26-Aug-2016

Dear Editor,

Thank you for the invitation to submit a revised version of our manuscript ECY16-0167.R1, entitled ‘Caterpillar seed predators mediate shifts in selection on flowering phenology in their host plant’.

ADD TEXT HERE…

Below, we provide a point-by-point list with answers to all questions and detailing the changes made in response to each of the comments by the reviewers and the editor.

Thanks again for your consideration of our manuscript.

Yours sincerely,

Alicia Valdés, on behalf of all authors

Response to review

Editor’s comments  
  
*Line 21.  The second reviewer addresses this issue, of the community context for selection.  I appreciate the reviewer's points, but I don't feel that the case is overstated.  Here, for example, the word "suggest" is clearly used.*

We agree with the editor in that the reviewer makes a valuable point, but we have specifically tried to avoid overstating the importance of the community context, as we are aware that further data are needed to confirm that the community context effectively contributes to among-population variation in selection.  
  
*30.  The word "mutualistic" is unnecessary at the start of that sentence.  Simply saying "Pollinators might select..." is sufficient.*

This is now changed.  
  
*43-44.  Re-order for clarity: "Variation in selection strength may potentially be driven by differences among populations in interaction intensities...".*

This is now changed.  
  
*66.  Change to "In this study, we asked if..." or "In this study, we examined the possibility that among-population variation...".*

This has now been replaced by the first option.   
  
*127.  Change to "individual reaches."*

This is now changed.  
  
*129.  Change "carried" to "made".*

This is now changed.  
  
*130.  "second option" is confusing here.  Do you mean to say "our approach."*

Yes, that is what we meant. We have changed this sentence now.   
  
*130.  Break this sentence up, so that one sentence ends with "two main advantages." and the next sentence starts "First, it allows for an assessment of..."*

This is now changed.  
  
*131-133.  I have to say that I don't really understand this point, about being "less dependent on seasonal variation."  If one of your years had been much warmer or colder, wouldn't that have been reflected in the measurements you took in your window of observation?*  
*172.  I second the reviewer's question here about the use of Type II SS.*

Please see answer to reviewer’s comment.

*186.  I'm not sure about your use of the term hierarchical here.  If you're using that term because the model includes nested elements, I believe it would be more straightforward to just say that and explain what was nested within what.*

Yes, the trait × population interaction effects were nested within predation. We have now removed the word “hierarchical” and described the nesting on the text.

*261.  Is that a net decrease in fitness?  In other words, is there a number of flowers that actually reduces fitness beyond (for example) having just a few flowers and not attracting any oviposition?*

No, the net effect of flower number on fitness was positive, as is shown if we calculate the total effects using the path coefficients in Fig. 2:

2010: 0.46+0.26\*(-0.21)=0.41

2011: 0.48+(0.45\*(-0.29)=0.35

We have now specified on the text that, although flower number increases predation, and this decreases fitness, the net effect of flower number on fitness remains positive.

*268.  I appreciate what you have done here.  This is a nice discussion of effect sizes.*

*286.  Shouldn't this be "among"?  Because you're talking here about analyses where the unit of replication was populations not individuals within populations, right?*

Yes, these analyses had populations and not individuals as the unit of replication, so we now start this sentence with “Among populations where the butterfly was present…”.   
  
*304.  Change "during" to "in".*

This is now changed.  
  
*314.  Reword this to be "In apparent contradiction to the idea that selection...".*

This is now changed.  
  
*322.  Change to: "This leads to the idea that, for a given egg load per plant, a higher number..."*

This is now changed.  
  
*334 - 335.  This might be easier to read with parentheses starting before "that caterpillar" and then closing after "early-flowering individuals."*

We agree with the editor and have now added parentheses in this sentence.

*337.  Should be "have shown".*

This is now changed.  
  
*340.  Reword this sentence, it's not clear how this contrasts with the previous sentence, but a contrast is implied by "Our study instead."*

“Instead” has been now removed and this sentence has been modified.

