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ENVIRONMENTAL IMPACTS ON BEE DIVERSITY

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Introduction

What factors dictate similarities and differences in diversity between bee communities at Brooklyn Bridge Park and those in other locations?

This procedure was conducted under the assumption that differences in bee diversity between Brooklyn Bridge Park and other locations are influenced by environmental conditions, resource availability, and habitat structure.

To determine this statement's validity, the bee diversity at Brooklyn Bridge Park was examined and these findings were compared to another location without using the large-scale sampling methods employed in past studies. Instead, the goal was to focus on localized sampling at the park's piers to identify key environmental factors influencing community similarities and differences.

Methodology

01 In a past study, the methods of network analyses, null model comparisons and beta-diversity analysis were used

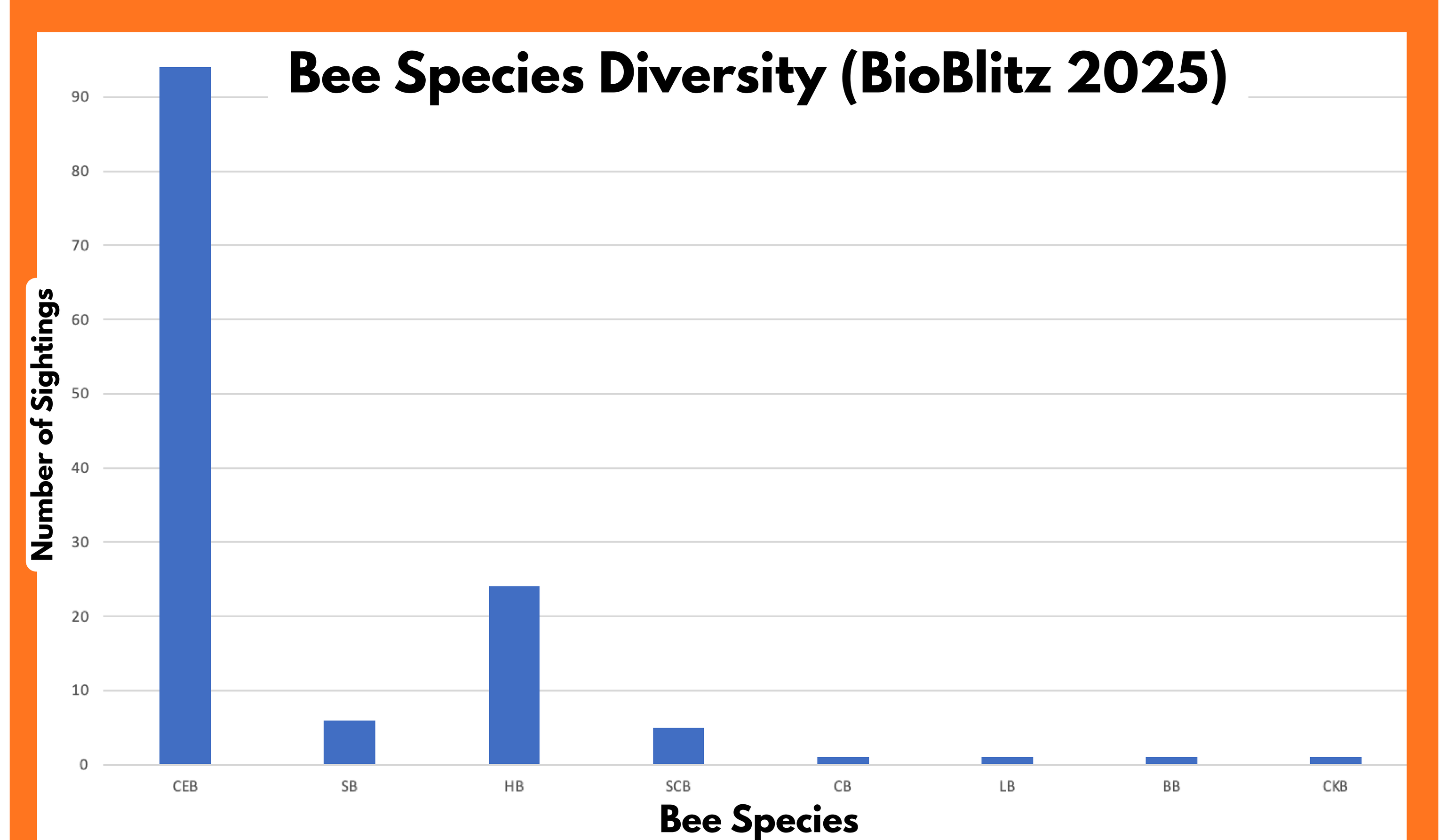
02 These methods were achieved through studying samples of 400 bees across north-east America

