

Southern Resident killer whale pregnancies, 2022/2023

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Rational. Photogrammetry measurements from vertical aerial photographs can reveal pregnant cetaceans, based on their increased breadth at midbody when viewed from above (Cheney et al. 2022). We have shown this method to be valuable for identifying pregnant Southern Resident killer whales (SRKW; <https://www.sealifer3.org/news/pregnant-whales-identified-among-the-southern-resident-killer-whales>), and documenting subsequent reproductive loss (Durban et al. 2016; <https://www.sealifer3.org/news/continued-lost-pregnancies-for-the-southern-resident-killer-whales>).

Sample Data. We measured the breadth at the anterior insertion of the dorsal fin from vertical aerial photographs of 28/31 possible reproductive female SRKWs (ages >8 and <50) known to be alive between September 2022 and April 2023 (not measured were L54, L77, L119). Images were obtained using an octocopter drone to carry a digital camera with full frame sensor (7360 x 4912 pixels) and a 55mm lens to ensure a flat and undistorted image. To control for variability in individual size, breadth in pixels was divided by the pixel measurement between the blowhole and the anterior insertion of the dorsal fin (BHDF) in the same photograph. The breadth of all J pod females was measured in March and April 2023 and L pod females in November 2022. Three K pod females (K16, K22, K43) were measured in November 2022, and the other four (K14, K20, K27, K36) were last measured in September 2022.

Identifying pregnant whales. The median of breadth/BHDF in the most recent measurement month for these 28 whales was included in a larger dataset of 200 whale-by month measurements of females from high resolution drone photogrammetry since 2015. This expanded dataset comprised 40 different females, including multiple previous measurements of all the females of current interest. We fit a generalized linear model in a Bayesian formulation to estimate the probability that each female's current measurement was greater than average by an amount consistent with female widths measured within six months of known births. We list five females with a high ($p > 0.75$) probability of conforming to this benchmark of increased breadth: J22, K16, K43, L72 and L94. There are other whales with breadths greater than average that may be in earlier stages of pregnancy when measured, with lower probabilities of support, and some of these may now be in the latter stages of pregnancy.

Notes. J22 was heavily pregnant when last measured in April 2023. The remaining four whales were last measured in November 2022, so have likely already given birth to a calf that is yet to be observed, lost their pregnancies since last being measured, or may have suffered unobserved mortality of a neonate. However, we note that our identification of breadths consistent with being within the last six months of pregnancy on average is probabilistic and we cannot be certain of the precise stage of pregnancy, due largely to individual variability in shape change during pregnancies. It is possible that some of these females were in earlier stages of pregnancy when last measured, but displayed breadths consistent with the average for later stages; as such they may still be pregnant. To demonstrate this point, L72 was measured with a width consistent with later stage pregnancy in January 2022. Even if she lost that pregnancy and conceived immediately, she could at most only be 10 months into a new pregnancy when most recently measured in November 2022. Alternatively, she may have been at an earlier stage of pregnancy than her increased breadth suggested in January 2022 and may have been in the very late stages of the same pregnancy in November 2022. This scenario is supported by the raw measurements: she had a greater breadth in November 2022 than January 2022.

References

- Cheney, B.J., Dale, J., Thompson, P.M. and Quick, N.J., 2022. Spy in the sky: a method to identify pregnant small cetaceans. *Remote Sensing in Ecology and Conservation*.
- Durban, J., Fearnbach, H. and Barrett-Lennard, L., 2016. No Child Left Behind Evidence of a killer whale's miscarriage. *Natural History*, 124(8), pp.14-15