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## No Child Left Behind

**Killer whales (*Orcinus orca*) know a lot about family values.** With optimal lifespans not unlike humans, reaching one hundred years of age or more, they form strong social bonds and devote tremendous energy to caring for their kin. They reproduce relatively infrequently, with females giving birth to only a handful of calves in their lifetimes. Not surprisingly, killer whales invest hugely in each of their offspring: gestation lasts a year and a half, and the calf will then spend its entire life with its mother's group, receiving help from close relatives in finding and capturing food, and in caring for its own offspring. As a result, however, killer whale populations grow very slowly, and the survival of each calf becomes crucial to the endurance of small populations.

One such endangered population of killer whales, known as the Southern Residents, aggregates every summer in the transboundary coastal waters of Washington State and British Columbia, where they come to feed on returning runs of Chinook salmon, their primary prey. This population has been studied for decades, with every individual whale and its corresponding lineage well known to researchers (see [www.whaleresearch.com](http://www.whaleresearch.com)). Several decades ago, a live-capture fishery that collected and sold the whales for aquarium displays significantly reduced their numbers. Since an annual census began in the early 1970s, Southern Residents have numbered less than one hundred individuals. The ongoing viability of the population currently depends on the reproductive efforts of just a few dozen females—every calf matters. But the number of calves born in most years can be counted on one hand, and there is growing scientific evidence that in some years more than half the pregnancies end in a miscarriage or early death of the young calf.

**The above photograph is a portrait of reproductive failure:** a stillborn fetus is being pushed to the water's surface by the presumed mother, a twenty-two-year-old female, known as "K27." The smaller whale swimming alongside her ("K44") is her first and only surviving calf—a five-year-old male that is still in close attendance. The fetus is between three and four feet long, half the size of a full-term calf, but already a miniature killer whale replica. We took the photograph while conducting an aerial photogrammetry study to measure the growth and body condition of Southern Resident killer whales (see [www.fisheries.noaa.gov/podcasts/2015/10/uav\\_killer\\_whale.html](http://www.fisheries.noaa.gov/podcasts/2015/10/uav_killer_whale.html)). By flying a small hexacopter drone more than one hundred feet above the water (under permit from the U.S. National Marine Fisheries Service and airspace clearance from the Federal Aviation Administration), we can photograph the whales without disturbing them, and by measuring body widths we can determine pregnancies and overall bulk. For killer whales, being fat equals good health. From these measurements, we can monitor reproductive success, or failure, and track the nutritional health of individual whales, to help us better understand the reasons why this population has failed to recover.[media:node/3047 caption horizontal large left]

Three key threats to Southern Resident killer whales have been identified in both U.S. and Canadian conservation plans: limited prey, disturbance from vessel traffic, and the ill effects of contaminants that accumulate in marine food chains—any or all of which can play a role in reproductive failure. The fetus we photographed quickly sank out of view and was unable to be recovered for diagnostic analyses. We also do not know how often females have miscarriages in robust killer whale populations, but our aerial photogrammetry will help us to detect pregnancies unobtrusively and monitor outcomes over time. Each image offers a new perspective on killer whale viability, but it isn't always a picture of health.

--JD, HF, LB-L

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