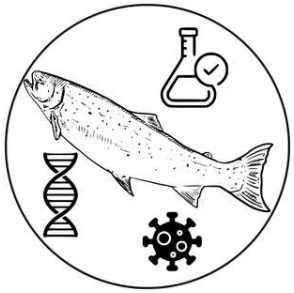
Adaptive genetic variation and climate change resilience in Canadian Pacific salmon



Conservation and Stewardship

BC Wide

PBS Nanaimo

Genetics

Genetic variants among and within populations of the majority of Canadian Pacific salmon have been characterized using relatively low numbers of genetic markers, and this characterization has enabled the development of the genetic-stock identification and parentage-based tagging programs within DFO that provide vital information for management of fisheries and hatcheries. Despite the utility of these developments, low-density genetic markers are insufficient to assess adaptive genetic variation in these species, leaving critical gaps for conserving fitness-associated genetic diversity and for improving resilience to climate change. Reductions in next-generation sequencing costs combined with publication of reference genome sequences for the Pacific salmonids has opened novel opportunities to address these gaps.

This project utilizes low-coverage whole-genome resequencing to assess genome-wide patterns of genetic variation among and within populations of Pacific salmon. These data will feed into several analyses to identify genomic regions and variation involved in environmental adaptation, to reassess the genetic support for currently defined conservation unit boundaries, and to estimate the relative climate change resilience of different populations of Canadian Pacific salmon.

Take-aways

- Pacific salmon genetic markers are regularly used to manage fisheries and hatcheries.
- While these genetic analysis efforts provide important stock management information, they could also be used to assess diversity of salmon species relative to habitat changes.
- This salmon genetic adaptation study gathers Chinook and sockeye DNA samples and compares genomes to environmental conditions and climate projections.

Initially, the project focuses on Chinook and sockeye with a goal of sequencing individuals from 48 populations of each species distributed across the species' range. In the longer-term, the objectives of this project will expand these sequencing efforts to increase the coverage of individuals, populations and species of Pacific salmon. This expansion of scope will be necessary to fully consider conservation of within population genetic diversity, and to resolve parallel patterns of genetic adaptation across Pacific salmon in Canada.

Timeline

✓ Jul 2023 - Mar 2024: Genome resequencing

🔄 Apr 2024-Mar 2025:

- Genome-environment analysis
- New raw resequencing reads

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Species

Chinook

Sockeye

Climate Vulnerability

Project ID

2437

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