Darwin's finches

Name_____

Overview A simulation to explore how the frequencies of four beak phenotypes change over generations in a population of birds on an island.

Introduction To start you will learn about a population of birds called finches on Daphne Major, one of the Galapagos Islands. Then you will simulate the birds using four possible variations in beak phenotypes. Each "bird's" ability to acquire food will determine whether it dies, or whether it survives and reproduces. The number of offspring produced depends on the amount of food each bird acquires, which can vary greatly under changing environmental conditions.

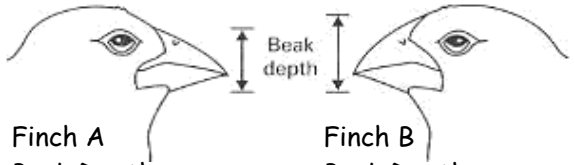
Background Finches typically feed on small, soft fruit and seeds. The birds prefer soft seeds because they are easier to crack. However, during periods of drought, food becomes scarce. The birds are forced to eat more hard seeds that are difficult to break open. Scientists studied the Daphne Major's population of finches and discovered that there are significant variations in the beak depths of individual birds. Birds with deeper beaks are better able to crack open harder seeds than birds with shallower beaks. These variations in beak depth made it possible for some of the finches to get enough food to survive and reproduce during long droughts.

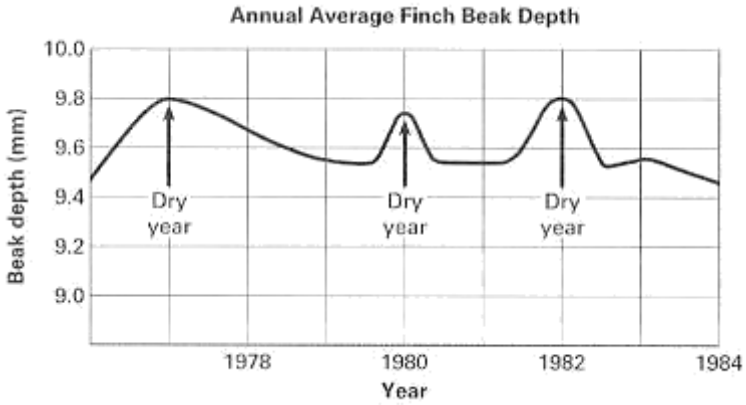
1. Measure the beak depths of the two medium ground finches to the right. Answer in space provided.
2. In which years did the medium ground finch population have the largest average beak depth?

3. Were these wet or dry years?

4. Why does the amount of precipitation matter?

5. Which of the two finches you measured in #1 do you think would be more likely to survive and reproduce in a drought year? Why?





Procedure

1. Each person is going to have a cup that will represent the nest. The nest will sit across the room from the food.
2. There are going to be several different beaks distributed among you and your classmates.
3. Rules of the Island:
   - You must use your beak and your beak only to pick up and transport the food to your nest. If you tip over your "nest" you may pick it up with your hands.
   - You may stab or scoop up the food with your beak whatever is the easiest.
   - You may only eat **one** piece of food at a time.
   - You may not push other "birds," or knock food out of their beaks.
   - You may not steal food from other bird's nests
   - When I say STOP you must return immediately to your nest if you have food in your beak you may deposit it in your nest.
4. The food will vary from year to year due to changes in climate and precipitation.
5. To calculate % Frequency. (Beak Type Population Size/Total Population Size) X 100 = % Frequency

Food Pieces Collected	Outcome
0-5	Does not survive
6-11	Survives but does not reproduce
12-17	Survives & produces 1 offspring
18-23	Survives & produces 2 offspring
24-29	Survives & produces 3 offspring

Beak Type	Round 1		Round 2		Round 3		Round 4		Round 5		Round 6		Round 7	
	Pop. Size	% Frequency	Pop. Size	% Frequency	Pop. Size	% Frequency	Pop. Size	% Frequency	Pop. Size	% Frequency	Pop. Size	% Frequency	Pop. Size	% Frequency
Tongs														
Forks														
Knives														
Tweezers														
Total		100%		100%		100%		100%		100%		100%		100%

Analysis

1. Plot 4 line graphs representing the success of each beak type throughout the 7 rounds. Plot the rounds on the x-axis and the % frequencies on the y-axis. Use a different color for each beak type.

2. Was there one beak phenotype that was more successful than another? Why was this one so successful?

3. Did the frequency of the different beak types change when the food supply changed? Relate this to what you learned about the finches on Daphne Major.

4. Competition and variation are two factors that play key roles in natural selection. Describe how these two factors resulted in natural selection in the population of ground finches on Daphne Major during drought years

5. How was this simulation different from what would have happened in nature? How is it the same?