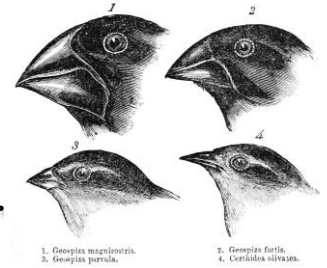


Lab Activity: Natural Selection and Bird Beaks



Background

During his visit to the Galápagos Islands, Charles Darwin recorded many observations in his journal about the different finches (birds) living on four different islands.

1. He noticed that the finches were all similar in many ways, except that the **shape** of their **beaks varied**.
2. He also observed that the environment on one island was quite different from the environment on the other island.

Darwin developed a hypothesis. He proposed:

- At one time, the finches had all been the same species, having all originally blown over from the coast of South America to the different islands.
- Within the island populations of finches, variation had been present. (*in what way? for which trait?*)
- The process of natural selection resulted in a change in the different populations over time. (*what changed?*)

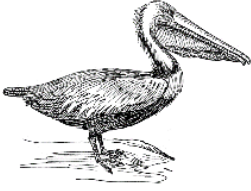


His careful observations supported the **theory of evolution** by **natural selection** developed by both Darwin and Alfred Wallace. The process of natural selection — sometimes referred to as “survival of the fittest” — predicts that organisms **best suited** to their environment will **survive and reproduce**, thereby passing on their traits (through their genes) to the next generation.


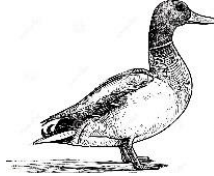
Materials

- 6 “islands”
- 6 “food items” (see table below)
- 5 “stomachs” (petri dishes)
- 5 “beak shapes” (see tables on the back of the page)

Food type	Represented by...
Clams	Pennies
Beetles	Marbles
Slugs	Beans
Aphids	Rice
Stick insects	Toothpicks
Dragonflies	Cotton swabs



Bird	Beak shape
Pelican 	Test tube holder
Finch 	Forceps
Avocet 	Chopsticks

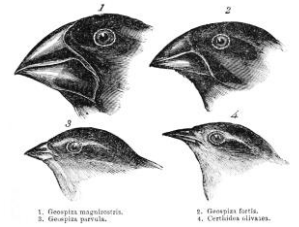
Bird	Beak shape
Spoonbill 	Spoon
Duck 	Clothespin

Procedure

- Each person in the group must choose **one beak**. After your choice, beaks may not be traded! Remember, you can't argue with DNA. You're stuck with the beak you were born with, so make the most of it!
- Each round will last 20 seconds. Once the timer starts, start "preying" upon the food available using your "beak" to pick up a piece **ONE AT A TIME. NO HANDS and NO SCOOPING (unless you're a spoonbill)!** You will "swallow" your food by placing it in the petri dish.
 - ▶ **You may not fling your food!** It must be picked up and dropped in the dish. Food that is dropped outside the dish is NOT considered eaten.
- At the end of the round, count how many pieces of food your bird collected and record it in the **data table glued to your "island"**.
- Repeat steps 2-3 for each bird.
- Once all birds have fed, "fly" to the next island and repeat the process in this new environment.
- Once all groups have completed the experiment, we will compile the class data and you will record this in the **CLASS** data table on your handout.
- Using the **CLASS** data, make a "clumped" **bar graph**. When creating your graph, check off the following:
 - your title (include the dependent and independent variables for a complete title)
 - axes labels and either units (y-axis) or category labels (x-axis)
 - axis increments (be consistent)
 - a key
 - use color
 - produce clear and neat work (use a ruler, erase mistakes, etc.)

Purpose:

