

Heat stress in Yukon River Chinook salmon

Yukon River temperatures

Summer water temperatures are surprisingly warm in Alaska’s Yukon River. The warmest water temperatures happen right in the middle of the the Chinook salmon run. Water temperatures reach between 18 and 21 °C (dashed lines in Figure 1; ~65 and 70 °F). These temperatures are known to cause heat stress in salmon. We wanted to understand if Yukon River Chinook salmon have heat stress. If heat stress levels are high that could help explain why Chinook salmon returns are low. This research does not rule out other causes of decline.

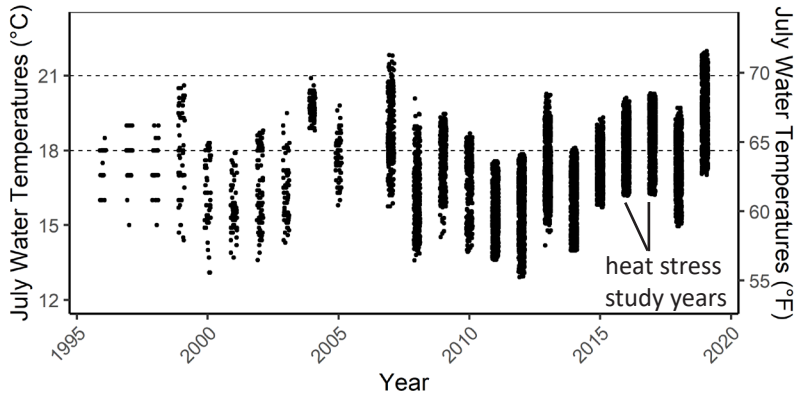


Figure 1. July water temperatures recorded by Alaska Department of Fish & Game near Pilot Station.



Figure 2. Yukon River Chinook salmon with a small sample tube for muscle tissue.

Heat stress could be part of low Chinook salmon returns

Most (54%) of the 477 Chinook salmon sampled had signs of heat stress in lab tests (Figure 3). This is a high and concerning heat stress level. We expect that heat stress has been present in Yukon Chinook salmon over the past 20 years based on these lab results and the longer temperature records.

High heat stress is linked to in-river death before spawning, even in years and places where there are no obvious fish kills. If fewer Yukon River Chinook salmon are putting eggs in the gravel because of heat stress that could be one of several reasons returns have been low since the 1990s. Tracking salmon in-river and confirming spawning are key next steps for Yukon Chinook salmon research.

This document summarizes *Evidence of prevalent heat stress in Yukon River Chinook salmon* (<https://cdnsiencepub.com/doi/10.1139/cjfas-2020-0209>). Author Vanessa von Biela can be reached at vvonbiela@usgs.gov with questions or comments about this new research.

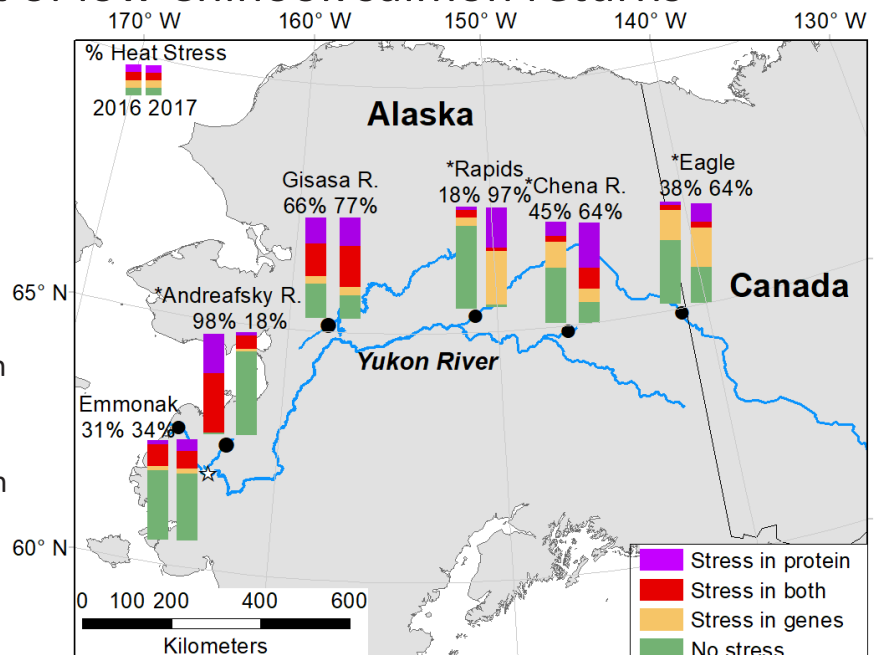


Figure 3. Colorful bars on the map show the type and percentage of Chinook salmon with evidence of heat stress at each location in 2016 (left bar) and 2017 (right bar). Green bars show fish without heat stress indicators and other colors show different ways heat stress was uncovered with lab tests. Muscle samples collected with Alaska Department of Fish & Game, U.S. Fish and Wildlife Service, and subsistence fishers.