



Breeding System Variation in *Oreocarya crassipes*

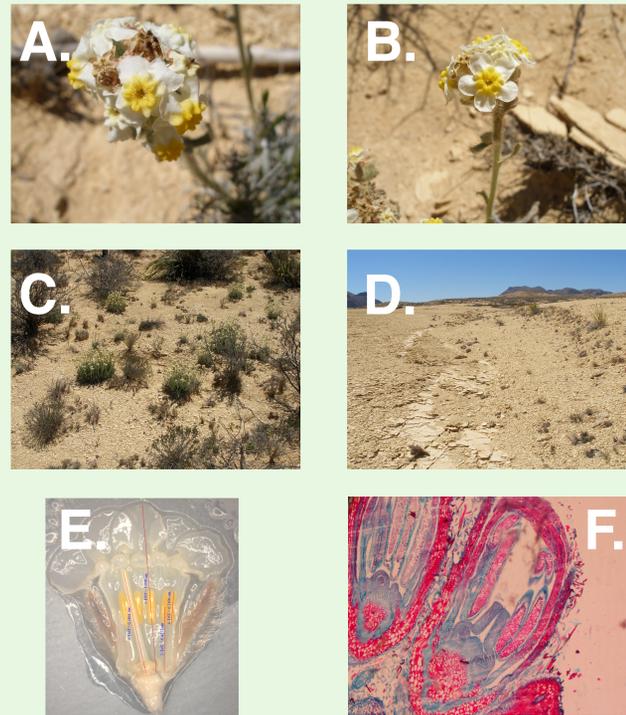


Jim Cohen, Kettering University, Flint, MI

Introduction

Oreocarya crassipes (Boraginaceae) is an endangered species endemic to Brewster Co., Texas, in the area just north of Big Bend National Park. The species is restricted to the area around Terlingua, Texas on terrain known as moonscape due to the barren ground and lack of vegetation. While the ecology and edaphic specialization of *O. crassipes* has been studied, much of the biology of the plant still remains unknown.

Oreocarya crassipes exhibits distyly, a complex and elegant type of breeding system that involves two floral morphs in the population. In the short-style (SS) morph, the anthers are situated above the stigmas, and in the long-style (LS) morph, the stigmas are positioned above the anthers. The anthers in one morph are at the same height as the stigmas in the other morph, and this condition is known as reciprocal herkogamy. While distyly is not uncommon in *Oreocarya* and information is known on other distylous species in the genus (e.g., *O. flava*), comprehensive studies on breeding system variation within *O. crassipes* have not been conducted. The present study is an attempt to investigate various aspects of floral morphology among populations of this endangered species.



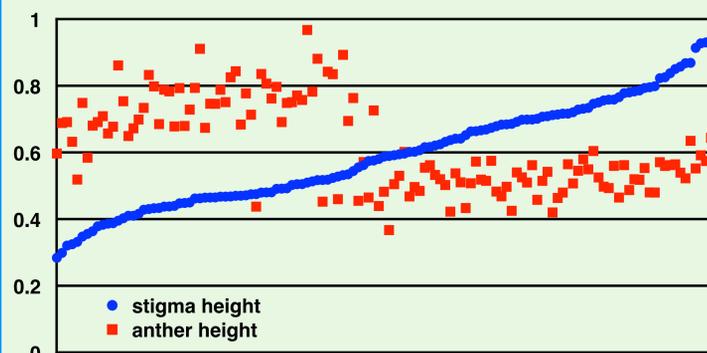
Flowers and habitat of *O. crassipes*. A. and B. are inflorescences of the two morphs, C. and D. show the barren moonscape habitat, E. is a dissected long-style flower with measurements, and F. is a longitudinal section of a developing inflorescence.

Methods

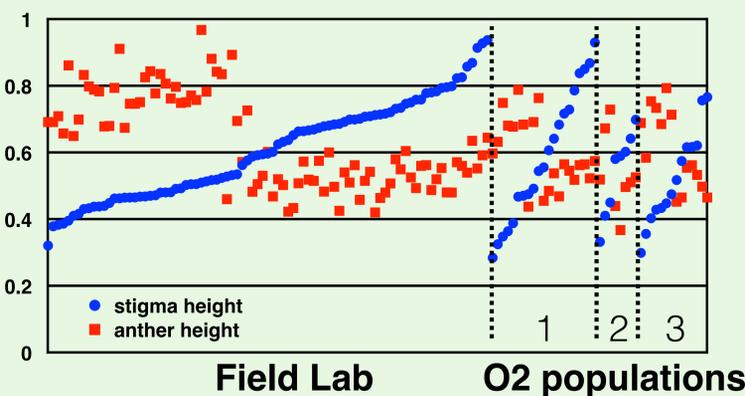
- In 2014, mature flowers from 130 individuals (70 LS and 60 SS) from four populations of *O. crassipes* were collected, one from the Field Lab (F) and three from the O2 Ranch (O2-1, O2-2, and O2-3).
- The following measurements were made: stigma height, anther height, anther-stigma separation, corolla length, corolla tube length, corolla width, and corolla tube width.
- In order to investigate differences between morphs and between morphs among the four studied populations, data were compared, in JMP v12.1, using the Wilcoxon/Kruskal-Wallis test.
- Data were also graphed in Numbers in order to visualize differences in anther and stigma heights.

Results

Anther and stigma height of all samples (in mm)



Anther and stigma height of samples in each population (in mm)



Anther-stigma separation for all samples (in mm)



- Stigma height, anther height, stigma-anther separation, and corolla tube width significantly differed ($Z < 0.0001$) between the long-style (LS) and short-style (SS) morphs of *O. crassipes*. The SS morph had a wider corolla tube compared to that of the LS morph. Corolla length, corolla tube length, and corolla width did not significantly differ between morphs.
- Anther-stigma separation displayed a relatively continuous distribution within and between morphs (green diamonds).
- Stigma height (blue circles) had a continuous distribution between morphs, but two distinct anther heights (red squares) were observed between morphs.
- The flowers of the SS morph differed in anther height, stigma height, corolla length, corolla width, and corolla tube width among various combinations of the three O2 Ranch populations and the Field Lab population. In general, the greatest differences were between O2-2 and F and O2-3 and F.
- The flowers of the LS morph only differed in stigma height, for O2-2 and F and O2-3 and F, and in corolla tube width for O2-1 and F.
- Given the closer geographic proximity of the three O2 populations to each other compared to any to the Field Lab population, it is unsurprising that the flowers of the three O2 populations are more similar to each other than they are to the F population.
- Knowledge of stigma and anther height and stigma-anther separation of the flowers of the two morphs can help better understand pollinators and pollen flow within an endangered species.
- Future research will focus on corolla, filament, and style cell length differences, between floral morphs, throughout development.

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