

SALMON TECHNICAL TEAM REPORT ON
2010 SALMON METHODOLOGY REVIEW

Bias correction for mark-selective fisheries in FRAM.

The Salmon Technical Team (STT) and Salmon Subcommittee of the Scientific and Statistical Committee (SSC) reviewed two presentations on bias resulting from mark-selective fisheries in the Coho Fishery Regulation Assessment Model (FRAM). Two sources of bias were analyzed: 1) bias resulting from multiple encounters in mark selective fisheries, and 2) bias that results in non-selective fisheries due to changing marked/unmarked ratios when concurrent mark-selective fisheries occur.

Simulations of bias and potential bias corrections indicate that the bias occurring in Coho FRAM because of mark selective fisheries is large enough in magnitude to be of concern. Biases on the order of tenths of a percentage point are significant when management constraints on upper Fraser coho and listed Columbia River and Oregon coastal natural (OCN) coho have forced the Council to manage pre-season modeled exploitation rates to a finer resolution than that of the potential bias. Theoretical bias correction methods have been developed for a simplified single pool model with a single stock partitioned into marked and unmarked components. Comparison of FRAM outputs from recent years with bias corrected values using these methods suggests that bias corrections developed from a single stock, single pool model may not be directly applicable to the FRAM model, which has multiple stocks and pre-terminal and terminal fisheries.

The STT believes that further investigation is warranted and should focus on developing a bias correction method that is compatible with the structure and algorithms in FRAM.

OCN forecasts

The STT and Salmon Subcommittee of the SSC reviewed recent work on forecasting the ocean abundance of river-rearing stocks of OCN coho. The analyses explored the use of a variety of marine environmental indices, averaged over 3-month periods, in addition to parental spawning escapement to explain the variability in recruitment of OCN coho. The strongest correlation of any single index was with the May-June-July Pacific decadal oscillation (PDO). This correlation was improved by using a 4-year moving average of the PDO. Parental spawning escapement was combined with other environmental indices and the 4-year average PDO in generalized additive models (GAMs). The best fit was obtained by using an ensemble mean of six of the 3-variable GAMs. This ensemble mean is proposed for use in forecasting the river rearing OCN coho. Hindcasting indicates that this predictor would have performed substantially better than the predictors that were used over the past 15 years.

The STT recommends that the new predictor be used for 2011.

Columbia River summer Chinook CWT codes

Columbia River summer Chinook are represented in the FRAM by three coded-wire-tag (CWT) codes from Wells Hatchery fingerling releases from the 1976 and 1977 brood years. There were no yearling CWT releases during the FRAM base period, and the fingerling releases from the broods in the FRAM base period had relatively poor survival, resulting in low tag recoveries. Exploitation rates in Council fisheries during the base period on the CWT tagged fish were well below the 5 percent criterion for excepting stocks from overfishing provisions of the salmon FMP. Recent evidence indicates that summer Chinook in the Columbia River have a substantial component that exhibits a river-type life history with yearling smolts.

The Model Evaluation Workgroup (MEW) developed new base period data set that included six additional tag codes from Wells Hatchery fingerling and yearling releases from the 1998, 1999, and 2000 broods, in addition to the three tag codes currently used to represent summer Chinook in the FRAM. FRAM runs using the new base-period data agreed more closely with the exploitation rates calculated from CWTs for Summer Chinook indicator stock used by the Pacific Salmon Commission's Chinook Technical Committee. These runs with the new base-period data also indicate that base-period exploitation rates in Council fisheries were less than 5 percent, but that recent average exploitation rates in Council fisheries have been greater than 5 percent.

The STT believes that incorporating recoveries of CWTs from more recent broods, and both yearling and fingerling releases, more accurately represents the exploitation patterns of summer Chinook in FRAM and recommends that the new base period data be used for modeling 2011 management measures.

PFMC
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