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Mr. Barry Thom, West Coast Regional Administrator
National Marine Fisheries Service
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232

Mr. Phil Anderson, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220

RE: G.2, Southern Resident Killer Whale ESA Consultation

Dear Chair Anderson, Mr. Thom and Council members:

Oceana is encouraged that the National Marine Fisheries Service (NMFS) and the Pacific Fishery Management Council are considering the effects of ocean salmon fisheries on endangered Southern Resident killer whales (orcas). The goal, ultimately, is to recover Southern Resident orcas and have vibrant, sustainable salmon fisheries. In this letter, we provide background information on the Southern Resident orcas plus comments and recommendations on the analysis of the effects of ocean salmon fisheries. We request NMFS, the Council, and the Ad Hoc Southern Resident Killer Whale Working Group consider these comments in the assessment of ocean salmon fisheries on Southern Resident orcas, and in the development of conservation measures and tools to limit and reduce ocean fishery impacts on Chinook salmon prey availability. This work is critical and urgent. Southern Resident orcas are now at high risk of extinction and without bold, comprehensive actions, they could soon be lost forever.

I. Southern Resident Orcas

Southern Resident orcas range throughout coastal ocean waters off Washington, Oregon and Vancouver Island, as far north as Southeast Alaska, and south to Monterey Bay[1], California. They frequent the Salish Sea, but often travel between the outer coast of Vancouver Island to the mouth of the Columbia River, likely following the migration of their primary prey, Chinook salmon.

This distinct killer whale population was listed as endangered in 2006.[2] With two births this year[3], there are now 76 Southern Resident orcas in the population (figure 1). The historical *minimum*

[1] Runwall, P (April 5, 2019). Endangered Killer Whales Make and Appearance in Monterey Bay. Mercury News. Available: https://www.mercurynews.com/2019/04/05/endangered-killer-whales-make-an-appearance-in-monterey-bay/
[2] 70 Fed Reg. 69,903 (November 18, 2005)

population size was determined to consist of 140 whales.[4, 5] As part of its "Species in the Spotlight" program, NOAA identified this distinct orca population as one of eight endangered species likely to go extinct in the near future.[6]

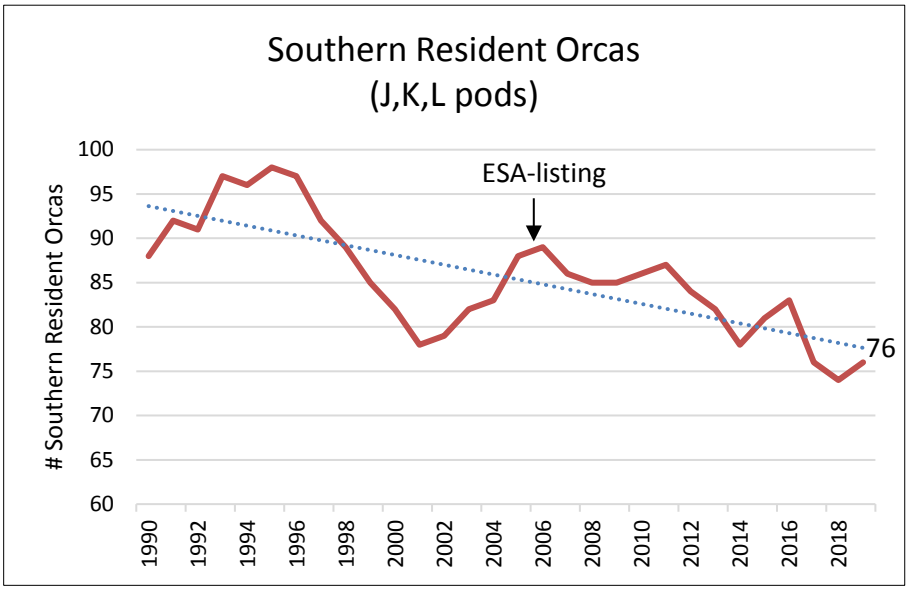

Figure 1. Southern Resident killer whale population size, 1990 to June 2019 (adapted from Center for Whale Research).

