

Frequency of Brood Care Behavior by Egg-laying *Bombus impatiens* Workers

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Introduction

The eusocial bumble bee *Bombus impatiens* utilizes a complex caste system with the queen as the dominant head of the colony.

- **The queen** suppresses the development of female workers' ovaries through physical contact and hormones.
- **Upon the removal of the queen**, female workers' ovaries begin to develop. More dominant bees (often the largest) tend to be egg-layers. Eggs laid by non-queens are male.
- **Hive members** have a division of labor, with some foraging and some caring for the brood or queen.
- **Workers** typically specialize in one task, but that task changes according to the part of their life cycle.

In the absence of a queen, will egg-layers spend more time caring for the brood than those that did not lay eggs?

Methods

Three randomly-selected bees were placed in each of four containers. All had free access to a pollen log and 50% sugar water (Fig. 1).

1. Focal animal given ten minutes of observation. Each behavior start time recorded in categories of Foraging, Brood Care, or Other.
2. All bees received two sessions of observation within the hour.
3. Foraging included manipulating pollen log or feeding on sugar water. Brood Care included manipulation of wax, incubation, and feeding of larvae. Other included other behaviors such as grooming.

Upon completion of study, bees were necropsied to check reproductive status until one was found with active ovaries in the mini-colony (Fig 2, 3).

Results

ANOVAs were performed looking at the response of time spent on each behavior to brood presence and reproductive status.

Brood care and other behavior had a statistically significant relationship to reproductive status (p-values = 0.0796 and 0.0373 respectively). Foraging behavior had a statistically significant relationship to brood presence (p-value = .0207).

Reproductively active bees increased brood care and decreased other behaviors. Foraging decreased after brood presence (Fig 4).

Figure 1 : Colony set up with pollen log, sugar water and starter for brood.



Conclusions

The higher level of brood care behavior supports our prediction that reproductively active bees spend more time on brood care. Limitations of this study include available time, interobserver bias, and bee deaths. These factors influenced our ability to effectively collect data and changes in bee behavior.



Figure 2: Necropsy of a bee with active ovaries, indicating an egg-laying bee.



Figure 3: Necropsy of a bee with inactive ovaries, indicating a non-egg-laying bee.

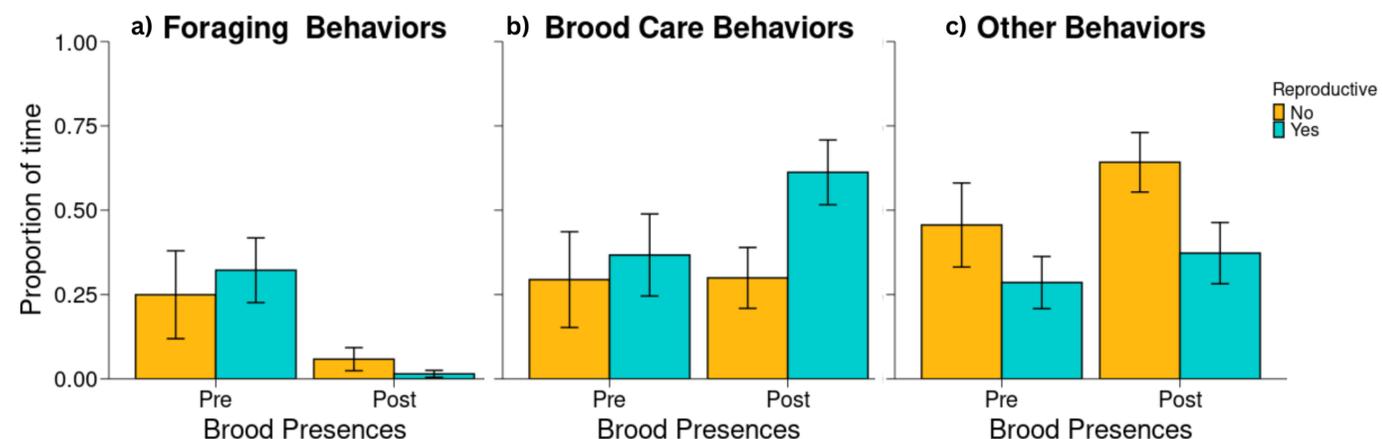


Figure 4: Proportion of time egg-layers vs nonegg-layer bees spent performing foraging (a), brood care (b), and other behaviors (c) before and after eggs were laid.