



Bird Beak Island Lab

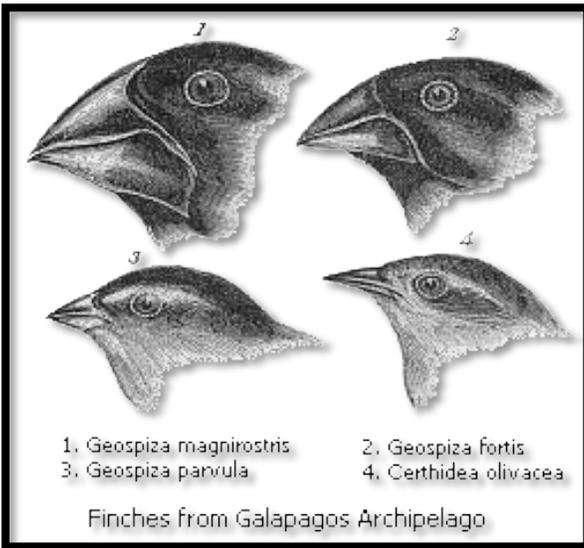
Making Observations in the Galapagos



Name: _____ Date: _____ Block: _____

Background Information:

Charles Darwin observed in his journal that finches living on different Galapagos Islands had different beaks. He also observed that the environment on each of four islands was quite different from the environment on the other three islands; in particular, the type of food available to finches was different on each island. He developed a hypothesis that the finches had all been the same at one time, (probably blown over from the coast of South America), with some variation in their beaks which made some beak types more adapted to the food on each island and so the birds with those beaks survived and reproduced and others did not on that particular islands with its particular type of food.



Below are examples of four different types of beaks found in finches living on the four different islands.

Island #1 –The first island on our journey has a tropical climate and an abundance of larger fruits.

Island #2 –The second island is a temperate and has many trees that grow medium-sized hard nuts. Any bird that’s going to have a meal must have a hearty beak to crack them.

Island #3- The third island has a temperate climate and many berry bushes. The fruits that grow here are small, but abundant.

Island #4- The final island on our journey has a very dry climate and little vegetation (just some low growing shrubs). The birds that live on this island must subsist on a diet of worms, which are snatched straight out of the dirt.

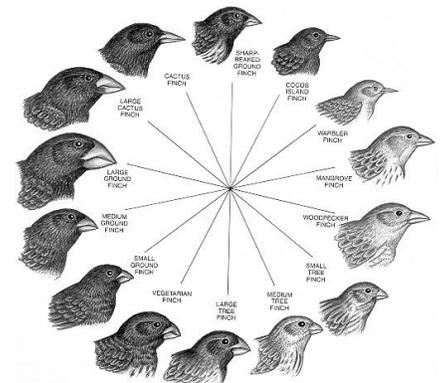
Materials:

Set of Finch Beaks: Salad tongs, tongs, tweezers, probe

Island Food Source: large fruit, nuts, small fruit, worms

Lab Procedure:

1. You will work with a partner and visit each of the 4 Galapagos Islands. You will answer the lab questions **independently**.
2. In your explorer knapsack (beakers), you will have a set of four bird beaks that are found in the Galapagos Finches. It is up to you to figure out which of the four beaks is best suited for the food that is available on each island.
3. Determine the beak of best fit by using each of the beak types in an attempt to retrieve the food on the island. **But be careful! Each beak can only be used once**, so while a beak that gathers and breaks nuts might not be able to dig out a worm, it may not be the beak that is best suited for the task.



Put a check mark in the box of the beak type that best corresponds to each island's food source.

	Salad Tongs	Tongs	Tweezers	Probe
Island #1				
Island #2				
Island #3				
Island #4				

Discussion:

Birds' beaks are the tools they have to use to gather food. The best adapted (fittest) to the available food have the best chance of surviving (not starving to death) and of having offspring. The different variations in these beak forms are each an experiment in natural selection. Only the fittest variant for the beaks will survive in this struggle for life. In this way, each beak is *selected* by nature.

These birds must have been separated geographically from each other for a long time. The place where they each lived must have different types of food, and since no two living beings are exactly alike, the ones with better beaks for the available food would have done better and had more descendants with this inherited beak type. In these descendants there would have been a selection at each generation towards the better beaks in the population.

Over time this selection would lead towards a better specific inherited beak type. This is how "survival of the fittest" or natural selection operates-through the interaction of the environment and genetic heredity.

Reflection Questions: ANSWER QUESTIONS IN COMPLETE SENTENCES & INDEPENDENTLY.

1. What role did the process of natural selection play in the observation of the various beak types of the Galapagos? _____

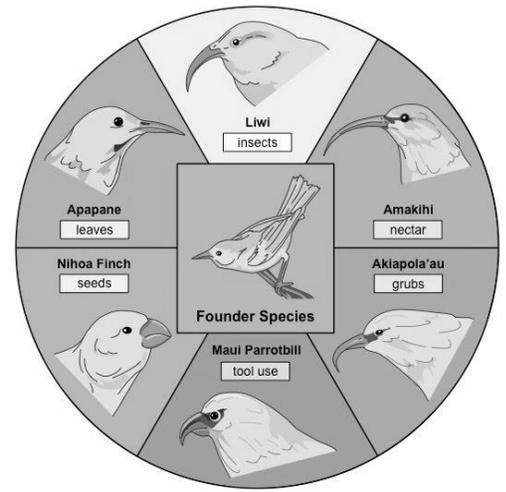
2. All of the finches on the Island are descended from the same type of Finch, but are now different species with different appearances. The finches were geographically separated (on different islands) and adaptations that were better suited to the available food source were selected for.

