OP-281 [Pollination and Bee Flora]
Divergent pollen collection by honey bees and bumble bees: Evidence from Calgary, Canada

Ron Miksha
ABC&C Ltd, Calgary, Canada

Understanding how different pollinators utilize floral resources is critical for assessing interspecific competition and ecosystem functioning. Honey bees (Apis mellifera) and bumble bees (Bombus spp.) are both major pollinators, yet their foraging behaviours differ significantly. This University of Calgary study aimed to quantify floral resource partitioning between these species in Calgary, Alberta, Canada, and to evaluate whether they exploit the same floral resources or demonstrate niche differentiation.

Resource overlap among pollinators can lead to competition, particularly in urban and fragmented landscapes where floral resources may be limited. Given that honey bees have extensive foraging ranges spanning kilometres, whereas bumble bees typically forage within 500 meters of their nests, it is hypothesized that these differences in foraging distances drive pollen resource partitioning.

Nine study sites were established within Calgary, each containing one honey bee colony and two bumble bee colonies. Pollen samples were collected simultaneously from returning foragers at each nest site over multiple sampling periods. Pollen was identified and quantified using microscopic analysis to compare floral resource use between species. Statistical analyses were conducted to determine the extent of pollen overlap.

The results revealed a striking divergence in pollen collection between honey bees and bumble bees, with no significant overlap in floral resources ($p < 0.0001$). Honey bee pollen originated from distant agricultural floral species; bumble bee pollen was from urban ornamental species. This suggests that the two groups largely avoid direct competition through differences in their foraging strategies. Honey bees likely access more distant floral sources, while bumble bees exploit nearby resources, resulting in distinct pollen compositions.

Beekeepers and conservationists should consider these findings when managing colonies in shared landscapes. Since bumble bees and honey bees may utilize different floral resources, their coexistence may not necessarily lead to competition for pollen. However, maintaining diverse floral plantings within 500 meters of bumble bee nests and ensuring adequate forage availability for honey bees beyond this range can support both species.

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Apimondia Scandinavia 2025

Honey bee vs wild bees

Support

Supervisor: Lawrence Harder

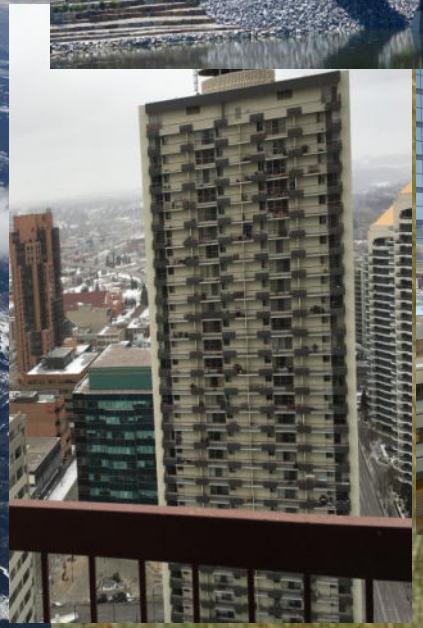
Committee: Paul Galpern, Jeremy Fox, Mindi Summers

