Monitoring of bee populations collected at Madison Avenue Pine Bush 2018

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Abstract:

Preliminary results of on-going monitoring of bee populations on the Albany Pine Bush are presented. Particular emphasis is given to populations of sand-nesting species. We hypothesize that if nest sites are limiting these species stand to benefit from recent habitat restoration efforts to remove invasive locust trees and open sand dune habitats to native specialist species.

Introduction and Overview:

On the Albany Pine Bush, several species of sand-nesting bees were documented, including four members of the subgenus *Litomegachile.* In this preliminary report we will focus on them because of the potential impact of habitat restoration efforts on their status. Restoration of sand dune habitat may benefit these species.

Historically, beginning in the early 1900's, the Albany Pinebush, then known as the Karner Barrens, have been the focus of extensive insect collecting by New York State Museum entomologists. McCabe (1995) documented the extirpation of some species and the addition of approximately the same number of species not present earlier. Thus although there was a background of change over the previous 100 years the fauna maintained the same species richness.

The Albany Pinebush supports a unique flora and fauna adapted to acidic nutrient poor soils, and frequent fires (Barnes, 2003). In 1991 the Nature Conservancy commissioned a scientific survey of the insects of the Pine Bush Preserve (McCabe, et al., 1993). That survey sought to document a base-line data set allowing comparison with future studies. The present study proposes to examine bees collected with Malaise traps. A Malaise trap is an intercept trap, which effectively samples flying insects.

Voucher specimens prepared by McCabe and his collaborators in 1981, 1984, 1986, and 1991 and preserved at the New York State Museum are available to compare with present day samples

collected with a similar methodology at the same sites twenty plus years apart. The present study extends the monitoring at this site begun in 2016 and continued in 2017 and 2018.

Method:

A malaise trap is operated by Dr. McCabe through out the frost free season, at his property adjacent to the Albany Pine Bush Preserve. The trap is serviced weekly and the specimens are frozen prior to preparation. The specimens were prepared and labeled by MSA and identified by AD.

Results:

In Table 1 we summarize collections in 2016-17-18

Table 1

Family	**Subfamily**	**Genus**	**species**	**2016**	**2017**	**2018**	**2019**
Apidae	Apinae	Anthophora	terminalis	5	0	1	
Apidae	Apinae	Bombus	affinis	0	0	0	
Apidae	Apinae	Bombus	ashtoni	0	0	0	
Apidae	Apinae	Bombus	bimaculatus	12	1	16	
Apidae	Apinae	Bombus	citrinus	0	0	0	
Apidae	Apinae	Bombus	fervidus	0	0	0	
Apidae	Apinae	Bombus	griseocolis	3	1	0	
Apidae	Apinae	Bombus	impatiens	24	77	13	
Apidae	Apinae	Bombus	pensylvanicus	0	0	0	
Apidae	Apinae	Bombus	perplexus	0	0	0	
Apidae	Apinae	Bombus	vagans	0	1	7	
Apidae	Apinae	Melissodes	agilis	0	0	0	
Apidae	Apinae	Melissodes	bimaculata	0	1	0	
Apidae	Xylocopinae	Ceratina	calcarata	24	8	12	
Apidae	Xylocopinae	Ceratina	dupla	20	0	9	
Apidae	Xylocopinae	Ceratina	strenua	11	1	11	
Colletidae	Colletinae	Colletes	inaequalis	9	0	0	
Colletidae	Hylaeinae	Hylaeus	illinoisensis	2	0	0	
Colletidae	Hylaeinae	Hylaeus	mesillae	3	0	0	
Colletidae	Hylaeinae	Hylaeus	modestua	5	0	0	
Colletidae	Hylaeinae	Hylaeus	verticalis	3	2	0	
Colletidae	Hylaeinae	Hylaeus	annulatus	0	0	0	
Halictidae	Halictinae	Agapostemon	sericeus	0	4	7	
Halictidae	Halictinae	Agapostemon	splendens	0	5	3	
Halictidae	Halictinae	Agapostemon	texanus	0	0	1	
Halictidae	Halictinae	Augochlora	pura	0	18	37	