Southern Resident orcas have complex social structures which are important in understanding their population dynamics. The whales are a distinct population segment of the Northeast Pacific resident killer whale lineage or ecotype.[7, 8] Southern Resident orcas consist of one clan, each with distinct vocal dialects.[9] Within the clan, there are three pods (J, K, L) which socialize internally, and

[3] Mapes, L. (May 31, 2019). New orca calf in Southern Resident J-pod. Seattle Times. Available: https://www.seattletimes.com/seattle-news/environment/new-orca-calf-reported-in-southern-resident-j-pod/
[4] Krahn, MM, MJ Ford, WF Perrin, PR Wade, RP Angliss, MB Hanson, BL Taylor, GM Ylitalo, ME Dahlheim, JE Stein, and RS Waples. 2004. 2004 Status review of Southern Resident killer whales (*Orcinus orca*) under the Endangered Species Act. U.S. Dept. Commer., NOAA Tech. Memo. NMFS- NWFSC-62, 73 p.
[5] NMFS. 2014. 10 Years of Conservation and Research: Southern Resident Killer Whales.
[6] NOAA Fisheries at: https://www.fisheries.noaa.gov/species/killer-whale#spotlight
[7] Barrett-Lennard, L. 2000. Population structure and mating patterns of killer whales (*Orcinus orca*) as revealed by DNA analysis. The University of British Columbia. 80 pp.
[8] Hoelzel, AR, J Hey, ME Dahlheim, C Nicholson, V Burkanov, and N Black. 2007. Evolution of population structure in a highly social top predator, the killer whale. *Molecular Biology and Evolution*, *24*(6), 1407–1415. http://doi.org/10.1093/molbev/msm063
[9] Ford, JKB. 2011. Overview of the life history, current status and trends of killer whale populations in coastal waters of the Northeastern Pacific. Evaluating the Effects of Salmon Fisheries on Southern Resident Killer Whales - Workshop 1. NMFS &DFO, Seattle, Washington.

migrate and forage as distinct groups.[10, 11] Orcas form families through matrilines, where an older female and all her progeny, including males, communicate, travel and feed in close association with one another.[12]

Lack of prey, particularly Chinook salmon; vessel noise and interactions; and bioaccumulation of toxins are the three major threats facing Southern Residents. Lack of prey is at the center of each of these stressors. With limited prey, vessel noise and interactions make it harder to forage successfully and toxin loads become more immediately dangerous as starvation releases chemical compounds stored in the orcas' blubber. Inherently low reproductive rates are further compounded by increasing rates of miscarriage linked to nutritional stress. Wasser et al. 2017 documented that up to 69% of detectable pregnancies were unsuccessful and that the low availability of Chinook salmon is a significant cause of late pregnancy failure.[13] What is more, Southern Residents have high newborn mortality rates; around 40% of calves do not survive past the first few years.

The health of Southern Resident orcas is strongly tied to Chinook salmon abundance. These specialized predators evolved in the Northeast Pacific side-by-side with salmon over tens of thousands of years.[14] They hunt cooperatively, and they engage in prey sharing between females and younger whales, roughly 76% of the time.[15] Diet studies show that 99% of their diet is salmonids, with roughly 80% being the largest and fattiest of fish, the Chinook (figure 2).[16]

Southern Resident orca births and deaths are closely linked with coastwide Chinook abundance. With lower Chinook abundance Southern Resident orca fecundity decreases and mortality increases (Ward et al. 2009, Ford et al. 2010).[17, 18] Recent low Chinook salmon returns have been

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[10] Bigg, MA, PF Olesiuk, GM Ellis, JKB Ford, and KC Balcomb. 1990. Social organization and genealogy of resident killer whales (*Orcinus orca*) in the coastal waters of British Columbia and Washington State. Report of the International Whaling Commission, Special, (12), 383–405.
[11] Parsons, K., K Balcomb, J Ford, and J Durban. 2009. The social dynamics of southern resident killer whales and conservation implications for this endangered population. *Animal Behaviour*, *77*, 963–971. http://doi.org/10.1016/j.anbehav.2009.01.018
[12] Id., Ford 2011, *supra note* 8.
[13] Wasser, SK, JI Lundin, K Ayres, E Seely, D Giles, K Balcomb, et al. 2017. Population growth is limited by nutritional impacts on pregnancy success in endangered Southern Resident killer whales (*Orcinus orca*). PLoS ONE. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0179824
[14] Foote AD, PA Morin, JW Durban, E Willerslev, L Orlando, and MTP Gilbert. 2011. Out of the Pacific and back again: insights into the matrilineal history of Pacific killer whale ecotypes. PLoS One 6: e24980.
[15] Ford, JKB, & GM Ellis. 2006. Selective foraging by fish-eating killer whales *Orcinus orca* in British Columbia. *Marine Ecology Progress Series 316*, 185-199.
[16] Ford, MJ, J Hempelmann, MB Hanson, KL Ayres, RW Baird, CK Emmons, … LK Parlk. 2016. Estimation of a Killer Whale (*Orcinus orca*) Population's Diet Using Sequencing Analysis of DNA from Feces. *PLoS ONE*, *11*(1), 1–14. http://doi.org/10.5061/dryad.ds6gc
[17] Ward, EJ, EE Holmes, and KC Balcomb. 2009. Quantifying the Effects of Prey Abundance on Killer Whale Reproduction. *Source Journal of Applied Ecology Journal of Applied Ecology*, *46*(46), 632–640. http://doi.org/10.1111/J.1365-2664.2009.01647.X
[18] Ford, JKB, GM Ellis, PF Olesiuk, and KC Balcomb. 2009. Linking killer whale survival and prey abundance: food limitation in the oceans' apex predator? Biol. Lett. (2010) 6, 139-142 http://doi.org/10.1098/rsbl.2009.0468

