Population Changes of *Lasioglossum* Over Time

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Introduction

- Bees are keystone organisms due to their pollination services, which contribute to ecosystem health and food production (Ghazoul, 2005).
- Although recent publications have indicated a decline in imported honey bee abundance, much is still unknown about our native bee communities (vanEngelsdorp and Meixner, 2010).
- *Lasioglossum* is the most species rich and abundant genus of native bee (Michener, 2007). A decline in *Lasioglossum* abundance may have a disproportionately large effect on the ecosystem due to their diverse functionality (Danforth *et al.*, 2003).
- The present study examines the relationship between land-use practices and *Lasioglossum* abundance over a two year period.

Study Sites

Table 1. Assessment of six study sites located in Plymouth County, Massachusetts. Beaver Brook and Native Meadow are located on the Massasoit Community College's Brockton campus.

SITE	% IMPERVIOUS	TERRAIN TYPE	SUSTAINABLE PRACTICE	MOWED
Christo's (CH)	46.85%	Urban parking lot	None	Never
Beaver Brook (BB)	46.03%	Urban campus	Riparian buffer	Annually
Native Meadow (NM)	32.03%	Urban campus	Native plantings	Annually
Sachem Rock (SR)	7.88%	Suburban park	Community garden	Occasionally
Dunrovin Farm (DF)	1.93%	Rural farm	None	Rarely
Leland Farm (LF)	0.50%	Suburban farm	None	Plowed

Methods

- Sampling took place from April to October during 2016 and 2017.
- Bees were caught by sweep netting and pan trap techniques to reduce collection bias (Roulston *et al.*, 2007).
- We deployed 30 pan traps consisting of the colors, blue, yellow, and white, at all sites which remained in the field for 24 hours (Shapiro *et al.*, 2014, Toler et al. 2005, Droege 2015).
- Following pan trap collection, sweep netting was conducted by two researchers along a 100-m transect for 30 minutes (Popic *et al.*, 2013, Droege, 2015).
- Geographic information system software (ArcGIS) was used to find % impervious surface (e.g. pavement and buildings) in a 300-m buffer zone around each study site.
- All collection methods were normalized to sampling effort to account for damaged pan traps.
- Two-way analysis of variance (ANOVA) was used to assess the effect of year, land-use, and the interaction of these independent variables on *Lasioglossum* abundance. Abundances were log-transformed to better meet the data normality assumption of ANOVA.

Results

Figure 1. *Lasioglossum* abundance assesed by pan trap and sweep net collection over seven months. Lines represent abundance in years 2016 (dashed) and 2017 (solid). Each data point indicates the total number of *Lasioglossum* caught per sampling effort at the six study sites using pan trap and sweep netting.

Figure 2. *Lasioglossum* average abundance assessed by pan trap and sweep net collection over time at all study sites. Lines represent change in abundance per year. ANOVA results: effect of site: $F_{5,142}$=7.395, p<0.001, effect of year: $F_{5,142}$=0.372, p=0.5427, interactive effect: $F_{5,142}$=2.599, p=0.0282.

Discussion

- Highest abundance was shown in July 2016 and August 2017 suggesting that peak season may vary from year to year, possibly due to natural seasonal variation.
- The most rural site, Dunrovin Farm, showed a higher abundance than all the other sites in both years, suggesting that rural sites may have the most ideal habitat for *Lasioglossum*.
- Native Meadow showed high abundance whereas Christo's, that has similar % impervious to the nearby college campus sites but no sustainable land-use practices, had the lowest abundance. This suggests that sustainable land use could be benefiting populations, even in urban areas.

Conclusion

- Although there is no clear trend, these data suggests that land-use practices could potentially be impacting *Lasioglossum* abundance.
- Longer term studies are needed to conclude whether this was due to natural seasonal variation or a longer term trend.

Picture 1. *Lasioglossum imitatum*

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