Halictidae	Halictinae	Augochloropsis	metallica	0	3	6	
Family	**Subfamily**	**Genus**	**species**	**2016**	**2017**	**2018**	**2019**
Halictidae	Halictinae	Augoclorella	aurata	0	11	49	
Halictidae	Halictinae	Halictus	confusus	0	0	4	
Halictidae	Halictinae	Halictus	ligatus	5	1	0	
Halictidae	Halictinae	Halictus	rubicaundus	1	0	0	
Halictidae	Halictinae	Lasioglossum	accuminatum			8	
Halictidae	Halictinae	Lasioglossum	brunei			1	
Halictidae	Halictinae	Lasioglossum	cressonii			5	
Halictidae	Halictinae	Lasioglossum	ephialtum			16	
Halictidae	Halictinae	Lasioglossum	lineatulum			11	
Halictidae	Halictinae	Lasioglossum	mitchelli			7	
Halictidae	Halictinae	Lasioglossum	oenotherae			1	
Halictidae	Halictinae	Lasioglossum	paradminandum			1	
Halictidae	Halictinae	Lasioglossum	pectorale			1	
Halictidae	Halictinae	Lasioglossum	pilosum			2	
Halictidae	Halictinae	Lasioglossum	planatum			2	
Halictidae	Halictinae	Lasioglossum	subversons			1	
Halictidae	Halictinae	Lasioglossum	taylorae			1	
Halictidae	Halictinae	Lasioglossum	tegulae			1	
Halictidae	Halictinae	Lasioglossum	trigeminum			`1	
Halictidae	Halictinae	Lasioglossum	weemsi			5	
Megachilidae	Megachilinae	Coelioxys	banksi	1	0	0	
Megachilidae	Megachilinae	Coelioxys	banksi	1	0	0	
Megachilidae	Megachilinae	Coelioxys	modesta	0	0	0	
Megachilidae	Megachilinae	Coelioxys	octodentata	0	0	0	
Megachilidae	Megachilinae	Coelioxys	proterae	0	0	0	
Megachilidae	Megachilinae	Coelioxys	rufitarsis	0	0	0	
Megachilidae	Megachilinae	Heriades	carinata	0	0	4	
Megachilidae	Megachilinae	Hoplitis	pilosifrons	0	0	1	
Megachilidae	Megachilinae	Hoplitis	producta	2	3	1	

Megachilidae	Megachilinae	Megachile	addenda	0	0	0	
Family	**Subfamily**	**Genus**	**species**	**2016**	**2017**	**2018**	**2019**
Megachilidae	Megachilinae	Megachile	brevis	0	0	0	
Megachilidae	Megachilinae	Megachile	campanulae	2	7	0	
Megachilidae	Megachilinae	Megachile	centuncularis	1	1	0	
Megachilidae	Megachilinae	Megachile	gemula	0	1	0	
Megachilidae	Megachilinae	Megachile	inimica	0	0	0	
Megachilidae	Megachilinae	Megachile	latimanus	0	0	0	
Megachilidae	Megachilinae	Megachile	mendica	2	3	1	
Megachilidae	Megachilinae	Megachile	montivaga	0	1	0	
Megachilidae	Megachilinae	Megachile	mucida	0	0	0	
Megachilidae	Megachilinae	Megachile	pugnata	0	0	0	
Megachilidae	Megachilinae	Megachile	relativa	2	1	0	
Megachilidae	Megachilinae	Megachile	rotundata	0	0	0	
Megachilidae	Megachilinae	Megachile	sculpturalis	0	6	1	
Megachilidae	Megachilinae	Megachile	texana	0	6	0	
Megachilidae	Megachilinae	Osmia	albiventris	0	0	1	
Megachilidae	Megachilinae	Osmia	atriventris	5	14	5	
Megachilidae	Megachilinae	Osmia	bucephala	5	18	10	
Megachilidae	Megachilinae	Osmia	cornifrons	16	3	2	
Megachilidae	Megachilinae	Osmia	distincta	0	0	0	
Megachilidae	Megachilinae	Osmia	lignaria	0	0	3	
Megachilidae	Megachilinae	Osmia	proxima	1	0	0	
Megachilidae	Megachilinae	Osmia	pumila	14	12	14	
Megachilidae	Megachilinae	Osmia	taurus	10	12	2	
Megachilidae	Megachilinae	Osmia	virga	5	1	3	
Megachilidae	Megachilinae	Stelis	labiata	0	0	0	
Melittidae	Melittinae	Macropis	ciliata	0	0	0	
species richness						42	

The following species accounts document the collections of sand-nesting Megachilid bees of the subgenus *Litomegachile*.

