

MEMORANDUM

To: Advisory Panel (AP), Western Alaska Salmon Stock Identification Program (WASSIP)

cc. Technical Committee (TC) to WASSIP

From: Michael Link, Art Nelson, Pat Martin, Denby Lloyd, and Doug Eggers (*Ad hoc* Committee)

Re: The ***Ad hoc* committee of the AP** was asked to work with the Gene Conservation Lab to characterize and quantify the effects of misallocation errors associated with not pooling the Coastal Western Alaska (CWAK) chum salmon stocks for WASSIP.

Date: October 18, 2011

Issue: At the September 21-22 joint meeting of the AP and TC of WASSIP, the Gene Conservation Laboratory (GCL) presented results of tests evaluating 11 reporting groups from the chum salmon baseline. These “100% proof tests” measured how well mixtures of fish drawn from single reporting groups allocate “to themselves”. Results showed that 4 groups from coastal western Alaska did not perform well. Specifically, these groups shared sufficiently similar genetic allele frequencies that accurately estimating their contribution to mixed-stock fishery samples had the potential to be problematic. For example, in some circumstances, reporting groups might be underestimated in a fishery, and other reporting groups could be overestimated. However, proof tests alone cannot estimate the bias associated with estimates drawn from a mixture of stocks. Furthermore, the 100% proof tests showed that pooling these 4 groups into a single aggregate Coastal Western Alaska (CWAK) reporting group, performed (as a single group) to the threshold typically used for defining reporting groups in WASSIP (>90% allocation threshold in a 100% proof test). CWAK was composed of the following groups: Norton Sound, Yukon Coastal, Kuskokwim, and Bristol Bay.

Methods: Given that the initial focus or goal of WASSIP was to apportion harvests down to the level of these 4 potentially problematic groups, the AP sought additional assurance or evidence that pooling the CWAK stocks was absolutely necessary. In particular, the AP asked what might the effects be in terms of bias and precision in stock composition estimates from a given fishery from not pooling these 4 groups. To do this, the GCL agreed to run several fishery-based proof tests of hypothetical mixtures of chum salmon that covered a range of possible real-life scenarios in fisheries around Western Alaska. An *ad hoc* committee was assigned to develop six hypothetical mixtures (Table 1 in Addendum 2 of Tech Doc 15). In contrast to the proof test, these fishery-based proof tests would assess how well fish are assigned to their own group or others in the presence of fish from many other stocks. The 100% proof test only examines that ability from a collection of fish from its own baseline(s). Mixtures were composed of fish drawn (without replacement) from the baselines for each of the reporting groups. Mixture analyses were conducted on the hypothetical mixtures with baselines that did not contain the

fish used in the mixture. The analysis methods are outlined in detail in each of the documents cited at the end of this memo.

Results/Discussion: Given the tight timeline, the GCL worked quickly to begin analysis of these mixtures to evaluate the performance of estimating the composition of 3 hypothetical fishery mixtures. These mixtures were modeled based on the *ad hoc* committee's professional judgment as to expected compositions in fisheries in the South Peninsula in June, Bristol Bay, and Kuskokwim Bay (i.e., hypothetical mixtures). Actual or precise proportions from these fisheries were not needed to characterize the accuracy and precision of estimates of the individual CWAK groups or the aggregate CWAK reporting group. For each fishery-based proof test, five random mixtures were developed and composition estimates and confidence intervals were developed by reporting group. Addendum 2 to Tech Doc 15 provides the results in tabular and graphic form from these three sets of fishery-based proof tests. Figures 1 through 6 in the tech document portray how well a pooled CWAK performed across a good range of underlying "true" compositions (Fig. 1, 3, and 5). The paired figures (i.e., 2, 4, and 6) in Addendum 2 of Tech Doc 15 show clearly how much less precise and biased estimates of the individual reporting groups from within CWAK were. For example, Figure 5 shows how the average estimated Bristol Bay composition was almost half the true percentage, and the credibility intervals did not even encompass the actual percentage, which was 78%. Figure 3 shows that the combined CWAK estimate is relatively precise and only slightly biased.

Committee Process: Communication among those on the *ad hoc* committee and the GCL staff was excellent over the three weeks. The ad hoc committee members talked one-on-one among themselves and with GCL personnel. In addition to phone and in-person discussions, the committee members exchanged several emails to develop the fishery-based proof mixtures, to discuss the incoming results, and discuss the need to run additional fishery-based proof test mixtures. On October 17, a teleconference was convened to review and discuss the results presented in Tech Doc 15 and its addendums.

Conclusion: The *ad hoc* committee agreed unanimously that the results provided by these analyses and presented in Tech Doc 15 and its addendums are sufficient to conclude that CWAK stocks should remain pooled for the purposes of estimating mixture samples in WASSIP. Furthermore, any attempts to estimate the contribution of any one stock within the CWAK reporting group would lead to imprecise and biased estimates, the problems from which would be further amplified when applying these composition estimates to estimate of harvests (numbers of fish) in WASSIP fisheries.

Literature Cited

C. Habicht, W.D. Templin, N. Decovich, J. Jasper . Technical Document 15 (WASSIP): Chum salmon reporting group evaluations using simulated fishery mixtures. Sent to the *ad hoc* committee on Sept 29, 2011.

Report by ad hoc committee of the WASSIP AP, Resolving approach to CWAK chum

C. Habicht, W.D. Templin, N. Decovich, J. Jasper. Addendum 1 to Technical Document 15: Chum salmon reporting group evaluations using 2 simulated fishery mixtures”. Send to the *ad hoc* committee on: October 10, 2011.

C. Habicht, W.D. Templin, N. Decovich, J. Jasper. Addendum 2 to Technical Document 15: Chum salmon reporting group evaluations using simulated fishery mixtures. Sent to the *ad hoc* committee on October 16, 2011.