03 There are travel and time constraints that would make it difficult to conduct our study in the same fashion

04 This is why our method is focusing specifically on the bees residing at the Brooklyn Bridge Park

05 It was more convenient for our purposes and for comparing it to another location

Figure 1:



Results

Through the data gathered at the Bioblitz and comparison to past studies, it indicates how the environment of an area could correlate to the bee species diversity. In the areas of the park that contained natural elements such as flowers and were near the water correlated to a higher number of bees. This also contributed to diversity of bee species, in this case, lack of, as bee species have their preferences such as the Common Eastern Bumble Bee, which was spotted the most compared to other bees at a drastic rate. In conclusion, when looking at the findings, it showcases how the environment of an area can impact the diversity of such a species.

Sites with greater variation in corolla length supported significantly more bee species, which makes sense because bees have different tongue lengths and feeding abilities. A wider range of flower shapes and depths allows more species to access nectar, creating multiple ecological niches and reducing competition. In contrast, variation in nectar sugar concentration had little effect on bee richness, and the average values of corolla length or nectar concentration, predicted by the optimal trait hypothesis, also did not explain diversity. This suggests that bee communities are not shaped by a single "ideal" flower type, but rather by the overall variety of floral traits. These findings highlight the importance of maintaining diverse flower forms in urban environments, as such variety can support a wider range of pollinators and contribute to healthier, more resilient ecosystems.

Discussion

The article [1] examined how variation in floral traits drives the diversity of wild bees within urban green spaces around Montreal. By sampling 1935 bees from 94 species and measuring flower density, species richness, corolla length, and nectar sugar concentration across 16 sites, the authors tested whether bee richness is driven by diversity within floral traits or by dominance of "optimal" traits.

They found strong support for the within-trait diversity hypothesis: greater variation in corolla length-reflecting a wider range of flower shapes and depths-significantly increased bee species richness, likely because bees with different tongue lengths can access different flower types. Diversity in nectar sugar concentration was unrelated to bee richness, and mean floral trait values (mean cororolla length or mean nectar concentration) did not support the optimal trait hypothesis.
Floral density was the strongest predictor across all models, with plots containing more abundant flowers supporting more bee species.

The study compared two main ideas about what shapes bee communities. The within-trait diversity hypothesis says that a wide range of floral traits, like different corolla lengths, supports more bee species because bees have different feeding abilities. The optimal trait hypothesis argues that bee communities are shaped by one dominant trait most bees prefer. Montreal's study sites were scattered urban green spaces with high variation in floral density and species richness, creating a more naturally diverse environment. In contrast, Brooklyn Bridge Park is a carefully designed, consistently managed landscape with ornamental plantings, offering less natural variation than the Montreal sites.

