Edge effects via biotic manipulation of native grasslands on *Chorthippus curtipennis* and *Pseudopomala brachyptera*: Comparing individual biomechanics, population density and competitive interactions on the National Bison Range (Moiese, MT)

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Introduction

Biotic selection is the hierarchical process of behavioral responses that may result in the disproportionate use of habitats to influence survival of individuals. In previous studies of heterogeneous ecosystems, research has focused on the manipulation of vegetation structure, quantity of plant species, microclimate variables and soil characteristics in order to decipher which factors influenced selection.

This study focused on observing biotic vegetation choice of two different grasshopper species within a controlled and finely scaled edge habitat (15 cm), (Figure 1.a and 1.b)

A natural grassland "edge" assisted in this study by serving as a boundary that separated two native grassland habitats, thus forcing the organisms to make a choice between lush, "wet" tall grass and "dry" textured prairie grass. This edge aided in the trace of movement, population fluctuation and competition that may have influenced biotic selection.

The purpose of this study was to determine whether or not there was significant biotic vegetation choice within and between grasshopper species and in addition, determine which factors influenced choice.

Using *Chorthippus curtipennis* (Figure 2) and *Pseudopomala brachyptera* (Figure 3) grasshopper species, the following factors were observed: individual biomechanics, population fluctuation, species competition. To aid in tracking influence of these movements, soil moisture, vegetation species and air temperature were recorded.

C. curtipennis is known to inhabit lush tall green grasses and are not know to diversify biotic selection. *Pseudopomala brachyptera* are abundant in assorted environments and do not demonstrate specific habitat preference.

The two grasshopper species were chosen due to their imperative role in the National Bison Range food sequence.

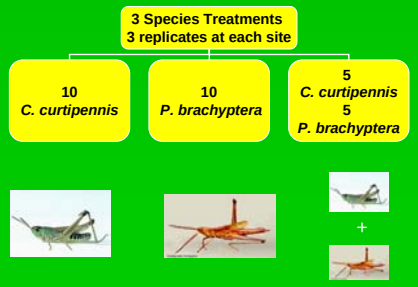

Figure 4

Materials and methods

Biotic selection, species biomechanics , population fluctuation and traces of species competition was observed using a total of 27 joint pair of aluminum insect screen cages (0.01m^2 X 0.91m) that were connected at the base with a 15cm tube at three different stations (Figure 1.a and 1.b). The tube was strategically placed on the edge that separated the grasslands consisting of lush green vegetation (wet) and grasslands that consisted of sparse prairie grasslands (dry). The tube served as a passageway that allowed the grasshoppers exposure to both habitats. The actual biotic choice was monitored by tallying the number of grasshoppers in each side of all cages twice a day for seven consecutive days.

Movement, population fluctuation and species competition was monitored using three treatments within the cages 1) *C. curtipennis* exclusively 2) *P. brachyptera* exclusively 3) *C. curtipennis* and *P. brachyptera* collectively (Figure 3).

Soil moisture was measured by sampling from both sides (designated wet and dry) of the cage. Samples were weighed, dried and weighed again to confirm water content.

Vegetation species was taken by placing a 12 point grid was both sides of 9 random cages. Plants within chosen points were tallied and identified to species.

Mean air temperature was recorded at the beginning and end of each survey.

These measurements not only aided in identifying possible biotic selection influences, they also confirmed the distinction between the controlled "wet" and "dry" grassland habitats.

Results/ Discussion

Statistical analyses were conducted using SYSTAT 10.0.

Soil moisture was tested using a two-way ANOVA. There was a significant difference between wet and dry habitats (df=2 f=5.298 p=0.008). Thus, vegetation on the wet side of the cages had a higher water content than the dry side. I believe dry biotic choice was made due to available basking sites and foraging activity. Also, competition may have played a major role in choice. In contrast, species may have choose the wet habitat for nourishment or to escape predation.

Vegetation species were tallied and showed a definite distinction between the vegetation in the wet areas (dominated by *Elymus* smithii) and that in the dry (dominated by *Bromus Mallus*) (Figure 5).

Temperature fluctuated between daytime and evening surveying which may have influenced biotic selection. As temperature increased or decreased the grasshoppers could have choose either the wet or dry side depending on activity (basking, ventilating, foraging).

Biotic choice was measured by tallying the total number of choices for both species of grasshoppers and averaging how many times they were present in each side. From here, a two-way ANOVA was used to differentiate choice and a Bonferroni post hoc test was ran on significant results (Figure 4).Overall, in the exclusive treatment *C. curtipennis* consistently chose the wet biota and had no apparent preference in the collective treatment. In both treatments (exclusively and collectively), *P. brachyptera* had no apparent habitat preference (df=3 f=12.412 p<0.001).

From these results, we can interpret change in biomechanics, population and influence of competition on this finely scaled bionetwork and anticipate results from a study performed on a larger or more diverse ecosystem.

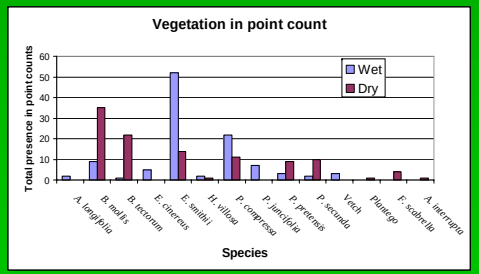

Figure 5

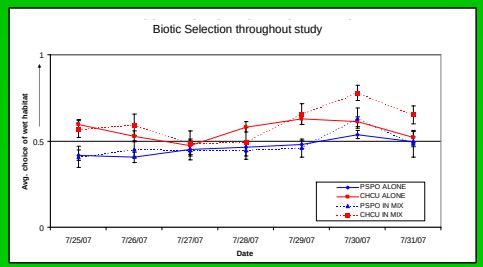

Figure 6