Spring 2014

[Sabbatical Report]

Lawrence Alan Alice
Western Kentucky University, lawrence.alice@wku.edu

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Dr. A. Gordon Emslie
Provost and Vice President of Academic Affairs

Dear Provost Emslie,

It is my pleasure to report to you the activities undertaken, and their current state, during my Spring 2014 sabbatical. My research sabbatical was conducted from 20 January to 19 July 2014 at the USDA-Agriculture Research Service, National Clonal Germplasm Repository (NCGR) in Corvallis, Oregon. My goals as proposed were to: 1) increase resolution and support for a chloroplast DNA phylogeny by acquiring more sequence data, 2) generate a robust nuclear DNA phylogeny by sequencing several single-copy genes, 3) use flow cytometry to estimate DNA quantity per cell (i.e., ploidy level) in *R. ursinus* and NCGR specimens of unknown ploidy level, 4) identify highly variable DNA microsatellite (or simple-sequence repeats) regions to assess genetic diversity in *R. bartonianus* and test species boundaries, and 5) prepare and submit manuscripts if sufficient data have been generated.

Since my sabbatical leave was approved, methodologies for the first two goals were modified. Rather than sequencing several DNA regions from the chloroplast and nuclear genomes, we used a new and powerful approach (uniquely available at NCGR and Oregon State University) to collect data from up to 500 genes simultaneously including the entire chloroplast. Our initial preparations showed inadequate DNA profiles to continue with the final two steps of the protocol. Thus, we have no data to date. We are currently troubleshooting our problems and hope to acquire data this fall.

The third goal has been very successful. We determined ploidy level of 150 plant accessions at the NCGR and a previously unsampled species, *Rubus bartonianus*. Due to a lack of funding, wild collections of *R. ursinus* could not be obtained from southern California. Moreover, we found a reduced genome size in a distinct group of *Rubus* species from New Zealand-Australia-southern Chile. In collecting *R. bartonianus*, we also discovered a rust fungus infecting this endemic species from Hell's Canyon. Interestingly, this rust fungus is also present on the original collection (holotype) from 1933. With plant pathology collaborators we are trying to identify the pathogen from wild collected specimens and the preserved holotype housed in the OSU herbarium. In addition, we collected putative hybrids between a native blackberry (*R. ursinus*) and an introduced and highly invasive European species (*R. armeniacus* or Himalaya blackberry). Associated with this, our plant pathology collaborators have demonstrated that these hybrids are not susceptible to a European blackberry rust fungus (*Phragmidium violaceum*). Our working hypothesis is that the indigenous species confers disease resistance in hybrids. Publications derived from this project are:

1. Report of ploidy levels for new accessions at the NCGR and small genome size in the Southern Trans-Pacific lineage
2. New report of a rust fungus infecting a rare plant in Idaho and Oregon (Hell's Canyon) possibly including a new species description of the pathogen

Department of Biology | Western Kentucky University | 1906 College Heights Blvd. #11080 | Bowling Green, KY 42101-1080
phone: 270.745.3696 | **fax:** 270.745.6856 | **web:** http://bioweb.wku.edu

3. Natural hybridization and disease resistance in native *Rubus ursinus* x introduced *R. armeniacus*

Our fourth goal was also very successful although the anticipated outcome was not for immediate publication. We could not obtain a sufficient number of *R. bartonianus* specimens to evaluate genetic diversity among populations and test species boundaries with closely related taxa. However, we have screened 120 genetic markers for variation among individuals or species for use in 10 future projects. These data will be used in a NSF pre-proposal due in January 2015. These projects are also well suited for students of all levels at WKU including Gatton Academy.

In summary, while some projects and outcomes were slightly different from my initial proposal in Fall 2012, my 6-month sabbatical at the NCGR has been extremely productive and should lead to three manuscript submissions in the short term and others over the next few years. Moreover, I have advanced my research capabilities and knowledge of the most current techniques in plant molecular genetics and will be able to transfer these approaches to my colleagues at WKU and to students in my lab and classes. A presentation summarizing my sabbatical activities will be included in the Biology Seminar Series in AY 14-15. I am very appreciative for this opportunity and believe it was highly beneficial. Lastly, I received a $5,000 grant from KYEPSCOR-National Laboratory Initiative to support travel and residency expenses during the sabbatical leave.

Sincerely,

Lawrence A. Alice, Ph.D.

Digitally signed by Lawrence A. Alice, Ph.D.
DN: cn=Lawrence A. Alice, Ph.D., o=Western Kentucky University, ou=Dept. of Biology, email=lawrence.alice@wku.edu, c=US
Date: 2014.07.18 15:41:08 -07'00'

Lawrence A. Alice Ph.D.
Associate Professor of Biology
Western Kentucky University