Exercise: How many species?

Don Swann, Saguaro National Park – June 2015

Determining how many species are in a certain place is much more difficult than most people think! Animals are particularly difficult because they are often wary of humans, nocturnal, good at hiding, and generally not common. To determine out how many species occur in an area, scientists first do field surveys, using the best field techniques available. Then, they use the data from these surveys with statistical techniques to *estimate* how many species there actually are.

There are many, many ways to estimate the number of species in an area, but the Species Accumulation Curve is a common technique that is easy and intuitive. The idea behind the species accumulation curve is that 1) the more you sample in an area, the more species you will discover, and 2) as the amount of sampling increases, the rate at which you find new species decreases to close to zero.

To do this exercise, we'll be using real wildlife camera data from Saguaro National Park (only slightly altered to make some of the very rare species more common). Steps:

1. Take the pack of playing cards. Shuffle, and deal out 10 cards.
2. Read the cards and, in the first column, record the number of individuals of each species: for example, 2 peccary, 1 desert cottontail, 1 gray fox, etc.
3. At the bottom of the column, tally the _total number of species_ for that sample.
4. Then, record the _cumulative species count_ – which after the first sample, will be the same as the total species for the sample.
5. Then, return the cards to the deck, re-shuffle, and deal out 10 more cards.
6. Fill out the data sheet for Sample #2 as for Sample #1.
7. Important! To calculate cumulative species count, add the total of **new** species in Sample #2 to the number of species in Sample #1.
8. Repeat 5-6 times.
9. Finally, fill out the graph of cumulative species for each sample period.

The greatest value of the Species Accumulation Curve is that it gives you an idea of how complete your sampling in an area is. If your line is still rising, you are still finding a lot of new species, and you probably need to do more sampling. As your line flattens out (and if your sampling techniques are effective at find the species that are there), then you are approaching the number of species in the area.

Data sheet for biodiversity sampling – large and medium mammals based on camera traps

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
Abert's squirrel						
Antelope jackrabbit						
Badger						
Black bear						
Black-tailed jackrabbit						
Bobcat						
Cliff chipmunk						
Coati						
Coyote						
Desert cottontail						
Eastern cottontail						
Gray fox						
Harris antelope squirrel						
Hog-nosed skunk						
Hooded skunk						
Javelina						
Mountain lion						
Mule deer						
Ringtail						
Rock squirrel						
Round-tailed ground squirrel						
Striped skunk						
Western spotted skunk						
White-tailed deer						
Number of new species	---					
Total species for survey						
Cumulative species count						

Data sheet for graphing Species Accumulation Curve

Species Accumulation Curve

Cumulative # species (y-axis): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24

Sampling Period (x-axis): 1, 2, 3, 4, 5, 6