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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 suborganismal processes, we employed the concept of synthesizing units (SU) to derive an oxygen-dependent correction factor that treats hypoxia as an inhibiting or damaging agent. We identified conversion efficiency for growth and mortality rates as the most likely DEB processes responsible for the previously observed responses to hypoxia.

We believe 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 hypoxia effects with an existing and widely applicable DEB model. This work has produced a valuable tool to supplement ecological stressor experiments, particularly in early life stages when measuring suborganismal processes is logistically challenging. Readers will also be interested in the implications of our findings for population dynamics. 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.

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 dissertation 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

All authors must suggest 4 reviewers on submission, together with their full addresses and email details. The suggested reviewers should not be a colleague, a close collaborator or in the same institutional location as the author(s).

* Yoann Thomas, lead author of DEB hypoxia paper, hypoxia DEB model of cod
* Elke Zimmer, DEBkiss, fish early life stages
* Benjamin Martin, DEB models of fish, hypoxia and metabolism work, DEBkiss
* Jonathan Flye-Sainte-Marie, DEB models of disease and other stressors, physiological effects of hypoxia
* Arturo Aguirre-Velarde, has done extensive work on hypoxia and biology, DEB model of scallop hypoxia,
* Natnael Hamda, DEBkiss model of sturgeon, including early life stages
* Laure Pecquerie, fish DEB models, metabolism, growth. Too close of a collaborator with Roger?