perilous for the Southern Residents. There were no successful Southern Resident orca births from 2016 to 2018 and half of the ten orcas born in the 2014/ 2015 "baby boom" later died. Some orcas have visibly starved to death. Last summer, 3-year old Scarlet, or J50, died after she became so emaciated that she lost the fat at the base of her head - what scientists call "peanut head."

The Southern Resident orca recovery goal of an annual average 2.3% growth rate over 28 years is not being met and neither are the recovery goals for threatened Chinook prey. As you know, declines in Chinook salmon population have been driven by historical overfishing, habitat loss, dams and other obstructions, as well as climate change (Myers et al. 1998, Gustafson et al. 2007).[19,20] To meet Southern Resident orca recovery goals and prey requirements, Chinook abundance needs to increase by at least 75%.[21]

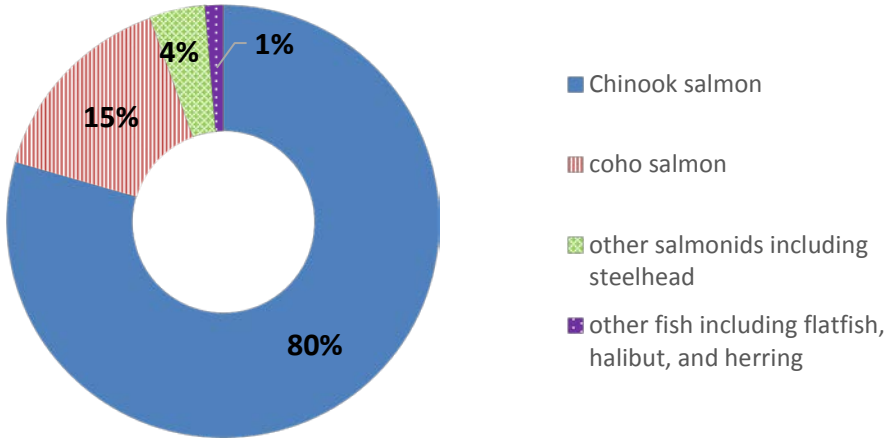

Figure 2. Southern Resident orca diet composition (99% salmonids, 80% Chinook). The average proportion of Chinook salmon in the orca's diet changes seasonally and in late summer, for example, it may be as low as 52% Chinook, and the proportion of coho in their diet increases (44%).[22]

II. Effects of ocean salmon fisheries on Southern Resident orcas

We appreciate that the Council and NMFS are considering the effects of ocean salmon fisheries on Southern Resident orcas. It was reported at the Council's May 23-24 Ad Hoc Southern Resident Killer Whale Working group meeting that even small reductions in Chinook salmon can lead to

[19] Myers, JM, RG Kope, GJ Bryant, D Teel, LJ Lierheimer, TC Wainwright, WS Grand, FW Waknitz, K Neely, ST Lindley, and RS Waples. 1998. Status review of chinook salmon from Washington, Idaho, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-35, Seattle.
[20] Gustafson, RG, RS Waples, JM Myers, LA Weitkamp, GJ Bryant, OW Johnson, & JJ Hard. 2007. Pacific salmon extinctions: Quantifying lost and remaining diversity. *Conservation Biology*, *21*(4), 1009–1020. http://doi.org/10.1111/j.1523-1739.2007.00693.x
[21] Williams, R, M Krkosek, E Ashe, TA Branch, S Clark, PS Hammond, … and A Winship. 2011. Competing conservation objectives for predators and prey: Estimating killer whale prey requirements for chinook salmon. *PLoS ONE*, *6*(11). http://doi.org/10.1371/journal.pone.0026738
[22] Ford et al. 2016, *supra note* 15

reduced Southern Resident fitness, increased foraging effort, low energy and decreased socialization. Given the status and declining trends of Southern Resident orcas, the urgency to prevent extinction and begin recovery of this population is extremely high.

