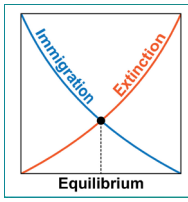


OVERVIEW

In this activity, you'll analyze data from published scientific studies to discover factors that influence the number of species found in a habitat. The concepts you'll explore are from a theory called **island biogeography**, which has helped guide efforts to protect wildlife. Principles of island biogeography apply to *any* isolated habitat, ranging from islands in the sea to "islands" of natural habitat on land surrounded by a "sea" of human roads, farms, or cities.

In the first part of this activity, you will work in groups to analyze data from a specific study. Then, you'll join new groups to share your knowledge with classmates who analyzed different studies. Just as scientists and community members work together to conserve species and habitats, you will collaborate with your group members to answer questions and understand new concepts.

PROCEDURE

PART 1: Analyze One Study

Your instructor will assign you to a group to analyze Figure A, B, C, or D. Each figure is from a study related to island biogeography. Work with your group to answer the following questions.

1. Which figure is your group analyzing (A, B, C, or D)?

2. What types of species were investigated in this study?

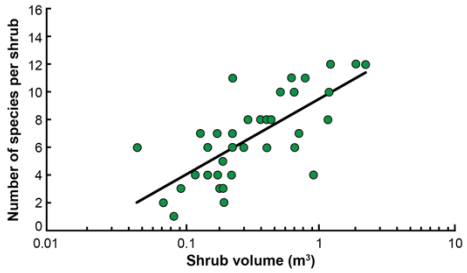
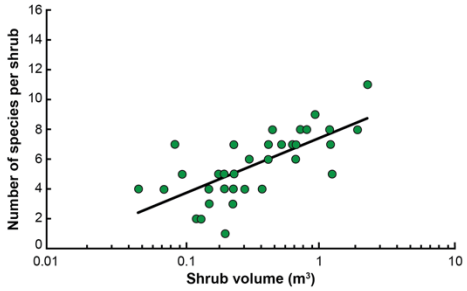
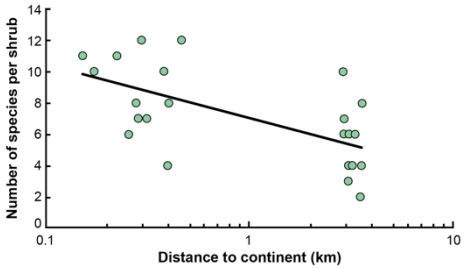
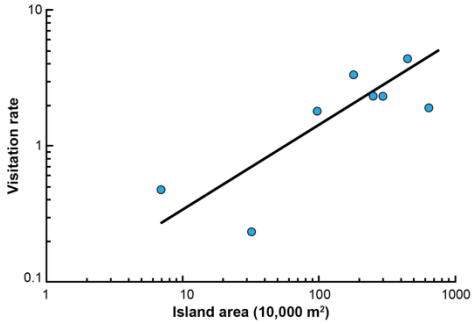
3. What were the "islands" (the habitats where the species live)? What was the "sea" (the surrounding habitat where the species are less likely to survive)?

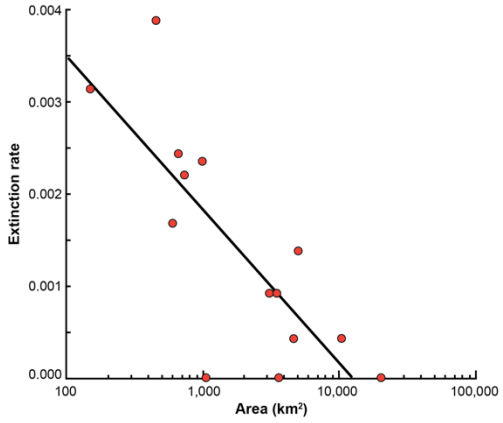
4. Summarize the main pattern or relationship your figure shows in one or two sentences.

PART 2: Put Together What You Learned

Your instructor will now assign you to a new group with members who analyzed different figures. Have each person in your group share what they learned about their figure and study in Part 1.

5. Fill out the following table based on the information that is shared.

Figure	Information
Figure A   	Types of species: What were the “islands” and “sea”? Main pattern/relationship:
Figure B  	Types of species: What were the “islands” and “sea”? Main pattern/relationship:
Figure C  	Types of species: What were the “islands” and “sea”? Main pattern/relationship:
Figure D	Types of species: What were the “islands” and “sea”?



Main pattern/relationship:

The theory of island biogeography was developed after scientists noticed certain relationships between the **number of species** on an island and the island's **area** (size) or **isolation** (distance from a main habitat, or "source," that more species can come from). These same relationships have been found for many types of islands in different places and for different groups of species (e.g., birds, insects, reptiles).

6. Based on the figures you discussed, how does the number of species on an island change with island area or isolation? Fill in the following table to describe these relationships.

	Island area	**Island isolation**
Number of species		

When scientists notice a relationship in nature, they often want to know the reason for that relationship. For example, the scientists who developed the theory of island biogeography wanted to know why the number of species on an island depends on area and isolation.

The scientists considered two processes that affect the number of species on an island: **immigration**, which affects the rate at which species enter and establish on the island, and local **extinction**, which affects the rate at which species die out and are no longer found on the island.

7. Consider how the rates of immigration and extinction would change with island area and isolation. Fill in the table below to describe these general relationships.
   - The relationships in the "Island area" column are shown by some of the figures above. You may want to revisit these figures with your group.
   - The relationships in the "Island isolation" column are *not* shown by the figures above. Predict these relationships based on what you know about these concepts.

	Island area	**Island isolation**
Immigration rate		
Extinction rate		

8. Think about the biological reasons for why these general relationships occur.

a. Why do you think island *area* affects immigration and extinction as you described?

b. Why do you think island *isolation* affects immigration and extinction as you described?

9. Next, predict how the number of species on an island would change if immigration or extinction rates change. Fill in the table to describe your predictions.

	Immigration rate	**Extinction rate**
Number of species		

10. Synthesize the concepts you've explored in the previous questions. Using the information you have learned about immigration and extinction rates, explain why the *number* of species on an island is affected by both island *area* and *isolation*. In other words, explain the reasons behind the relationships you described in Question 6.

EXTENSION: Habitat Fragmentation

You will now examine Figure E, which shows the results of an experiment related to island biogeography and **habitat fragmentation**: the process of habitats being broken into smaller, separated pieces called fragments.

1. Read the profile to learn about the study in Figure E.
   a. What types of species were investigated in this study?

   b. What were the "islands"? What was the "sea"?

2. Parts of this experiment examined the effects of both fragment area and isolation on species number.
   a. What was the effect of *area* on species number? Support your answer by comparing specific treatments in Figure E.

   b. What was the effect of *isolation* on species number? Support your answer by comparing specific treatments in Figure E.

   c. Imagine that isolation had *no* effect on species number. Sketch or describe what the bar graph in Figure E would look like in this case.

According to a hypothesis in island biogeography called the **rescue effect**, islands that are *less isolated* will have *lower* rates of extinction. This is because less isolated islands are more likely to receive immigrating organisms from other places. These organisms increase the number of individuals for their species on the island, making the island less likely to lose species overall.

3. Are the results in Figure E consistent with the rescue effect? Why or why not?

4. Describe a specific habitat that is fragmented by human development, maybe a habitat you have learned about or are personally familiar with. How might the results of this study, or island biogeography in general, apply to protecting species in this habitat?