Biological models to support prioritizing salmon stocks under future climates

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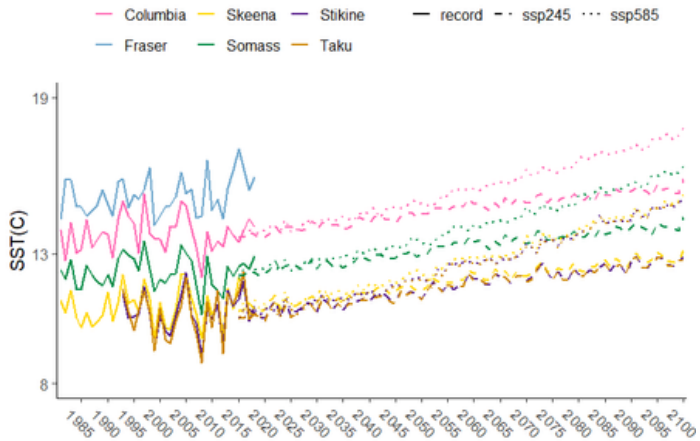
Climate change impacts on Pacific salmon populations are expected to vary in space and time, as well as, across species and life stages. As a result, quantifying stock-specific risks of environmental change is critical for prioritizing DFO management actions. This project fits retrospective, life stage-specific models in a data-driven analytical framework to evaluate functional responses to climate variables across the salmon life cycle and make projections for how stocks will respond to climate change scenarios. This modelling approach is intended to be sufficiently flexible to incorporate variability in data quality.

This multi-year project involves two components:
1) Pairing existing data on Pacific salmon population dynamics with readily available freshwater and marine environmental data to estimate the effect of variables such as temperature and flow on salmon productivity (e.g. recruits per spawner). The model will quantify life stage-specific effects on survival for stocks, including those with estimates of both juvenile and adult abundance. Initial modelling will focus on sockeye salmon stocks with estimates of both freshwater and marine productivity. Stocks range from the Columbia River to the Transboundary region and have variable status relative to Wild Salmon Policy benchmarks.

2) Coupling this modelling framework with downscaled climate models to project stock-specific responses under projections of freshwater and ocean temperatures from future climate scenarios. The projected biological status of different stocks, and associated uncertainty in them, is intended to strengthen the scientific foundation upon which management interventions can be prioritized.

Take-aways

- Predicting how salmon stocks respond to climate change is difficult because salmon life stages span diverse habitats seasonally.
- This modelling project studies the relationships between salmon survival and environmental data in freshwater and marine habitats, then applies those relationships to more specific stocks with less available information.
- By modelling these relationships across all salmon stocks, decision-makers are better able to predict the state of salmon stocks under a variety of climate change scenarios.



Historical (solid lines) and two future emissions scenarios (dashed lines) of sea surface temperatures for six salmon population ocean entry points in B.C.

Timeline

- Oct 2023-Dec 2024: Compile salmon and environmental data
- Apr 2024-Aug 2025: Develop and fit hindcast models
- Dec 2025-Mar 2026: Develop and fit future climate scenario models

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Location
PBS Nanaimo
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IOS Sidney

Species
Sockeye

Climate Vulnerability

Project ID
2405