05 Feb 2021

Dear Professor Long,

We are pleased to submit this research article titled “Influence of warming temperatures on coregonine embryogenesis within and among species” for your consideration for publication in *Global Change Biology*.

1. **What is the scientific question you are addressing?**

Does aquatic biota have the potential to respond the speed and magnitude of warming waters in a changing climate? Here we specifically experimentally explore how cold water salmonid embryos from different species and populations respond to increasing temperature both in term of survival, phenology and size of larvae.

We address the question, how do elevated water temperatures impact coregonine embryogenesis within- and among-species? We estimate the reaction norms across an incubation temperature gradient in conspecific and congeneric coregonines, identify alternative temperature adaption strategies for coregonines, and argue the importance of using standardized protocols for long-term comparisons.

1. **What is/are the key finding(s) that answers this question?**

1) Coregonine embryos had contrasting trait responses to temperature within- and among-species; 2) female and male effects controlled a portion of offspring trait phenotypes; ~~3) few experimental studies use standardized protocols during incubation; and consequently~~ 3) our results provide a reproducible reference point for embryo temperature responses from climate change. 4) *a more general result would be great (what’s new for the scientific community? Almost sure Jason could find the take home message!)*

1. **Why is this work important and timely?**

The greatest aquatic threat from climate change is increasing lake temperatures. To our knowledge, this is the first cross-species, cross-continent analysis for coregonines using standardized methods and provides an important benchmark for future global comparisons. We expect this paper to be well-received based on current coregonine restoration and conservation efforts.

1. **Does your paper fall within the scope of GCB; what biological AND global change aspects does it address?**

Our paper integrates increasing water temperatures, which are rising globally within lakes. In particular, our focus is on the embryo response of cold-water fishes in North America and Europe to elevated incubation temperatures. Consequently, we feel our paper is an excellent fit for *GCB*.

1. **What are the three most recently published papers that are relevant to this question? This information will assist the Editors in selecting reviewers.**

Karjalainen, J., Keskinen, T., Pulkkanen, M., & Marjomäki, T. J. (2015). Climate change alters the egg development dynamics in cold-water adapted coregonids. Environmental Biology of Fishes, 98(4), 979–991.

Jonsson, B., & Jonsson, N. (2014). Early environment influences later performance in fishes. Journal of Fish Biology, 85(2), 151–188.

Little, A. G., Loughland, I., & Seebacher, F. (2020). What do warming waters mean for fish physiology and fisheries? Journal of Fish Biology, 97, 328–340.

**Suggested Reviewers**

Trevor Pitcher, University of Windsor, [tpitcher@uwindsor.ca](mailto:tpitcher@uwindsor.ca)

Louis Bernatchez, Université Laval, [Louis.Bernatchez@bio.ulaval.ca](mailto:Louis.Bernatchez@bio.ulaval.ca)

Jean Adams, United States Geological Survey, [jvadams@usgs.gov](mailto:jvadams@usgs.gov)

Brian Weidel, United States Geological Survey, [bweidel@usgs.gov](mailto:bweidel@usgs.gov)

We look forward to your response.

Sincerely,

A picture containing sky, insect

Description automatically generated

Taylor R. Stewart (on behalf of all co-authors)

Ph.D. Candidate, Department of Biology, Rubenstein Ecosystem Science Laboratory

University of Vermont