Northwest Indian Fisheries Commission

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Dear Mr. Hall,

We wish to provide additional comments regarding the presentations from the second workshop on the "Effect of Salmon Fisheries on Southern Resident Killer Whales." We would request that these comments be shared with the Expert Panel. Our comments focus on four main topics: 1) Southern Resident Killer Whale (SRKW) population abundance and growth; 2) SRKW diet; 3) the relationship between Chinook salmon abundance and SRKW population growth; and 4) possible benefits to the SRKW population from increased Chinook abundance due to decreased fishing.

1) SRKW Population Abundance and Growth

The estimated historical population size for SRKW for at least the last 100 years, and probably much longer, is only about 100 to 115 animals, so the current population is not much below the historical level. The current SRKW population would appear to be at 65% to 80% of historical abundance. This does not appear to be unreasonable given the current status of many fish and wildlife populations relative to their historical numbers. Human induced changes to, and effects on, both terrestrial and marine environments make it unlikely that most fish and animal populations can reach previous historical sizes. We feel it's unreasonable to expect that the SRKW population would rebound to historical levels from the depression caused by the aquarium removals due to changes in the Salish Sea ecosystem that have occurred during this same time frame.

All three pods have a positive growth rate and the expected growth rates for K and L pods appear to have increased recently. All analyses suggest there is a very small probability that the population is declining. The random SRKW mortality due to issues other than food availability has a much larger and more immediate effect on growth and recovery than any perceived benefits due to increased availability as salmon as prey. The recent death of an adult SRKW due to "unknown" trauma has a much larger and more long-lasting effect on the growth and recovery of the SRKW population than any effect of increased salmon abundance which may increase the population by a 2-3 animals over a 15 year period.

2) SRKW Diet

Diet information presented in workshop 2 indicates that the SRKW prey base is much larger and less selective than portrayed during workshop 1. Specifically:

- The re-analysis of the Chinook length selectivity curve resulted in a curve that was less steep and shifted to the left indicating that smaller and younger Chinook contribute more to the diet than was portrayed in workshop 1.
- The recent SRKW winter diet sampling indicates that 2 and 3 year old Chinook (smaller Chinook) contribute more to the diet than previously thought. We suggest that if smaller Chinook are prey items during the winter they could contribute more to the diet in the summer if there was a need. High selectivity for larger Chinook during the summer seems to be more a matter of choice by the SRKW than of necessity.
- Although the sample size was very small (n = 3 or 4), it is interesting to note that the diet data from stranded whales for the most part indicated a much more varied diet than is demonstrated from tissue and fecal samples.

3) Relationship Between Chinook Salmon Abundance and SRKW Population Growth

We still have a concern that the analyses relating SRKW survival to salmon abundance, as measured by Chinook Technical Committee (CTC) indices of annual salmon abundance, are a case of "relationship shopping". That is, the relationships between SRKW survival and a whole host of abundance indices were examined and some "significant" ones were found. Similarly to the results presented in the first workshop, there is no easily explained reason why some of the indices which had the "best" relationship with SRKW survival are important as the stocks they represent do not appear to coincide with SRKW presence in time or place. It is unclear how the stocks represented by these indices can actually contribute to the SRKW diet in any significant way. This seems to be a "correlation" not "causation" exercise and is difficult to interpret.

One analysis we would like to see is a simple correlation matrix showing the correlations among all the various CTC indices presented at this workshop, the FRAM abundances used for the analyses in the previous workshop, and SRKW survival and fecundity (appropriately lagged).

4) Possible Benefits to SRKW Population Growth Due to Decreased Fishing

Modeling the effect of Chinook harvest reductions on SRKW population growth suggests very modest improvements in population growth rate or population size and this occurs only after relatively long time periods.

We urge more consideration be given to the data on other marine mammals that was presented at the second and first workshops. While assessing the growth potential for the SRKW population, consideration should be given to the abundance trends of the other apex

predators that also consume the same prey base as the SRKW within their critical habitat range. Specifically:

- The harbor seal population is at a record high for the period 1970 to present.
- California sea lion abundance has increased from about 50,000 to almost 300,000 during the same time period.
- The Stellar sea lion population has been increasing by 3.5% to 5% per year since the 1970s.

Diet studies indicate that seals and sea lions prey on Chinook salmon more than previously thought and initial ecosystem analysis indicates that these increasing seal and sea lion populations likely consume more Chinook salmon (in number) than do the SRKW. What is unknown, and not incorporated into any of the current "possible benefits" analyses, is how many of the Chinook salmon "saved" through fishery reductions would actually contribute to the diet of the SRKW population. A reasonable expectation is that only a modest fraction of them would accrue to SRKW as these other marine mammal populations would also benefit from more abundant salmon. Therefore, any benefit to SRKW of increased Chinook salmon resulting from reduced fisheries is over-estimated (possibly greatly) by the current models.

This supports the need for a more thoughtful, rigorous, and developed ecosystem analysis than is currently available. Two ecosystem models are probably needed, one for Georgia Basin and one for Puget Sound. We suggest that we have exhausted the utility of the current models relating SRKW fecundity and growth to Chinook salmon abundance. What is needed is more focused work on ecosystem analyses. An entire workshop dedicated to just this topic would be more useful than anymore presentations of Bayesian logistic models exploring the relationships between Chinook salmon abundance and SRKW population metrics and model projections on how increased salmon abundance may benefit SRKW population growth.

Sincerely,

Craig Bowhay

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