

ASPT Graduate Student Research Grant Final Report

2020 Recipients

Please complete (typed) this form by *June 30, 2021* and submit it as a .pdf or .doc attachment to: Mike Moore at mmoore@oberlin.edu

Name: Carly Anderson Stewart

Department: Ecology and Evolutionary Biology

Institution: University of Colorado at Boulder

City: Boulder State: CO Postal/Zip Code: 80301

Country: United States

Title of Study: "Strides forward in lichenology: constructing the largest-ever morphometric phylogeny of *Cladonia* (lichenized Ascomycota).

Amount awarded: \$2000

Report:

**In the space below, please type a report of no more than 200 words that explains how you used the funds awarded to you. You should indicate the status of your research project (i.e. completed, ongoing, currently analyzing data etc.) and how the funds contributed to that status (what you were specifically able to accomplish, e.g. specimen collecting, data generation, data analyses).

Funding from this grant will be used wholly to pay for a plate of Next-Generation Sequencing using RADseq (Restriction Site Associated) technology. This sequencing allows researchers to use small pieces of DNA throughout the breadth of a genome—this is especially useful for my project. Because I'm sequencing hundreds of genomic vouchers for a phylogenetic tree, using more of the genome (e.g. not relying on a single or several genes that could provide an inaccurate picture due to incomplete lineage sorting) but not using whole-genome sequencing (which would make the analysis computational impossible) is essential.

Recently I returned from the last field collecting trip of my PhD, an excursion to the states of Baja California and Baja California Sur (Mexico), to collect *Cladonia* lichens in the heterogeneous peninsula of northwestern Mexico. These, as well as lichens from global loans as well as previous collection trips to New Caledonia and Hawaii, will be incorporated into the sequencing plates. These analyses will provide the data for what will be the largest RADseq phylogeny of lichens and certainly one of the largest, if not the largest, *Cladonia* phylogeny in existence.

Thanks ASPT!

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Name: Ioana Anghel

Department: Ecology and Evolutionary Biology

Institution: UCLA

City: Los Angeles

State: CA

Postal/Zip Code: 90095

Country: USA

Title of Study: Species boundaries and mechanisms of speciation in sympatric species of *Linanthus*

Amount awarded: \$1,300

Report:

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The ASPT student research grant partially funded the costs of running a NovaSeq lane to sequence 192 samples of *Linanthus* individuals from all 25 species in the genus and 3 outgroups. The sampling included 60 samples that occurred sympatrically with another *Linanthus* species. I am currently assembling and analyzing the ddRAD data. These genetic analyses will clarify species boundaries across the genus and help us understand whether divergence with gene flow is at play in some of the taxa in the genus. Thank you so much for your support of my project!

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x yes no





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Name: Anna Becker

Department: Department of Biology

Institution: University of Florida

City: Gainesville

State: FL

Postal/Zip Code: 32601

Country: USA

Title of Study: The Evolution of Hawaiian Blueberries

Amount awarded: \$1500

Report:

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Because of the COVID 19 pandemic, my dissertation project has been put on hold. The \$1500 from the ASPT award is set aside for my second round of sequencing that focuses primarily on the Hawaiian *Vaccinium*. The results of the first round of sequencing (a more broad-scale study) will determine some of the taxa selection for the second round mentioned above. That first round of samples has been sitting in a lab waiting for processing for over a year because of the pandemic. I should get that data by the end of this month. Analysis will take a few months, and I should be set to submit the next plate (second round of sequencing) around the beginning of 2022. In the meantime, I have been awarded additional grant funds for more field work, which I will accomplish early 2022. Some of the material I get from that field work will be incorporated into this second set of sequencing as well. Analysis for the second round should take a few months, and I then would be able to write up the results of that around middle/end of 2022. This year, I was able to pass my qualification exams.

