Substrate Choice of Crab Spiders in Relation to the Heights of Flowering Plants

Rogers George Thomas（筑波大学 生物学類）　　指導教員：Prof. Yokoi Tomoyuki（筑波大学生命環境系）

Introduction

Crab spiders are a classic example of animal crypsis- using their substrate as camouflage to aid in both predator avoidance and prey capture. Previous research has indicated that crab spiders prefer flowers based on color, both the spider's and of the substrate's (Heiling et al, 2005; Théry et al, 2004). While studies have shown that flower color plays a role in substrate choice, it hasn't been determined whether other floral traits such as the height of the plant or number of flowers has similar importance. It has been demonstrated that crab spiders spend more time on flowers of high quality than those of low quality in some species of flowering plant (Chien et al, 1998). Given the physical presentation of senescence in flowers (personal obs.), this study aims to elucidate the influence of physical metrics of flowering plants (particularly height) on the substrate selection preference of crab spiders.

Material & Methods

Crab spiders were collected from flowering plants in a vacant grass area (~10m x 10m) on University of Tsukuba main campus from April to September 2021. Collections were made around once a week. The plants from which the spiders were collected were measured for the number of flowers on each plant, the natural height (the distance from the ground to the spider-bearing flower), the flower height, and the flower width. The number of spiders found on each plant variety were assessed and the effect on the spider number by each of the flower metrics was assessed using linear regression.

Results

The metrics of flowers at the site remained consistent over the collection period, however the relative abundance of flowers gradually shifted to predominantly red clover and annual fleabane. While the abundance of other plants was higher earlier in the season, at no point were crab spiders found on flowering plants other than annual fleabane, red clover, and white clover (Tab 1). Basic linear regression analysis was performed, and no significant linear models were found for flower height ($p=0.647$) or flower width ($p=0.848$), but significant models were found showing interactions between flower number and spider number ($p<0.001$), and for natural height and spider number ($p=0.022$).

Discussion

From these results, it appears that the physical dimensions of the flower itself are not taken into consideration by spiders when choosing substrates. Rather, of the metrics sampled by our work, it seems to be more flowers on a plant that make it more likely to find spiders inhabiting it, along with the natural height of the plant. The spider's choice of substrate seems to be based on the color of the flower and then within those flowers the spiders will select, plants with more flowers on them will be more likely to host spiders by virtue of offering more substrate overall. Given that crypsis by crab spiders is both a foraging technique and a means of predator avoidance, in addition to higher quality flowers attracting pollinators more effectively, the results of our study may reflect that regardless of the physical dimensions of a flower, crab spiders select substrate by color relationships, as indicated in prior research (Heiling et al, 2005; Théry et al, 2002; Chien et al, 1998). The influence we saw from natural height may have been the result of red clovers and annual fleabane, the two most abundant flowers, having a higher average natural height than most of the other flowers present in the field. However, another plausible explanation might be that crab spiders first seek out flowers by climbing and then stay or move on based on color as demonstrated by previous research (Chien et al, 1998). Based on these results, a more controlled study may be done that isolates natural height and flower number as factors for interpretation.

Table 1: Number of Spiders Observed by Plant Species

Plant species	Number of flowers per plant	Average natural height of plants (cm)	Number of spiders that were observed	Average number odf spiders per survey
Red Clover	1.93	37.26	32	1.68
Annual Fleabane	25.42	90.61	24	1.26
White Clover	1.09	26.57	1	0.05
Ixeris stolonifera	1	13.13	0	0
Dandelion	1	24.24	0	0
Philadelphia Fleabane	5.8	57.27	0	0
Potentilla	1	9.42	0	0
Fish Mint	1	24.15	0	0
Unidentified Red Flower	1	42.4	0	0
Non-Flower	0	66.25	3	0.15
Total			60	3.15

References

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