Name Class Date

**Guided Inquiry • Skills Lab**

Chapter 17 Lab  **Competing for Resources**

**Problem**

How can competition lead to speciation?

**Introduction**

At first Darwin did not pay much attention to the small brown birds he observed in the Galápagos Islands. Later, he realized that, despite their differences, all these birds were species of finches. Darwin hypothesized that the variation in beak shape and size among the species was related to the food they ate.

Because Darwin’s time on the islands was limited, he was unable to gather the evidence to support his hypothesis. That task was left to Rosemary and Peter Grant, who spent years on the islands. The Grants were able to observe that finches tended to mate with finches that had similar beaks. This behavior was one of the factors leading to speciation among the Galápagos finches. Another factor was the competition for seeds.

In this lab, you will model variation in the size and shape of finch beaks. You will determine which “beaks” are better adapted to each type of food. You will also observe how competition and the abundance or scarcity of food affects survival.

**Skills Focus**

Use Models, Predict, Apply Concepts

**Materials**

• assorted tools • small paper plates

• seeds, large and small • timer or clock with second hand

• large paper plates



**Safety**

Do not direct the sharp points of any tools toward yourself or others. Do not eat any of the seeds used in this lab.

**Pre-Lab Questions**

**1. Use Models** In this lab, what do the different types of tools represent?

**2. Predict** Which tools do you think will work best for picking up small seeds? Which will work best for picking up large seeds?

**Procedure**

**Round 1: Feeding Without Competition**

In this round, you will model feeding when there is abundant food and no competition.

**1.** Choose a tool and obtain a large plate of small seeds and an empty small plate.

**2.** Each student in your group should practice using the tool to pick up seeds and transfer them to the empty plate. Pick up only one seed at a time.

**3.** Obtain a large plate of large seeds. Repeat Step 2. Then, decide which type of seed you can pick up more easily with your tool. Return the other plate of seeds to your teacher. Record the type of tool and the type of seeds you will use in Steps 4 and 5.

Type of Tool:

Type of Seed:

**4.** In this step, your goal will be to pick up as many seeds as possible in 15 seconds. Each student will do three 15-second trials. Assign each person in your group a letter code—A, B, C, and so on—to represent the order in which people will do the trials. Your teacher will tell you when to start and end each trial. Use Data Table 1 to record the number of seeds picked up and placed in the small plate for each trial. Don’t count seeds that do not land in the plate.

**5.** After each member of your group has done three trials, calculate the average number of seeds that were picked up in 15 seconds.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Table 1: Seeds Picked Up in Round 1** | | | | | |
| **Trial** | **Number of Seeds** | **Trial** | **Number of Seeds** | **Trial** | **Number of Seeds** |
| A1 |  | C1 |  | E1 |  |
| A2 |  | C2 |  | E2 |  |
| A3 |  | C3 |  | E3 |  |
| B1 |  | D1 |  | F1 |  |
| B2 |  | D2 |  | F2 |  |
| B3 |  | D3 |  | F3 |  |
| Average Number of Seeds Picked Up: | | | | | |

**Round 2: Feeding With Competition**

In this round, you will model feeding when there is abundant food and competition. Use the same tool and type of seeds you used in Round 1. Your group will be paired with another group that used the same type of seeds.

**6.** Each student will do three 15-second trials, as in Round 1. But this time each trial will involve competition with a member of the other group. The two competitors will pick up seeds from the same large plate at the same time. Record your group’s results in Data Table 2.

**7.** After each member of your group has done three trials, calculate the average number of seeds that were picked up in 15 seconds.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Table 2: Seeds Picked Up in Round 2** | | | | | |
| **Trial** | **Number of Seeds** | **Trial** | **Number of Seeds** | **Trial** | **Number of Seeds** |
| A1 |  | C1 |  | E1 |  |
| A2 |  | C2 |  | E2 |  |
| A3 |  | C3 |  | E3 |  |
| B1 |  | D1 |  | F1 |  |
| B2 |  | D2 |  | F2 |  |
| B3 |  | D3 |  | F3 |  |
| Average Number of Seeds Picked Up: | | | | | |

**Round 3: Feeding When Food Is Scarce**

In this round, you will repeat the procedure from Round 2. This time, however, there will be fewer seeds on the large plate to represent a time when food is scarce, which is a true test of your tool’s adaptability. You will work with the same group you worked with in Round 2.

**8.** Count out 30 seeds and put them on the large plate. Return the rest of the seeds to your teacher.

**9.** Repeat Steps 6 and 7.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Data Table 3: Seeds Picked Up in Round 3** | | | | | |
| **Trial** | **Number of Seeds** | **Trial** | **Number of Seeds** | **Trial** | **Number of Seeds** |
| A1 |  | C1 |  | E1 |  |
| A2 |  | C2 |  | E2 |  |
| A3 |  | C3 |  | E3 |  |
| B1 |  | D1 |  | F1 |  |
| B2 |  | D2 |  | F2 |  |
| B3 |  | D3 |  | F3 |  |
| Average Number of Seeds Picked Up: | | | | | |

**Analyze and Conclude**

**1. Compare and Contrast** Look at all the tools that were used to pick up seeds. Identify at least one general difference between the tools that were better at picking up small seeds and those that were better at picking up large seeds.

**2. Analyze Data** In nature, a seed-eating bird would need to collect a minimum number of seeds to survive. For your model, assume that the minimum for survival is 14 seeds in 15 seconds. How many individuals in your group would have survived Round 1? How did the procedure in Round 1 help their survival?

**3. Relate Cause and Effect** When food was abundant, how did competition affect the survival rate? Why?

**4. Relate Cause and Effect** When food was scarce, how did competition affect the survival rate? Why?

**5. Use Analogies** How might scarcity of food affect the size of a finch population?

**6. Predict** Within a gene pool, there will be alleles that result in beaks that are well adapted to the available food and beaks that are not well adapted. Use your results with the tools to predict which birds survive and can affect the alleles in the gene pool of the bird population.

**7. Apply Concepts** How might changes in the gene pool affect the ability of birds with beaks that are not well adapted to find mates?

**8. Use Analogies** How might scarcity of food affect the size of a finch population?

9. **Predict** Within a gene pool, there will be alleles that result in beaks that are well adapted to the available food and beaks that are not well adapted. Use your results with the tools to predict which birds survive and can affect the alleles in the gene pool of the bird population.

10. **Apply Concepts** How might changes in the gene pool affect the ability of birds with beaks that are not well adapted to find mates?