Chinook salmon populations are only a fraction of their once former abundance and many are threatened with extinction. Over half the wild salmon populations in the Columbia Basin, for example, are already extinct; some 37 genetically distinct salmon runs have been lost forever.[23] This year Chinook salmon runs continue to be low. The recent NMFS analysis of ocean salmon fisheries on Southern Resident orcas shows that 12 of 16 priority Chinook stocks are projected to be below the 1992-2016 median run size.[24] The Seattle Times reports a "Chinook bust on the Columbia River" with spring Chinook returns at less than 50% of the recent ten-year average.[25] Given the correlation between Chinook abundance and Southern Resident births and mortalities, this is a bad sign for the orcas.

Broad-scale actions are clearly needed to recover and restore salmon throughout their range, with long-term benefits to orcas, coastal communities and fisheries. While the threats to Chinook salmon are many, reducing salmon fisheries now would serve as a temporary mitigation measure to allow time for the implementation of other management actions to increase salmon productivity. A resident orca population viability analysis shows that while status quo conditions will likely lead to Southern Resident orca extinction, reduced Chinook salmon catch will likely result in increased orca fecundity, survival and a positive population growth rate.[26] Another indicates that Southern Resident orca recovery can be obtained through a combination of increased Chinook abundance and a reduction in other human threats like vessel noise.[27]

We reviewed the recent NMFS assessment of 2019 ocean salmon fisheries on Southern Resident orca and attended the Council's Ad Hoc Southern Resident Killer Whale working group meeting in Portland, Oregon May 23-24. With respect to future work of the Ad Hoc committee that will build off this 2019 assessment, and recommendations for conservation and management, we offer the following comments:

Recommendations for Analysis:

1. Comparing preseason priority Chinook salmon[28] abundance estimates to 1992-2016 post season run sizes using a stop light - 'red', 'yellow', 'green' – approach appears to be an

[23] http://www.psmfc.org/habitat/salmondam.html
[24] NMFS 2019. Assessment of 2019 PFMC Salmon Fisheries on Southern Resident Orca. Agenda Item F.1.e , Supplemental NMFS Presentation 1, April 2019. Available: https://www.pcouncil.org/wp-content/uploads/2019/04/F1e_Supp_NMFS_Presentation1_Jording_APR2019BB.pdf
[25] Mapes, L. May 30, 2019. Chinook bust on the Columbia: Spring returns worse than forecast on Northwest's largest river. Seattle Times. Available: https://www.seattletimes.com/seattle-news/environment/chinook-bust-on-the-columbia-spring-returns-worse-than-forecast-on-northwests-largest-river/
[26] Velez-Espino, L. A., J. K. B. Ford, H. A. Araujo, G. Ellis, C. K. Parken, and R. Sharma. 2014. Relative importance of Chinook salmon abundance on resident killer whale population growth and viability. Aquatic Conservation: Marine and Freshwater Ecosystems. 25(6): 756-780.
[27] Williams et al., supra note 21.
[28] NOAA Fisheries WC Region and Washington Department of Fish and Wildlife (June 22, 2018). Southern Resident Killer Whale Priority Chinook Stocks Report. Available: https://www.westcoast.fisheries.noaa.gov/publications/protected_species/marine_mammals/killer_whales/recovery/srkw_priority_chinook_stocks_conceptual_model_report__list_22june2018.pdf

insensitive measure of risk and an insensitive measure of Chinook salmon availability to Southern Resident orca. Even though 12 of the 16 priority Chinook stocks are projected to be below the median run size compared with the 1992-2016 baseline this year, NMFS concluded that because these runs were in the broader interquartile range (yellow), there is likely less risk to orca.[29] Below average priority Chinook runs should be a concern given the current state of the orca population.

2. Comparing current Chinook salmon run sizes to a 1992-2006 baseline is not appropriate given that this reflects a largely degraded system. Many Chinook ESA-listings occurred during this 'baseline', beginning in the early 1990s. In evaluating the threats to Southern Resident orcas, Lacey et al. suggested Chinook abundance may need to be sustained near the highest levels of the 1970s.[30]

3. Future analyses should consider all priority Chinook stocks. This year's analysis does not include consideration of Snake River Spring and Summer Chinook, Middle and Upper Columbia Spring Chinook, Central Valley (Sacramento) Spring Chinook or Washington Coast Spring Chinook. If these priority Chinook stocks are not taken by ocean salmon fisheries in any significant amounts, their abundance should still be tracked and reported, as low abundance levels of these runs will impact Southern Resident orcas, which should be considered in the overall level of risk.