*341 - 350.  See if you can't simplify the rest of this paragraph, as this text feels pretty repetitive with what has been said before.  In fact, for this next revision you should be aware of repetition throughout the Discussion and streamline wherever possible.*

We have now tried to simplify this paragraph and have carefully revised the discussion for repetition.  
  
*360.  When talking about among-population variance in butterfly presence, it might be more accurate to say "that this seed predator not only prefers earlier-flowering plants within populations but also tends to be associated with earlier-flowering populations."  After all, persistence might be more of an issue than preference per se at the population level.*

We agree with the editor’s point, and have changed the text accordingly.   
  
*393.  Remove "of" after "likelihood."*

This is now changed.

*395.  Re-order sentence to read "we also need to know."*

This is now changed.

Reviewers' comments

Reviewer: 1  
  
By re-arranging presentations of the data and performing additional analyses , Valdes and Ehlern clarify their findings strengthen their conclusions: the direction of selection for flowering phenology imposed by a pre-dispersal seed predator is reversed when that predator's a second prey species is absent.  
  
I am sympathetic to the argument in favour of the "stage-based" measure of phenology, and can certainly see how it was the only alternative given the scope of the study.   I would still argue that it has yet been demonstrated to be as good as repeated censuses.  But then this might just be me riding my hown hobby horse.  
  
Congratulations on a very fine study.  
  
  
Reviewer: 2  
  
Review of ECY16-0167.R1 “Caterpillar seed predators mediate shifts in selection on flowering phenology in their host plant”  
  
In this manuscript, the authors measure selection on flowering time of Gentiana pneumonanthe in 20 populations in each of two years.  They demonstrate that a butterfly pre-dispersal seed predator is an agent of selection on flowering time, and that the presence of butterflies depends on the present of their ant hosts.  Consequently, they conclude that variation in selection on plant traits depends in part on the community context (i.e., the presence of ants).  
  
The authors have a very nice dataset; there are few studies of selection on plant traits that are both spatially and temporally replicated to this degree.  But I had three significant concerns about the manuscript as currently written.  First, I think that the authors overstate their case when it comes to the effect of the community context on selection.  They need to demonstrate that the ants affect selection on plant traits, not just the probability that a population will contain butterflies.  Second, the introduction does not do a compelling job of explaining how the current study differs from past studies of the causes of selection.  There are other studies of the effect of pre-dispersal seed predators on selection, so as a reader I need to know what new angle this study brings to the table.  Third, many of the interpretations in the discussion are tossed out without being well-developed (see numbered comments below for examples).

COMMENT 1-2-3  
  
*1.      Lines 41-56: The message of this paragraph is unclear.  I agree that there are many potential causes of variation in selection, but for the reader’s benefit I think that this paragraph should focus on the cause or causes that you are testing.*

*2.      Lines 57: The relationship between this paragraph and the one that came before it is unclear.  Why are we suddenly hearing about butterflies?*

We understand the reviewer’s concern, and start now this paragraph by talking about the potential of antagonistic interactors to mediate selection on plant traits, introducing then the case of Large Blue butterflies as an example.

*3.      Lines 172-173: Why were Type II sums of squares used?*

*4.      Line 184: I don’t understand “to avoid basing contrasts on estimated selection coefficients”.  What is the perceived problem here?*

We have performed this analysis because we believe it is more powerful to actually test for the effect of the presence of the predator in the population (variable “Predation”) than to barely compare the coefficients estimated by the previous model among populations with and without the predator (c.f. one-way ANOVA comparing linear selection gradients for phenology between populations where the predator was present and absent, Fig. 1). We think that the analysis in Table 2 reinforces what is shown in Fig. 1.

*5.      Lines 236-240: Is there a typo here?  I would think that a positive selection coefficient would mean selection for later flowering, and a negative selection coefficient would mean selection for earlier flowering.*

No, this is correct, positive selection coefficients mean selection for earlier flowering, because higher values of the phenology measure indicate a more advanced floral development at the day of recording, i.e. an earlier flowering. This is indicated in the Methods section (P7L124-125).

