

Describing the Floral Morphology and Initiating Propagation Protocol for *Thelypodium stenopetalum*

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Introduction

Considering that *Thelypodium stenopetalum* occurs in a considerably small area, the importance of understanding this plant’s morphology, germination, and propagation methods is paramount. For this reason, 4 trials of 4 different treatments will be conducted and 2 maternal lines will be used. The first line is 200 seeds from Baldwin Lake Ecological Reserve and the second line is from Sierra Nevada, CA, 200ft. NW from Needles Fire Lookout. *T. stenopetalum* (Slender-Petaled Thelypodium) is a rare plant species in the Brassicaceae (mustard family). It is restricted to Big Bear Valley in the San Bernardino Mountains and occurs primarily in 4 locations: Baldwin Lake, Erwin Lake, Holcomb Valley, and the South Shore of Big Bear Lake. Not much is known about this plant’s reproductive biology, but inferences can be made based on known knowledge of plants from the same genus.

Background

The Brassicaceae family consists of +/- 330 genera, with Thelypodium occurring in western North America (Berkeley) with 16 species. Thelypodium prefers temperate habitats, with the “highest diversity in Mediterranean area[s]...[and] western North America” (Berkeley). Although the online Jepson manual reports 16 native species in western North America under the genus Thelypodium, the United States Department of Agriculture reports that there are 17. *Thelypodium stenopetalum* is listed in the California Native Plant Society Rare Plant Inventory and has a CA Plant Rank: 1B.1, meaning that this plant is rare, threatened, or endangered in California and elsewhere; seriously threatened in California. *T. stenopetalum* prefers “vernally wet meadows, alkaline flats, and lakeshores at elevations of 6, 470 ft.-7, 430ft.; tend to occupy drier sites within meadows in areas dominated by sage-brush scrub” (Center of Plant Conservation). It prefers “clay soils that are saturated in the spring but dry out by July” (Henderson, p. 21).



Fig 1. Left: *Thelypodium stenopetalum*; Naomi Fraga ©
Right: 8 pots, each containing 50 seeds of *T. stenopetalum*

Materials and Methods

For the propagation methods, a total of 4 treatments were tested on *Thelypodium stenopetalum*, accomplished with 4 trials. Two seed accessions were used, each having 200 seeds that were further divided into 8 groups of 50. To describe the floral morphology of *T. stenopetalum* and compare with other species of Thelypodium, four species from Thelypodium were measured: *T. stenopetalum*, *T. laciniatum*, *T. integrifolium*, and *T. milleflorum*. Parts of the flower that were measured included the: flower, sepals, petals, short/long stamens, anthers, gynoecium, stigma, distance of exertion stamen, and pollen length. The primary focus will be on the flower, short stamens, gynoecium, and pollen size.



Fig. 2: Left: *Thelypodium stenopetalum* undergoing treatment and then subsequent potting.
Right: 8 pots, each containing 50 *T. stenopetalum* seeds, sitting in the growing chamber.

