

## **Modeling Coevolution of Birds & Flowers**

*How do flowering plants & their pollinators co-evolve?*

### **Introduction**

Flowering plants and the organisms that pollinate them illustrate many examples of co-evolving species. In this investigation, you will model how these plants & birds evolve in response to one another.

**Pre-Lab** – Answer the following in complete sentences.

1. Explain the relationship between flowers and their pollinators. Is it mutualistic, parasitic, or commensalistic? Why?

2. What is co-evolution?

3. If birds need to retrieve nutrients from flowers, and the flowers are very thin & tall, what would you predict about the bird beaks?

4. If flowers need to be pollinated, and the bird beaks are large, what would you predict about the flowers?

5. **Prediction** In this lab, you will either use a spoon, forceps, or fingers to obtain seeds from a short, open flower. Which tool do you think will be best **adapted** to the task?

6. **Prediction** You will also use either a spoon, forceps, or fingers to obtain seeds from a tall, thin flower. Which tool will be best **adapted** to this task?

7. What is an adaptation?

### **Materials (per group)**

Forceps (long, pointy beaks)

3 Film canisters (3 tall, thin flowers)

Spoon (short, round beaks)

3 weigh boats (3 large flowers)

Dried peas (nectar)

3 bowls (pollinated flower)

### **Procedure**

1. Obtain a film canister of peas for each “bird” in the group.

2. First, dump the canister of peas into the weigh boat. **DO NOT SPILL THE PEAS.**

#### *Part I: Weigh Boat → Bowl*

3. When you are told to begin, you will transfer as many peas as possible from the weigh boat to the bowl. However, you **cannot move the weigh boat** at all, and **any peas you drop** will be counted against your score.

4. Transfer peas for 30 seconds.

5. When time is up, count the peas you transferred and subtract any that dropped. As you count, **transfer peas back into the film canister.**

6. Write your total under the “nectar” column in data table 1, and fill out the information for other members of your group. This represents the volume of nectar the bird obtained.

7. Calculate the number of flowers that were pollinated: Divide nectar by 5 and fill in the data table.

8. Calculate class averages.

*Part II: Film Canister → Bowl*

9. When you are told to begin, you will transfer as many peas as possible from the film canister to the bowl. However, you **cannot move the film canister** at all, and **any peas you drop** will be counted against your score.
10. Transfer peas for 30 seconds.
11. When time is up, count the peas you transferred and subtract any that dropped. Write your total under the “nectar” column in data table 2, and fill out information for other group members and class averages.
12. Pick up any peas off the floor and answer all questions in complete sentences.

**Data**

**Table 1: Weigh Boats as Short, Open Flowers**

BEAK TYPE	GROUP DATA		CLASS DATA - AVERAGES	
	Nectar (ml)	Pollinations (flowers)	Nectar (ml)	Pollinations (flowers)
Forceps				
Spoon				
Fingers				

**Table 2: Film Canisters as Tall, Thin Flowers**

BEAK TYPE	GROUP DATA		CLASS DATA - AVERAGES	
	Nectar (ml)	Pollinations (flowers)	Nectar (ml)	Pollinations (flowers)
Forceps				
Spoon				
Fingers				

**Analysis & Conclusion** – Answer the following in complete sentences. Use the **class averages**.

1. Which bird species obtained the most nectar from the weigh boats?
  
  
  
  
  
  
  
  
  
  
2. Which bird species obtained the most nectar from the film canisters?
  
  
  
  
  
  
  
  
  
  
3. For each bird, what type of flower was best for obtaining nectar?
  
  
  
  
  
  
  
  
  
  
4. What are the advantages of a plant with short, open flowers?
  
  
  
  
  
  
  
  
  
  
5. What are the advantages of a bird with a long, narrow beak?
  
  
  
  
  
  
  
  
  
  
6. Which birds are best suited for pollinating tall, thin flowers?
  
  
  
  
  
  
  
  
  
  
7. Describe two ways that you could improve this lab to obtain more valid data.