



Fisheries

## As Yukon Chinook salmon populations decline, researchers turn to technology for answers

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By Lela Nargi

### Scientists propose tracking towers and drones to find out why king salmon populations in Alaska continue to decline



Using drones, researchers seek to better understand where, along an almost 2,000-mile migratory route, things go wrong for chinook salmon. Photo by Daniel Auerbach.

In 2022, Yukon River chinook salmon crossing from Alaska to their spawning grounds in Canada continued to show steep declines, hitting their smallest recorded numbers to date. Where annual crossings of 42,500 Chinook salmon were identified by 2002's [Yukon River Salmon Agreement](#) (<https://www.fws.gov/law/yukon-river-salmon-agreement>), as essential to maintaining robust populations, this past year [only 11,000 fish](#) (<https://www.theglobeandmail.com/canada/british-columbia/article-yukon-salmon-population-decline/>) made the crossing.

Not only are Yukon Chinook salmon (king salmon, *Oncorhynchus tshawytscha*) population sizes decreasing, they are impacted by fishing, [warming Bering Sea](#) (<https://www.fisheries.noaa.gov/feature-story/whats-behind-chinook-and-chum-salmon-declines-alaska>), temperatures causing declines of prey and prey quality, and increased incidences of [ichthyophonus infections](#) ([https://www.researchgate.net/publication/237834719\\_Ichthyophonusis\\_An\\_Emerging\\_Disease\\_of\\_Chinook\\_Salmon\\_in\\_the\\_Yukon\\_River](https://www.researchgate.net/publication/237834719_Ichthyophonusis_An_Emerging_Disease_of_Chinook_Salmon_in_the_Yukon_River)).

But as a [recent article](https://www.biographic.com/trouble-at-sea/) (<https://www.biographic.com/trouble-at-sea/>) by the Food and Environment Reporting Network and bioGraphic points out, the fish are also "growing more slowly at sea and, in many cases, returning to spawn younger and smaller than ever before. In some places, the biggest, oldest salmon have completely disappeared."

Researchers are seeking to better understand where along their almost 2,000-mile migratory route things are going wrong for this beleaguered species of Pacific salmon. The Alaska Department of Fish and Game hopes to radio tag some 500 Chinook salmon (including some of the Yukon population, if Yukon First Nations agree to it) in spring of 2023. To follow the fish, tracking towers would be set up along the Yukon River to the U.S.-Canada border.



(<https://link.cthbl.com/aquapod>).

"The strategic approach here is to track the upriver success of those Canadian-origin fish to determine whether they are making it to the border, and, if they're not, where they are having problems," one of the department's researchers [told the CBC](https://www.cbc.ca/news/canada/north/yukon-chinook-salmon-research-1.6679608#:~:text=CBC%20News%20Loaded-,New%20study%20proposes%20to%20uncover%20where%20chinook%20salmon%20could%20be,eventually%20) (<https://www.cbc.ca/news/canada/north/yukon-chinook-salmon-research-1.6679608#:~:text=CBC%20News%20Loaded-,New%20study%20proposes%20to%20uncover%20where%20chinook%20salmon%20could%20be,eventually%>

Daniel Auerbach, an environmental scientist at Washington State University, told the *Advocate* he wouldn't be surprised if drones weren't soon equipped with radio tag receivers to boost these sorts of efforts. "While drones do have limitations... in conjunction with other efforts [they] may be quite useful," he said.



Drones may be the least invasive way to count redds and the images they yield can help track habitat changes over time. Photo by Daniel Auerbach.

Another study in the region has been tracking ichthyophonus to suss out its role in salmon deaths. But confirmation of the disease requires killing fish – of which 40 percent were found to be infected last year. That's caused [tension](https://www.cbc.ca/news/canada/north/alaska-yukon-chinook-ichthyophonus-study-1.6546749) (<https://www.cbc.ca/news/canada/north/alaska-yukon-chinook-ichthyophonus-study-1.6546749>) with Indigenous communities that have voluntarily stopped harvesting salmon to boost numbers.

Could drones shed some light on the plight of Yukon Chinook salmon? [Auerbach's own research](https://onlinelibrary.wiley.com/doi/10.1002/rra.4065) (<https://onlinelibrary.wiley.com/doi/10.1002/rra.4065>), conducted on Washington's Wenatchee River in 2020, showed promise in counting salmon nests (or redds) that female fish scoop out in streambeds. A drone flown at 150 feet was successful in finding about twice the number of redds than observations made when walking or boating downriver.

## Startup awarded \$1 million to create a 'digital twin' of the North Pacific Ocean



PolArctic is using AI to create a "digital twin" of the North Pacific to understand and prepare for the impacts of climate change.

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This sort of technology has its challenges since it can't count eggs lain, and it can be difficult to tell the difference between a redd and any old rocky hollow. On the plus side, drones may well be the least invasive way to count redds and the images they yield can help track habitat changes over time – baseline data that will come in handy when and if scientists are successful in stabilizing salmon populations.

"It is important that we infer back to these datasets to understand how populations stabilized after certain events and use them to guide our actions now and into the future," Auerbach said. He's looking to expand his redd research into other areas, including salmon habitat modeling, individual counts and machine learning for redds.

"My current research has been somewhat isolated to two ideal systems," he said, noting that he's also used drones to count sockeye in Alaska. "We need to start applying it across entire rivers in different locations."

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