Student Assistants:
Colette Shellian
Kyra McRitchie

Pollen analysis: Sophie Warny
Bee ID: Lincoln Best

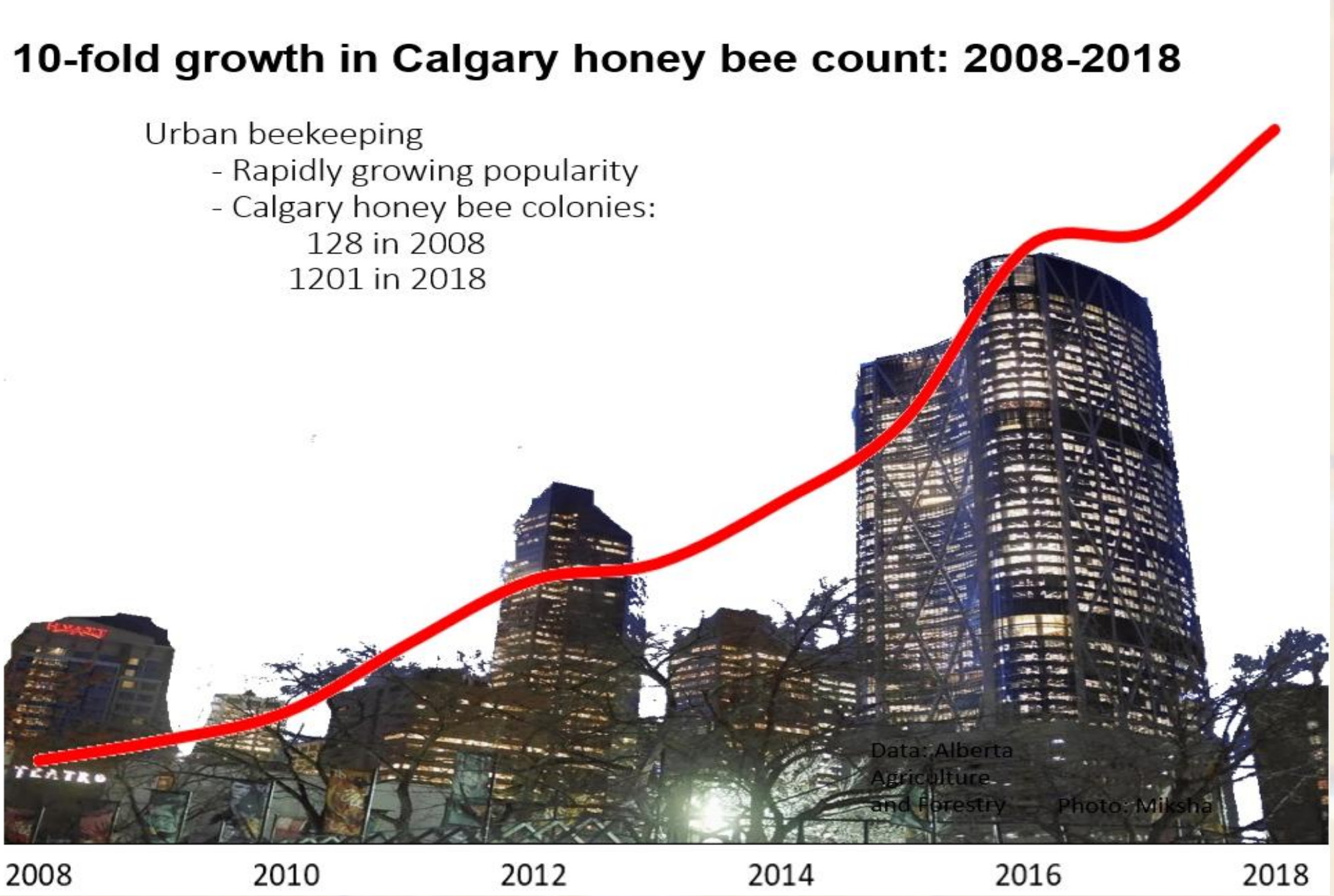
Calgary

Calgary



10-fold growth in Calgary honey bee count: 2008-2018

Urban beekeeping
- Rapidly growing popularity
- Calgary honey bee colonies:
  128 in 2008
  1201 in 2018

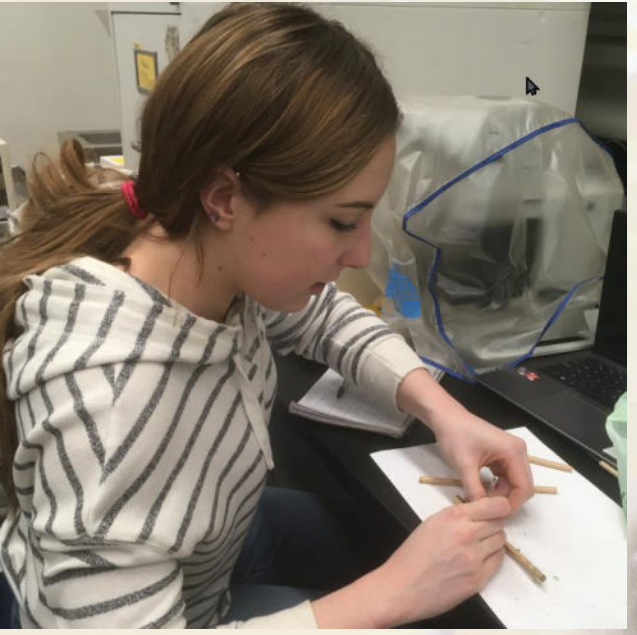


Is this a problem?

