

## APPENDIX IV. CORRESPONDENCE BETWEEN KINTAMA RESEARCH SERVICES AND THE PACIFIC SALMON COMMISSION'S CHINOOK TECHNICAL COMMITTEE

Note that this Appendix contains the main correspondence between the KRS and the CTC about our requests for clarification on issues raised in FPC Memo 53-20. Some replication of questions has been removed. Additional clarifications by KRS that were not sent to the CTC follow some of the issues.

**TO:** David Welch, Aswea Porter, Erin Rechisky, Kintama Research  
**FROM:** Antonio Velez-Espino, John Carlile, Jon Carey, Chinook Technical Committee Co-Chairs  
**DATE:** January 4, 2021  
**SUBJECT:** Request for CTC Clarification  
**CC:** Jessica Gill, CTC Coordinator

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On December 14, 2020, John Carlile and Antonio Velez-Espino received an email requesting clarification on data used in a recent publication (*A synthesis of the coast-wide decline in survival of West Coast Chinook Salmon (Oncorhynchus tshawytscha, Salmonidae)* published in Fish and Fisheries, October 2020). The responses to the clarification questions are below in blue.

1. Could you please advise which of you was contacted by the Fish Passage Center, so that I can attribute any CTC responses to an individual?

**A:** Both Antonio Velez-Espino and John Carlile were contacted by the FPC. The entire CTC participated in the discussion and preparation of response to the FPC.

2. Is it true that “*the CTC does not compute SARs in any of their analyses and no such database exists*”?

**A:** True. The CTC uses and maintains various data sources that contain the information necessary to calculate SARs as they are defined in the paper, but they were not developed for this purpose.

- a. Gayle Brown of the CTC provided us with the data used in our paper well prior to her retirement in July. (As the Acknowledgement section of our paper states, we also had discussions with Kristen Ryding). According to our understanding, the column labelled “TotalCWTSR” is the SAR (smolt to adult return) rate as we defined it in our paper. Is this incorrect?

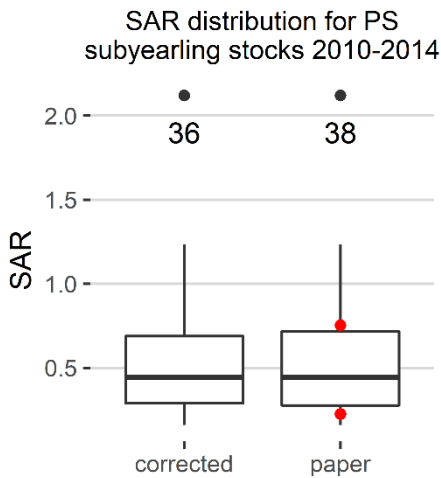
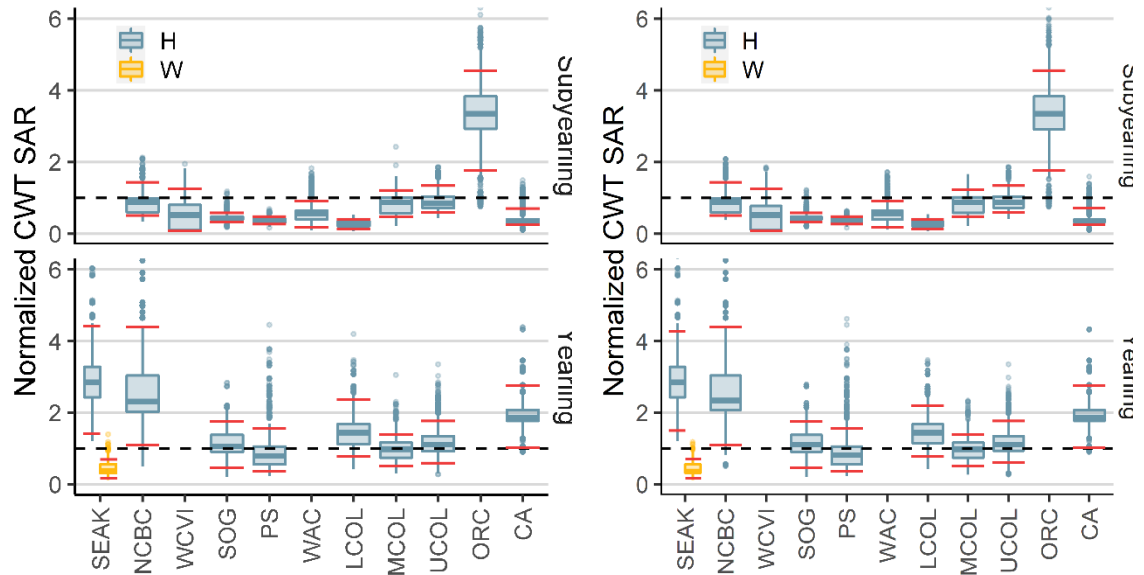
**A:** We were able to very closely replicate the SAR values used in the paper with outputs from our CWT-based annual Exploitation Rate Analysis (ERA), but cannot be certain which file specifically was provided by Gayle and what level of post-processing it contained. Would you be willing to send us the data set that

you were provided? KRS: We have responded and provide this to the CTC as requested.

