Investigation of the impacts of singular and coinciding acute climate stressors on the nutritional quality of the pteropod *Limacina helicina*, a juvenile Pacific salmon dietary species

Conservation and Stewardship

PBS Nanaimo

PSEC West Vancouver

Laboratory Testing

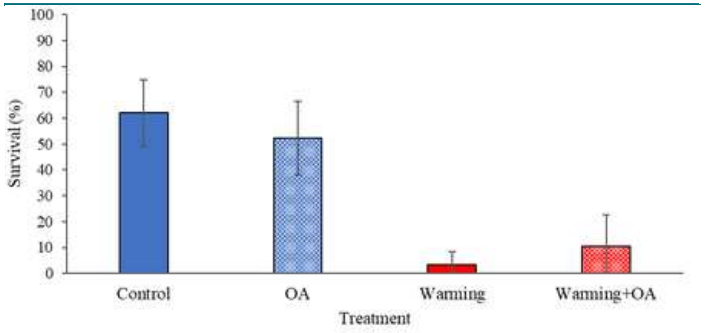
Limacina helicina (credit: M. Poerner Loureiro, VIU).

Limacina helicina, a cold-water pteropod species of high abundance within zooplankton communities of the Northeast Pacific coastal region, is highly susceptible to climate change stressors, with documented impacts of ocean warming and acidification on shell development, growth, and survival. However, there has been minimal investigation of climate change effects on the species' nutritional status (e.g. fatty acid composition) under regionally-relevant conditions.

Given the importance of *L. helicina* as a dietary item for populations of juvenile Pacific salmon species, it was proposed that any change in the nutritional status of *L. helicina* under climate stressor conditions could have carry-over impacts to juvenile salmon growth, health, and survival. Impacts on the fatty acid profiles of *L. helicina* under climate change conditions were examined via a laboratory experiment during which pteropods were exposed to singular and coinciding warming and upwelling (i.e. high pCO_2) conditions, with fatty acid analyses carried out at 48-hr and 5-day timepoints. Lab results indicated a significant negative impact of warming, but not pCO_2, on survival at 5 days, and a significant impact of pCO_2 on pteropod fatty acid fractions at 48 hours (some fatty acids being positively affected and others negatively).

Take-aways

- A laboratory-based investigation of the nutritional status (fatty acid profiles) of a zooplankton species (pteropods) under future climate change conditions.
- Analyses of historic field samples to examine time-series changes in pteropod fatty acid composition in relation to temperature records.



Graph of warming and upwelling impacts on pteropod survival.

Additional fatty acid analysis of historical preserved plankton samples, collected in the region over 2014–2023 as a part of DFO's Strait of Georgia survey program, is currently underway to examine time-series changes in pteropod fatty acid composition in relation to temperature records. Results of this work will contribute to an increased understanding of the impacts of climate change on pteropod species, and help to illuminate ecological interactions under climate change conditions, particularly with regard to food-web dynamics.

Timeline

- ✓ Jun - Oct 2023: Pteropod collection
- ✓ Sep - Oct 2023: Lab experiment
- ↻ Oct 2023 - Mar 2024: Fatty acid analyses
- ↻ Apr - Jun 2024: Peer-reviewed publication
- ↻ Apr 2024: Final report

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Location

Pacific Biological Station

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Collaborations

Salmon Marine Interactions Program

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