Megachile (*Litomegachile*) *brevis* Say, 1837

Historical records of this species on the Albany Pine Bush are limited to four specimens. One each year in 1981, 1982, 1985 and 1991. Clearly, *M. brevis* is so rarely encountered that trends are not apparent. It was not collected in 2016-18.

Megachile (*Litomegachile*) *mendica* Cresson 1878

Historical records document this species to be the most common and consistent species of *Litomegachile* on the Albany Pine Bush. Throughout the 1980's and 1990's 2-4 specimens were collected each year. Our recent surveys also recorded 2-3 specimens a year.

Megachile (*Litomegachile*) *texana* Cresson, 1878

Historical records indicate that this species was collected in small numbers (1-5 specimens) in every year from 1981-1986. In 1991 two specimens were recorded. Our collections found six specimens in 2017 but none in the preceding and following years. Clearly the numbers are too small to draw significant conclusions concerning its status on the Albany Pine Bush, however its numbers appear somewhat variable but reasonably stable.

Megachile (*Litomegachile*) *lippiae* Cockerell, 1900

A single specimen, tentatively identified as this species, was collected in 2018. If this identification is confirmed, it is a new state record (Sheffield, et al. 2011; Bzdyk, 2012).

Discussion:

Sand-nestng bees in the temperate Northeastern United States, such as the Megachilid subgenus *Litomegachile*, face a problem with moisture. They provision their brood cells with a mixture of pollen and nectar, however excess moisture causes the food supply to either liquify or be overgrown by fungi which spoils its food value (Eickwort, *et al.,* 1981). The Megachilid bees — Leafcutter Bees — gather plant material to line their nests. This foreign material is both hydrophobic and antibacterial (Michener, 1953). The basal lineages of the Megachilidae were desert dwellers who had little need for such provisions however the evolutionary innovation of leaf cutting allowed their descendants to occupy a much wider ecological space (Litman *et al.* 2011).

Records over the last 25 years indicate that species richness for this lineage is stable. We may anticipate increasing nesting success as invasive plants are removed and sand dunes are exposed.

Megachile (*Litomegachile*) *brevis* Say, 1837

This species is the most consistently encountered Megachilid species across the entire extent of North America. Its biology, including nest making, provisioning and development, is well documented by Michener (1953). He found nest sites in a variety of sites, including abandoned burrows of other insects and spaces between rocks. The female was observed flying inches above the ground searching for nest sites which were usually near the soil surface. *M.*

brevis nests were parasitized by a number of species especially several species of the Megachilid genus *Coelioxys.*

Megachile (*Litomegachile*) *mendica* Cresson 1878

This species distribution spans the continent but is concentrated on the east coast.

Megachile (*Litomegachile*) *texana* Cresson, 1878

This bee, although described originally from Texas, is a widespread species found across North America. Eickwort *et al.* (1981) showed that in addition to utilizing existing burrows as nesting sites they also excavate their own nests.

Megachile (*Litomegachile*) *lippiae* Cockerell, 1900

This bee is very similar to *M. texana*, differing superficially only in the distribution of black setae on the abdomen. Its distribution is for the most part restricted to the states west of the Mississippi. There are multiple reports in peninsular Florida and isolated occurrences in Virginia and North Carolina, however none from the Northeastern states. Perhaps more interesting in relation to the single specimen collected in 2018 on the Albany Pine Bush are several reports from the north shore of Lake Superior and Lake Michigan. These sites have extensive sand dunes similar to those recently cleared of invasive locust trees on the Pine Bush

We recommend that efforts to evaluate the effects of Albany Pine Bush restoration should include sustained intercept trapping and netting of sand-nesting bees as they visit flowering plants to provision their nests.

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