Dear Editor,

Please find attached the manuscript entitled “Indirect effects of microclimate on plant reproductive performance via an antagonistic interaction” to be considered for publication in Oikos.

Variation in plant reproductive performance is widespread both among and within natural plant populations, and identifying the environmental causes of this variation is necessary to understand the ecological and evolutionary dynamics of populations. Sexual plant reproduction is particularly sensitive to climatic variation and effects can be both direct and indirect, mediated by changes in plant traits, plant interactions with animals, and the environmental context of plants. Although some of these indirect effects have been assessed at large scales, we still lack a comprehensive knowledge of how climatic variability results in within-population variation in plant performance through different pathways.

In this study, we examined how microclimate influences reproductive performance of a plant through effects on oviposition by a seed-predator butterfly, plant phenology, plant density, and the distribution of ants serving as second hosts of the butterfly. We show that microclimatic effects on plant reproductive performance were mainly indirect and mediated by the interaction with the antagonist. We also show that microclimate indirectly affects plant reproduction not only by directly influencing the intensity of the antagonistic interaction, but also by affecting plant phenology and the plant context, which in turn influence the intensity of the interaction. Such complex indirect effects of microclimate on within-population differences in plant performance have not been explored previously.

Our results are exciting and novel because they illustrate the important role that species interactions play in mediating effects of climate on plant reproductive performance. A broader implication of the results is that variation in environmental conditions over spatial scales of only a few meters can cause variation in individual plant performance within a population through multiple and complex pathways.

The attached work has not been published or accepted for publication elsewhere, and is not under consideration for publication in any other journal or book. Its submission for publication has been approved by both authors, and all persons entitled to authorship have been so named.

We thank you in advance for your consideration of our manuscript.

Yours sincerely,

Alicia Valdés, on behalf of both authors

Suggested reviewers: David Nash, Irma Wynhoff (need to suggest at least two)... Jeremy Thomas… any other ideas? Any non-butterfly person that you can think of? What about N P Lemoine? Katriona Shea?

Questions to be answered when submitting:

\* Please provide a 2-3 sentence abbreviated abstract summarizing your article.

Climatic variation over different spatial scales can influence plant reproduction both directly and indirectly, via changes in plant traits, interactions with animals, and the surrounding environment. We investigated how microclimatic variation influenced reproductive performance of a plant, and found that effects were mainly indirect and mediated by the interaction with an antagonist butterfly, but also through even more complex pathways involving changes in plant phenology and the environmental context. Our results demonstrate that species interactions can play an important role in mediating effects of variation in climate over small spatial scales on plant reproduction, and highlight the complexity of the relationship between environmental variation and individual performance.

\* What is your main reason for submitting this paper to Oikos?

Our results are novel in the sense that they provide a basis for a more nuanced view of how variation in climate and environmental conditions can contribute to within-population heterogeneity, which we believe makes it suitable for a broad-audience concept-oriented journal like Oikos.

\* What in particular makes your manuscript competitive for publication in Oikos given the limited space available?

Our manuscript advances the knowledge about the multitude of direct and indirect pathways through which climatic conditions can contribute to variation in reproductive performance. Although one or a few of these pathways have sometimes been explored at large spatial scales, the effects of microclimatic variation on plant reproduction have not yet been comprehensively explored.