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Temporal genetic structuring of a specialist parasitoid, *Lysiphlebus hirticornis* Mackauer (Hymenoptera: Braconidae) attacking a specialist aphid on tansy

FRANKLIN N. NYABUGA[1,2]*, HUGH D. LOXDALE FLS[1,2], DAVID G. HECKEL[2] and WOLFGANG W. WEISSER[1]

[1]*Institute of Ecology, Friedrich Schiller University, Dornburger Straße 159, D-07743 Jena, Germany*
[2]*Department of Entomology, Max Planck Institute for Chemical Ecology, Hans-Knöll-Straße 8, D-07745 Jena, Germany*

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In insect species characterized by inbreeding, limited dispersal, and a metapopulation structure, high genetic differentiation and reduced genetic diversity within local populations are expected. Using the model system *Lysiphlebus hirticornis* Mackauer, a specialist parasitoid of the tansy aphid, *Metopeurum fuscoviride* Stroyan (Hemiptera: Aphididae), we examined within-site temporal population dynamics and genetics, including molecular variation at the tansy plant level. Aphid-parasitoid dynamics were surveyed and parasitoids sampled from 72 tansy plants at 11 sites in and around Jena, Germany, over one growing season. Thereafter, parasitoid samples were genotyped at 11 polymorphic microsatellite loci. Colonization, extinction, and recolonization events occurred during the season. Allele numbers and identities were highly variable over time. When samples from all sites were pooled, allele number over all loci showed a decreasing trend with time. At the level of sites, temporal changes in genetic diversity were more variable. Analysis of molecular variance revealed that samples at the plant level explained the highest variance compared to at site level. We conclude that the genetic structuring of this insect is very fine grained (i.e. at the tansy plant level) and the temporal genetic diversity is explained by a combination of extinction and recolonization events, as well as inbreeding. *Biological Journal of the Linnean Society*, 2011, **102**, 737–749.

ADDITIONAL KEYWORDS: alleles – diversity – gene flow – insects – metapopulation – *Metopeurum fuscoviride* – microsatellites – population dynamics – spatial genetics – *Tanacetum vulgare*.

INTRODUCTION

Genetic diversity is the material on which selection acts and its amount in a population at any given time results from a balance between the gain and loss of allelic variants (Amos & Harwood, 1998). An increase in genetic diversity can come from the creation of new alleles by mutation, through migration of individuals into the population bearing different alleles, and through sexual reproduction by mixing and recombination of the alleles present in a population. Loss of genetic diversity arises via natural selection, random genetic drift, and emigration (Amos & Harwood, 1998).

In structured populations characterized by low dispersal among patches, genetic variability in space and time is influenced by colonization and extinction cycles (Whitlock & McCauley, 1990; Husband & Barrett, 1996) and variations in population density (Lynch, Conery & Burger, 1995). Wright (1940) suggested that patterns of extinction and recolonization would enhance genetic differentiation of local populations because the number of individuals colonizing a patch is likely to be much smaller than the local carrying capacity. By contrast, Slatkin (1985) argued that such interdemic selection is inherently unlikely

*Corresponding author.
E-mail: franklin.nyabuga@uni-jena.de