each method is needed.

- The TAC should evaluate the advantages of using methods which forecast ocean abundance directly and determine whether the continued use of river-mouth abundance forecasts is warranted.

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