I want you to take the example and apply it to the discussion we were having in class recently about human skin color. If all modern humans originated in Africa (circa 200,000 yrs), why do humans now have so many variations in skin color? *Compare skin color variation to variations in Finch beaks.* **Feel free to use another paper to answer this question.** _____

Furthering the Research:

In 1834 Charles Darwin studied birds on the Galapagos Islands. He observed that even though all the birds he saw were finches, the various species had different shaped beaks. He proposed that the finches all descended from a common ancestor, and the beak shapes changed as the birds adapted to each different foods. It was a great theory, but at the time he had no way to prove it.

More than 100 years later, a couple from Princeton University set out to prove Darwin's hypothesis. They studied medium ground finches on Daphne Major, a tiny island in the Galapagos. They were able to measure the beak depth of the 1,200 finches that live on the island. The finches on this volcanic island eat seeds cracking them open with their beaks. They found that finches beak size was correlated with the size of the seed they ate (large beaked finches ate large seeds, and small beaked finches ate small seeds).



Daphane Major typically receives 130mm rainfall per year. Then, in 1977 there was a drought and the island only received 24mm of rain. Because of the little rain, there were fewer seeds growing, and 84% of the birds died of starvation.

Predict: Which type of birds do you think survived the drought—finches with big beaks or finches with small beaks?

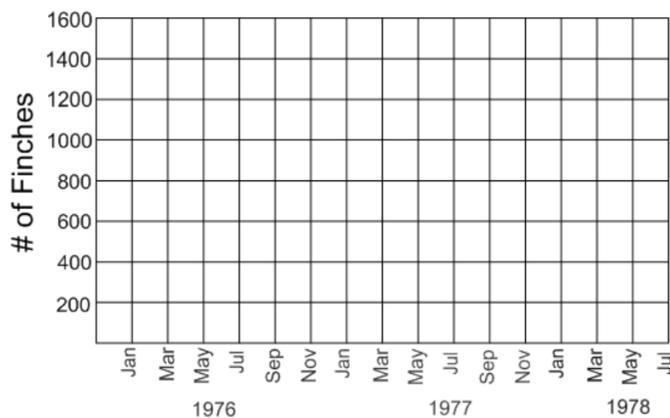
WHY? _____

Graphing Directions:

1. You will be completing 3 line graphs on the following page (number of finches, number of seeds, and seed size). The graphs show data before, during and after the drought.
2. After plotting you points, connect the dots.
3. Answer the analysis questions independently, based on the graphs.

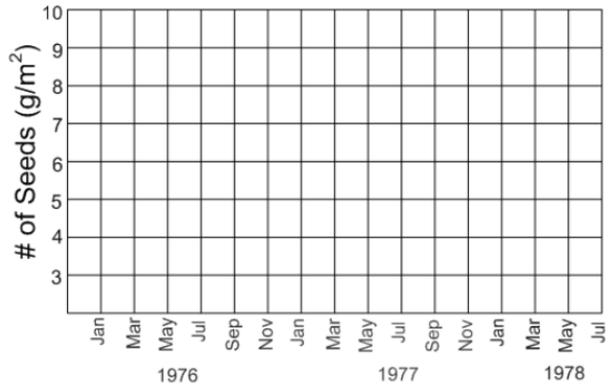
Graph #1

Year	# Finches
Jan 1976	1150
April 1976	1400
June 1976	1200
Dec 1976	850
March 1977	600
June 1977	400
Dec 1977	200
June 1978	380



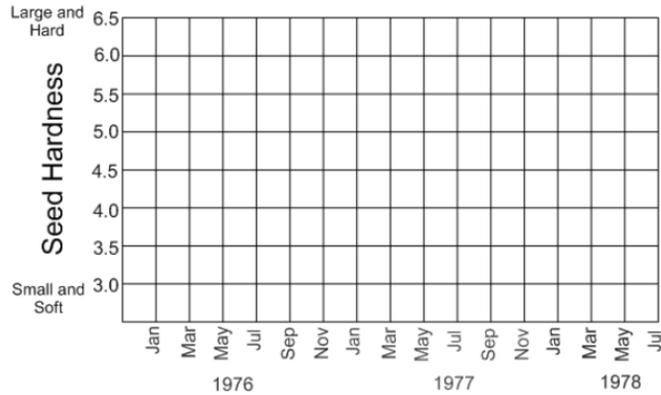
Graph #2

Year	# Seeds
Jan 1976	7.5
April 1976	8
June 1976	10
Dec 1976	7.9
March 1977	7.8
June 1977	6
Dec 1977	3
June 1978	3.8



Graph #3

Year	Hardness
Jan 1976	4.7
April 1976	4.2
June 1976	3.8
Dec 1976	5.5
March 1977	6.2
June 1977	6
Dec 1977	5.9
June 1978	5.7



Analysis Questions:

1. What is the relationship between the number of seeds available and the number of finches? (Graphs 1 & 2) _____

2. Which type of seeds survived after the drought? (Graph #3) _____

3. Based on the seeds available after the drought, which type of bird do you think survived the drought? Explain your reasoning. _____

4. In 1983, there was an abundance of rain-1359mm! Predict what the bird population looked like in 1984. What types of beaks were most common, explain. _____

5. Explain the following statement: "Selection occurs within generations; evolution occurs between generations." _____

