8 November 2024

Kathryn L. Cottingham, Ph.D.

Editor-in-Chief

*Ecology*

Dear Dr. Cottingham:

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

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

One general problem for ecology is the challenge of understanding variation of, and predicting recruitment (population growth) rates of, small short-lived organisms in natural settings (species with a Type III survivorship). In this study, we take a novel empirical approach in studying how predator-prey interaction strength is influenced by environmental variation (e.g., temperature, seasonal changes in predator communities) within size-structure prey populations. Environmental variation can influence both growth rates of the prey and per-capita foraging rates of predators. 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. Most studies have been conducted in controlled experimental environments (e.g., controlling predator composition and density), focusing on prey survival as the measure of interaction strength, and have only explored single predator-single prey interactions.

Here, we addressed the question of recruitment with seasonal variation in environmental conditions and predator community composition in a natural environment (i.e., wetlands with wet and dry seasons). Our results were scaled up to 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 previously published size-structured population model, and then we compare empirical measures of prey growth and survival in natural wetlands to the isocline. While measuring prey survival/mortality we also studied predation 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 and presents a general framework to scale up predator-prey interactions studies using models within natural settings.

In addition to the novelty of our approach, our study species, the Florida apple snail (*Pomacea paludosa)* is a species of conservation concern because the adult snails were historically the sole prey of the US federally endangered Evergaldes Snail Kite (*Rostrhamus sociabilis*). Declines in the Snail Kite population in 2002 and again in 2007 have been linked to declines in populations of the Florida apple snail. Current Florida apple snail populations remain too small to support nesting in most of the Evergaldes. Our approach generated new hypotheses about what may be limiting Florida apple snail populations and could present approaches to rejuvenate Florida apple snail populations for endangered Kites.

**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.

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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