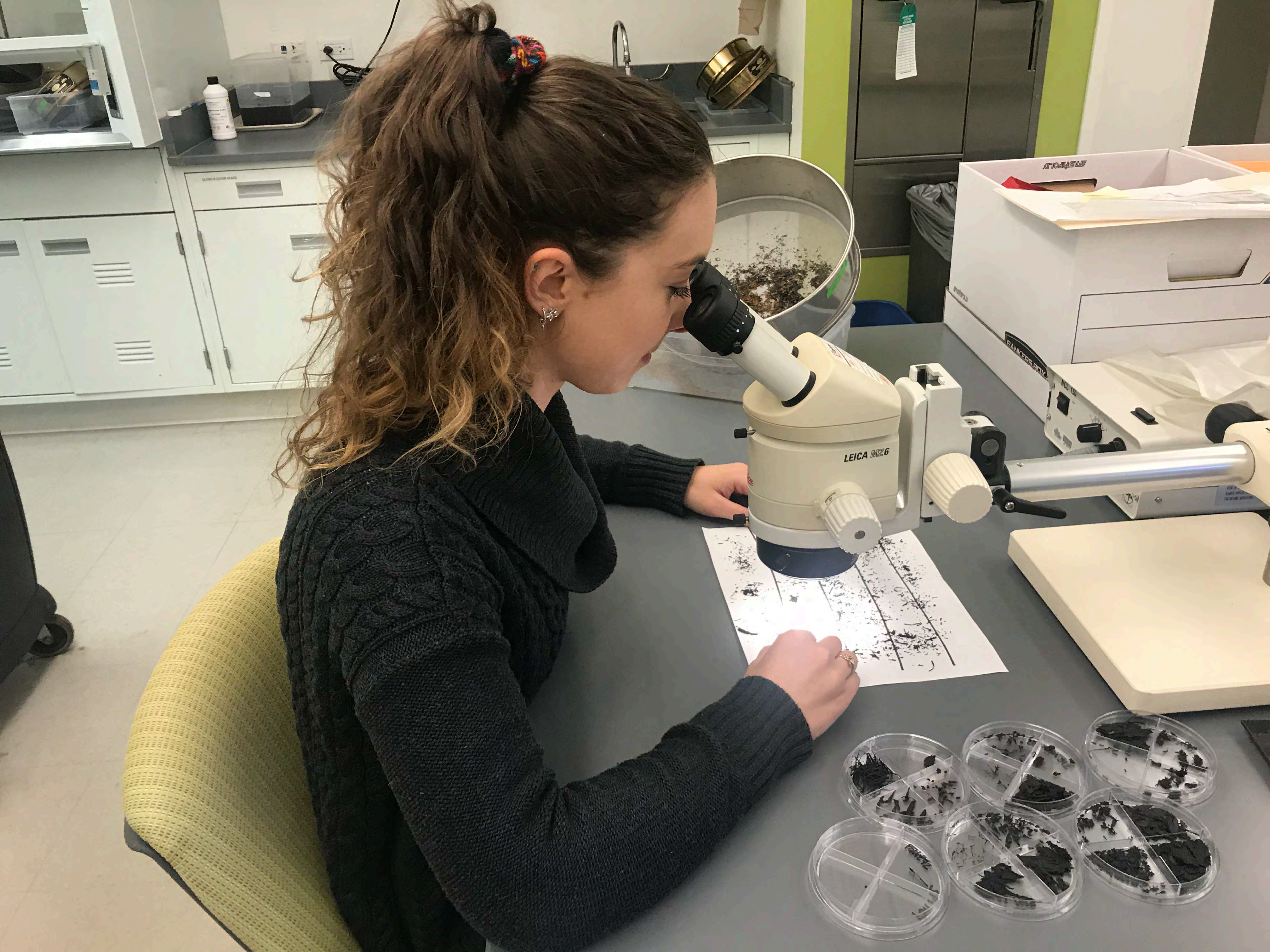
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X yes no

Yes of course! 😊



ASPT Graduate Student Research Grant Final Report

2020 Recipients

Name: Maya Bickner

Department: Plant Biology and Conservation

Institution: Chicago Botanic Garden and Northwestern University

City: Glencoe

State: IL

Postal/Zip Code: 60022

Country: United States of America

Title of Study: New Early Cretaceous Seeds from Mongolia and Inner Mongolia, China Expand the Diversity of Seed Plants.

Amount awarded: \$1,200.

Report:

ASPT generously supported my ongoing study of the Early Cretaceous seeds from Mongolia and Inner Mongolia, China. Over the past year, I have investigated fossil seeds preserved as mesofossils, macrofossils, and permineralizations. I studied these fossils using a combination of traditional anatomical sectioning and X-ray microtomography, allowing me to incorporate the different modes of preservation into robust species descriptions. ASPT funds have allowed me to conduct X-ray computed tomography at the University of Chicago. Due to Covid-19, the funds which were intended to be used for international travel were instead used to purchase lab supplies, including hydrofluoric acid and mounting media, and for beam time at the University of Chicago. Utilizing these lab supplies and X-ray computed tomography data, I have recovered excellent anatomical and morphological information to establish at least four new species of gymnosperm seeds. Some funds remain, which will be expended in the upcoming months primarily on additional X-ray microtomography. I presented preliminary results of this study at the 2021 Midcontinent Paleobotanical Colloquium and will be presenting at the upcoming Botany 2021 conference. I am currently working on the taxonomy and systematic placement for these new fossils; I am also preparing two manuscripts for publication.

