Introduction

• Bumblebees are important modeling species that have nuanced social organizations and can be used to study the development of more complex social interactions.
• The first 9 days of a bumblebee’s life is considered the critical period when brain structure changes taper off.
• Social input is known to impact social development but only in a general sense that requires research.

Objective of the Study

This study aims to learn more about how isolation during the critical period impacts social development both behaviorally and neurologically.

Methods

• Isolate callows from hives for 9 days in independent chambers and assign treatment.
• Test bumblebees in behavioral assay, which records interactions for 30 minutes.
• Train neurological network to learn bumblebee behaviors and track path to analyze quantitatively using LEAP.

Results

• Trained LEAP Estimates Animal Pose Program to be able to identify the shape of a bee using Nurse x Forager assays.
• Using trained neural network, tracked path of individual bees during behavioral assay as well as tracked each of their labelled body parts.
• Measured factors during behavioral analysis such as overall distance travelled, velocity of specific body parts, varying levels of interaction between bumblebees, orientation of body, etc.
• Bees that have been tested were stored in PFA and will be dissected in order to examine the possibility of neurological differences caused by social isolation. Brains will be compared to a bumblebee atlas in the process of being created.

Future Plans

• Brains will be dissected for further investigation on neurological differences associated with social deprivation.
• Will conduct resilience studies:
  • Will return bees that had been isolated for 9 days to their original hives and see if a restoration of environment after the critical period results in some sort of recovery behaviorally and neurologically
  • All tested bees will be returned

Questions

• Is the 9 day frame of the critical period an accurate measure?
• Is three days of returning bees to their hives enough time to test resilience?

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