*6.      Lines 245-249: It would be helpful if you took a little more time to describe these results.*

The main focus of our paper is on selection on flowering phenology, so we wanted to give less weight to the part describing selection for other traits. However, we have now modified this paragraph in order to better describe among-population variation in selection on flower number and shoot height and to state if this variation was associated with the incidence of the predator in plant populations.

*7.      Lines 254-256: How did the relationships vary?  In strength, direction, both?*

Most of these relationships were positive (see Table 4), so there was almost no variation in direction, although they largely varied in strength. This is now specified in the text.

*8.      Lines 257-282: This paragraph is very difficult to follow.  I am struggling to figure out how the different details presented here relate to each other.*

*9.      General comment: “The predator” and “the butterfly” are used interchangeably, which I found pretty confusing.  It would help me as a reader if you picked one set of terminology and stuck to it.*

We have now chosen to keep “butterfly” or “butterfly seed predator” for further clarification throughout the text.

*10.     Lines 295-298: I do not find this statement terribly persuasive.  For this to be the case, you’d need evidence that the strength of selection, not just the probability that butterflies are present, covaries with ant abundance or presence.  That link to selection seems to be missing here.*

We agree with the reviewer in the fact that more evidence is needed to confirm that the community context influences selection. Our aim here is not to state that this is the case in our study, but only to point out that the observed relationship among incidence of the predator and ant abundance suggests that the community context could contribute to among-population variation in selection. We are aware that further data is needed to prove this hypothesis, and therefore present it here only as a suggestion for further research. We have now tried to avoid overstating the importance of the community context by slightly modifying our wording (writing that “suggesting that the community context in terms of the second host of the butterfly *could potentially* influence selection” instead of “influences selection”.

*11.     Lines 314-323: This is interesting, but it is a new idea that belongs in a new paragraph.*

We agree with the reviewer’s point and have now started a new paragraph here.

*12.     Lines 300-304: Do you have any evidence supporting either of these hypotheses?*

*13.     Lines 354: What do you think that these unidentified factors could be, given what you know about your study system?*

As stated in the text, we think that abiotic factors could also play a role in selection on flowering phenology, and we have now specified temperature and humidity as two examples of these factors.

*14.     Lines 374-375: What do you think that the relevant environmental could be, given what you know about your study system?*

As specified in the text, we think that the height of the vegetation surrounding *G. pneumonanthe* plants could modify the preferences of the butterflies regarding shoot height. We expect the preference for taller shoots to be stronger in populations with high surrounding vegetation, as these shoots would be able to stand out of the canopy, and would be more easily spotted by the butterflies. We have now added a reference to support this.

*15.     Lines 392-404: The material in this paragraph seems peripheral/speculative and could be cut.*

This paragraph was added in response to previous reviewers’ comments. Here, we acknowledge the limitations of our study and refer to unpublished data on population differentiation that could support our conclusions, so we would prefer to keep it if possible.

*16.     Lines 405-416: This seems to largely rehash what has already been said in the introduction and discussion.  Consequently, it is not the strongest way to end the paper.*

*17.     Your study is relatively unique in being both spatially and temporally replicated, but that strength is not effectively leveraged here.  How did the magnitude of spatial vs. temporal variation in selection differ?  Do you expect the butterflies and ants to have a larger effect on spatial or temporal variation in selection?*

We agree with the reviewer in that our study is well-suited to study spatial variation in selection. However, we only have two years of data and we do not think this is enough to make strong conclusions about temporal variation.

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Regarding the effects of butterflies and ants, we expect them to have a larger effect on spatial variation, as their abundances would probably vary more among populations than among years. However, although extreme variations in summer temperatures and/or precipitations could probably strongly modify the abundances of both butterflies and ants).