

Dear Reviewer,

We have carefully reviewed and thoroughly considered all the comments you provided on our manuscript. We would like to express our sincere gratitude for your insightful and constructive feedback, which has been invaluable in enhancing the scientific rigor, technical detail, readability, and overall accuracy of this paper. We respond to each of your comments individually below. For clarity, we have formatted our response as follows: your original comments are presented in black text, our point-by-point responses in blue text, and the corresponding revised manuscript text in red text. All revisions have been incorporated into the revised manuscript.

I appreciate the authors' detailed responses to the reviewer feedback and their revisions of the manuscript. The changes made are overall to my satisfaction. I find that the revised manuscript is now more streamlined and one of my largest concerns from the previous round of revisions has been addressed; the novel contributions of this work are easier to identify, and the ambiguity from results from previous works has now been clarified. I think the new title is a good improvement, also.

Weibo: Thank you very much for your positive feedback on our revisions. We have carefully considered and addressed all your remaining comments in this updated manuscript. We hope that the revised paper is now suitable for publication.

My suggestions for additional changes at this point are minor and are listed below:

- Some of the figures appear to be at a low resolution (e.g. Fig 8 is blurry to me); disregard if this is just due to how the PDF documents are created, but in any case I just wanted to mention so the authors are aware

Weibo: Thank you for your note on figure clarity. All figures in the original manuscript were prepared at 300 PPI to ensure sharp text and details. We will submit all original high-resolution figure files separately to the submission system to guarantee optimal clarity in the final version.

- I think the EEMD results (as presented in Figure 3 of the author response document) are good to see and strongly reinforce the authors' results; as such, I suggest the authors include them as a supplement and briefly mention the consistency of the results using this different method in the text.

Weibo: We have incorporated your proposed Figure 3 into the Supplementary Materials and provided corresponding clarification in the revised manuscript at lines 192–195, demonstrating that the EEMD method yields consistent results and underscoring the robustness of our findings.

- Paragraph at L533: Several ecological facts are mentioned in this paragraph without any references; please add citations. (E.g. poleward shift of groundfish communities: which publication discusses this?)

Weibo: Thank you for your suggestion. We have added several relevant references in the revised manuscript at lines 535–537.

- Figure 8: is the correlation coefficient colourbar scale for Fig. 8b scale the same as in Fig. 8 a? Please specify in the caption.

Weibo: We have added the sentence "**Both panels share an identical colorbar scale for correlation coefficients**" to the caption of Figure 8 in the revised manuscript at line 353 as suggested.

- Figure 10 caption: “under sea ice conditions”; I think this was “under extreme sea ice conditions” before and it still needs some sort of descriptor like that (or just say “under HI and LI conditions” and remove the parenthetical)

Weibo: As suggested, we have revised "under sea ice conditions" to "under HI and LI conditions" in the revised manuscript at line 402.

Technical corrections:

L239: “exhibits significant causal relationship” -> “exhibits a significant causal relationship”

Weibo: Thank you for your valuable suggestion. We have made the necessary revisions to the manuscript at line 240 as you recommended.

L240: “information flow” -> “information flows”

Weibo: As suggested, we have made the necessary revisions to the manuscript at line 241.

L443: “Competition mechanisms” -> Rephrase as either “Competing mechanisms” or “Competition of mechanisms”

Weibo: According to your suggestion, I have revised "Competition mechanisms" to "Competing mechanisms" in the revised manuscript at L444.