

# Hidden complexity: The population genetic structure of *Hyles lineata*



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## Introduction

*Hyles lineata*, commonly known as the White-lined Sphinx, is native to North America and can be found in all United States except Alaska and Hawaii. This hawkmoth plays a fundamental part in the reproduction of many moth-pollinated flora across the country. They have a distinctive symbiosis with the evening primroses family, the Onagraceae. *H. lineata* and the evening primroses have a unique mutualism, where these flowers depend on this insects to be pollinated and they depend on the plants to lay their eggs; both of them need each other for reproduction.

To better appreciate this, we are focusing on understanding the genetic structure of the population of *H. lineata* across the Western United States. This part of the story can tell us a lot about the behavior of this moth and how this affects not only them, but the species they pollinate.

## Hypotheses

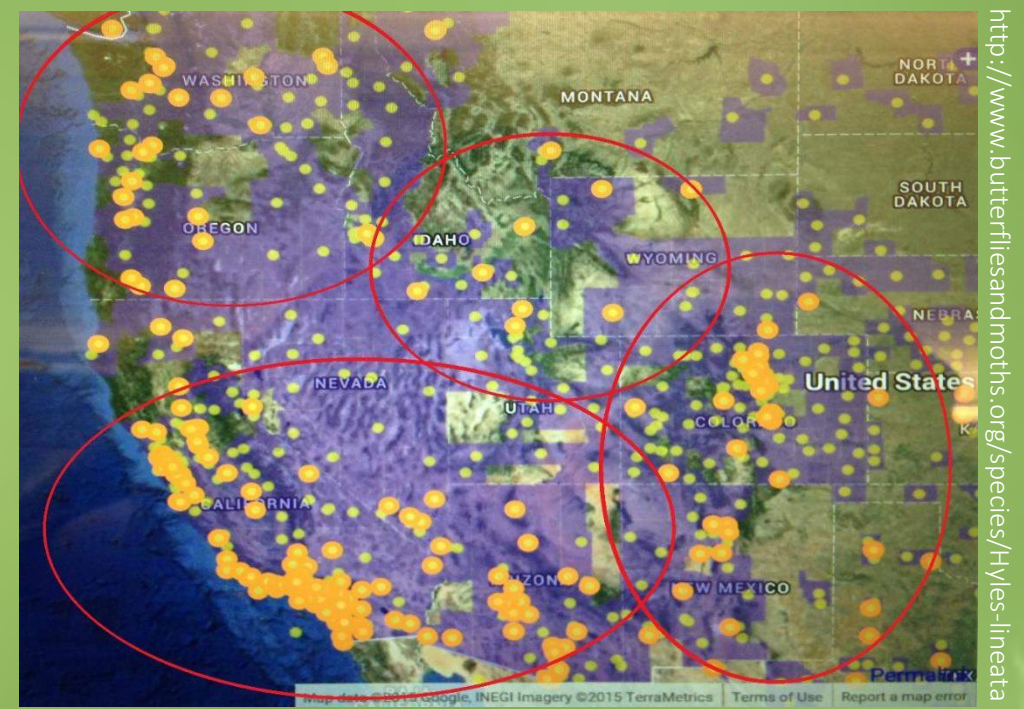


Figure 1. Inferred species range from observations of *H. lineata* from BAMONA.