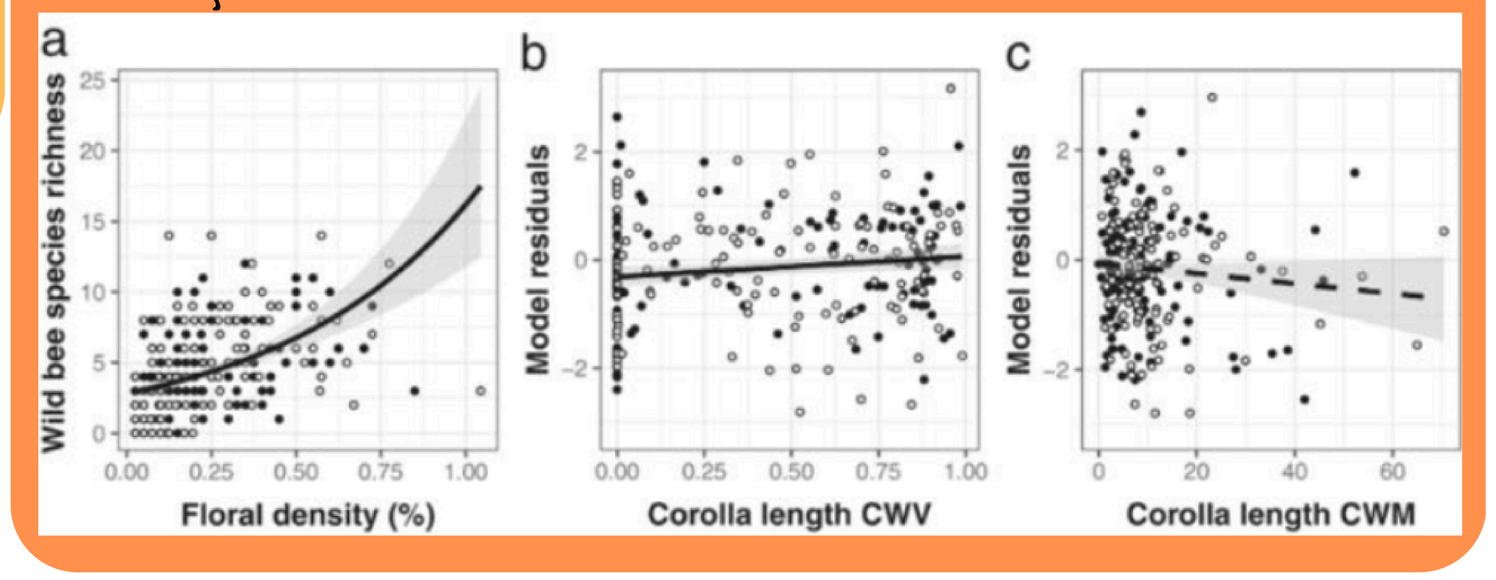
Name	Area (m^2)	Latitude	Longitude	Type	Min bee richness	Max bee richness	Mean bee richness
Shaare Zion	16483	45.55	-73.66	Cemetery	0	8	2.81
Urgel Bougie	62100	45.51	-73.66	Cemetery	0	6	2.44
Lakeview	147000	45.44	-73.84	Cemetery	0	4	1.31
La Presentation	13005	45.44	-73.74	Cemetery	0	5	1.25
Etienne-Desmarteaux	5149	45.56	-73.58	Garden	5	12	7.75
Prieur	4221	45.58	-73.65	Garden	0	8	4.31
Pere-Marquette	3180	45.54	-73.60	Garden	3	14	7.69
Roseraie	2117	45.59	-73.55	Garden	1	14	4.5
Rosemont-Eglantier	7514	45.57	-73.57	Garden	2	9	5.69
Réal Gareau	960	45.44	-73.67	Garden	2	11	7.31
Bois-de-Liesse	1716	45.50	-73.76	Park	4	14	6.75
Pointe-aux-Prairies Marais	9211	45.69	-73.53	Park	0	7	1.81
52e Ave	10,962	45.67	-73.51	Park	0	6	2.38
Georges Vanier	957	45.50	-73.57	Garden	2	8	4.44
Pointe-vert	836	45.48	-73.56	Garden	0	11	4.94
Laurendeau	2320	45.60	-73.57	Garden	0	8	3.44

Figure 2:

Conclusion & Future Direction

Majority of the bee photos taken at the 2025 BioBlitz capture the bees resting on 1 of 3 types of flowers. The most common 3 were goldenrods, bonesets, and pineapple lilies. Of the 33 images captured, this is a rather small collection of flower species. This lack of diversity can be connected to the lack of diversity within the bee species as different bees have preferences towards certain flowers. About 20-45% of native bees are pollen specialists meaning that they use only pollen from one species (or genus) of plants. This implies that in the future, parks such as BBP should provide bees with a wider variety of plants. New types of bees will gravitate towards the park as a result. This is because the length of differnt bee species' tongues also determines which flowers they must select.

Figure 3:



References
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