

1 December 2018

Dear Ideas & Perspectives Editors:

Phenological mismatch (i.e., the ecological consequences of shifts in the timing of species interactions) is an active and expanding area of research as scientists work to predict the consequences of climate change for communities and ecosystems. However, while there have been theoretical (2,3) and empirical studies (4,5) based in single systems about phenological mismatch, evidence from these systems have provided no consensus, thus making it difficult to determine if there are general patterns across systems.

We propose an Ideas & Perspectives paper about the disconnect between the underlying ecological theory (i.e., match-mismatch hypothesis) and the phenological responses to climate change that are currently documented. While other studies have further developed the match-mismatch theory (2,3), we provide a review of 41 phenological mismatch studies to:

1. Review the array of potential mechanisms underlying the match-mismatch hypothesis.
2. Show how the type of data currently collected by researchers interested in testing or applying the mismatch hypothesis in the context of climate change does not advance the field’s aims.
3. Demonstrate how baselines are critical to understanding the mechanisms underlying the match-mismatch hypothesis
4. Discuss approaches that can move this field beyond documentation, towards accurate predictions of phenological mismatch driven by climate change.

By highlighting the data-theory discrepancy on the topic of phenological mismatch, our paper will help shape the future path of the field. It will also provide the framework for building the required depth in evidence across studies to determine general patterns in climate change-driven changes in phenological mismatch through a meta-analytical approach, an approach not currently possible given the current state of the field.

This review has not been submitted elsewhere, and we welcome the opportunity to submit it to *Ecology Letters*.

Sincerely,

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References

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5. Plard et al. (2014) Mismatch between birth date and vegetation phenology slows the demography of roe deer. PLoS Biology 12:e1001828.