

A continental-scale survey of *Wolbachia* infections in blue butterflies reveals evidence of interspecific transfer and invasion dynamics

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Abstract

Infections by maternally inherited bacterial endosymbionts, especially *Wolbachia*, are common in insects and other invertebrates but infection dynamics across species ranges are largely under studied. Specifically, we lack a broad understanding of the origin of *Wolbachia* infections in novel hosts and the factors governing their spread. We used Genotype-by-Sequencing (GBS) data from previous population genomics studies for range-wide surveys of *Wolbachia* presence and genetic diversity in over 2,700 North American butterflies of the genus *Lycaeides*. As few as one sequence read identified by assembly to a *Wolbachia* pan-reference genome provided high accuracy in detecting infections as determined by confirmatory PCR tests. Using a conservative threshold of five reads, we detected *Wolbachia* in all but two of the 107 sampling localities spanning the continent, and with most localities having high infection frequencies (mean = 91\% infection rate). Three major lineages of *Wolbachia* were identified as separate strains that appear to represent three separate invasions of *Lycaeides* butterflies. Overall, we found extensive evidence for acquisition of *Wolbachia* through interspecific transfer between host lineages. Strain *wLycC* was confined to a single butterfly taxon, hybrid lineages derived from it, and closely adjacent populations in other taxa. While the other two strains were detected throughout the rest of the continent, strain *wLycB* almost always co-occurred with *wLycA*. Our demographic modeling suggests *wLycB* is a recent invasion. These results demonstrate the utility of using resequencing data from hosts to quantify *Wolbachia* genetic variation and provide evidence of multiple colonizations of novel hosts through hybridization between butterfly lineages and complex dynamics between *Wolbachia* strains.

Hosted file

wolbachia_lycaeides.pdf available at <https://authorea.com/users/464870/articles/559593-a-continental-scale-survey-of-wolbachia-infections-in-blue-butterflies-reveals-evidence-of-interspecific-transfer-and-invasion-dynamics>