MARINE MAMMAL COMMISSION

25 September 2023

Lance Kruzic
NOAA Fisheries
2900 NW Stewart Parkway
Roseburg, OR 97471

Dear Mr. Kruzic:

On 10 August 2023, the National Marine Fisheries Service (NMFS) published a notice of intent to prepare a draft programmatic environmental impact statement (dPEIS) in accordance with the National Environmental Policy Act that will analyze alternatives for funding a program directed at increasing the availability of prey to Southern Resident killer whales (*Orcinus orca*) (88 Fed. Reg. 54301). NMFS requested comments on the scope of the analysis and the identification of relevant information, studies and analyses. NMFS is proposing to continue to fund hatchery production of Chinook salmon (*Oncorhynchus tshawytscha*), the primary prey of Southern Resident killer whales, and will consider alternatives to increase their availability to Southern Resident killer whales, such as the restoration of spawning habitat and reduction in the fisheries take. The staff of the Marine Mammal Commission (Commission) are pleased to offer comments herein.

Additional management actions are needed to reverse the population's trend toward extinction Southern Resident killer whales, and to achieve their recovery. The population is near its lowest size observed or estimated since 1960. After a relatively sustained period of growth from 68 whales in 1970 to 98 in 1995, the population size has decreased by 23.5 percent to 75 whales in 2023. Three anthropogenic factors are widely considered to be the major threats to Southern Resident killer whales and the likely causes of the recent population decline: 1) reduced prey availability; 2) contaminants bioaccumulated from prey; and 3) interference by vessels and disturbance from vessel noise (e.g., NMFS 2008, Williams et al. 2016, Lacy et al. 2017, Clarke Murray et al. 2021), with reduced prey availability often identified at the most important factor.

Chinook salmon make up the bulk of the diet of Southern Resident killer whales (Ford and Ellis 2006, Hanson et al. 2010, 2021). Hanson et al. 2021 found that Chinook salmon constituted from 50 to 100 percent of their diet, depending on the season. Although, Southern Resident killer whales prey on other species of salmon and non-salmonid fishes during some seasons (Hanson et al. 2021), there is no evidence to suggest that those other species could fully replace Chinook salmon in their diet. Large Chinook salmon are the preferred prey because of their size and because they are the most energy-rich species, providing over twice the energy per fish than any of the other salmon species consumed by Southern Resident killer whales (O'Neill et al. 2014). Given this strong reliance on Chinook salmon, it is not unreasonable to assume that a declining abundance of the salmon, and hence declining availability to killer whales, would eventually limit Southern Resident killer whale population growth (Hilborn et al. 2012).

Large declines in the abundance of spawning-age fish in many Pacific Northwest Chinook stocks have occurred over the last 60 years (Ford 2022). Since 2000, the abundance of some stocks has increased in some years, but generally remain well below the historical highs of the 1950s and 1960s. As a result of spawning habitat loss, dam placement in spawning river systems, road culverts, overfishing, and among other factors, most stocks or evolutionarily significant units in the Pacific Northwest are listed as 'endangered' or 'threatened' under the ESA (Ford 2022). Gustafson et al. 2007 found that nearly 30 percent of historical west coast salmon stocks are extinct, and that only 46 percent of Chinook stocks remain extant.

Statistical and modeling analyses have demonstrated a link between the abundance of Chinook salmon and the nutritional state, fecundity and/survivorship of Southern Resident killer whales .

- Ward et al. 2009: data from 1981-2007 showed that fecundity was highly correlated with Chinook salmon abundance
- Ford et al. 2010: between 1973 and 2005 survival rates drove population trends and those rates were highly correlated with the availability of Chinook salmon
- Vélez-Espino et al. 2014: data from 1987 to 2011 revealed multiple cases of correlation between Chinook abundance and Southern Resident killer whale vital rates, but the effects were assessed to have had no more than a small influence of population growth and viability
- Williams et al. 2016: modeling suggested a depletion of salmon stocks of 10 percent or greater would have population consequences for Southern Resident killer whales, with the effect increasing proportionally with the degree of depletion
- Wasser et al. 2017: low availability of Chinook salmon between 2008 and 2014 appeared to be a significant cause of late pregnancy failure, which occurred in 33 percent of detectable pregnancies
- Shields et al. 2018: from 1994 to 2016, the abundance of Chinook salmon was a significant predictor of the presence/absence of the Southern Resident killer whales in their core foraging habitat
- Groskreutz et al. 2019: Southern Resident killer whales that went through their maturation phase (0-15 years of age) during periods of low Chinook salmon abundance were smaller as adults than individuals who matured at other times
- Stewart et al. 2021: Fraser River, Salish Sea and Puget Sound Chinook salmon abundance between 1981-2007 was the best predictor of body condition / nutritional status of individual whales in two of the three Southern Resident killer whale pods
- Stewart et al. 2023: a decrease of 50 percent in Fraser River Chinook salmon catch rates coincided with a 75 percent decrease in presence of Southern Resident killer whales in their core summer foraging habitats

