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Dr. Hsiao-Hsuan Wang, Ph.D.

Editor-in-Chief

*Ecological Modelling*

Dear Dr. Wang:

I am writing to submit our manuscript entitled “Attributing hypoxia responses of early life *Menidia menidia* to energetic mechanisms with Dynamic Energy Budget theory” for your consideration as a Research Article in *Ecological Modelling*, in the special issue “Metabolic organization across scales of space and time”.

We used a simplified Dynamic Energy Budget model (DEBkiss) to understand the mechanisms responsible for responses of Atlantic silverside (*Menidia menidia*) to hypoxia, an ecological stressor that is intensifying globally. This study expands on previous experimental work on Atlantic silversides that documented reduced early life growth, hatching success, and survival when reared under environmentally relevant levels of hypoxia. To connect these whole-organism responses to the energy budget, we employed the concept of synthesizing units (SU) to derive an oxygen-dependent correction factor that treats hypoxia as an inhibiting or damaging agent – a novel application of the SU concept. We identified conversion efficiency for growth and stage-specific mortality rates as the most likely DEB processes responsible for the experimentally observed responses to hypoxia.

This work will be of great interest to the readers of *Ecological Modelling* and this special issue because it takes a novel approach to modeling impacts of the real-world problem of intensifying hypoxia with a widely applicable DEB model. This model is a valuable tool to supplement ecological stressor experiments, particularly in early life stages when laboratory procedures are logistically constrained. Our results suggest that damage to the SUs, likely by anaerobic byproducts such as lactate, reduced the efficiency of growth and development, which could lead to lower recruitment and fecundity in realistic hypoxia scenarios. Readers will be interested in the implications of our findings using a model at the organismal scale of organization for population and ecosystem dynamics, as well as our suggestions for future work to refine the model using suborganismal data linked to physiological modes of action.

All authors have seen and approved the manuscript for submission to *Ecological Modelling* and have agreed to abide by the Editorial Policy. The authors confirm that this manuscript is original research that has not been previously published and is not under consideration for publication elsewhere. A previous version of this work is published only in my Ph.D. thesis and subsets of our findings have been presented at the following conferences: the 2023 Dynamic Energy Budget Symposium in Baton Rouge, LA; the 2022 Larval Fish Conference in San Diego, CA; the 2021 Dynamic Energy Budget Symposium (virtual); and the 2021 American Fisheries Society meeting in Baltimore, MD.

Thank you for your time and consideration. I look forward to your response.

Sincerely,

Teresa G. Schwemmer, Ph.D.

Corresponding Author