Monitoring and predicting the exposure of Pacific salmon to harmful algal biotoxins

Conservation and Stewardship

West Coast Vancouver Island

Habitat Monitoring

Biosampling

Harmful algal bloom along a marine shoreline.

This project investigates the risk, impacts, and pathways of exposure to harmful algal biotoxins in WCVI Chinook salmon. Water (filtrate) and plankton (filter) samples collected monthly at 5 locations (Robbers, Coaster, Swale, Sarita, Mckenzie) in Barkley Sound are being analyzed for a range of biotoxins. Analysis of samples collected from July to November 2023 suggests that biotoxin concentrations tend to peak in September, with domoic acid reaching levels close to those associated with accumulation in shellfish (100 ng/L). Concentrations of saxitoxins, which can cause respiratory distress and paralysis in fish, were close to the highest we have seen in B.C. coastal waters (>4000 ng/L), suggesting that migrating fish may be exposed to these toxins in Barkley Sound. Yessotoxin, which is toxic to shellfish, was highest in August. Other lipophilic toxins were present at lower concentrations but may be of concern due to their potential to bioaccumulate in salmon and/or their prey.

Environmental conditions and the type and abundance of harmful algal species are also being recorded in order to investigate how these relate to the timing and levels of biotoxin exposure in critical salmon habitat.

Biotoxins have also been measured in gill tissue obtained from microtrolled Chinook salmon ranging in size from 185 to 283 mm and 68.2 to 241.4 g, using a new extraction procedure. Domoic acid and the saxitoxin dcGTX-2 were detected in gill tissue from the smallest fish, using about 0.4 g of sample. Larger quantities may be needed to detect and quantify more biotoxins in gills, liver, and other tissues from individual fish so that biotoxin levels can be related to parameters such as size, health, gene expression, and life history as determined by microchemical analysis of otoliths. Meanwhile, our results show that harmful algal biotoxins can be detected in WCVI Chinook salmon and their habitat, suggesting that exposure of these fish to potentially harmful concentrations of biotoxins is possible, particularly in late summer and fall.

Take-aways

- Pacific salmon in Barkley Sound may be exposed to high levels of harmful algal biotoxins in the fall.
- Biotoxins have been detected in gill tissue from Chinook salmon collected in Barkley Sound.
- We are comparing biotoxin levels with environmental conditions and indicators of fish health.

Picture of a juvenile Chinook salmon.

Timeline

- ✓ Jul - Nov 2023: Biotoxin and water sampling
- ✓ Jan 2024: Methods development
- ✓ Apr 2024: Reporting
- ↻ Jul - Nov 2024: Biotoxin and water sampling

DFO Science Division
Ocean Sciences

DFO Science Section
Ecology and Biogeochemistry

Project Leads
Andrew Ross
Mackenzie Mueller

Location
Barkley Sound

Collaborations
Snuneymuxw First Nation, Cermaq Canada, Pacific Salmon Foundation Citizen Science Program

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