28 May 2024

Lara A. Ferry, Ph.D.

Executive Editor

*Functional Ecology*

Dear Dr. Ferry:

We are pleased to submit our manuscript “Seasonal variation in juvenile growth and predation predicts declining populations of a freshwater gastropod” to *Functional Ecology* for consideration as an article.

**Section 1: Contribution and advancement of science**

In this study, we take a novel approach in studying how predator-prey interaction strength is influenced by environmental variation (e.g., temperature) within size-structure prey populations. From previous work, environmental variation that increases growth rates of the prey should decrease interaction strength because prey grow to size refuges more quickly. Further, environmental variation can also increase per-capita foraging rates of predators due to increases in metabolism. Thus, whether predator-prey interaction strength is increased or decreased depends on the asymmetry in responses between predator foraging and prey growth to environmental variation. However, most studies have been in controlled environments, have focused on prey survival as the measure of interaction strength, and have only explored single predator-single prey systems.

Here, we used natural seasonal variation in environmental conditions and predator community composition in a subtropical climate (i.e., wet and dry seasons) to scale up these predictions to the population-level (i.e., prey recruitment and prey population growth). We overcome the challenges of scaling up predictions of predator-prey interaction strength by creating a zero-population growth isocline from a size-structured population model, and then we compare empirical estimates of prey growth in natural settings and prey survival under natural assemblages of predators to the isocline. While measuring prey survival we take advantage of prey remain artefacts to identify putative predators responsible for the patterns. To the best of our knowledge, this is the first time this approach has been used within this context and presents a general framework to scale up predator-prey interactions studies within natural settings.

In addition to this unique general approach, our study species, the Florida apple snail (*Pomacea paludosa)* is a species of conservation concern because it is historically the sole prey of the endangered Evergaldes Snail Kite (*Rostrhamus sociabilis*). Declines in the Snail Kite population in 2002 and again in 2007 are thought to be caused by declines in populations of the Florida apple snail. Current Florida apple snail populations remain too small to support substantial numbers of Snail Kites in the Evergaldes. This approach helped generate new hypotheses about what may be limiting current Florida apple snail populations and could present new approaches to rejuvenate Florida apple snail populations for endangered Kites within the Everglades.

**Section 2: Manuscript length and conclusions**

Our manuscript is 25 pages long, and the main text has a word count of 7488 (Introduction through Conclusions, References, Tables and Figure Captions). We include supplementary material that provides enriching context for the main results. We confirm that this manuscript has not been published elsewhere. We do not have conflicts of interest to disclose, and all authors have read and approved the final manuscript for submission at *Functional Ecology*.

Finally, should you select this manuscript for peer review, we suggest a potential subject matter editor and reviewers because they have the background to evaluate our findings objectively. To the best of our knowledge, those suggested have no conflicts of interest, financial or otherwise.

Editors:

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Sincerely,

A black and white photo of letters

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On behalf of Mark I. Cook and Nathan J. Dorn