Island Biogeography

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Focus: The students will practice the basic code to test MacArthur and Wilson's (1967) Island Biogeography model, focusing on how island size, distance, and perturbation affect species numbers.

Overview: This lesson focuses on collecting and generating curves from immigration and extinction data for MacArthur and Wilson's (1967) Island Biogeography model. The students will complete a lesson in R to practice the basics of using R for generating simulated data and how to plot vectors. They will apply the methodology outlined in this swirl lesson to data they collect for immigration and extinction on various island types.

Learning objectives:

1. Complete a prelab reading to familiarize themselves with the goals of the lesson and the background ecological information of Island Biogeography as described by Wilson and MacArthur (1967)
2. Practice coding elements necessary to create vectors and practice simple 'for' loops to create plots of both simulated and real data in R
3. Apply the methods and coding learned through swirl to their own immigration and extinction data for various island types (near vs. far, large vs. small, etc.)

Lesson sequence:

1. Introduce the basic idea behind Island Biogeography (orally/graphically; may be skipped if recently covered in class)
2. Swirl lesson
    a. Intro
    b. Simulating Data
    c. Producing Curves
3. Have the students run an experiment that models Island Biogeography and graphs their results
4. Use R to calculate and complete lab worksheet

Pre-lesson activities: Prelab reading relative to the basic elements of Island Biogeography, if students need a refresher (it will help make sense of the calculations and curves generated in the SWIRL lesson). This can be skipped if you have already (and recently) addressed this in your course. The goal is that students familiarize

themselves with the general idea of Island Biogeography and that they have code (and the associated rationale) to help them in collecting and visualizing their own data.

Post-lesson activities: Students are to come to lab with their code saved to later run on their Island Biogeography data collected in lab. It is suggested that students submit their in-lab work (commented code and data collected) at the end of the lesson, but that the commented code from the swirl prelab be checked prior to beginning in-lab work. This is also an excellent lab for writing a Discussion section because it forces the students to consider the important details and assumptions of the model which might be broken by nature, and also how models are improved with time and tested against natural instances.

Implementation notes: This lesson was designed to be done prior to a 3-hr laboratory where students actively collect data and repeat the coding steps using their data. The lesson is subdivided into several subparts of increasing difficulty, culminating in a graph generated from simulated, for-loop-generated data. This lesson should not be used as an introduction to R; rather, this should come after students are comfortable with writing vectors and data frames and have done some basic R plots. Encourage students to go slowly and keep a document or script open in which to paste the code (and any notes) as they work; it will make generating their own R code easier later.

Helpful References for Background:

DeJarnette, A. 2010. Final Learning Activity. Project proposal submitted in CETL 2000 BIO, Fall 2010. Georgia Institute of Technology, Atlanta GA.

Kingsolver, R.W. 2006. Ecology on Campus lab manual. Benjamin Cummings, San Francisco,CA.

MacArthur, R. H. and E. O. Wilson. 1967. The theory of island biogeography. Princeton University Press, Princeton, N.J.