- b. Is it true that the CTC does not maintain a database? We would appreciate it if you could shed some light on what the FPC is claiming, as we are at a loss as to how “*the CTC does not maintain a database*” and yet carry out your functions. (Perhaps all the FPC are implying is that the data are held in Excel spreadsheets, as we received it from Gayle, rather than a formal database?).
- A: The CTC maintains numerous databases, but there is no “SAR database” or one that “provides several measures of SAR,” as the paper indicates, as the CTC does not compute SARs in any of their analyses.
3. In our comparison of Chinook SARs for the three populations NSF, SKF, and SQP, we allocated them to subyearling or yearling categories based on actual smolt age at release (not the life history type). (“*Furthermore, the CTC chairperson advised that the authors assigned incorrect smolt-ages for three stocks (NSF, SKF and SQP)*”). Were we mistaken in doing so, or is the issue the FPC is identifying that yearling smolt populations may not actually leave the river and migrate to sea in the year of their release?

A: In the SAR\_Data.csv supplemental data file provided with the paper, for the three stocks mentioned (Nooksack spring subyearling, Skagit spring subyearling, Squaxin Pens), while the smolt age appears to be correctly identified, it appears that the SAR values are associated with the incorrect smolt years (offset by +1 for Nooksack and Skagit and -1 for Squaxin). For example, the SAR value of 0.1106 for Nooksack spring subyearling that is associated with smolt year 1990 is based on releases from the 1988 brood year, which were released in 1989, not 1990.

KRS: The CTC’s statement is correct and an error in the dataset we received made it into the published paper. When we corrected the error, two datapoints were removed from the 2010-2014 dataset for Puget Sound subyearlings. Fortunately, this change does not affect the conclusions. We have reproduced here three figures: the original Figure 4 from the published paper (left), the revised Figure 4 with corrected data (right), and the distribution of the SAR data in Puget Sound before and after the correction (below). In this last figure, the two data points that were removed are overplotted in red.



4. Could you clarify what concerns you had with our paper? (*“The CTC expressed serious concerns with how the CTC data were characterized in the Welch et al. (2020) paper”*).

A: Chiefly, the CTC is concerned with how the CTC data are characterized in your paper. In many places the paper implies that the SAR values being used are a formal CTC product, which is untrue (i.e., *“The PSC database provides several measures of SAR. We used their estimates calculated as...”*). The paper references a CTC SAR database, however, as previously noted, the CTC does not compute SARs in any of their analyses and no such database exists. No current CTC members were afforded the opportunity to review the analyses prior to the paper’s publication.

KRS: We did think these were formal products of the CTC. It appears this was not true; however, the SARs values were at least calculated using vetted CTC data with the formula provided in the paper. No current members of the CTC reviewed the paper, but the Canadian co-chair of the CTC provided us with the estimates and met with us to discuss. Further clarification on this point is included in the CTC's response dated Jan 18, 2021.

5. What, in your interpretation, does the FPC mean when they state "*the CTC does not use their CWT recovery data to calculate SARs*"? As we defined them in our paper (see the equation at the bottom of p. 3), the "TotalCWTSR" is a measure of the sum of all adults age 2+ divided by the release numbers with older ages uninflated for potential mortality between age 2 and older ages of return. As we are using the CTC's calculated number, by definition the CWT recovery data have been used to calculate the SAR.

A: We use CWT data to calculate maturation rates, distribution of mortalities, survival rates from release to age 2 (subyearling) or age 3 (yearling), brood-year and calendar-year exploitation rates.

KRS: Further clarification on this point is included in the CTC's response dated Jan 18, 2021.

**Questions from Kintama Research posed January 7, 2021. The Chinook Technical Committee responded January 18, 2021.**

1. What is the definition of a "*formal CTC product*"?

CTC Response: We would consider a "formal CTC product" to be something that is annually calculated and reported on as part of our annual analyses. Generally these are stock and fishery data critical to implementation of the Pacific Salmon Treaty.