Calgary apiaries
~60 M honey bees
~300 apiaries

Apiary location
1,500 m radius

Calgary Base Map
(Source: Wiki cc by Qyd



Native bee abundance and productivity

74 citizen-scientist volunteers
82 leafcutter-bee nest blocks
80 biodiversity traps (x3 collections = 240 samples)
1600 landscape samples
143 bumble-bee nest boxes in observation backyards

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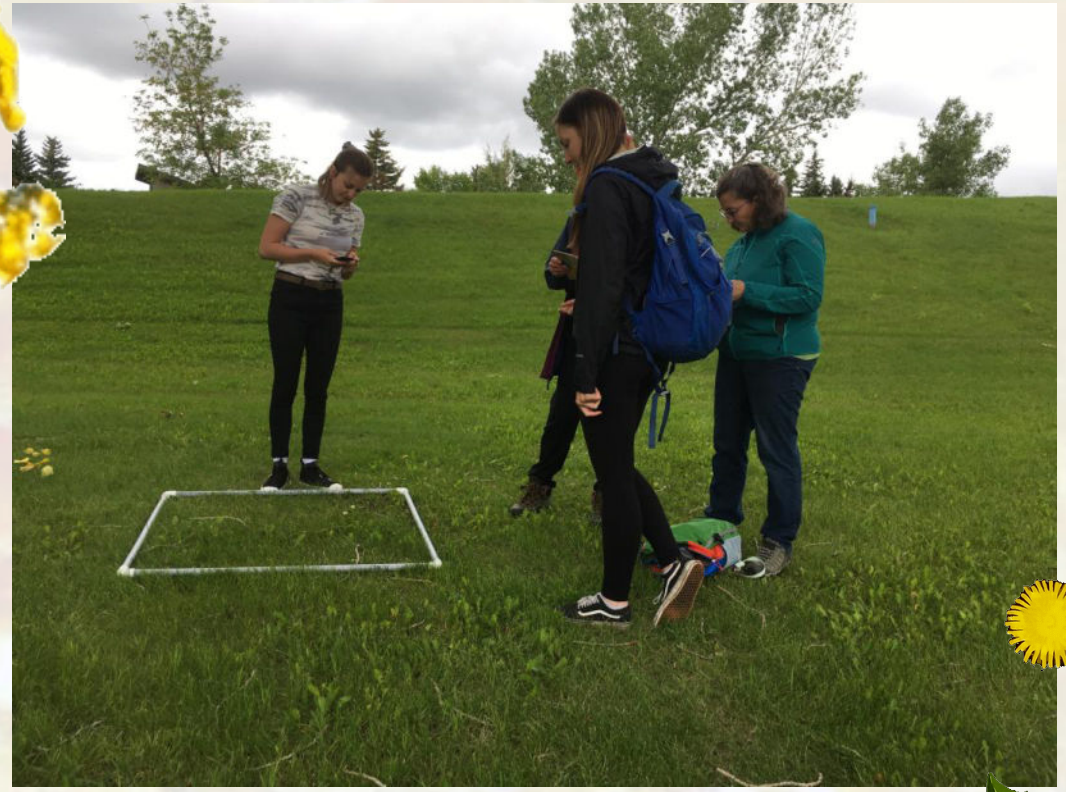

