Field and theoretical study of the role of biotic interactions on community assemblage in nettle-feeding butterflies.

Hélène Audusseau*†[1,2], Nils Ryrholm[3], Sylvain Londe[4], and Reto Schmucki[2]

[1]Stockholm University – Zoologiska institutionen, Ekologi, 106 91 Stockholm, Sweden
[2]Centre for Ecology and Hydrology [Wallingford] (CEH) – Maclean Building Benson Lane, Crowmarsh Gifford, Wallingford OX10 8BB, United Kingdom
[3]Högskolan i Gävle – 801 76 Gävle, Sweden
[4]Institut des Sciences de lÉvolution de Montpellier (ISEM) – Université de Montpellier, Institut de recherche pour le développement [IRD] : UR226, Centre National de la Recherche Scientifique : UMR5554 – Place E. Bataillon CC 064 34095 Montpellier Cedex 05, France

Abstract

Biotic interactions structure communities and determine species co-occurrence patterns. However, because they often operate in complex networks, biotic interactions are difficult to study and it remains unclear how they will interfere with species response to environmental changes.The analysis of occurrence data of two nettle-feeding butterflies (*Aglais urticae, Aglais io*) has shown the potential effect of a third species (*Araschnia levana*) that has expanded its range across southern Sweden. Throughout the establishment of *A. levana*, we observed directional changes in the distribution of the two resident species. Based on our knowledge of this system and the lack of direct competition between the species, we suggested that these changes in realized niches are likely to be triggered by modifications in parasitoid pressure in relation to the arrival of *A. levana*, increasing apparent competition where species co-occur. To test our hypothesis, we started collecting field data (2017-2018), fortnightly throughout the reproductive period of the species and 19 sites spread across a latitudinal gradient (where *A. levana* is present or absent). The results from our first field season already suggest that the population dynamics of our three study species are partly regulated by parasitoids. This regulation process is likely to be cumulative and shared across species as they were infected by the same parasitoids. In parallel to our field study, we developed an R program to run spatial explicit simulations and test hypotheses related to apparent competition in hosts-parasitoids systems. With this tool, we started investigating the role of niche breath, dispersal, and reproduction, on the population dynamics and spatial distribution of the hosts. We also explored the combined effect of the spatial structure of the environment on niche partitioning. Together with our empirical data, these models can be useful to understand the role of biotic interactions on community assemblage in a changing environment.

*Speaker
†Corresponding author: helene.audusseau@zoologi.su.se