Name(s):_____

I. Estimating Population Sizes

Whether you're doing basic scientific research, involved in conservation, or working in a wildlife management capacity, knowing how many organisms are out there is often necessary. Consequently, ecologists have put considerable effort into developing approaches to allow estimation of population sizes. Today we'll work through one method of using capture-mark-recapture to do this estimation. This method is commonly referred to as "Lincoln-Peterson Estimation" and involves trapping (or otherwise sampling) a group of individuals. These individuals are marked in some way and then released. During a subsequent trapping/sampling period the number of unmarked and marked individuals is recorded and, from that, the population size can be estimated.

A. Fifteen individuals sampled from a population

Trapping Session 1 ID	Trapping Session 2 ID
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____
6. _____	6. _____
7. _____	7. _____
8. _____	8. _____
9. _____	9. _____
10. _____	10. _____
11. _____	11. _____
12. _____	12. _____
13. _____	13. _____
14. _____	14. _____
15. _____	15. _____

M = ; C = ; R = ; N =

B. Ten individuals sampled from a population

Trapping Session 1 ID	Trapping Session 2 ID
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____
6. _____	6. _____
7. _____	7. _____
8. _____	8. _____
9. _____	9. _____
10. _____	10. _____

M = ; C = ; R = ; N =

C. How do these values compare?

II. Estimating number of species in an area

Besides knowing how many individuals of a single species are present, we often also want to know how many species are present. This is typically done through similar approaches as estimating single species population sizes. Commonly, the species located/captured along a transect are recorded and collecting continues based on available sampling effort. Just like it is possible to never catch a specific individual, since species are detected based on their ability to be detected and their abundance, many species may never be detected. Ecologists examine what are called *Species Accumulation Curves* to infer whether they have likely caught many of the species present and estimate the total number of species in an area.

Using the app at https://ccast-shiny.northcentralus.cloudapp.azure.com/ conduct repeated sampling of the ant community and record the number of species you detect.

A. "Sample" the ants at La Selva Rainforest in Costa Rica 10 times. How many different genera did you find? Which genera, if any, did you find multiple times?

B. Sample the ants another 10 times (for a total of 20), now how many genera have you detected? Is this the same as other members of your group, why? Repeat this for another 10 samplings (30 total). How many unique genera have you detected now?

C. Does the number of genera detected appear to be leveling off with 30, 40, or 50 samplings?

III. Estimating diversity and richness at different spatial scales

Besides knowing the diversity and richness at a single location, it can also be useful to understand how diversity is distributed more broadly. For this we calculate alpha, beta, and gamma diversity or richness

A. Use the app again and sample the ant community 10 times. What is your alpha diversity/richness?

B. What is the beta diversity/richness between your group and one neighbor group? (this requires you to compare the actual genera names)

C. Across three groups, what is your gamma diversity?