Dear Editor,

Please find attached the manuscript entitled “Resource overlap and dilution effects shape host plant use in a myrmecophilous butterfly” to be considered for publication in Ecology Letters, under the category Letters.

Variation in the intensity of species interactions over time and space has important effects on ecological and evolutionary dynamics. Yet, we know little about the factors driving variation in the intensity of species interactions.

In this study, we examine how within-population variation in the intensity of the interaction between a butterfly and its host plant is simultaneously determined by individual host plant traits, density and trait distributions of neighbors, and abundance of ant species serving as the second hosts of butterfly larvae. We show that butterflies prefer host plant individuals with an early flowering phenology and host plants that have a high abundance of host ants in their immediate neighborhood. These effects are interactive, i.e. butterfly preference for plant flowering phenology is stronger at higher ant abundance. We also show that the intensity of the interaction between the butterfly and the plant decreases with an increasing neighborhood density of host plants, and that this dilution effect is stronger when neighbors have a suitable phenology. Our results are exciting and novel because they illustrate how processes acting at the levels of individuals, populations and communities interactively determine the intensity of a consumer-resource interaction. A broader implication of these results is that small-scale spatial variation in natural selection and population dynamics driven by species interactions can sometimes only be understood as the net outcome of processes simultaneously acting at the levels of individuals, populations and communities.

Previous work from the authors on this study system has focused on the outcome of the plant-butterfly interaction in terms of butterfly-mediated selection on plant flowering time, while the current study focuses on identifying the set of factors that drive variation in interaction intensities. In previous studies, we have demonstrated that butterflies have strong negative effects on plant fitness and show a preference for early-flowering plants (which are of higher quality), leading to butterfly-mediated selection for later flowering (Valdés & Ehrlén 2017). We have also shown that the outcome of the interaction depends on the environmental conditions, through effects on both butterfly behavior and plant trait expression (Valdés & Ehrlén, *in press*). The current study is novel compared to the results of these and other studies because it identifies the simultaneous and interactive effects of factors at the individual, population and community level that drive small-scale spatial variation in interaction intensity.

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

*References:*

Valdés, A. & Ehrlén, J. (2017). Caterpillar seed predators mediate shifts in selection on flowering phenology in their host plant. *Ecology*, 98, 228–238.

Valdés, A. & Ehrlén, J. (In press). Direct and plant trait-mediated effects of the local environmental context on butterfly oviposition patterns. *Oikos*, doi: 10.1111/oik.04909.