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Name: Patricia W. Chan

Department: Botany

Institution: University of Wisconsin Madison

City: Madison

State: Wisconsin

Postal/Zip Code: 53706

Country: United States

Title of Study: Molecular phylogenomics, historical biogeography, floral evolution, gene flow, and species diversification in *Darwinia* (Myrtaceae)

Amount awarded: \$1200

Report:

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ASPT generously supported my ongoing research on the molecular phylogenomics, floral evolution, gene flow, and diversification of Western Australian *Darwinia* (Myrtaceae). Despite the postponement of multiple field seasons due the COVID-10 pandemic, I have been able to progress on the molecular phylogenomics portion of this research. Thanks to the funds awarded by ASPT, we have been able to extract and sequence DNA from 12 *Darwinia* and *Verticordia* samples acquired by Australian collaborators, resulting in a preliminary nuclear phylogeny with high bootstrap support, resolving previously unresolved nodes. I plan to further utilize these molecular data to construct whole plastomes. In addition, the funds awarded have aided in developing methods to estimate genome size using flow cytometry, a technique complicated by the metabolites found in *Darwinia*'s foliar tissue. These research funds were originally awarded to support travel within Australia for specimen collection, which was not possible for 2020 and 2021 in the midst of the pandemic. With ASPT's continued permission, this will serve as an interim report as we hope to use remaining funds during a 2022 field to conduct pollinator observations and population level sampling,

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X yes

Yes, and I prefer this to represent an interim report.



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Name: Chun Su

Department: Botany

Institution: Smithsonian Institution

City: Washington DC

State: DC

Postal/Zip Code: 20011

Country: USA

Title of Study: Phylogenetic systematics of East Asian *Astragalus* (Fabaceae)

Amount awarded: \$1500

Report:

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Thank you for the American Society of Plant Taxonomists (ASPT) Shirley and Alan Graham Grant. With the travel ban during the pandemic, I was able to use the grant to pay for a NEBNext® Ultra™ DNA Library Prep Kit. The grant also covered 200+ samples of the DNA extraction kit. These kits were very important for me to get chloroplast and nuclear genome data from herbarium specimen samples. One research paper was published: Chloroplast phylogenomics and character evolution of eastern Asian *Astragalus* (Leguminosae): Tackling the phylogenetic structure of the largest genus of flowering plants in Asia in the journal *Molecular Phylogenetic Evolution* (2021). The ASPT fund was acknowledged in the paper mentioned above, and in my Ph.D. thesis as well - *Phylogenetics and evolutionary history of eastern Asian Astragalus (Fabaceae)* (2021). Another paper on the phylogenetic systematics of *Astragalus* will also acknowledge the ASPT grant.

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YES

yes no



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Name: Jacob Keshtvarz

Department: Department of Biological Sciences

Institution: University of Cincinnati

City: Cincinnati
45221

State: Ohio

Postal/Zip Code:

Country: USA

Title of Study: Change in Occurrence of Heavy Metals in Greater Cincinnati from 1879-2019 within native *Solidago* spp.

Amount awarded: \$1200

Report:

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Funds awarded by the ASPT 2020 Graduate Student Research Grant helped to cover the cost of ICP-MS testing (Inductively coupled plasma mass spectrometry) for common heavy metal pollutants lead, arsenic, chromium, and cadmium within 24 *Solidago* tissue samples (6 from historical herbarium specimens) and 6 soil samples collected from around Greater Cincinnati, Ohio, USA from 1879-2019. Pollution is a major concern for the livelihood of nearly all living things. As a major city, Cincinnati, Ohio, creates and expels a relatively large amount of pollution. Having a gauge on pollutant levels is critical for public and environmental health and the health of native flora of the region including the several native *Solidago* spp. examined in this study. The results of this study will shed light on how pollutant levels have changed over these 140 years as Cincinnati has grown and industrialized and could help inform policies and decision making that work to preserve our native flora. Currently the testing process is underway and is expected to be complete by the end of July 2021.

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Name: Andrea Monserrath López Martínez

Department: Departamento de Botánica

Institution: Instituto de Biología, Universidad Nacional Autónoma de México

City: Ciudad de México State: Ciudad de México Postal/Zip Code: 04510

Country: México

Title of Study: Phylogenetic relationships of fossils flowers, and their relevance to investigate floral evolution

Amount awarded: \$ 1,200 USD

Report:

The fund was requested to partially cover travel expenses for a research internship in Dr. Hervé Sauquet's lab at the Royal Botanic Gardens and Domain Trust in Sydney, Australia. Unfortunately, due to the COVID 19 crisis, Australia has closed its borders and consequently does not allow the entry of foreigners. Therefore, I could not use the ASPT fund and required a time extension for use.

