Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lab: Beaks of Finches**

**INTRODUCTION**:

Environmental conditions act as a selecting agent because they select the organisms with the most beneficial traits to become the parents of the next generation. Within a species, individuals with variations that make them better adapted to their environment will survive and reproduce in greater numbers than those without such adaptations.

Observations have shown that the offspring of better-adapted individuals inherit many of their parents’ favorable variations. Finches are small birds found in many locations throughout the world. Charles Darwin used the numerous finch species found on the Galapagos Islands as evidence of natural selection. The great variety of beak adaptations present on the Galapagos Islands is thought to be due to the isolation of bird populations on the islands with different kinds and amounts of food. Seed-eating finches exhibit a great number of differences in beak shape and sizes. During ongoing competition for resources, some finches are successful and become more numerous, while less successful decrease in number. In this laboratory activity, you will work with different tools that will serve to model finch “beaks”. The seed provided represent finch food on a particular island. You will compete with other “finch” species to see which “beak” is best adapted for obtaining a specific food.

**OBJECTIVES**:

In this lab you will:

* state how structural differences may affect the survival rate of species
* simulate competition for resources among different species of organisms
* see the role of environment as a selecting agent

**MATERIALS:**

* small dish or cup
* large dish
* variety of tools to serve as beaks
* Spoons-for spoonbill birds (1per bird)
* Popsicle Sticks - for stick birds (1 pair per bird)
* Scissors - for scissor birds (1 pair per bird)
* Tweezers - for tweezer bill birds (1 per bird)
* Clothespins - clothespin birds (1 per bird)
* large seeds – lima beans
* small seeds – lentil beans

**PRE Lab Questions**

1. Examine all the different tools (“beaks”) and seeds provided. Predict which “beak” will be the most successful at picking up the small seeds. Give a reason for your choice.
2. Predict which “beak” will be least successful at picking up small seeds. Give a reason for your choice.

**Procedure**:

1. From this point on you and your partner will model a finch feeding. The tool you were assigned will be your “beak”. Describe what characteristics it has that will make it good for picking up small seeds. Also draw an outline of your assigned beak.

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1. Both you and your partner should practice transferring the small seeds quickly from the large dish to the small dish before the competition begins.
   1. The **large dish** of small seeds represents the island environment where you live and feed.
   2. The **small dish** **or Cup** represents a finch stomach.
   3. ***You may only move one seed at a time. You will receive credit only for a seed that falls into and stays in the small dish.***

**Round One: No Competition, Original Island**

1. When given the signal to start, one member of your team should use the “beak” to pick up small seeds one at a time from the large dish and place them in the small dish. Repeat this for a total of four trials, two trials for each partner. A timekeeper will tell you when to start and stop each trial. Record your results in the data table below.

|  |  |  |
| --- | --- | --- |
|  |  | **Seeds Collected** |
| **Partner #1** | Trial #1 |  |
| Trial #2 |  |
| **Partner #2** | Trial #3 |  |
| Trial #4 |  |
|  | Average |  |

**Round One: Feeding with no Competition**

1. Calculate the average number of seeds obtained during the four trials. Round off to the nearest seed. **In order to “survive”, your species needs to collect an average of 13 seeds per trial**. If you achieve that goal, you remain healthy and continue to live on the original island and eat small seeds.

**If your team averaged fewer than 13 small seeds per trial, you and your partner will “migrate” to a new island with a different food supply to avoid starvation**. Ask you teacher to give you a new large dish that contains large seeds. This will be your island for Round Two. Perhaps your “beak” will be better adapted for feeding success in a new environment.

**Round Two: Competition**

1. In this round, instead of feeding alone, you will be competing for food with finches that have different kinds of “beaks’. To simulate this competition, your team will feed from the same dish as one other team. If you are successful during Round One, you will be feeding with finches on small seeds. If you were not successful, you will be competing for large seeds.

**Round Two: Feeding with Competition**

**(Place a check next to the island you are feeding in)**

|  |  |
| --- | --- |
| * Original Island (small seeds) | * New Island (large seeds) |

|  |  |  |
| --- | --- | --- |
|  |  | **Seeds Collected** |
| **Partner #1** | Trial #1 |  |
| Trial #2 |  |
| **Partner #2** | Trial #3 |  |
| Trial #4 |  |
|  | Average |  |

1. Calculate the average number of seeds obtained during the four trials. Round off to the nearest seed. If your team collected an average of 13 seeds or more per trial, you go on to Round Three.
   1. *If your team collected fewer than 13 seeds per trial, you and your partner are now eliminated.*

**Round Three: Increased Competition**

1. During this round, you will be competing with all of the other finch species left alive on your island. In other words, all the finch teams that were successful at feeding on small seeds will compete at one dish containing small seeds. At the same time, all finches successful at feeding on large seeds during Round Two will compete at one dish of large seeds.
2. In the “Round Three: Feeding with Increased Competition” data table, indicate whether you are feeding on small or large seeds. Complete the four trials as before and record the results of each trial and your average.

**Round Two: Feeding with Increased Competition**

**(Place a check next to the island you are feeding in)**

|  |  |
| --- | --- |
| * Original Island (small seeds) | * New Island (large seeds) |

|  |  |  |
| --- | --- | --- |
|  |  | **Seeds Collected** |
| **Partner #1** | Trial #1 |  |
| Trial #2 |  |
| **Partner #2** | Trial #3 |  |
| Trial #4 |  |
|  | Average |  |

**Analysis Questions**: Answer all of the following questions on a separate sheet of paper using complete sentences.

1. What characteristics of your “beak” interfered with feeding success on the original island?
2. Name three traits other than beak characteristics that could contribute to the ability of a finch to compete successfully.
3. Why did some “beak” types survive on the new island (with large seeds) when they could not survive on the original island?
4. Explain how this activity simulates each of the following concepts as they are involved in natural selection.
   1. Variation –
   2. Competition –
   3. Natural Selection –
   4. Adaptation –
   5. Environment –

Complete the Class Results data table on the last page of the lab before answering the remaining questions.

|  |  |  |
| --- | --- | --- |
| **Class Results Data Table** | | |
| **Beaks That Were** | **Number of beak types** | **Characteristic of beaks**  **(Size & Shape)** |
| Present at the beginning of the activity |  |  |
| Successful at feeding in Round One on the original island – fed on small seeds, did not need to migrate |  |  |
| Not successful at feeding in Round One on the original island – fed on small seeds, had to migrate to the new island |  |  |
| Successful at feeding in Round Two on the original island – fed on small seeds |  |  |
| Successful at feeding in Round Two on the new island – fed on large seeds |  |  |
| Not successful at feeding in Round Two on either island – species dies out |  |  |
| Successful at feeding in Round Three on the original island – fed on small seeds |  |  |
| Successful at feeding in Round Three on the new island – fed on large seeds |  |  |
| Not successful at feeding in Round Three on either island – species eliminated |  |  |

1. Did those who were successful in Round One survive equally well when others were competing for food at the same dish during Round Two? Explain your answer.
2. At the end of Round Three, were the types of “beaks” that were successful on the new island the same as the types of beaks that were successful on the original island? Explain your answer.