Results

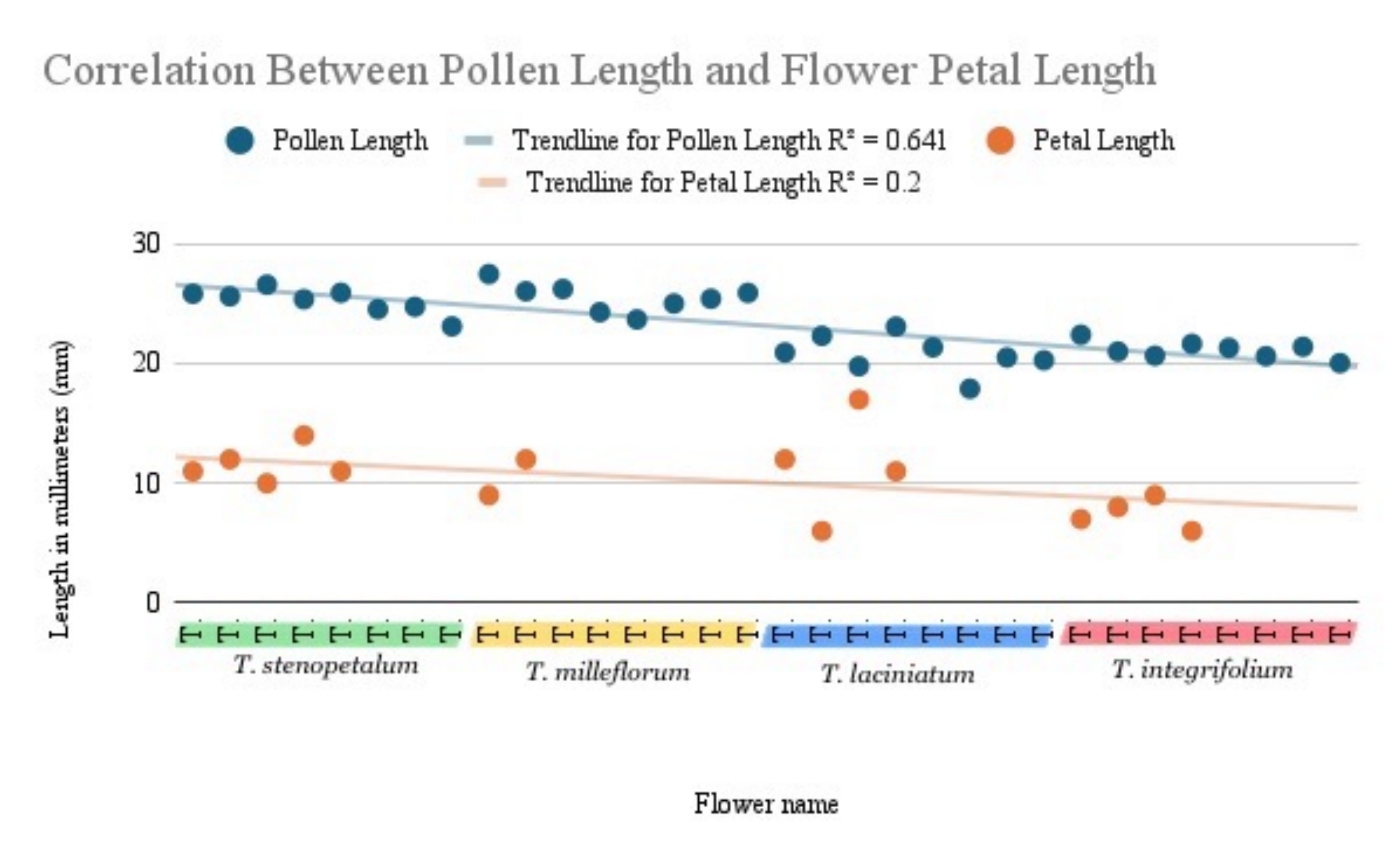


Fig. 3 Graph depicting correlation between pollen length and flower petal length

- Reviewing the measurements taken from both the morphological structure of the flower and its pollen, a look into the correlation between pollen size and petal size was examined, but data was not sufficient to justify there being a positive relationship between the two.

Accession #18411/#26560				
Trial #	Treatment	#Seeds	Location	
1	NT	50	Growth chamber	
2	WS (72HR)	50	Growth chamber	
3	WS (72HR) & CS2 (1 month)	50	Growth chamber	
4	CS2 (1 month)	50	Growth chamber	

A#18411 Germination					A#26560 Germination				
Trial #	11-Jul	26-Jul	1-Aug	8-Aug	Trial #	11-Jul	26-Jul	1-Aug	8-Aug
1			1 "	"	1				
2		1	2 "	"	2				
3					3			1 "	"
4				1	4				

Fig. 4 Tables depicting propagation and germination data based on 2 maternal lines

- The propagation of 400 *Thelypodium stenopetalum* seeds yielded a total of 5 seeds successfully germinating. The maternal line that saw the most success was line #18411, Baldwin Lake Ecological Reserve (BALA). The trials that saw success in this maternal line were numbers 1, 2, and 4.



Fig. 5: Left: *Thelypodium stenopetalum* seeds under a microscope
Right: Trial #2, maternal line #18411, August 1, 2024

Discussion

There is a higher occurrence rate of *Thelypodium stenopetalum* in Baldwin Lake Ecological Reserve than in the Sierra Nevada. Considering that Baldwin Lake Ecological Reserve is near the Big Bear area, field work on the type of soil present will need to be conducted. The Sierra Nevada is characterized by its granitic formation, and their soil reflects that as well, noting how “rocky and thin” (USGS) it is. Measurements were also taken of three species within the Thelypodium genus to compare between them and *T. stenopetalum*. It is important to note that aside from *T. stenopetalum*, *T. milleflorum* is also a rare species and for that reason, only two specimens were available to work with; Data will be skewed for this species. Based on morphological analysis, the majority of *T. stenopetalum* specimens displayed a floral trait known as reverse herkogamy, where spatial separation is present between male and female parts. In this case, the male parts are taller than the female part (style).

Conclusion

Very little is known about the reproductive biology of *Thelypodium stenopetalum* and its relatives but given the relatively large flower size and the spatial separation of the androecium and gynoecium, it is likely that this species reproduces by cross pollination.



Fig. 6 *Thelypodium stenopetalum*, Naomi Fraga ©

Future Works

Considering that *Thelypodium stenopetalum* germinates in a consistently cooler environment, at high elevations in montane regions, with moist soil, an extended cold stratification period would be desirable in future projects. It’s also important to note that germination trials began in the summer, which may not be ideal conditions for germination. When comparing *T. stenopetalum* to three others of the same genus, *T. milleflorum* only had two specimens to work with, which will skew the data when used in comparison to other species. Background research was gathered from literature review and field research was not conducted at this time. Future field research that would be beneficial is pollinator observations, recording floral measurements in the field, and taking better photos. One theory, currently, is that bees are prevalent pollinators of Thelypodium.

References

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Conclusion: Very little is known about the reproductive biology of *Thelypodium stenopetalum* and its relatives but given the relatively large flower size and the spatial separation of the androecium and gynoecium, it is likely that this species reproduces by cross pollination.

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