Draft 1

Questions?

Does RDM predict insect abundance or diversity?

Why – it is commonly used by land managers.

Does productivity (RDM) change along the gradient?

Does shrub/open/RDM change along the gradient?

How to integrate hoppers? Guilds of insects?

Questions

1) A survey of rdm under shrubs and in the open will facilitate an assessment of productivity associated with foundation plant species and estimate the strength of plant-plant interactions.

2) Importantly, burrow density will also be recorded at each sampling instance to infer secondary-consumer (and indirect) effects on community dynamics.

3) To disentangle the relation

Methods

Site description

Between the dates of June 23rd and July 8th, 2019, I sampled 3 sites each within 3 desert regions.

Study species

**Residual dry matter and vegetation characteristics**

At each site, I chose 30 shrub open pairs. Shrub microsites were located on the northern aspect of the shrub, within the dripline. A 0.5 m by 0.5 quadrat was placed by randomly throwing it under the shrub and the open microsites were chosen by throwing the quadrat over my shoulder and were located at least 2 m away. Within in quadrat, I estimated cover of the residual dry matter, green veg cover, measured the height of the vegetation within the quadrat. I counted the number of burrows under the shrub within the dripline, and at open microsites within a 1.5m radius around the quadrat to approximate the size of the shrub. For shrubs, I measured the length of the longest axis, it’s perpendicular and the height. I collected all residual dry matter within a 20 cm quadrat placed at the center of the 0.5 m quadrat using scissors ensuring only plants rooted within the quadrat were collected. These were placed in paper bags, and then dried within a *blank* oven at 85º C for 75 hours. The samples were weighed using *blank* scale with a precision of 0.001 g.

**Measuring ground-dwelling arthropod communities**

At eight shrub/open pairs per site, pitfall traps were used to sample the arthropod communities. Clear plastic drink cups (10 cm tall, 7 cm diameter) were used. These were placed in the center of the 0.5 m quadrat so the top of the cup was flush with the ground. The traps were filled with a 50% propylene glycol and water mixture and left for 72 hours. They were checked during this time and topped up with water as needed. Residual dry matter was collected after the traps were collected. Arthropods were sieved and placed in labelled vials containing 95% denatured ethanol.

Insects were identified depending on the group (see Appendix) using keys. They were assigned to morphospecies where possible. Mutillidae were not morphotyped because of strong sexual dimorphism. Only worker and major caste Formicidae were included in analyses. Springtails and insects smaller were excluded due biases arising from sieve mesh size. Larval stages and hemipteran nymphs that could not be associated with the adult form were excluded.

**Data analysis**

Interaction strength between *E. californica* and the annual communities was estimated using RII. Treatment was the weight of residual dry matter under the shrub and control was the rdm in open areas. RII used x equation.

To test for differences in arthropod communities associated with *Ephedra californica*, we fit generalized linear mixed models (glmmTMB). For abundance, one sample was excluded as an outlier (it had 1200 individuals and everything else is below 350). Microsite and RDM were included as predictors, and the study site nested within the region was included as a random effect. Poisson was used for species richness and a negative binomial error distribution was used for abundances because overdispersion was detected.

To test for differences in the composition of arthropod community, RDA (vegan) was used with microsite, site, RDM and region as constraining variables. The species abundance matrix was Hellinger transformed to account for differences in sample abundance and provide more ecologically relevant information (citations).

-Indicator species analysis for insects

Results

Arthropod community responses: A total of ~6300 arthropods were collected. Ants were the most abundant group.

* Arthropod abundance and morphospecies richness greater under shrubs. No influence of RDM.
* RDM higher under shrubs.
* No arthropod response to RDM at all.
* RDA & CCA show community are different.
* Also betadispersion tests show same results.
* More burrows in open areas – likely because there is no shrub in way.

Discussion

Camel crickets important to antelope squirrel diet in winter and spring (Harris, 2019).

**Figures and Tables**

Map of 3 study sites

Table of counts of morpho-species

Boxplots of RDM, abun, H and evenness for each region, split by microsite

RDM linear models of RDM & abun….