Micah Freedman

Ph.D. Candidate

University of California, Davis

Department of Evolution and Ecology

Davis, CA 95616

mfreedman@ucdavis.edu

Dr. Mohamed Noor

Editor-in-Chief

*Evolution*

Dear Dr. Noor,

I am pleased to submit an original research article entitled “Host plant adaptation during recent global range expansion in the monarch butterfly” for publication in *Evolution*.

This research focuses on the recent global range expansion of the monarch butterfly as a way to understand how patterns of dietary breadth and host plant specialization may evolve in insects. Monarchs have expanded outside of North America in the last 200 years and now form discrete, non-migratory populations that feed on novel assemblages of milkweed host plants. We conducted a fully factorial rearing experiment that involved raising nearly 4,000 monarch caterpillars from six populations around the world on live plants of six milkweed species.

This study contributes to our understanding of contemporary evolution and the mechanisms generating local adaptation in plant-herbivore systems. For example, we often assume that local adaptation arises because of performance tradeoffs, and that monarch populations associated with novel host plants would have a performance advantage on these hosts; however, we find that local adaptation instead arises from the loss of performance of derived populations on their ancestral hosts. This highlights the potential importance of relaxed selection as a force generating host plant specialization: monarch populations show significantly reduced performance on ancestral hosts after only ~150 years in isolation. In addition, our study provides empirical support for the hard-to-test Oscillation Hypothesis (Janz and Nylin 2008), which posits that the early stages of speciation in herbivorous insects may be associated with joint changes in geographic range and dietary breadth. Finally, this study is highly integrative and combines historical records, chemical ecology, and common garden experiments in a species (the monarch butterfly) that has become a model for studying ecological genomics (e.g. Zhan et al. 2014, *Nature*). As such, we feel that this research would be of broad interest to the readership of *Evolution*.

We certify that this research has not been submitted to any other journals and that all data and associated code are stored at http://github.com/micahfreedman. I hope that you will consider it for publication in *Evolution*.

Sincerely,

Micah Freedman