



Bees on the Brink

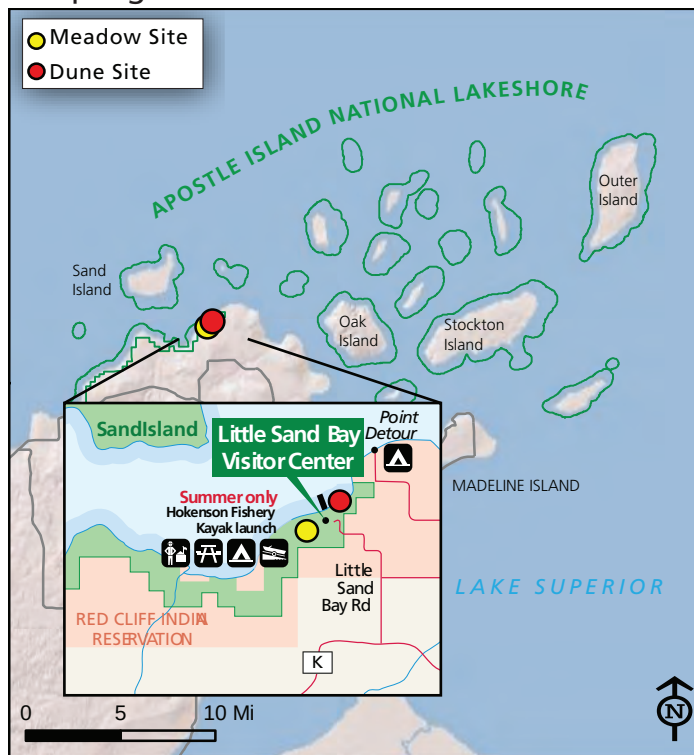
Research at Apostle Islands National Lakeshore

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. Apostle Islands National Lakeshore 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 located on the mainland near Little Sand Bay Visitor Center. The vulnerable site was located in a beach dune area and the paired common site was less than a kilometer away, in an interior field surrounded by woodland. 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. Three samples were taken in July and August, 2010, and three more were taken between May and September, 2011, timed to coincide with peak bee activity. 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.



Dune Site
on the mainland near
Little Sand Bay Visitor
Center



Meadow Site
in an interior field
surrounded by woodland
on the mainland near
Little Sand Bay Visitor
Center

Results

A total of 206 bees were collected in 2010 and 2011. Approximately three times as many bees were caught in the common meadow site as in the vulnerable dune site (150 and 56 individuals, respectively). In addition to trapping more individuals, the meadow site also yielded more species (32) than the dune site (23), perhaps a reflection of greater plant and therefore pollen diversity in surrounding habitats. Seven species occurred at both sites (see bar graph below).

Overall, although species composition differed between the two sites, the bees collected in Apostle Islands National Lakeshore represent a fairly typical fauna of northern climates, with few sand specialists. One species found only at the dune site, *Lasioglossum pictum*, is always associated with sandy habitats, but is not considered a dune specialist. The mason bee, *Osmia michiganensis*, found only at the meadow site, is associated with dunes, however, the taxonomy of this group is currently under revision, and so the true identity of the single specimen is currently suspect. The lack of distinct dune fauna may not be surprising in this park, as open sandy habitat is limited to narrow strips in bays and at stream outlets.



Coelioxys rufitarsus, a "cuckoo bee" that lays its eggs in the nests of leafcutter bees, where its larvae kill the host larvae and eat their pollen supplies.
Photo: © 2012 The President and Fellows of Harvard College

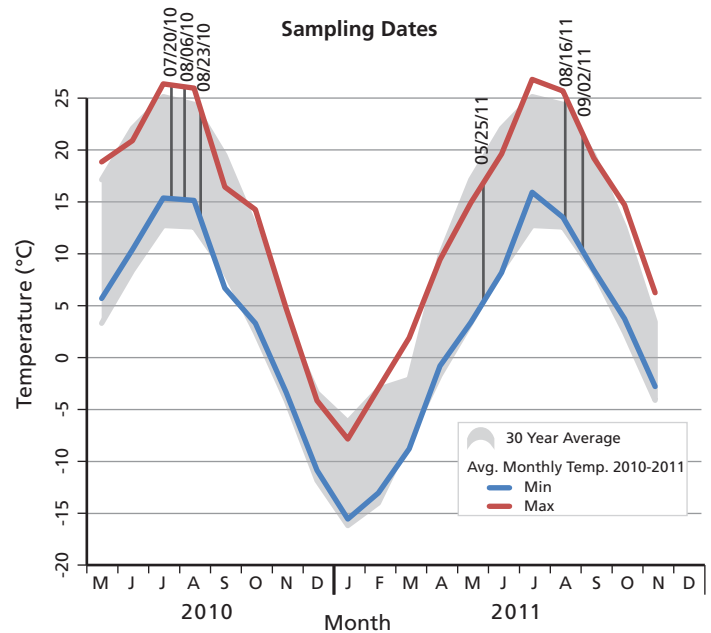
Lasioglossum pictum, a sand-associated species found at the dune site.
Photo: © 2010 Packer Collection at York University, York University



A tricolored bumblebee, *Bombus ternarius*, found at the dune site.
Photo: © 2010 Tom Murray



The female leafcutter bee, *Megachile relativa*, collects pollen on the underside of her abdomen. She constructs brood cells with pieces of leaves or petals that she cuts with her large mandibles.
Photo: © 2010 Tom Murray



Average monthly min/max temperatures compared to the 30-year average temperatures for the six 2010/2011 bee

Data source: PRISM Climate Group, Oregon State University,
<http://prism.oregonstate.edu>, created January 2011.

Two species of interest from the survey are *Stelis labiata* (found at the dune site) and *Pseudopanurgus albitarsis* (found at the meadow site). *Stelis labiata* is a rare nest parasite, most likely of one of the *Osmia* species. Nest parasites, or "cuckoo bees," lay their eggs in the nests of other species, and the developing young cuckoos kill the host eggs or larvae then consume their pollen provisions. *Pseudopanurgus albitarsis* is also an uncommon species, and is likely a pollen specialist of plants in the Asteraceae family.

Comparison of bee species richness within genera in dune and meadow sites in Apostle Islands National Lakeshore

