Sustaining Molecular Phylogenetics Research With Herbarium Specimens In A Covid-19-Hit World: A Case Study

I am writing this little piece for all the herbarium curators and faculty out there at primarily undergraduate institutions (PUIs) like mine, to share my experiences on sustaining plant systematics research with undergraduate students in the midst of a pandemic-hit world. Currently, the most daunting challenge and impediment in terms of field collection of plant samples is the COVID-19 pandemic. Strict precautions need to be maintained, along with adequate distancing, to prevent the spread of the virus.

My current research at Missouri Western State University (MWSU) involves understanding the evolution and diversification of three plant groups, the Lamioid mints (Lamiaceae), the temperate North American *Agalinis* Raf. ("False foxgloves," Orobanchaceae), and *Silphium* L. ("Rosinweeds," Asteraceae), well known for their ecological, economic, evolutionary, and cultural significances. A large majority of our samples of Lamioid mints are native to Europe, Asia, and Africa. Traveling to the native habitats of these mints for sample collection can be challenging and sometimes nearly impossible, particularly in this COVID-19-hit world, with global travel restrictions and regulations. Our financial resources are limited, with MWSU being a regional primarily undergraduate institution, and we have to be judicious in our expenditures at all times. However, in spite of these and other challenges, my students and I have been successfully able to continue our research, mainly because of collaborations and sample collections from herbarium preserved plant materials.

Fig. 1. Shawn Boss, Missouri Western State University undergraduate researcher in Dr. Roy's lab, collecting samples from an herbarium preserved specimen at NY. Photo credit: Tilottama Roy.

During our spring break in March of 2020 one of my undergraduate research students, Shawn Boss, and I went to the William and Lynda Steere Herbarium (NY) at the New York Botanical Garden (NYBG), to collect samples from herbarium specimens (Fig. 1,2). We were able to do our sampling just in the nick of time, since the Herbarium and NYBG (and many other herbaria across temperate North America and elsewhere)

Fig. 2. The author (Tilottama Roy) collecting samples from an herbarium preserved specimen at NY.

closed to visitors, due to the pandemic, almost immediately after we came back from our trip. We were able to collect ~40 samples, mostly of members of the genus *Agalinis*, as well as some mint taxa during this trip. These samples proved to be of immense value to us and played a crucial role in allowing us to continue research in my lab at Missouri Western throughout the year. We did not have to worry about going out to do field collections in order to sustain our research, since we had a steady supply of herbarium preserved plant materials for this purpose.

I hope my musings above on the uses of herbarium samples as an alternative to field collection, especially under adverse conditions, will encourage other faculty at similar PUIs to consider them as a very crucial resource for molecular phylogenetics research. This can prove to be a redeeming feature for such research projects in multiple aspects, including minimizing time, effort, and financial resources that are usually involved in field collection.

Acknowledgements: The author would like to thank Drs. Mark Mills and Todd Eckdahl at Missouri Western State University, and Dr. Charlotte Lindqvist at the State University of New York at Buffalo, for helpful discussions and feedback, motivation, and encouragement.

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