XX September 2022

Dear Dr. Bolnick,

We hope that you will consider our manuscript, “Bet hedging is not sufficient to explain intraspecific variation in germination patterns of a winter annual plant,” for publication in *The American Naturalist.*

Studies on the ecology and evolution of delayed germination sparked what has become a rich literature on bet hedging. In general, a bet hedging strategy is expected to evolve if a trade-off between arithmetic mean fitness and variance in fitness benefits geometric mean fitness. Whether delayed germination functions as bet hedging involves evaluating its long-term fitness consequences. While delayed germination in plants has played a key role in motivating bet hedging theory, few studies have tested the consequences of reduced germination fractions on long-term fitness.

We used a long-term demographic dataset to test whether bet hedging explains low and variable patterns of germination in populations of *Clarkia xantiana* ssp. *xantiana*. We examined three complementary predictions made by bet hedging theory about the fitness consequences of delayed germination. First, we tested whether delayed germination increased long-term, geometric population growth rates via a trade-off between arithmetic mean fitness and variance in fitness. Second, we used a density-independent model for bet hedging to calculate optimal germination fractions, which we then compared to estimates of germination from the field. Third, we assessed whether germination fractions were negatively correlated with risk across the life cycle—both high seed bank mortality and high variability in per-capita reproductive success should select for delayed germination. Our results suggest that density-independent bet hedging is insufficient to explain germination patterns in the field. In the Discussion, we present readers with alternative and complementary processes that could help explain the observed patterns.

We are excited to submit this manuscript for consideration at *The American Naturalist*. Historically, bet hedging has been a fruitful site for feedback between empirical and theoretical research, an interplay that we expect to appeal to readers of the journal. In our study, we combine long-term demographic observations and modeling to test predictions of bet hedging theory, and we have sought to emphasize both the empirical evidence and conceptual implications throughout our work.

We suggest Dr. Nancy Emery as a potential Associate Editor with relevant expertise in evolutionary ecology and plant ecology. In addition, potential reviewers with relevant expertise in empirical research on bet hedging via delayed germination in plants, and with bet hedging theory more generally, include Dr. Jennifer Gremer ([jrgremer@ucdavis.edu](mailto:jrgremer@ucdavis.edu)), Dr. Margaret Evans ([mekevans@email.arizona.edu](mailto:margaret.ekevans@gmail.com)), and Dr. Andrew Simons ([AndrewM.Simons@carleton.ca](mailto:AndrewM.Simons@carleton.ca)).

The submitted manuscript is not published nor under consideration at another journal. We have submitted a preprint of the manuscript at [repository]: [link]. If accepted for publication, the preprint will be updated with a link to the published paper. Data associated with the manuscript has been archived on Dryad: [link]. Code associated with the manuscript has been archived on Zenodo: [link]. All authors have read the manuscript, and approve of its submission.

We look forward to hearing from you.

Sincerely,

Gregor-Fausto Siegmund, David A. Moeller, Vincent M. Eckhart, Monica A. Geber

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