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Resources vs Co2 on Humboldt Bees'

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INTRODUCTION

The prediction is that bee richness will be higher in agricultural areas while abundance will be high in both agricultural and urban areas due to the open concept rather than 'natural' areas such as the neighboring red wood forest. Richness should be higher in agricultural areas as these areas have lower human and car activity and more areas for nesting and gathering. Urban developments have shown to have large amounts of various flower species and random open areas that could be appealing for bees which could increase activity in these areas but possibly have a higher Co_2 count (Leonard et al). The control will be the 'natural' areas that are located further into the forest with the least amount of human activity to compare.

The aim of this study is to pinpoint the areas of most benefit for bee richness and abundance and what mitigation steps that could be implemented for further progression of survival in the future while also revealing the Co_2 levels in the area to show correlations. Some of the questions we want answered include: What areas are productive for bees' species, and what species are those? Do the levels of Co_2 emissions impact the activity and abundance of bees? Do urban areas negatively impact bees, or do they provide a variety of food resources (Lanner et al)? What mitigations are needed in these areas to aid bee conservation?

METHODS

Traps were made to catch bee specimens and placed in 3 types of sites, that had two locations and two traps per location. These traps were made from solo cups, clear packers tap, mountain dew, and dish soap. For one trap to be made it required: two solo cups – One regular solo cup and the other will have the bottom cut out and placed in the solid cup with 2 in of space from the bottom, then the clear packer's tape was be placed around the cup's edges to secure both cups in place. Following this about ¼ cup of mountain dew was put in the trap with about 1 teaspoon of dish soap. This was recreated 12 times for this project, providing two traps per site. The mountain dew is the sweetener, and the dish soap aids in trapping by weighing down the bees in the liquid. A Co_2 meter was used to calculate the level of emissions in each area from vehicles, , the units of measure are in ppm (parts per million). Observational data was also collected such as, bee counts, resources, habitats, weather, etc..

Fig 1

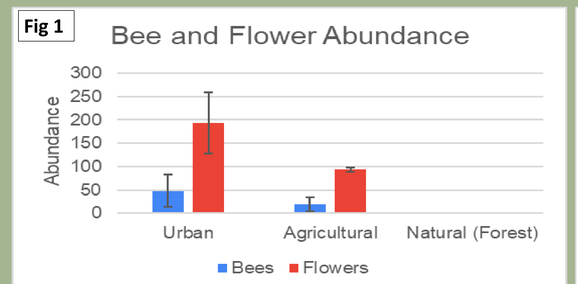


Fig 2

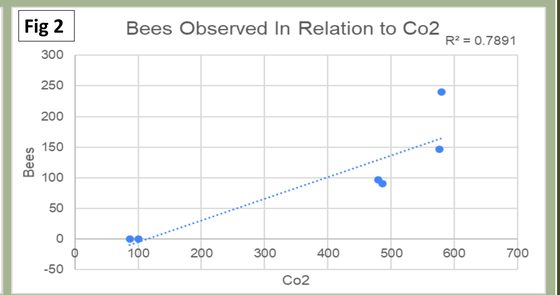
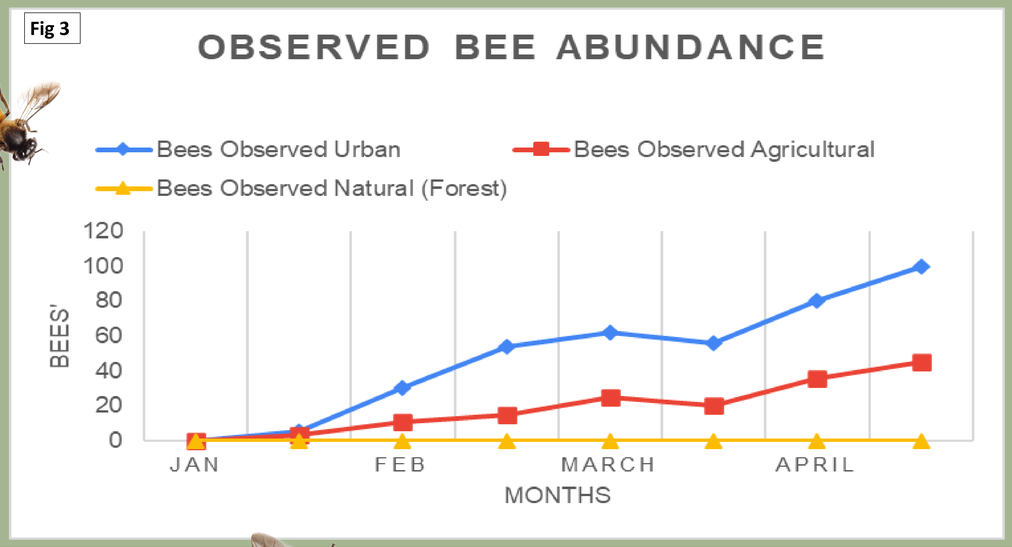
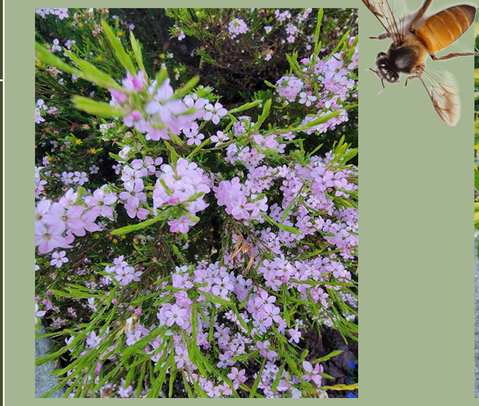


Fig 3





RESULTS

- Based on observational data, I found no bees in the forest, and >2x more bees in urban areas relative to agricultural sites (Fig. 1, F=9.76, df =2,21, P=0.001).
- Similarly, flower abundance was greater in urban compared to agricultural areas (Fig.1, F=3.24, df =2,21, P=0.058). There were no flowers in the forest.
- Co2 Levels revealed that there was an unusually positive correlation with Co2 and bee presence. Despite Co2 levels being higher in urban areas were more bees in these areas (Fig. 2, R^2=0.73, P= 0.019).
- Bee abundance increased over my study period (Fig. 3, Urban: R^2 = 0.94 , P= 5.62662E-05 Agricultural: R^2 = 0.93, P= 7.98E-05).

DISCUSSION

The data shows that bee abundance is reliant upon Flower abundance regardless of Co2 levels in the area. It was originally predicted that agricultural areas would hold higher abundace of bees as well as richness. From this expierenment we see that abundance is higher in urban areas possibly due to these 'flower pockets' that have a wide variety of exotic and native flowers. Urban gardens and floral décor could be attracting these bees to the area where they decide to live due to the constant food sources. I was also able to notice that bee activity was especially higher in urban neighborhoods that had these open drainage fields left to be overgrown or have natural growth with no trees. This could allow for open habitat as well as additional resources. The reson behind the reduced number of bees observed and captured in Agracultural areas can be due to the lack of floral diversity or presence. Many farms lacked any flowers or natural growth even if they had less Co2 levels, bees naturally gravitated towards the areas with better food availability.

Acknowledgements
McKinleyville, Eureka, Arcata areas and https://www.pngall.com/bee-png