Dear Editor,

Please find attached the manuscript entitled “Butterfly-mediated shifts in selection on flowering phenology depend on host ant abundance” to be considered for publication in Ecology Letters, under the category Letters.

Spatial variation in selection is fundamentally important to maintain genetic variation within populations, for local adaptation and genetic differentiation of populations, and for speciation. Identifying and quantifying the effects of different selective agents, as well as how the relative importance of different agents vary with the environmental context is therefore key to a more mechanistic understanding of natural selection and evolution. Yet, these relationships have rarely been quantified for large sets of natural populations. In this study, we examine how selection on timing of reproduction in a perennial herb is mediated by interactions with butterfly seed predator and how these interactions depend on the abundance of a second (ant) host of the butterfly. The results clearly shows that selection shifts from favoring earlier flowering within a season in plant populations where the antagonist is absent, to favoring later flowering when it is present. Our results are important and novel in demonstrating how among-population variation in the direction of natural selection can be explained by interactions with an antagonistic selective agent, and simultaneously showing that the incidence of this antagonist is related to the community context, in terms of the abundance of its second host. Our results highlight that to link variation in selection to the environment, we need to assess both the effects of species interactions on fitness, and the effects of the environmental context on the outcome of the interaction.

Although previous studies by one of the authors have examined the role of antagonistic interactions for among-population in selection on timing of reproduction as well as the effects of environmental context (Arvanitis et al., 2010, Ehrlén et al. 2015, König et al. 2015), the current study is novel, compared to this work as well as to the work of others, in several important respects.

First, it deals with a study system – *Phengaris* (*Maculinea*) butterflies and its two hosts, plants and Myrmica ants, used in sequence - that is extremely well studied but that has never been thoroughly examined in the current context. (None of the authors have published from this study system previously.)

Second, the study is important and novel because it clearly shows that among-population in not only the intensity but also the direction of selection on timing of reproduction in a plant can be explained by the presence and preferences of an antagonistic interactor.

Third, the study is novel in an even broader context because it demonstrates how community context can be linked to among-population variation in natural selection via a plant-antagonist interaction. While previous studies, by the authors of this manuscript and others, have highlighted the importance of the environmental context for antagonistic interactions, this is one of the first to link variation in the community context to variation in selection through species interactions.

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 (corresponding author)

*References:*

Arvanitis, L., Wiklund, C., Münzbergova, Z., Dahlgren, J. P. & Ehrlén, J. 2010. Novel antagonistic interactions associated with plant polyploidization influence trait selection and habitat preference. *Ecology Letters* 13:330-337.

Ehrlén, J., Raabova, J. & Dahlgren, J.P. 2015. Flowering schedule in a perennial plant – Life-history trade-offs, seed predation and total offspring fitness. *Ecology* 96:2280-2288.

König, M., Wiklund, C. & Ehrlén, J. In press. Timing of flowering and intensity of attack by a butterfly herbivore in a polyploid herb. *Ecology and Evolution* 5:1863-1872.