



April 23, 2020

Dear Dr. Findlay:

Please consider our paper, entitled “Winter temperatures dominate spring phenological responses to warming” for publication as a ‘Letter’ in *Nature Climate Change*. This manuscript is a second revision of an earlier submission (NCLIM-19081773, NCLIM-19081773A). We include a point-by-point response to reviewer comments.

As you may recall, our manuscript utilizes a new global database to address a research topic of critical relevance to a broad reach of *Nature Climate Change* readers: the timing of spring phenology (e.g., budburst) in woody plants. Spring phenology impacts plant fitness, shapes plant and animal communities, affects wide-ranging ecosystem services from crop productivity to carbon sequestration and unites the fields of biometeorology, ecology, cellular and molecular biology. Our work is groundbreaking in its synthesis of four decades of research across 72 experiments to quantify the relative importance of three environmental cues critical to phenology for 203 species from around the globe.

In this round of reviews, we addressed concerns of Reviewers 1 and 2 (Reviewer 3 felt our manuscript was clear, greatly improved from the previous version, and agreed with the conclusions of our manuscript). Though Reviewers 1 and 2 felt our study addresses an important question, constitutes an impressive dataset and includes sophisticated analyses, they also highlighted some concerns in regards to our methods and how we presented those methods. Given these concerns, we have double-checked many of the studies contained in our database to search for additional information on measurement error and sample size, conducted five additional analyses, revised text and figures in the main text, and added a new figure and modified text in the supplement. The new analyses yielded results very similar to our previous analyses, so we have not always included the new results in our supplement, which is already substantial. The results are summarized in our response to reviewers below, though, and we would be happy to include them in the supplement upon request. Our original results and conclusions are unchanged but we believe this new version of the manuscript is stronger now and shows even more clearly how and why our results are robust.

Upon acceptance for publication, the database and relevant code will be freely available at KNB (currently meta-data are there); the full database is available to reviewers and editors upon request. This work is a meta-analysis, so data have been previously published; however, the synthesis of these data and the tables, figures, models, and materials presented in this manuscript have not been previously published nor are they under consideration for publication elsewhere.

Sincerely,

A handwritten signature in cursive script, reading "Ailene Ettinger".

Ailene Ettinger

Quantitative Ecologist, The Nature Conservancy- Washington Field Office
Visiting Fellow, Arnold Arboretum of Harvard University

Ailene Ettinger

From: PHILLIMORE Ally <aphillim@exseed.ed.ac.uk>
Sent: Wednesday, March 11, 2020 1:02 PM
To: Ailene Ettinger
Subject: Re: photoperiod manuscript revision clarification questions

Hi Ailene

Many thanks for getting in touch - being able to clarify points like this is one of the major benefits of signing reviews.

From your description here I think my suggestion of within subject centering might have been based on a misunderstanding on my part. If we consider forcing alone to keep things simple my concern was that at higher latitudes perhaps the forcing temperatures are always colder than at low latitudes and phenology is always later at higher latitudes, and that this difference could feed into the slope estimates. By centering based on the mean temperature experienced at a site (or used in an experiment) then the model would solely be estimating the effect of the treatment. Does that make sense or do you think this scenario does not apply here? If the mean experimental values shift with latitude then I think within subject centering would be appropriate even with short term experiments. But i may be wrong.

I have to confess with this paper I found the key results really amazing, but I found the methods so hard to follow I couldn't work out whether I could believe the results. If you can do a bit more to make the methods easy to understand I think that would really help.

best wishes and good luck

Ally

On 11 Mar 2020, at 18:14, Ailene Ettinger <ailene.ettinger@TNC.ORG> wrote:

Dear Dr. Philimore,

Thank you for your thoughtful review of our manuscript submitted to Nature Climate Change, entitled "Winter temperatures dominate spring phenological responses to warming." We greatly appreciate the time you have put in and hope you may be able to answer a question we're struggling with from your review.

One of your suggestions was to use a within-subject centering approach (as in Van de Pol and Wright) to separate out temporal versus spatial variation. This approach seems like it would work well for observational

data across multiple years and different latitudes. Our meta-analysis is focused on short-term experimental studies, however, and we believe that this approach could erase important differences in experimental treatments (e.g., one study may have varied photoperiod from 8-12 hours, whereas another included treatments of 0, 12, and 24 hours) that may drive variation in responses.

We wanted to confirm that you think this approach should work for short-term experiments of budburst phenology (typically several months in duration) conducted in controlled environments (i.e. growth chambers) and that we did not, instead, explain the experimental design poorly (such that we suggested the design includes high natural variation across time and space)?

Thank you again for your input and time.

Best wishes,

Ailene Ettinger

Ailene Ettinger, PhD
Quantitative Ecologist
ailene.ettinger@tnc.org
781.296.4821 (mobile)

The Nature Conservancy
Washington Field Office
74 Wall Street
Seattle, WA 98121

WashingtonNature.org

Dr Albert Phillimore

Chancellor's Fellow
Institute of Evolutionary Biology
University of Edinburgh

tel: +44(0)1316505413
labpage: <http://phillimore.bio.ed.ac.uk>
& <https://phenoweb.org>

The University of Edinburgh is a charitable body, registered in Scotland, with registration number SC005336.