





Is Cryptogramma acrostichoides undergoing speciation?

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Introduction:

- Cryptogramma acrostichoides is a species of fern found in boreal climates. It only grows on acidic rock. This species can best be identified by its dimorphic leaves and similarity to parsley.
- Sky Islands isolate populations of many different species, C. acrostichoides being among them. The majority of *C. acrostichoides* isolated on sky islands are the populations found within the southwestern **United States**
- The project is testing whether the populations found within the southwestern United States and the northwestern populations are undergoing speciation.



Methods:

- **DNA Extraction**
 - Qiagen Kit
- **PCR**
 - Denaturing (94°C)

This is taking the DNA strands

Annealing (50°C)

in order to isolate the gene sequence needed.

Extension (72°C)

- **Electrophoresis**
 - A 1% agarose gel was filled with PCR product and then 80-90 volts was shot through it for 30-45 minutes. This evaluated which PCR product had the best DNA.
- Sanger Sequencing
 - The PCR product was sent to the High **Throughput Genomics Center for** sequencing.



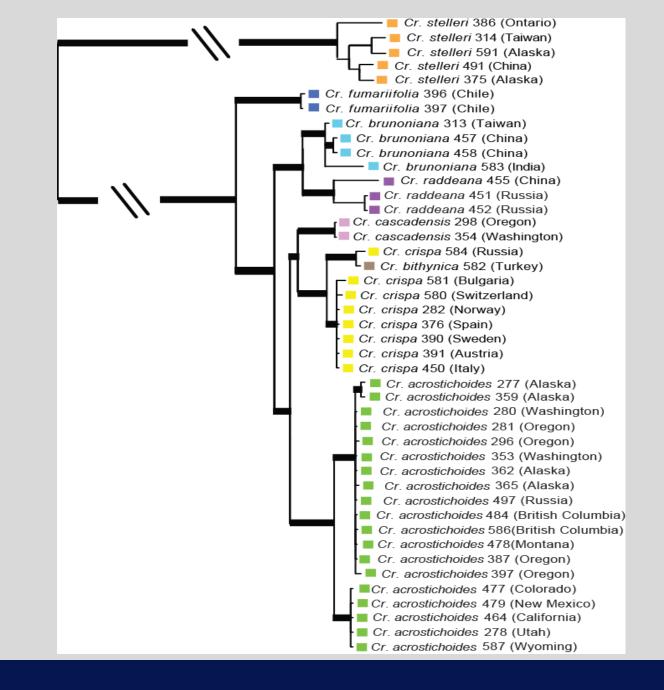
- The results that we received are highly supportive of our goal on figuring out if *C. acrostichoides* is undergoing speciation.
- The northern and southern populations of *C*. acrostichoides have been separated into two clades based off the number of mutations found present within the plants.
- The thicker branches are highly supported by the combined PAUP and Bayesian statistics. They are shorter though, which indicates that the species is only beginning to undergo speciation.
- There is not yet proof of morphological (physical) changes within the plants. Jordan Metzgar (my mentor) will look into the issue of whether there are any morphological differences within the southern and northern populations of *C. acrostichoides*.

Figure and Tables:

This graph represents the PCR test results with the strongest bands (reactions).

387	Cr. acrostichoides	Rothfels 3853	Oregon	RAHI04-1	RAHI04-17				
393	Cr. acrostichoides	Sigel 2010-94	Oregon	RAHI04-2	RAHI00-17			Color	Band Strength
464	Cr. acrostichoides	Stoughton 1400	California	RAHI01-3	RAHI04-19				Strong
477	Cr. acrostichoides	Sigel 2011-18	Colorado	RAHI04-3	RAHI04-20				Weak
478	Cr. acrostichoides	Sigel 2011-30	Montana	RAHI01-5	RAHI00-20				None
479	Cr. acrostichoides	Sigel 2011-15	New Mexico	RAHI04-4	RAHI10-1				
484	Cr. acrostichoides	Marr 10-424	British Columbia	RAHI04-5	RAHI00-22				
586	Cr. acrostichoides	SJ-2550	Pemberton, BC	RAHI04-6	RAHI00-23	RAHI00-11	_		
587	Cr. acrostichoides	ALA V3327	Wyoming	RAHI04-7	RAHI10-3				

created using the combined PAUP and Bayesian statistics.



Conclusion:

There is strong statistical support that the southern and northern C. acrostichoides populations are undergoing speciation. Further investigation is required though.

Acknowledgements:

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Citations:

- Siegmund, W. (2011, 10 09). File:cryptogramma acrostichoides 5862.jpg. Retrieved from http://commons.wikimedia.org/wiki/File:Cryptogramma acrostichoides 5862.JPG
- Metzgar, J. S., Alverson, E. R., Chen, S., Vaganov, A. V., & Ickert-Bond, S. M. (2013). Diversification and reticulation in the circumboeal fern genus cryptogramma. Elsevier, doi: 67 (2013)589-599