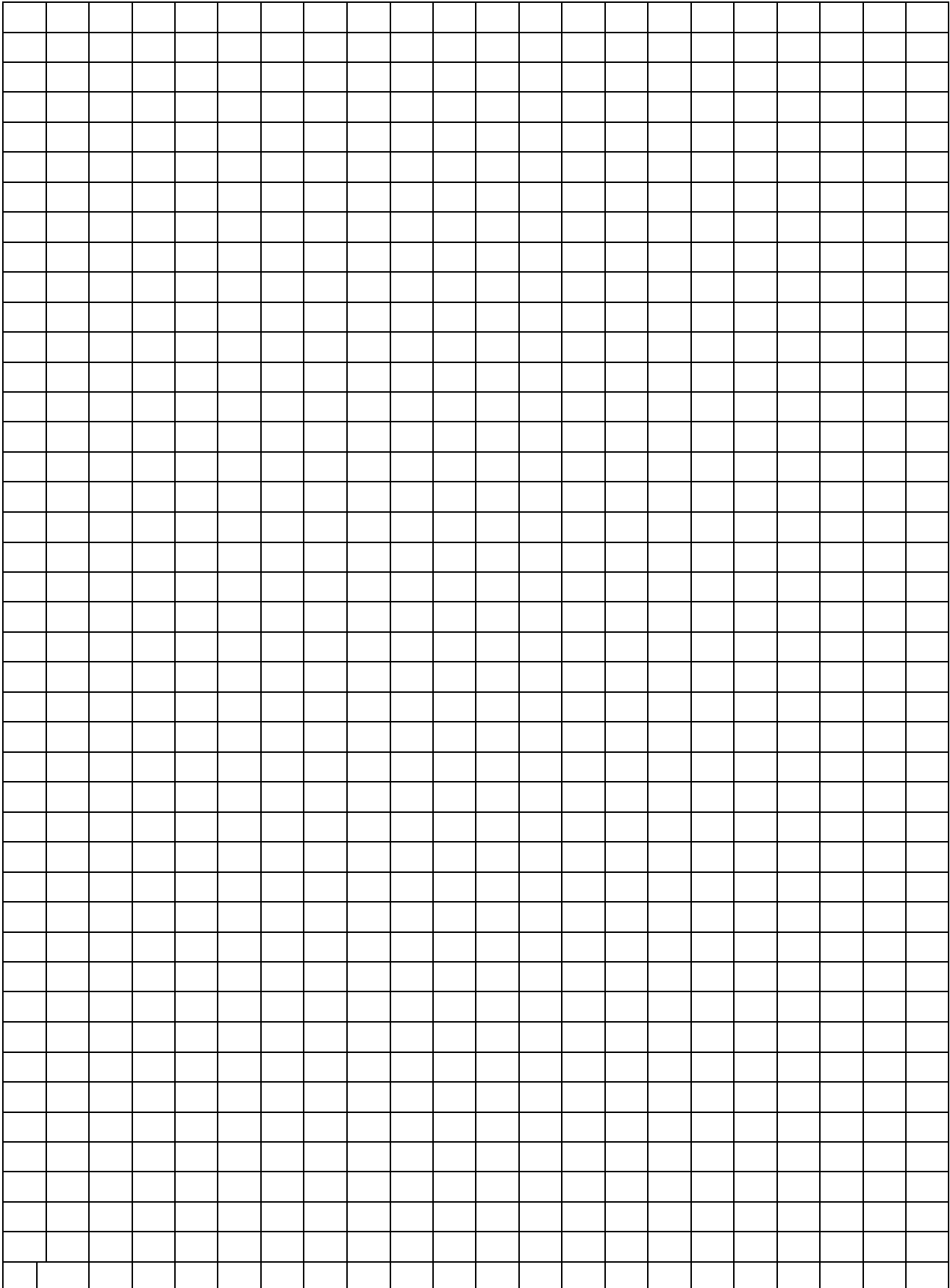
*Hint: What are we demonstrating in this lab? Write complete sentences!



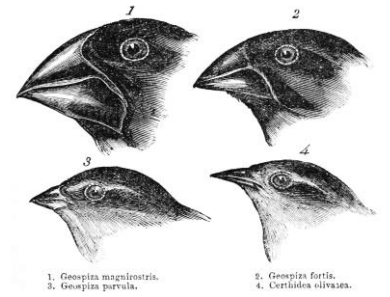
Data

Average amount of food eaten by each bird (This is what you will graph.)

Beak Shape	# of Clams (pennies)	# of Aphids (rice)	# of Slugs (beans)	# of Beetles (marbles)	# of Stick insects (toothpicks)	# of Dragonflies (cotton swabs)
Pelican (Test tube holder)						
Finch (Forceps)						
Avocet (Chopsticks)						
Spoonbill (Spoon)						
Duck (Clothespin)						



Analysis Questions



1. Which bird species (singular or plural) seemed best adapted to eating...

- a. Flat clam pennies _____
- b. Fast marble beetles _____
- c. Toothpick stick bugs _____
- d. Small aphids _____
- e. Bean slugs _____
- f. Dragonfly cotton swabs _____

2. Which bird species (singular or plural) seemed least adapted to eating...

- a. Flat clam pennies _____
- b. Fast marble beetles _____
- c. Toothpick stick bugs _____
- d. Small aphids _____
- e. Bean slugs _____
- f. Dragonfly cotton swabs _____

3. **Define** the term natural selection (use your notes!). Include the 4 principles of natural selection.

4. **Explain** how the lab demonstrates each of the following principles of natural selection.

- a. Genetic variation in population

- b. Competition for survival

5. Think of your lab group of birds. Suppose that any bird species that ate **fewer** than the average number of food items (in our class data) is not healthy enough to reproduce. What would eventually happen to that bird species in that community over time? What about the birds that caught **more** than the class average?

6. Suppose a drought caused the local extinction of all insects, slugs, and clams. This allowed the drought-resistant "deep stick bug" to multiply in their absence. The deep stick bug lives **12 centimetres** underground. Using your knowledge of the different beak shapes in your community, and understanding of the steps of natural selection, **explain** how the change in environment would affect the populations of bird species.

7. List and **briefly explain** three other characteristics (other than beak shape) that could help a bird survive if this were a "natural" island environment.

1.

2.

3.