4. Consider the cumulative effects of total U.S. and Canadian fisheries mortality on the availability of prey for Southern Resident orca including directed salmon fishing landings and bycatch mortality, and bycatch in other managed fisheries (e.g. groundfish, Alaska pollock). In 2016, for example, total mortality for all Pacific Salmon Treaty fisheries was 1.69 million Chinook salmon, of which 1.16 million Chinook were taken in U.S. fisheries.[31] A recent analysis of the genetics of Chinook bycatch in the Bering Sea pollock fishery found that 19 percent, or nearly 6,000 Chinook taken in the fishery as bycatch in 2017 were of West Coast origin.[32] NMFS must assess the total impact of combined Chinook salmon fisheries and bycatch mortality on Southern Resident orcas in order to ensure the management of ocean fisheries is not preventing the recovery of the species.

5. Coho salmon are also important in Southern Resident diet, especially in late summer. Attention must be given to coho salmon availability and competition with ocean coho fisheries. For example, when Chinook abundance is low like current conditions, higher allowable catch levels for coho could result in added competition and stress to the orcas.

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[29] NMFS 2019, *supra note* 23
[30] Lacy, RC, R Williams, E Ashe, KC Balcomb, JN Brent, CW Clark, … and PC Paquet. 2017. Evaluating anthropogenic threats to endangered killer whales to inform effective recovery plans. *Scientific Reports*, **7**, 14119. https://doi.org/10.1038/s41598-017-14471-0
[31] Pacific Salmon Commission. 2018. Thirty-Third Annual Report 2017/2018, at 169. Available: https://www.psc.org/publications/annual-reports/commission/
[32] Guthrie III, CM, Hv T Nguyen, M Marsh, JT Watson, and JR Guyon. 2019. Genetic stock composition analysis of the Chinook salmon bycatch samples from the 2017 Bering Sea trawl fisheries. U.S. Dep. Commer., NOAA Tech. Memo. NMFSAFSC-391, 36 p. Available: https://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-391.pdf

Recommendations for Conservation and Management:

6. As part of this process, identify and implement a *critical Chinook salmon abundance threshold*, below which Pacific Ocean salmon fisheries would close in order to maintain the prey base for Southern Resident orca. This is similar to the concept of a "CUTOFF" in the Council's Coastal Pelagic Species FMP and may be similar to times when the Council has drastically cut ocean salmon fisheries due to low Chinook abundance. Chinook salmon runs were low much of the 1990s and this was a time of increased Southern Resident mortality. The Ad Hoc working group should compare Southern Resident orca mortalities to Chinook abundance and identify thresholds for when to curtail and/or close fisheries.

7. Consider and implement time and area closures in Southern Resident orca foraging areas to minimize direct competition between ocean salmon fisheries and orcas during times of low Chinook abundance. This can also reduce the noise associated with fishing vessels, which can make it difficult for orca to locate their prey.

8. To guide future management, we request the Council update the Pacific Coast Salmon Fishery Management Plan with an objective of managing and regulating salmon fisheries in a manner that accounts for the foraging needs of Southern Resident orcas and ensures their protection into the future. We note that the Salmon FMP does not include objectives to account for orcas or consideration of ecological factors in determining Optimum Yield as required by the Magnuson-Stevens Fishery Conservation and Management Act.

9. Adopt a goal to fully recover all Chinook salmon stocks to support healthy fisheries, account for the needs of dependent predators, and fulfill the obligation to achieve optimum yield.

10. Beyond fishery management, we request NMFS and the Council support comprehensive and bold actions to recover Chinook salmon throughout the region by preventing any further loss or degradation to essential fish habitat and supporting actions to restore degraded or blocked salmon habitat including removing dams, like those on the Lower Snake River.

It is imperative actions are taken quickly to recover the Southern Resident orca population and Chinook. In the long run, this will benefit not only the orcas, but salmon fisheries and communities throughout the region. Now is a critical time to act. Thank you for attention to this important conservation issue.

Sincerely,

Ben Enticknap
Pacific Campaign Manager and Senior Scientist

cc. Chris Yates, NMFS Assistant Regional Administrator for Protected Resources