I am currently in the second year of my PhD program. At this stage, I have been working on completing and curating an extensive morphological dataset that consists of 33 floral traits for more than 100 fossils and 1201 extant species. In addition, we have obtained some analyses of the phylogenetic placement of a set of 24 fossils using diverse approaches and data combinations implementing parsimony, maximum likelihood, and Bayesian inference methods.

We have planned to perform several phylogenetic analyses for the research internship in Australia next year, including the phylogenetic estimation for all fossil species scored; the time divergence estimation for all angiosperm families implementing total-evidence dating and fossilized birth-death model methods, and; finally investigate the evolution of floral traits directly informed by extant and fossil representatives.

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Name: Caroline C. Vasconcelos

Department: Graduate Program in Botany

Institution: Instituto Nacional de Pesquisas da Amazônia

City: Manaus

State: AM

Postal/Zip Code: 69067-375

Country: Brazil

Title of Study: Towards an integrative revision of the overlooked genus *Ecclinusa* (Sapotaceae): taxonomy, molecular phylogeny, and diversification patterns

Amount awarded: \$1200.00

Report:

My research on the integrative systematics of the genus *Ecclinusa* is ongoing with an emphasis on measuring specimens for morphological and near-infrared spectroscopic analyses using available collections (INPA, PDBFF) and loaned specimen (MO) – the data of which I am currently analyzing. The funds from this award will support my visit to North American herbaria with representative collections for my project, a trip that has been delayed due to the COVID-19 pandemic. As soon as things get back to normal, I intend to make this much-needed trip to complete specimens sampling and thus finalize a manuscript that will be submitted to the Botanical Journal of the Linnean Society as part of my thesis.

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Name: Hannah Vollmer

Department: Biological Sciences

Institution: Plymouth State University

City: Plymouth

State: NH

Postal/Zip Code: 03264

Country: USA

Title of Study: Conservation genetics of two rare alpine roses in the White Mountains of New Hampshire

Amount awarded: \$1500

Report:

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The ASPT funds I was awarded were allocated toward DNA sequencing and lab supplies, specifically DNA oligos, restriction enzymes, sequencing cleanup beads, centrifuge tube filters, tubes, and well plates. I collected tissue from the globally rare alpine plant *Potentilla robbinsiana* and received dozens of specimens of this species, its sister species *Potentilla hyparctica*, and the regionally rare, locally extirpated *Sibbaldia procumbens* from which I also sampled tissues. I modified protocols for a next-generation and high throughput sequencing technique, double digest restriction site-associated DNA sequencing (ddRAD). I isolated DNAs from the field collected and herbarium tissues and digested them with enzymes. Ongoing work includes completing the library preparation of DNA fragments for sequencing. I have also prepared a protocol for nuclei isolation that will allow an analysis of chromosomal ploidy via flow cytometry. The genetic fingerprinting resulting from this work can help us understand the origin and relationships of these rare plants and how best to conserve them. I had several opportunities for outreach about my research resulting in pieces in a local television show, several newspaper articles, an educational video and photo shoot, a museum exhibit, and an outdoors magazine.

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Name: Bethany Zumwalde

Department: Department of Biology & Florida Museum of Natural History

Institution: University of Florida

City: Gainesville

State: FL

Postal/Zip Code: 32611

Country: USA

Title of Study: Investigating the Species Limits of a Promiscuous and Multi-Cytotype Species, *Cylindropuntia leptocaulis* (Cactaceae)

Amount awarded: \$1,200

Report:

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The current status of my research project is ongoing. The funds awarded were used to cover the costs for preliminary fieldwork for my dissertation research. During this trip I was able to visit 16 populations of *Cylindropuntia leptocaulis* across the state of Texas, of which had no prior cytogeographic knowledge for this northeastern-most part of the species' distribution. I was able to collect over 100 samples for both flow cytometry and population genetic analyses. Stems from each plant are currently growing in the greenhouse at UF and are additionally being used to support an undergraduate student working with me on stomatal morphology. Due to the pandemic, the collection of flow cytometry and population genetic analyses are slowly progressing; however, I have subsequently preformed chromosome counts on at least one individual from each population, which notably has led to the discovery of the first triploid population of this species outside of the Sonoran Desert. Additionally, I was able to form collaborations with researchers at both University of North Texas and Tarleton State University that have allowed me to obtain additional samples following field work.

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