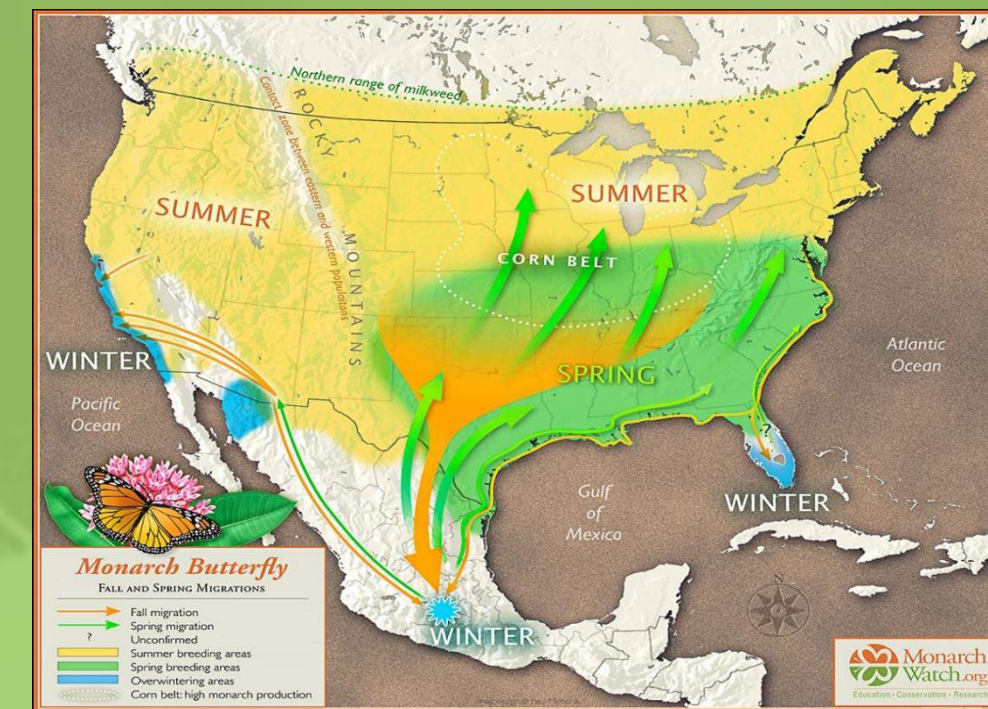
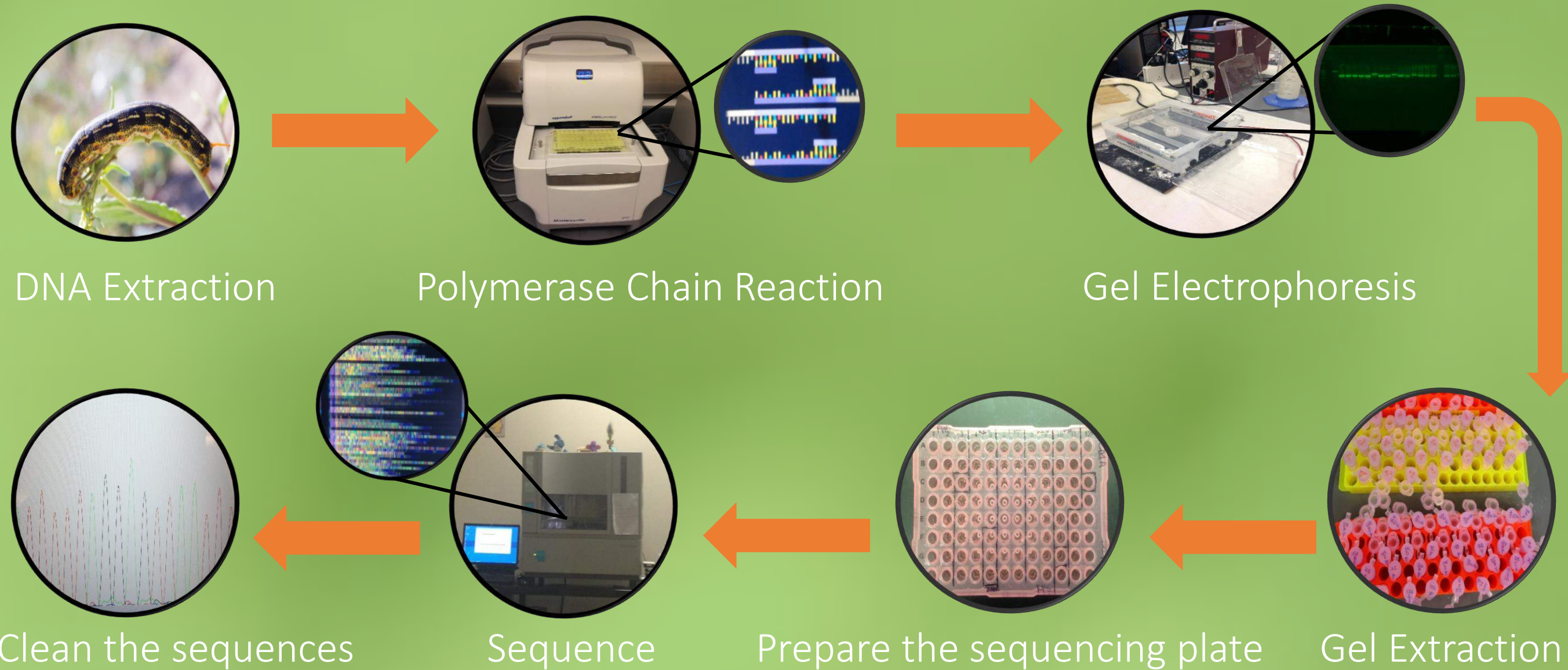


Figure 2. Migration of Monarchs during the winter.

- I. Based on results from a previous study on *Hyles euphorbiae*, we hypothesized that population genetic structure could be associated with sex (Mende and Hundsdoerfer 2013); since males are thought to disperse greater distances than more locally-based females. If this holds true for *H. lineata*, we would expect to see higher genetic structure in maternally inherited markers (mtDNA) in comparison to nuclear markers.
- II. Monarchs, another lepidopteran which travels long distances, have been shown to have very low genetic structure. We hypothesize that similar patterns of admixture may occur in *H. lineata*, however almost nothing is known about the migrational patterns of *H. lineata*. If their movements are qualitatively similar to those of monarchs, we would expect to see high relatedness across the Western US.

## Methods



## Results/Discussion

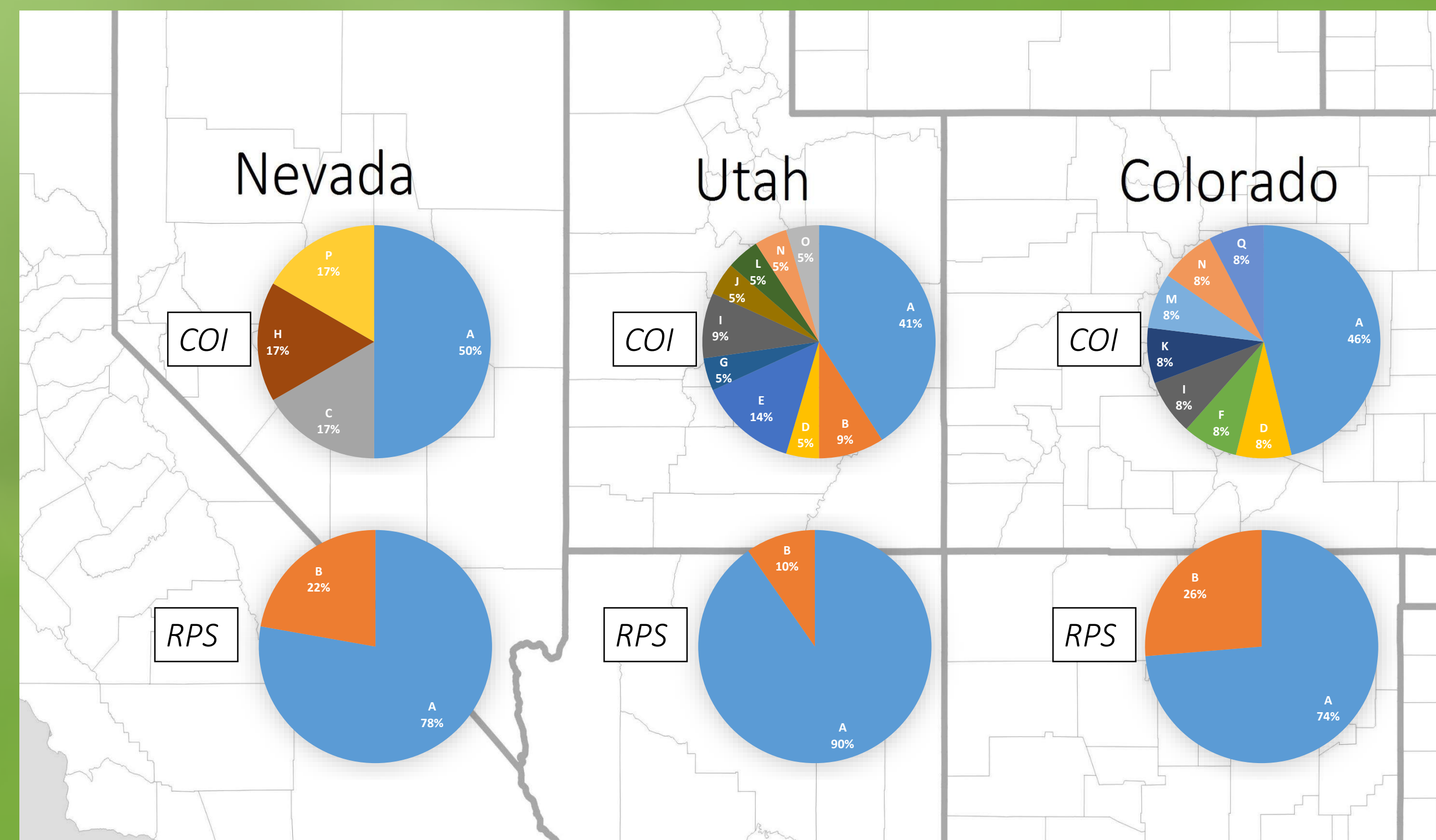


Figure 3. Haplotype diversity of *H. lineata* across three states and two loci. COI is a mtDNA marker which is maternally inherited, whereas RPS is a nuclear marker which is subject maternal and paternal inheritance.

We demonstrate that a high level of genetic structure exists among populations of *H. lineata*, which is qualitatively higher than that of monarch butterflies and similar to that of *H. euphorbiae* from Europe. We also demonstrate that our maternally inherited locus (COI) exhibits higher levels of genetic structure than in our nuclear marker (RPS), suggesting that males may indeed disperse longer distances than females. Our findings suggest that plants which rely on *H. lineata* for pollination, such as evening primroses family (Onagraceae), might have a higher chance of pollination success when in fragmented or isolated populations. Our data supports the idea that females might be more locally based as they are under selection to remain in areas where host plants can be reliably found in order to reproduce successfully. In contrast, males may disperse longer distances, looking for new populations of food plants and females.



## Conclusion

- The White-lined Sphinx shows high levels of mtDNA diversity and structure between the three states sampled in our analysis. This diversity is qualitatively much higher than that in monarchs, another long-distance dispersing Lepidopteran that has been well-studied genetically.
- High levels of structure exist in maternally inherited mtDNA markers in *H. lineata*, as compared to nuclear markers, suggesting that males disperse further distances than females in this species.



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