CH2 Chunk removals

and members of the genus Eupeodes requires specific larval resources (Henderson, 1982).

Shrub facilitation has been show to facilitate floral development for the beneficiary (Garcia-Cervigon, 2016) but this was not the case in this system. We did not detect indirect effects of L. tridentata on the understory via the annuals.

Furthermore, honeybees communicate the locations of food sources to the colony, thus arriving bees were likely searching for L. tridentata rather than openly foraging, leading to a complete preference for L. tridentata.

Weather data

A Campbell weather station (www.wrcc.dri.edu/ucnrs) in the adjacent Granite Cove provided hourly site-level environmental data. Data logged between 10 am and 5:00 pm were used to correspond with study timings. The mean of hourly wind speed (m/s), mean temperature (ºC) and mean solar radiation were calculated for that time period daily.

Heterospecific pollen were identified using a reference collection created of 38 species from surrounding sites in 2017 and 2018. This reference collection was photographed using Lumenera microscope camera at 100 x and 400x and the size of grains were measured using Infinity Analyze to aid identification. The digitized reference collection was uploaded to global pollen project (DOI) and the slides are in Lortie Lab at York University.

Spring time flowering is often triggered by rainfall in the winter (Beatley, 1974).

Interactions for pollinators between plants forms a continuum from competition to facilitation (Ratchke, 1983). During the flowering period of the focal plant it may not be possible to separate interactions for pollinators from those that do not require co-blooming. On the competition side, it may not be possible to separate competition due to parasitizing pollinator visits versus interference.

Chung et al removed the flowers from Rosa multiflora (2014), but found no effect on bee visitation rates to co-blooming annuals. While one study has tested for mechanistic differences (Jacobsen), this is a test for sequential mutualism. This is particularly true in arid ecosystems where facilitation of shared pollinators can be particularly important in deserts because harsh environmental conditions can lead to large spatial variation in floral abundances and pollinator populations (Rathcke, 1983).

Mean plant visits per hour. This is just the mean number of potential foraging bouts. ± the standard deviation.

|  |  |  |
| --- | --- | --- |
|  | Open | Shrub |
| Pre-blooming | 4.2955249 ± 4.621614 | 2.9976793 ± 3.134733 |
| Blooming | 1.2526164 ± 1.376179 | 0.9458532 ± 1.271302 |

Mean number of flowers visited per hour. ± standard deviation.

|  |  |  |
| --- | --- | --- |
|  | Open | Shrub |
| Pre-blooming | 5.758404 ± 7.547992 | 3.776575 ± 4.742340 |
| Blooming | 1.722185 ± 2.218946 | 1.268643 ± 2.047149 |

Stealing pollinators is parasitism.

Conclusions:

Conversely, Michener (cite) says synchorization of floral phenologies should increased specialization. The desert is home to many bee specialists.

Ambrosia dumosa increased seed set in annuals, however it is not possible to know if this was due to pollinator visits or a more direct sort of facilitation.

Among honeybees, color is not always the key factor in flower constancy (Greggers and Menzel 1993). Pollinator visitation to other shrubs was not measured, however there was no influence of non Larrea shrub density on M. glabrata visitation. Oil specialist Centris bees were the second most frequent visitor to Larrea, but never visited Malacothrix.

Phenological shifts interact with ontogenies to determine net outcomes (Yang and Rudolf, 2010).

Manipulation experiments have found competition between sequential bloomers (Campbell and Motten, 1985).

Megandrena encelia (Hymenoptera: Andrenidae) and Hesperapis larrae (Hymenoptera: Melittidae) are both locally oligolectic, visiting L. tridentata exclusively as long it is present (Hurd Jr and Linsley, 1975).