Review of Welch et al. 2020. A synthesis of the coast-wide decline in survival of West Coast Chinook Salmon (Oncorhynchus tshawytscha, Salmonidae). Fish Fish. 2020; 00:1–18. https://doi. org/10.1111/faf.12514.

Preface: The biodiversity of Chinook salmon is based on many life histories including spring, summer and fall races, different spawn timing, different lengths of freshwater, estuary and ocean residency and other variations. These life history differences are critical for sustaining Chinook salmon populations in a highly variable environment. Successful conservation of Chinook salmon in light of climate change is dependent on maintaining life history biodiversity.

Below is a brief summary of two reviews of the Welch et al. paper by 1) senior fish biologists, Dr. Howard Schaller, Dr. Charles Petrosky, and Dr. Margaret Filardo and 2) the Fish Passage Center biologists. Both papers demonstrated that Welch et al. 2020 is technically unsound with misuse of data, faulty analyses and flawed conclusions.

1. Welch et al. wrongly claims that large ocean factors primarily drive Chinook salmon survival coastwide and freshwater life history impacts have little to no influence. Therefore, they falsely conclude that freshwater management and mitigation activities are misapplied. Their analysis fails because they use "apples to oranges" comparisons, misuse the data, conduct flawed analyses, and as a result, reach erroneous conclusions. Welch et al. ignores the regional approach for Columbia River populations, which seeks to understand the influence of marine conditions when evaluating restoration actions in the freshwater environment.
2. The speculative conclusions by Welch et al. are partially based on largely using and misusing Coded Wire Tag (CWT) data versus Passive Integrated Transponder (PIT) tag data. CWTs are retrieved from dead fish collected from ocean and inland sport and commercial fisheries, and spawning ground surveys to recover the coded information. Essentially PIT tags are best to use compared to PIT tags in the many ESA listed fish populations, because they indicate where fish travel, produce a survival estimate that is more precise and do not require a dead fish. PIT tags are detected multiple times at multiple life stages and provide more extensive life history data and more precise, estimates of SARs. The comparison of PIT tag data and CWT data by Welch et al. is misleading and reflects the authors' lack of understanding of both types of data and their application.
3. The calculation of CWT based Smolt to Adult Survival estimates (SARs) for Columbia River populations by Welch et al. was inconsistent with that used for the rest of the Chinook salmon stocks from Oregon, Washington, British Columbia and Alaska. Data discrepancies and methodology problems are a fundamental flaw in their coastwide SAR analysis based on CWT tag data. Welch et al. comparisons also inappropriately use a recent and short time 5-year time series without taking into consideration the high level of uncertainty for CWT tag-based SARs.
4. Welch et al. relied largely on *coastwide subyearling hatchery* Chinook survival rates to make conclusions about Snake River wild yearling Chinook which is highly inappropriate because there are differences in life history patterns, period of ocean residence, and ocean exploitation rates (ER). For some unknown and undocumented reason, the authors assume that distant Chinook hatchery populations with a different life history are a better SAR comparison to Snake River yearling Chinook populations than nearby wild yearling populations in the Columbia River, which migrate through fewer dams, but share the same estuary and early ocean conditions.
5. Quantitative analysis of the Welch et al. coastwide CWT data found very weak evidence for a common survival pattern across stocks, indicating little support for the claim that ocean processes are a primary driver of West Coast Chinook salmon survival. The majority of stocks (66%) showed no significant trend over time, while 14% increased and 20% decreased.
6. Welch et al.'s conclusion that ocean conditions drive coastwide SAR patterns is contrary to published literature. The authors ignore many published studies that indicate local and ocean factors for life cycle survival rates and both freshwater migration and marine conditions highly influence Chinook survival rates. Many studies found that both freshwater and oceanic factors best explain the variation in Snake and Columbia River yearling Chinook SARs, are based on long time series, and include large variations in both marine and freshwater environments. Studies have consistently shown that Snake River salmon (above 8 dams) survived about one quarter as well as reference populations from the John Day River (above 3 dams). A temporal analysis indicated that 76% of Snake River juvenile salmon that survived the hydrosystem subsequently died in the marine environment from their outmigration experience. Many scientists have shown that delayed hydrosystem mortality increases with the number of powerhouse passages and lower speeds of outmigration from going through multiple dams and their reservoirs.
7. Welch et al. falsely concludes that if coastwide Chinook populations have declined, then Snake and Columbia population declines are primarily the result of ocean conditions. Yet, Welch et al. fail to conduct any direct analysis of how ocean conditions influence patterns for SARs.