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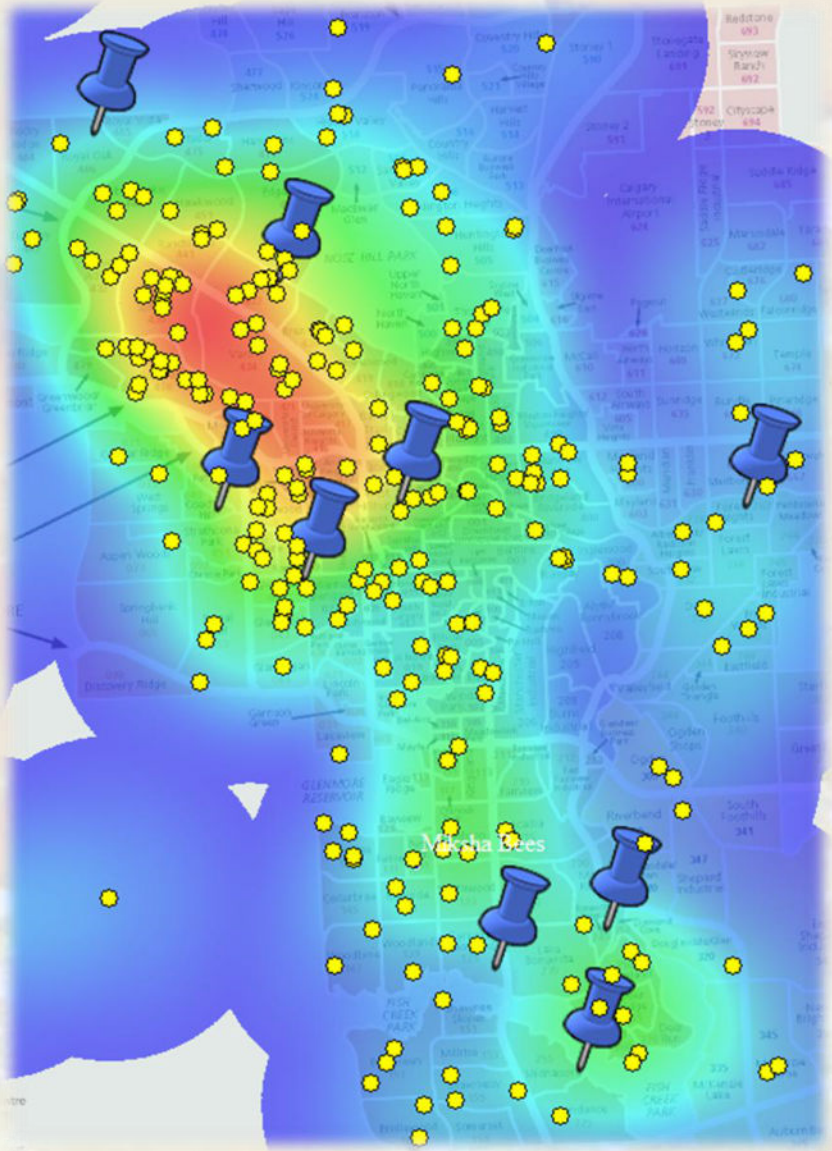
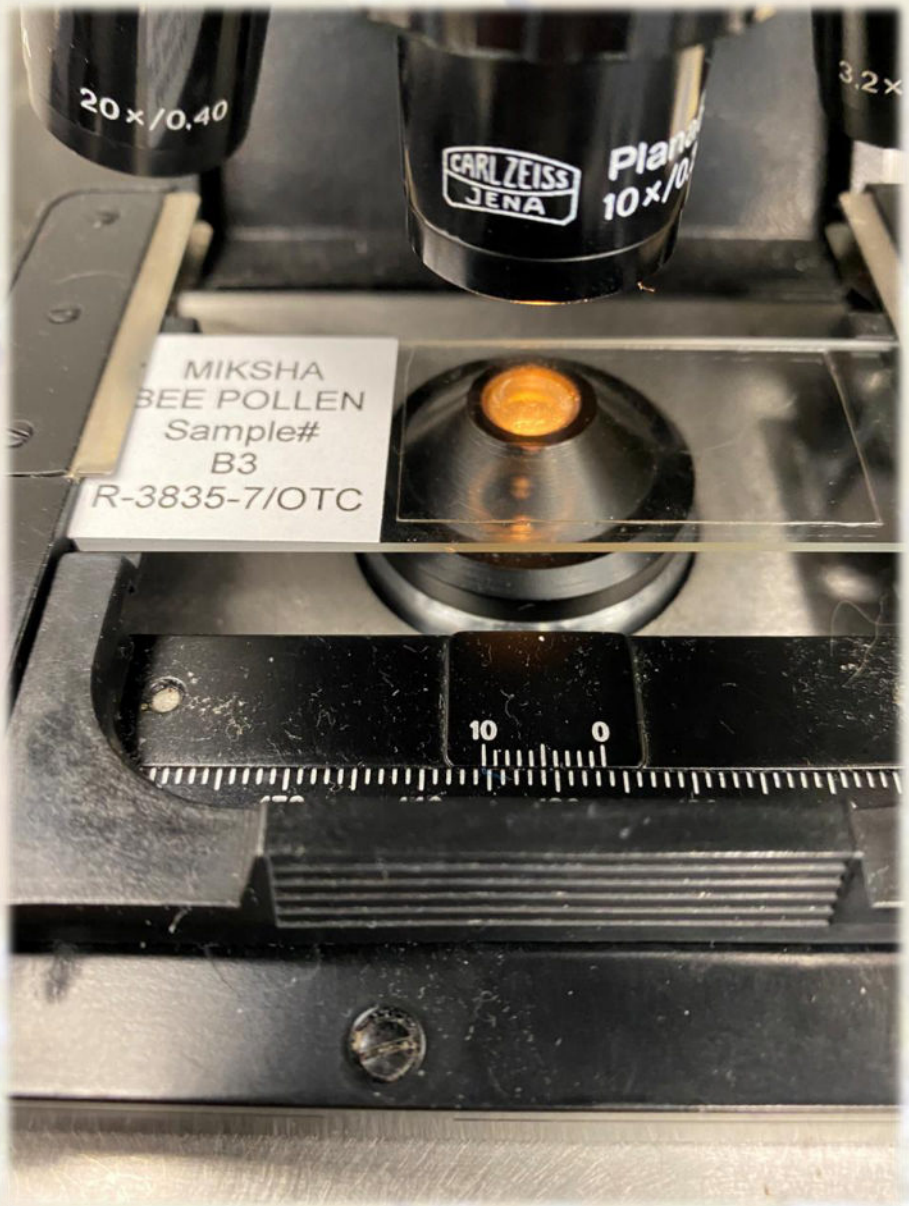
Nine (9) Bumble Bee / Honey Bee Locations