Because these species and their ecosystem cannot be experimentally manipulated, managers must rely on correlational evidence of a causal link between the abundance of Chinook salmon and the population trajectory of the Southern Resident killer whale population. As in predator-prey system, there must be causal links that connect Chinook salmon to Southern Resident killer whales, and causal links that connect Southern Resident killer whale net energy intake from their prey to the nutritional condition of individuals, to their likelihood of surviving and successfully reproducing, and therefore to the population's growth trajectory (Clarke Murray et al. 2021). However, there are numerous ecological, environmental and anthropogenic factors that also affect the availability of prey (e.g., other predators, inter-annual variability in oceanographic conditions, abundance of their prey, fishing), and the Southern Resident killer whale population trajectory (e.g., disease, contaminants, vessel impacts, inbreeding depression). Further, there are lengthy and variable time lags in several of the linkages in the chain between prey abundance and Southern Resident killer whale population growth. Thus, a strong signal from such a linkage is likely to be detected only through the analysis of long, appropriately lagged, time-series of data, as is the case in most of the studies cited above.

When considering the linkage between predator and prey dynamics, it is not unexpected to encounter noisy statistical relationships. The longer the chain of interactions between the prey and predator measures, the greater the number of drivers and covariates affecting the relationship, and the greater the influence of demographic and environmental variability, the less likely an underlying causal linkage will be statistically detected. Detecting prey limitation in predator vital rates could be obscured by other limiting factors or by environmentally or demographically driven variability in key covariates. Conversely, choosing measures close together in the chain will increase the likelihood of detecting a causal linkage. For example, in this case, assuming that there is a causal linkage between Chinook salmon abundance and Southern Resident killer whale trends, one would expect to see a much tighter and significant correlation between the availability of large Chinook salmon, the preferred prey, where Southern Resident killer whale are foraging, and the net energy gain by the whales, than the correlation between the measures at the ends of the causal chain. By extension, although targeting management /conservation measures at this link may not have as large of an effect as globally increasing the abundance of the salmon, it may provide a greater certainty of achieving the desired effect. For example, by this principle, increasing the availability of large Chinook salmon on a specific foraging ground precisely when Southern Resident killer whales are present, or spatio-temporally preceding their presence, should more reliably improve the nutritional status of those whales. Southern Resident killer whales with diminished nutritional status have been shown to have a higher mortality rates, and therefore conversely improved nutritional status should be expected to contribute to increased survival (Fearnbach et al. 2018, 2020; Stewart et al. 2021, 2022).

Without commenting on their relative efficacies, it is important to include alternatives in the pDEIS that would provide funding to increase hatchery production and spawning habitat restoration, especially of the high priority stocks.[1] However, those efforts, if effective, will take many years or decades to increase the availability of Chinook salmon to Southern Resident killer whale. And, as suggested above, it is far from certain that they will result in significant increases in large Chinook salmon in the right places and times. There are two, much more immediate factors, that have the potential to increase the local spatial-temporal availability of Chinook salmon to foraging Southern Resident killer whales – reductions in fishing effort and interference/disturbance by vessels. NMFS and the State of Washington have undertaken substantial, multi-faceted programs

[1] https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/southern-resident-killer-whale-priority-chinook-salmon

directed at reducing the impacts of vessel traffic on the foraging success of Southern Resident killer whales. However, while broad-scale reductions in fishing effort could over time significantly increase the abundance of Chinook salmon, NMFS declined to adopt that approach in the recently finalized Amendment 21 of the Pacific Coast Salmon Fishery Management Plan (86 Fed. Reg. 51017), despite the strong objections of the Commission[2] and others concerned about the impact of salmon fishing on the viability of the Southern Resident killer whale population. What is missing, in both NMFS's and the State's actions, is any significant control of Chinook fishing effort overall and in the areas and times that Southern Resident killer whale most rely on to obtain the prey they require. This suggests NMFS include an alternative in the pDEIS that would implement broad-scale controls on Chinook salmon fishing effort, especially in, around and leading to Southern Resident killer whale core foraging areas. Ideally, to enable the effectiveness of such controls to be assessed, NMFS would monitor prey abundance, and Southern Resident killer whale abundance and foraging success, especially in those core foraging areas.

Thank you for the opportunity to provide the Commission staff comments. Please contact me if you have any questions about our comments or their rationale.

Sincerely,

Peter O. Thomas, Ph.D.,
Executive Director

Cc: Chris Yates, Assistant Regional Administrator, Protected Resources Division, West Coast Region, NMFS
Lynne Barre, Seattle Branch Chief, Protected Resources Division, West Coast Region, NMFS

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[2] https://www.mmc.gov/wp-content/uploads/21-08-02-Thom-2021.0892-SRKW-West-Coast-Salmon-FMP-Amendment-21_.pdf

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