4-27-2022

Rare Elfin Abundance Correlates with Host Plant Density

Matthew Look
Providence College

Rare Elfin Abundance Correlates with Host Plant Abundance

Matthew Look, Rachel Bonoan**,**

Biology, Providence College, 1 Cunningham Square, Providence RI 02918
mlook@friars.providence.edu

INTRODUCTION

The frosted elfin (*Callophrys irus*) relies on yellow indigo (*Baptisia tinctoria*) as one of its host plants. Recent declines in frosted elfin populations can be attributed to limited habitat area and fragmentation. Fragmented habitats are an obstacle in efforts to help the butterfly population recovery. Previous studies suggest indigo density has an effect on the number of adult frosted elfins spotted[1]. We aimed to test multiple factors and observe the possible effect they could have on frosted elfin count. Host plant patch density at Gavins Pond (Sharon/Foxboro, MA) was measured to observe elfin count at varying levels of plant density. The observation of frosted elfins was also conducted to collect annual data for population estimates. Further research into host plant nutrition is ongoing, as previous studies show nutrition is known to have an effect on specialists[2].

Yellow Indigo (*Baptisia tinctoria)*

Frosted Elfin (*Callophrys irus)*

MATERIALS AND METHODS

Butterfly Sampling

- Sampling was conducted using the Pollard Walk method. Observers walked through the 22 indigo patches located at Gavins Pond (Sharon/Foxboro, MA).
- Data collection is performed annually.

Host Plant Density

- Density was measured in 2021, see Isabelle Heron's poster.

Elemental Analysis

- Indigo leaf sample weights were collected prior to elemental analysis.
- Sample analysis of carbon and nitrogen was conducted using an Elementar UNICUBE.

Data Analysis

- All analysis of butterfly population was done using R Studio.
- A Poisson GLM with a fixed effect of host plant density used to determine if there was a correlation between observed elfin count and host plant density.
- Linear models were used to determine a significant difference between patch grouping.

RESULTS

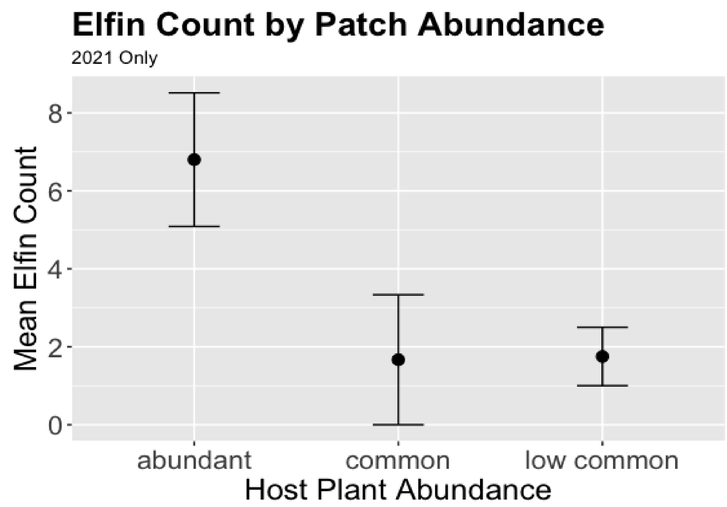


Figure 1. Patch Specific Data, Number of elfins(± 95% CIs) spotted in patches of varying abundance, ordered from most abundant to least abundant on the x-axis.

Patch specific data showed there was a significant correlation between host plant densities and elfins spotted (ANOVA on GLM, $X^2 = 249.17$, df = 3, p = 2.2e -16). On average, more elfins were observed in the "abundant"(see photo to the right) patches than both "common" and "low common" patches.

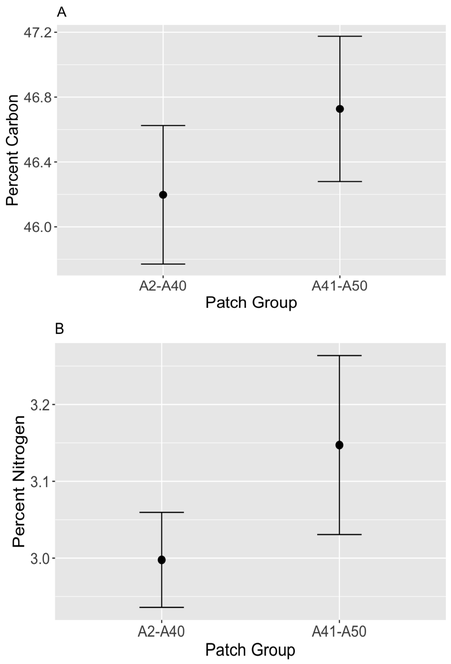
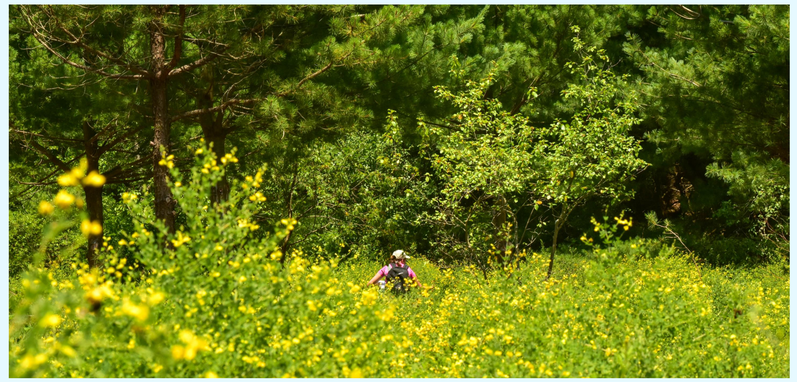


Figure 2A & 2B. Patch Group Data, Percentage of carbon and nitrogen makeup (± 95% CIs) by patch grouping

Patch group data shows there is no significant difference between mean percentages of carbon (ANOVA, F=0.3849, df=1, p=0.5362) and nitrogen (ANOVA, F=1.2582 , df= 1, p=0.2643). The second patch group had higher average percentage of nitrogen and carbon compared to the first patch group.

CONCLUSIONS

More elfins were observed in abundant patches of host plant indigo. This means that elfins can be observed in patches where indigo is more prevalent. Which means elfin caterpillars or eggs are more likely to be found. Preliminary elemental analysis has shown patch groupings did not have a significant difference in carbon or nitrogen percentages. This means most patches had similar levels of nutrition in leaves, suggesting elfin count might be a combination of nutrition and plant abundance. Future studies will look to examine patch specific nutrition density as well as the effect climate change may have.



Frosted elfin caterpillar on small yellow wild indigo

References

[1] Albanese et al. (2007) *Biological Conservation* **136:** 53-64

[2] Keaton-Wilson et al. (2019) *Ecology and Evolution* **9:** 13104-13113

Acknowledgments

Research reported in this presentation was supported by the Southeastern New England Educational and Charitable Foundation, grant award to R. Bonoan.

Research reported was also supported by Dr. Rachel Bonoan and partially by Madeline Champagne.