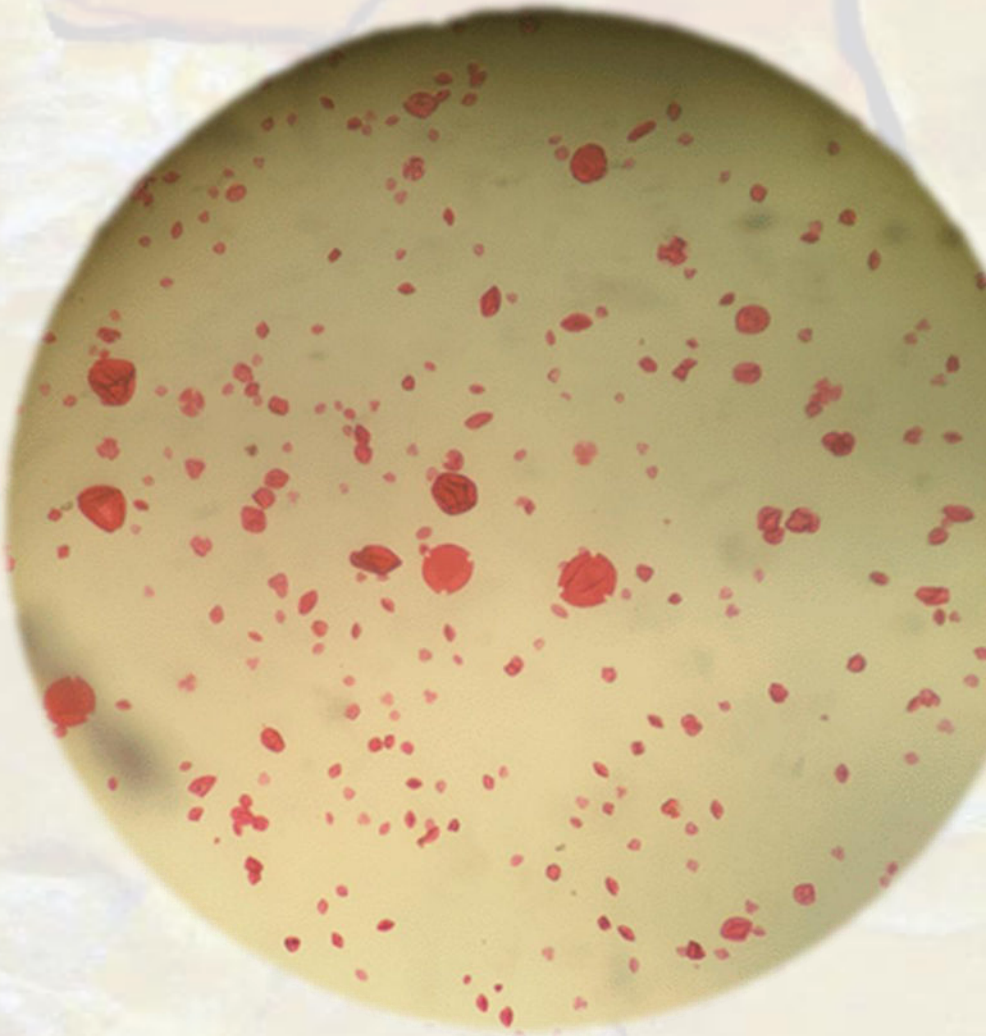


Pollen Collection: Bumble Bees

Pollen Collection: Honey Bees

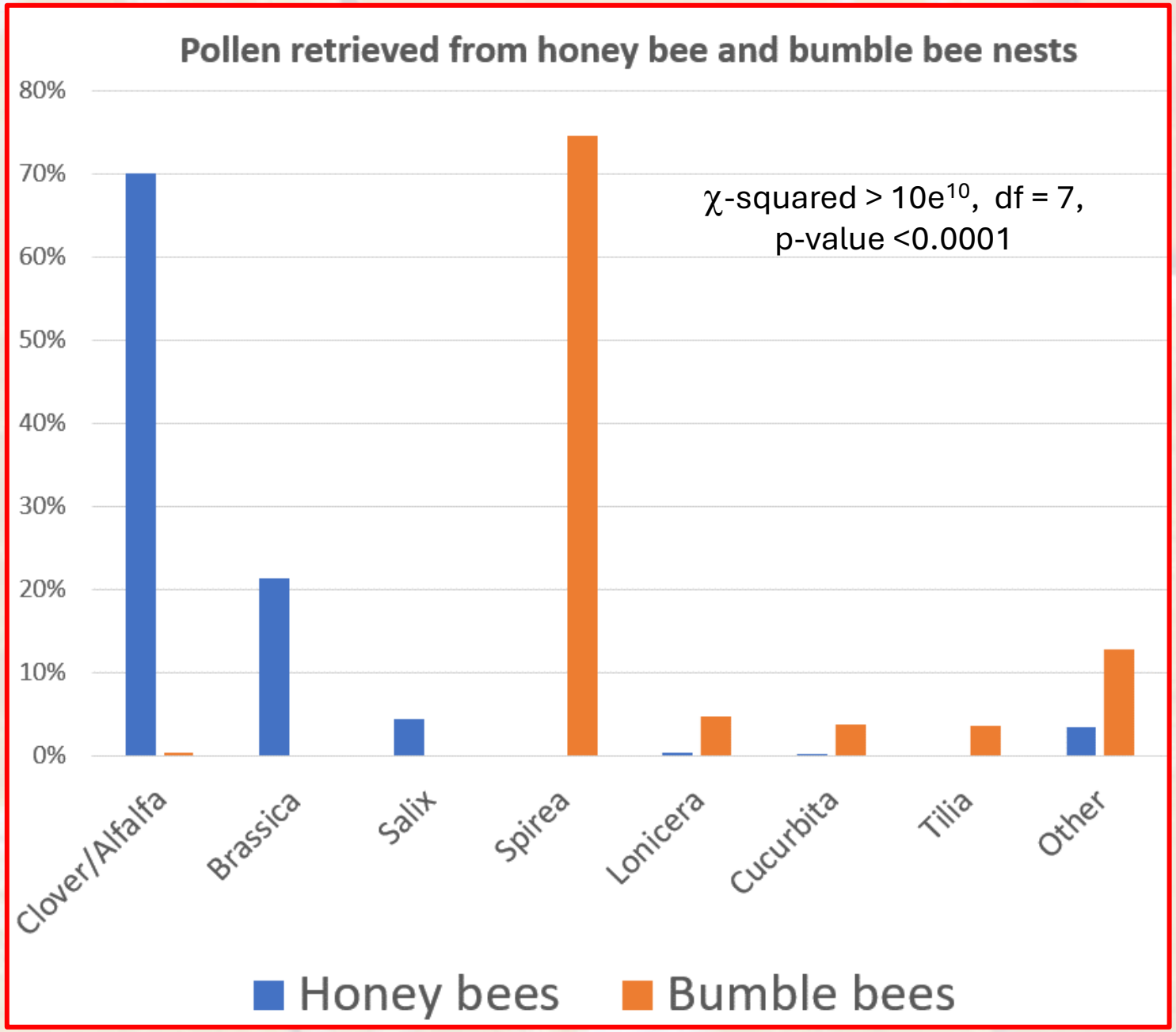
Pollen Analysis





Pollen analysis: Sophie Warny

Similarity index for proportions of pollen sources



Conclusions

No overlap in honey bee and bumble bee pollen foraging
Little apparent impact on biodiversity
Little apparent impact on bumble bee development
Honey bees are foraging outside the city in summer
Honey bees are not pollinating backyard gardens

Do honey bees have no effect on native bees?

Only two bumble bee species were examined for pollen use
Spring and autumn periods were not examined
Spread of pathogens among bee species was not examined
Honey bees may contribute to expansion of non-native plants

DENSITY OF HONEY BEES IS LIKELY BELOW IMPACT LEVEL
ALL RESULTS ARE SPATIALLY AND TEMPORALLY LOCAL