2. In your follow-on response (#5), you state "*We use CWT data to calculate maturation rates, distribution of mortalities, survival rates from release to age 2 (subyearling) or age 3 (yearling), brood-year and calendar-year exploitation rates*". Yet in response #4 you state "*the CTC does not compute SARs in any of their analyses and no such database exists*", but then state that you use the data to calculate "*survival rates from release to age 2 or age 3*" (Response #5). I'm not sure if this is a matter of semantics or something more fundamental, which is why I am trying to be as careful as possible here. We calculated the SARs used in our paper from the data Gayle Brown provided and you seem to make the same calculation as well. Can you clarify whether you have a concern with the scientific quality of what we have done or is your concern with our (apparently) implying that we employed a "formal product" of the CTC? (And any clarification of what a "formal product" is would be helpful).

CTC Response: There are key differences between the survival rates calculated by the CTC and the smolt-to-adult return values calculated in your paper. The difference is more than semantics and has to do with the value used in the numerator. The CTC calculates survival from release to age 2 or 3, where the numerator is the cohort size of age 2 or 3 fish (depending on life history type) prior to recruitment into fisheries (section 2.1.3 of TCCHINOOK (19)-02). The smolt-to-adult return values calculated in your paper provide a different metric where the numerator includes the sum of escapement and fishery mortalities for fish of all ages. This results in SAR estimates that are confounded by variability in fishing levels, because a pre-terminal fishery mortality, particularly one of a younger aged fish, is not equivalent on a one-to-one basis with a fish in escapement. Depending on the age of the fish, it is possible that if it were not caught, it would remain in the ocean and die of natural causes, never making it back to its natal stream.

KRS: We agree with the CTC's description of the difference. The CTC's "cohort size" measure is the estimated number of age 2 (fall) or 3 (spring) Chinook alive in each year prior to the start of the fisheries. This is calculated using cohort (VPA) analysis. The CTC is estimating the abundance of young Chinook in the ocean prior to the fisheries starting, not what would survive to return as adults. The latter value is what is relevant for our study.

The smolt-to-adult return values we used in our paper (Column TotalCWTSR in the CTC datafile we received from Dr. Gayle Brown, the former CTC Co-Chair) used as the measure of adult abundance catch at all ages plus adult escapement. This is most similar to what is used in the CWT-based SAR estimates we obtained for populations within the Columbia River basin. (In other words, the scientific question we are interested in is not how many salmon were alive in the ocean prior to becoming vulnerable to the fisheries, but how many survive to return to the river—or (presumably) would have if there were no fisheries).

In the figure to the right, we have compared the calculated survival estimates used in our published paper with what is obtained using the PSC's Chinook Technical Committee estimate TotalCWTSR. (In both cases the number of released smolts, the denominator, is the same). The relationship has a slope of 2.5, so the CTC estimates that 2.5-times as many salmon are alive prior to the start of the fisheries as are caught or return to the river as adults.

Put the other way, 40% of the pre-fishery abundance ( $=1/2.5$ ) is caught or returns to the river, so 60% die from other causes. The exact value of the slope will depend upon the maturity schedule applied (i.e., the proportion of salmon remaining to older ages in the

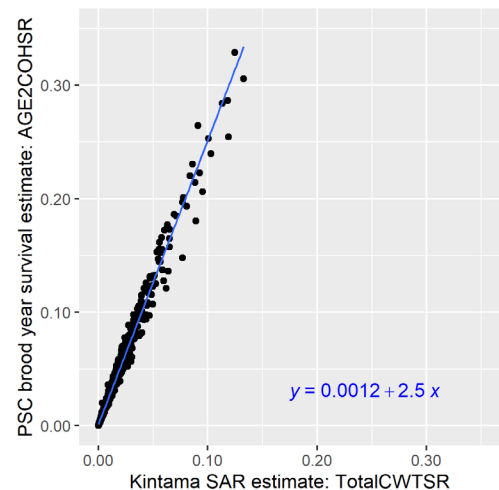


Figure 1. Comparison of survival estimates using CTC data for all stocks and all years (yearlings and subyearlings combined; incomplete brood years removed).

ocean and being exposed to more natural mortality), the natural mortality rate, the fishing mortality rate (F), and the incidental rate of fishing mortality on “shakers” (sub-legal Chinook that are caught and released but die as a result; treated in this way as a component of M). This 40:60 ratio seems plausible to us, but obviously will vary somewhat with the values the CTC chose to use.

In summary, there is a strong relationship between the two measurements. The primary issue concerns what is the appropriate abundance level to use in the numerator of CWT-based SAR estimates to compare with the Columbia’s SAR values (and especially the values for Snake River populations). The PSC’s CTC “formal product”, AGE2COHSURV, over-estimates the number of adults returning to the Columbia River because it is the estimated abundance of immature fish in the ocean prior to the start of fisheries. The TotalCWTSR estimate we used in our paper is closer to what various hatcheries within the Columbia River basin calculate in their CWT-based SAR estimates: the sum of harvest(s), hatchery rack returns, and the spawning ground escapements.