

World population and beak size

[Science](#), [Biology](#)



Before you undertake this assignment, please read carefully the handout that gives an overview of EvolutionLab. This will make it much easier for you to understand the assignment and complete it correctly. 1. There are many ecological and biological factors that affect evolution. In EvolutionLab, two populations of finches are tracked over the course of 300 years on two different islands to see how changing the traits of the birds and their environment affect their long term viability as a sustainable population.

Let's begin by doing a " null experiment" where conditions are identical on the two islands. Set the " revisit in" drop-down menu to 300 years and then click the Run Experiment button. Click the Input Summary tab and note that in this experiment and note that all factors (both biological and ecological) were identical. Then click the Beak Size tab. Which of the following is true? (Keep in mind that the term " rate" refers to how fast, not how much. Also, we are looking for major differences, not minor ones due to random chance.)

a. When all factors are equal, the beak size of both species increased at a different rate over 300 years. b. When all factors are equal, the beak size of both species increased at roughly the same rate over 300 years.

2. Click the Population tab. Which of the following is true?

a. The finch populations of both islands increased at roughly the same rate over 300 years. b. The finch populations of both islands increased at different rates over 300 years

3. Based on the results for beak size and population numbers, what can you conclude about evolution when all factors are equal?

a. While the populations both increased in size, mean beak size did not. Therefore, when all factors are equal, evolution does not occur. b. The mean beak size of both populations increased. Therefore, under these circumstances, evolution did occur in both species. c. Neither (a) nor (b).

4. Click the New Expt button and then click the Change Inputs button. Increase the initial beak size of the Darwin Island finches to 30 mm and decrease the initial beak size of the Wallace Island finches to 10 mm. Click on the Precipitation button and look at the distribution of hard, medium, and soft seeds. Note that most of the seeds are hard. Click the Done button and then click the Run Experiment button. Which statements below are true?

a. Beak size of Darwin Island finches varied considerably over time. b. Beak size of Darwin Island finches showed little variation over time. c. Beak size of Wallace Island finches showed little variation over time. d. Beak size of Wallace Island finches varied considerably over time. e. Both (a) and (c).

f. Both (b) and (d).

5. After clicking the Beak Size tab, indicate which of the below statements most accurately describes what occurred? (Note: birds with bigger beaks are better able to utilize hard seeds and therefore have higher survival rates.)

a. On Wallace Island, individuals with large beaks were better able to utilize the more abundant hard seeds and survive at higher rates. This resulted in an evolutionary increase in mean beak size on Wallace Island over time. b. On Darwin Island, most of the finches already had large beaks and were adapted to the more abundant hard seeds. This is the reason why mean beak size remained relatively constant over time. c. Both (a) and (b).

d. None of the above.

6. After clicking the Population tab, which of the below statements most accurately describes what occurred? (Note: birds with bigger beaks are better able to utilize hard seeds and higher survival rates.)

a. As mean beak size increased on Wallace Island, individuals with large beaks were better able to utilize the more abundant hard seeds and survived at higher rates. This resulted in a slow increase in population numbers over time. b. Because mean beak size of finches on Darwin Island were large, the birds were well-adapted to the abundance of hard seeds. Therefore the population increased quickly and remained at the carrying capacity of the island. c. Both (a) and (b).

d. None of the above.

7. Clutch size refers to the average number of eggs laid by female finches. Click the New Expt button and then click the Change Inputs button. Click the Clutch Size button and decrease the clutch size of the Darwin Island finches to 6. Click the Done button and the Run Experiment button. Click the Beak Size tab and then the Population tab. Why do you think the Darwin Island finches went extinct whereas the population on Wallace Island survived?

a. On Darwin Island, they didn't go extinct, it just looks like they did. b. On Darwin Island, the clutch size was too small to sustain the population for more than a few generations. Clutch size was sufficient on Wallace Island for the population to grow and adapt to the hard seeds available. c. On Darwin Island, the initial population size was too small and so the population went extinct. On Wallace Island the initial population was large enough to allow

the population to survive and adapt to the hard seeds available. d. The differences between Darwin Island and Wallace Island are just due to random chance.

8. Let's repeat the experiment in question 7, but with large initial mean beak sizes. Click the Revise Expt button and then click the Change Inputs button. Click the Beak Size button and increase the initial beak size of both Darwin Island and Wallace Island to 20 mm. (Make sure the clutch sizes are still 6 for Darwin Island and 10 for Wallace Island.) Click the Done button and the Run Experiment button. Click the Beak Size tab and then the Population tab. Compare the results to what happened in the previous question. Why do you think the Darwin Island finches survived this time even though the clutch size was small?

a. The differences between Darwin Island and Wallace Island are just due to random chance. b. Although clutch size was smaller on Darwin Island, the initial beak size was large enough to allow the finches to utilize the hard seeds and survive. On both Darwin Island and Wallace Island the populations grew and adapted to the hard seeds available. c. Clutch size must have increased on Darwin Island.

9. Precipitation plays an important role in the evolution of these finches. Low levels of precipitation results in plants that produce hard seeds. High levels of precipitation favor plants that produce smaller softer seeds. Medium levels of rain produce medium seeds. Click the New Expt button and then click the Change Inputs button. Click the Precipitation button. Notice the percentage distribution of hard seeds, medium seeds, and soft seeds as precipitation is changed. Finches with small beaks are better at utilizing soft seeds as a food

source. Medium and hard seeds require larger beaks. Increase the annual precipitation on Darwin Island to 100.0 cm/year and Wallace Island to 10.0 cm/year. Now click on the Beak Size button and set the initial beak size on both islands to 20 mm. Click the Done button and Run Experiment button. Click the Beak Size tab and then the Population tab.