April 22, 2019

Dear Dr. Richardson,

We are happy to submit a final revision of our manuscript pbio.2006806, entitled: Trophic interactions modify the temperature dependence of community biomass and ecosystem function.

We have addressed the last, few minor comments by Reviewer #1 (acknowledgements of these are below this letter). We have also made our data available at Zenodo (

<https://doi.org/10.5281/zenodo.2652579>).

Sincerely,

Mary O’Connor and co-authors.

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Reviewer 1

The authors have made many changes to the manuscript. I found some changes, such as the addition of figure 3 and reconfiguring of other figures to be helpful for interpreting the results. Again, I think this is a very well-done study with a novel design and interesting results. However, I struggled with the writing due to long sentences with jargon/similar words repeated. I found that the revisions made the paper a little more difficult to understand and thought the changes shifted the paper to read more like one targeted at an MTE audience.

Particular sentences that need to be clarified or re-written:

**Response:** L60-63 [done], L84-88 [done], L134-140 [done], L493-495 [done], L512-514 [done]

Hypothesis 1: re-word, perhaps ‘the relationship between algal biomass and temperature is modified by the number of trophic levels’

**Response:** done

L232: Should grazing rates be changed to consumption rates since the sentence is talking about the effect of predators on zooplankton?

**Response:** No, but we clarified the sentence with a minor revision.

L118-120: which of these lines are solid and which are dashed? It is hard to tell them apart. What is the difference in line weights representing?

**Response:** We have revised these figures and clarified this.

L144-147: This is a very clear statement of the hypothesis. Having this clear explanation earlier would help interpret the ‘paradox’ described in the introduction.

**Response:** done

L101: Include the word ‘to’

**Response:** done

L202-204: Shift in body size distributions can also be the outcome of indirect effects of temperature due to shifts in competitive hierarchies. Perhaps this wording could be changed

**Response:** We chose not to change it here, because we could not test for this possibility. We did add a note of this possible effect in the introduction (line 107-109) and in the discussion (lines 248-250).

L253-254: The beginning of this sentence is redundant

**Response:** done

L306-307: Please add that the different colored lines represent different weeks

**Response:** done

L326- 327: The values of the dotted lines don’t seem to match the figure

**Response:** We clarified this by adding ‘vertical’ to the legend, and darkening these dotted lines in the figure.

Throughout: italicize Daphnia and per capita

**Response:** done

361: The units on the size measurements seem incorrect

**Response:** These are correct; we checked.

Figure 4: keep the labels of the trophic level treatments consistent and change the legend. Is the grey line in panel B for different weeks or with a predator, please clarify

**Response:** done

L405: Capitalize LMM

**Response:** done

L448-451: This no longer describes the new figure, remove and check the rest of the caption

**Response:** done

L511: a missing word in this sentence

**Response:** done

L590: Add sentence to conclude the point about the lake temperature

**Response:** done

L634-635: Not clear what community biomass or community change are referring to.

**Response:** We clarified this sentence: In our systems, algal biomass and zooplankton abundance in food webs were more resistant to temperature in the presence of longer food chains.

L643-645: This requires more explanation. I would suggest you remove this entirely as it isn’t relevant to the experimental design as you outline in the next sentence.

**Response:** We removed these sentences, as suggested.

L654: “fixed predation-related mortality” is unclear. Mortality can vary with temperature, or is that interpretation incorrect?

**Response:** done

References need to be checked for consistency

**Response:** done

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Reviewer 3

The authors have gone above and beyond what was asked of them in their initial set of reviews. I am particularly pleased with the care taken in the presentation of theory (and needed explanation text), and the new analysis using random effects to account for temporal autocorrelation. The text is more fluid now, the figures and legends are improved, and the discussion has been expanded as required by the reviewers. I believe this article is ready to be accepted in its current format. I do note however that I have not seens a data availability statement there, and I do think that the authors need to provide their raw data and code publicly prior to acceptance.

**Response:** we have added our data availability statement and posted our data.

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Reviewer 4

The authors have greatly improved the manuscript in response to my, and the other reviewers, comments. In particular, the presentation of the ideas and results is much clearer, the new mathematical treatment provides greater clarity around the hypotheses and mechanisms and makes a more explicit connection to previous work, and the statistical treatments no longer convolute the results.

I have only one additional minor comment, which is that in Lines 212-213 it would be good to emphasize that this assumption is in fact one of the hypotheses being tested.

**Response:** We modified the last sentence in that paragraph to read: To test this hypothesis, and the alternative that is independent of temperature, we linearized Eqn 3 for analysis by log transforming (Methods: Eqn 7).