# Species range expansion constrains the ecological niches of resident butterflies.

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**Abstract**

Changes in community composition resulting from environmental changes modify biotic interactions and affect the distribution and density of local populations. Such changes are currently occurring in nettle-feeding butterflies in Sweden where *Araschnia levana* has recently expanded its range northward and is now likely to interact with resident species (*Aglais urticae* and *Aglais io*).
We used citizen data of butterfly occurrence collected over two regions of Sweden (Skåne and Norrstŕom) where *A. levana* has and has not established, and two time-periods (2001-2006, 2009-2012) during its establishment in Skåne, to investigate how the recent range expansion of *A. levana* may have affected the environmental niche of resident species. Using the PCA-env and the framework described in Broennimann *et al.* (2012), we characterized, in each time-period and region, the realized niches of our focal species across topographic and land use gradients. We then quantified overlaps and differences in realized niches between and within species over time.
Our results showed that the ongoing establishment of *A. levana* has modified local biotic interactions, and induced shifts in resident species' distributions. In Skåne, *A. levana* has stabilized its distribution over time while the distribution of the native species has shifted. These shifts depicted a consistent pattern of avoiding overlap between the native species and the environmental space occupied by *A. levana,* and it was stronger for *A. urticae* than for *A. io.* Among the mechanisms that can explain such patterns of niche partitioning, parasitoid-driven apparent competition may play an important role in this community.

**Keywords:** biotic interactions, citizen science, community composition, environmental niche model, indirect competition, nettle, feeding butterflies, ordination technique, parasitoid, realized niche.

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