Bees on the Brink

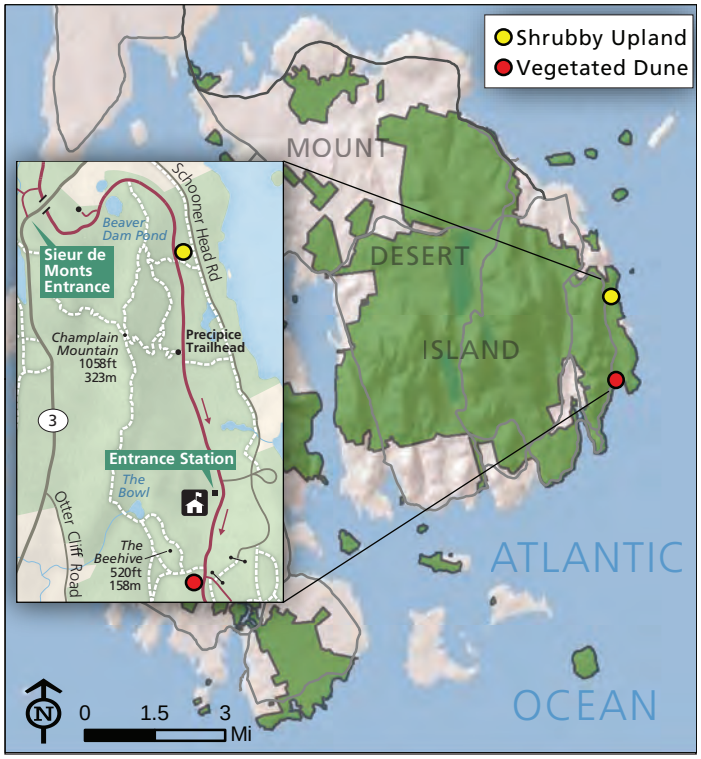
Research at Acadia National Park

Importance:

Pollinators at risk in a changing climate

Bees provide a critical ecosystem service, pollination, yet we know little about their abundance, diversity, and distribution across National Park Service (NPS) lands. We know even less about the possible effects of climate change on bee populations. Coastal areas are particularly vulnerable to effects from climate change, and sand dunes are often hot spots for rare and/or endemic bee and plant species. Acadia National Park is one of 48 NPS units that are surveying the distribution of bee species in vulnerable habitats (coastal dunes, inland dunes, and alpine areas). The bee species within the targeted habitats are compared to bee species found in nearby, more common habitats. Comparing these different habitats within each park will reveal if there are rare and/or endemic bee species associated with sensitive areas which might be vulnerable to processes such as species loss, population decline, and disruption of pollination networks in response to climate change. These areas can then be targeted for future monitoring, and where appropriate, for active management.

Sampling Location



Augochlorella aurata, a common green metallic sweat bee, found in the park. Photo: © 2006-2010 John Ascher

Collecting bees: Pouring the contents from one of the 30 blue, yellow, and white "bee bowls" through a strainer, and then into a plastic bag for storage and shipping.

Methods

Both sites were on Mount Desert Island. The vulnerable site was located in the dunes on Sand Beach (the only reasonably large sandy beach in this otherwise rocky coastal park), and the paired common site was in open, shrubby upland habitat. A transect of 30 small painted bowls spaced 5 m apart was laid out at each site. Bowls were filled with soapy water and left open for 24 hours on sunny days, collecting bees which are attracted to the color. Five samples were taken between May and September, 2011. Another six samples were collected between May and August, 2012, and nine samples were taken between May and September, 2013. After each run, bees were collected (see photo above) and sent to a central processing facility at Patuxent Wildlife Research Center (USGS Maryland) for identification.

Vegetated Dune Site on Mount Desert Island in the dunes on Sand Beach

Shrubby Upland Site on Mount Desert Island in an open, shrubby upland habitat

Results

A total of 1,698 bees were collected from 2011 to 2013. The vulnerable dune site yielded more bees (903) than the open shrubby site (795). Species richness was similar between the sites, 57 identified species at the dune site, and 67 at the shrubby site, with 36 species occurring at both sites (see bar graph below).

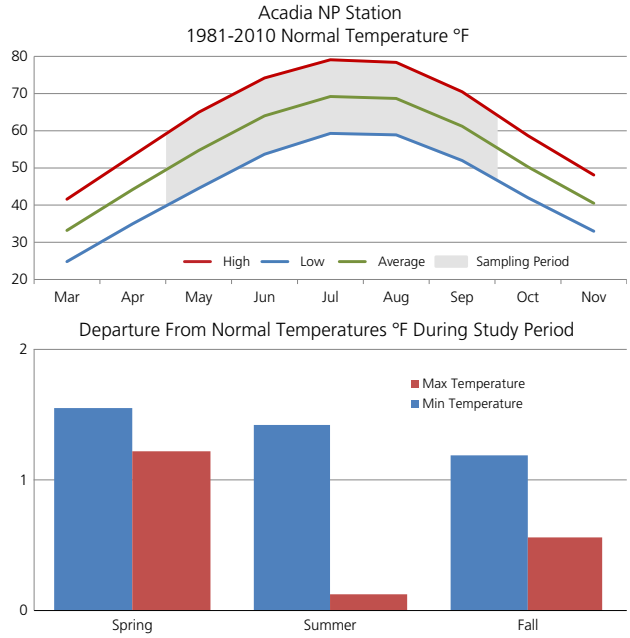
Previous bee surveys conducted at Acadia documented 136 species in the park. Sixteen of the species collected at the vulnerable and common sites in this study had not previously been recorded. However, some of these "new park records," especially for species in the genus *Lasioglossum*, may represent new taxonomic names, rather than previously undetected species.

Although the bee communities at the two sites differed noticeably in species composition, and some of the shared species were abundant in one site and less frequently captured in the other, there were no obvious sand specialists present at the vegetated dune site. A possible exception was the sweat bee, *Lasioglossum leucocomum*; this is a newly described species that seems to be associated with sand, but because it is new, more needs to be learned about its habits and distribution.

The two-spotted bumble bee, ***Bombus bimaculatus***, is an eastern species. Collected at both sites.
Photo: © 2010 Tom Murray

Hyleaus basalis, a masked bee, has a largely western distribution, although it has been documented elsewhere in New England.
Photo: © Matt Bearup

The mining bee, ***Andrena frigida,*** is active in the spring, and forages on willows and other early-blooming plants. Collected in the open, shrubby site
Photo: © 2010 Tom Murray



The top graph shows the 30 year normal minimum, maximum, and average temperatures from a weather station in or near the park, for the months that bees were sampled. The bottom graph shows how seasonal temperatures during the five year (2010-2014) study period departed from normal. Spring warmed the most, but all three seasons were warmer than normal, driven primarily by warmer minimum temperatures at night.
Data source: Corrected weather station data sets, used as inputs to create TopoWx. (Oyler et al., 2014); NOAA NCEI 1981-2010 Climate Normals www.ncdc.noaa.gov

Other species of interest included *Bombus sandersoni*, a relatively uncommon bumblebee that has shown up in the past few years in the park. In general, it seems to be unaffected by the declines that bumblebees in other subgenera are experiencing. *Hylaeus basalis* is a masked bee that appears to be uncommon throughout its range and has a largely western North American distribution, although it has been documented previously elsewhere in New England and Newfoundland.

Comparison of bee species richness within genera in vegetated dune and shrubby upland sites in Acadia National Park