
How local-scale processes build up the large-scale response of butterflies to global changes

Reto Schmucki*¹, Guy Pe'er², and Romain Julliard³

¹Centre for Ecology and Hydrology – Maclean Building, Benson Lane Crowmarsh Gifford, Wallingford Oxfordshire, OX10 8BB, United Kingdom

²Helmholtz Centre for Environmental Research - UFZ – Permoserstr. 15 04318 Leipzig, Germany

³Centre d'écologie et des sciences de la Conservation (CESCO) – CNRS : UMR7204, Museum National d'Histoire Naturelle, Université Pierre et Marie Curie - Paris VI – CP51, 55 rue Buffon 75005 PARIS, France

Abstract

Long-term, standardized monitoring programs are key to assessing the state of biodiversity. While such data sets have been successfully used to measure density or abundance and monitor and detect population change in time and space at the national level, little is known as to how these changes are organized across scales and along broad latitudinal gradients. In the LOLA-BMS project, we gathered a team of 15 researchers, including ecologists, butterfly experts, statisticians and modellers to enable fruitful collaborations and develop innovative approaches to better use and leverage information that is contained in these unique data sets. We compiled data from eight butterfly monitoring schemes (BMS) distributed across Europe, North America and Israel to enable more integrative analyses and examine how local dynamics build up in large-scale responses. More specifically, we examined how butterflies responded to climate change and how range-shift and expansion affect the composition and the structure of butterfly communities across Europe. Along this latitudinal gradient, we also tested for signatures that could indicate local adaptation in population's response to variation in temperature and drought. The combined data sets also enabled us to examine how population trends align with species traits and how these relationships vary in space. Our experience as working group at the CESAB clearly shows that collaborative efforts combined with rich and extensive data sets offers fantastic opportunities for examining the impact of environmental change on biodiversity at multiple scales and produce crucial knowledge that is timely and highly relevant for stakeholders and decision makers.

Keywords: BMS, Citizen Science, Climate Change, Conservation, Insect, Land Cover, Macroecology, Monitoring, Occupancy, Range Shift

*Speaker