Diversity of Native Bee Populations in the Adirondacks in Relation to Elevation and Land Use

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Flowering plants depend on the spread of their pollen to reproduce. By far the most important group of pollinators is insects, accounting for the pollination of 67% of all flowering plants (Kearns 1997). Bees (Apoidea) make up a large portion of this percent, pollinating thousands of wild and domestic plants. Bees differ from other insects by having specialized hairs to collect pollen that is then used to provision their larvae. Thirty percent of human food is derived from bee-pollinated crops. In United States, the introduced, colonial, European honeybee (*Apis mellifera*) is just one of hundreds of species important to pollination, yet they are almost exclusively used in agriculture. Native bees, whose ecology is only basically understood and differ widely in sociality and size, may offer agricultural alternatives to honeybees in addition to their natural ecological importance. New York is home to at least 378 native bee species (Ascher, 2002) though no systematic sampling of bee populations has ever been done in the Adirondacks. Despite their significance, native bee communities are known to be declining in abundance and diversity (Kearns 1997). Their declines have been documented in Europe, Asia and the America's. Little information on the causes of these declines is yet available but they appear to include pesticide use, the introduction of alien pollinators and habitat alteration. Bees require habitats with sufficient nesting areas (dead wood and sandy soils) and floral resources. A deeper knowledge of the baseline diversity and ecology of native bee species would provide greater insight into the possible causes of their decline and aid the development conservation methods. This project contains three studies of bees in the Adirondack Mountains, each of which attempt to address this goal. As well as the aims of the individual projects, the study will establish baseline diversity data on pollinators that can be used as a comparison for future studies.

In order to make a systematic study of bees which is both repeatable and accounts for differences in temperature and time of day, a recently developed collecting technique called pan trapping was utilized. In this technique, different colored bowls

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(pan traps) containing water and soap are placed at respective locations for approximately five hours at each collection time. Bees land in the bowls believing they are flowers and are trapped. Every sampling location contains two replicate transects of 18 bowls, six of three colors: blue, white and yellow. Data loggers were used to keep track of temperature that will be used to determine the length of time the temperature was at an optimal foraging temperature for each sampling period. Afterwards the bees were identified to genus using Michener's guide and several diversity indices were calculated. In addition, data on floral diversity was collected.

One study examined the effect of elevation on bee communities. As elevation changes so do environmental factors such as temperature, wind speed and precipitation. These abiotic factors lead to a gradient of habitats and floral communities moving up a mountain which also influence bee diversity. We hypothesized that this would create a significant difference in the diversity in bee populations, and that this diversity would change over the summer since seasonal progressions of differing altitudes are offset from one another. Samples were taken at five different elevations along Whiteface Memorial Highway. As the summer has progressed, abundance and diversity have increased at higher elevations.

A second study examines the diversity of bees in bogs in the Adirondacks. A unique habitat, bogs are home to a variety of flowering plants such as blueberries that may have specialized pollinators not found elsewhere in this area. Replicate transects were taken at three bogs weekly. Eleven genra have been identified in the bogs, at least two of which have not been found at other sites.

The last study compares diversity of bees in relation to logging methods. The study is a contribution to a long-term project being conducted by FERDA (forest ecological research development area) at Paul Smith's College. Bees were sampled in replicate transects weekly in three different tree-cutting regimes: shelterwood, clear cutting and single tree selection. We predict the shelterwood area will have the greatest abundance and diversity of bees because there are high percentages of flowers and dead wood while some trees left behind offer protection from wind and overheating. Preliminary analysis of the data suggests there is a difference between the control, the single-tree selection and the clear-cut and shelterwood, but not between the clear-cut and shelterwood in bee diversity and abundance.

All three of these studies represent ecological factors and habitats that are important to the Adirondack Mountains. Hopefully they will offer new insight to the ecology of bees in terms of elevation and land use that can be applied more globally to conservation methods and developing native bees as agricultural pollinators. In

addition, these samples will create baseline data on Adirondack bees that can be used to monitor their populations in the future.

Sources

Ascher, John S. and K. Magnacca. 2002 Bee Fauna of New York State, with emphasis on the Fingerlakes Region (Hymenoptera: Apoidea). Unpublished.

Kearns, C. A. and D. W. Inouye. 1997. Pollinators, Flowering Plants, and Conservation Biology. *BioScience* 47(5): 297-307.