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Abstracts

HOW CAN I GO WITHOUT YOU? THE EFFECTS OF GEOLOGICAL EVENTS ON THE DIVERGENCE OF *RHAGOLETIS POMONELLA* AND ITS HOST

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The “true” fruit fly *Rhagoletis pomonella* (Diptera: Tephritidae) has been a model system for the study of speciation, and its host affiliation has been indicated as the major factor in the divergence of this fly. The fly has traditionally been found only in temperate North America, particularly northeastern US, utilizing typically temperate hawthorns as hosts. However, our recent survey surprisingly discovered its distribution in both highland and lowland Mexico, with two endemic hawthorn species as their host plants. Phylogeographic analyses based on the DNA sequences of multiple loci distributed across the genome reveal that: (I) The lowland fly populations may have been introduced into Mexico along with their host hawthorns during a cooling period in history, which corresponds with the introduction of many temperate plants from eastern United States into Mexico; (II) The highland populations belong to a different lineage that has been recently derived, corresponding with a warming period in history during which the fly’s temperate host plants could have spread onto Mexican highland regions. This study has multiple implications to various fields. First, it confirms that ecological factors, in this case host plants, are very important for the evolution of species. Second, geological events could have a great impact on the biogeography and divergence of species and the evolutionary response could be very rapid. Third, ecological diversity could be an important contributor to species diversity. Finally, the historical relationships between ecology and species richness could be revealed by evolutionary examination, particularly phylogeographic analyses.

Keywords: *speciation, host affiliation, phylogeography, historical climate changes*

LONG DISTANCE SEED DISPERSAL IN A FRAGMENTED LANDSCAPE: IMPLICATIONS FOR PLANT RESPONSES TO CLIMATE CHANGE

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Many species may be unable to shift their distributions in response to the expected rates of climate change. Movement of species may be particularly impeded in fragmented landscapes where large distances exist between natural areas. Information on long distance dispersal (LDD) may help in determining the types of species that will be capable of distributional responses but such data are extremely rare. I sampled woody plant seed rain throughout five forest fragments in Michigan over two years (forest fragment size 4 - 8 ha, n = 114 traps total, trap surface area = 28.5 m^2). To quantify between-fragment dispersal, I took advantage of species absences from individual fragments. Species absences for fragments were determined by initial surveys and were then verified through resurveys for all successful immigrants. Of seventeen species, seed

dispersal into fragments was detected for only four disturbance-adapted woody plants (*Acer negundo, Betula papyrifera, Celastrus scandens, Elaeagnus umbellata*). In contrast, species such as *Acer rubrum* and *Tsuga canadensis* showed no between-fragment seed exchange despite the ability to saturate individual fragments with seed. Multiple LDD events were recorded for *Betula papyrifera* allowing some exploration of the spatial and temporal patterns of long distance dispersal. Long distance seed exchange was greatest in November, directly after leaf litter fall, with immigrant seed randomly distributed throughout the receiving fragment. The temporal pattern of exchange suggests wind patterns rather than peak seed availability may increase the number of long distance dispersal events. It is perhaps not surprising that early-successional, disturbance-adapted plants appear to be better than others at moving through fragmented landscapes. Conservation of species with other life history characteristics may require more direct intervention as on-going global change occurs.

Keywords: *Northern hardwood forest, Seed dispersal, Forest fragmentation*

AN AQUATIC EXPERIMENTAL SYSTEM FOR ASSESSING THE RELATIONSHIP BETWEEN GENETIC DIVERSITY AND POPULATION PERSISTENCE IN A CHANGING ENVIRONMENT

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The relationship between population adaptive potential and extinction risk in a changing environment is not well understood. Although the expectation is that genetic diversity is directly related to the capacity of populations to adapt, the statistical and predictive aspects of this relationship in real populations are not well known. From a conservation perspective, it is useful to understand this relationship so that genetic data may be incorporated into population viability models which traditionally rely on demographic and ecological data. Here we present an experimental design using the freshwater amphipod species *Hyalella azteca*. These organisms represent a useful contrast with Drosophila and Tribolium laboratory models. The design involves creating inbred lines from diverse native populations. Individuals from each inbred line will be combined to form “synthetic” populations from either three or six randomly selected inbred lines in order to generate experimental populations with controlled levels of genetic diversity, and the entire set will be replicated ten times. This design will permit the adaptive capacity of populations founded by 1, 3, or 6 inbred lines to be compared to that of native populations and an admixed laboratory population representing genes from all sampled natural populations. By experimentally manipulating levels of population genetic diversity, we will be able to formally assess both the relationship between genetic diversity and population viability in an increasingly hostile environment and also determine the statistical efficiency of various classes of genetic markers.

Keywords: