
BOOM OR BUST

FOR THE TEACHER

Discipline

Biological Science

Theme

Systems and Interactions

Key Concept

Seabird reproductive success is strongly tied to the yearly variation in ocean productivity due to currents and upwelling.

Synopsis

Students play a game as seabirds hedging their bets and deciding whether or not to invest in reproductive activities and spend "time/energy points" under various breeding conditions.

Science Process Skills

predicting, inferring, relating

Vocabulary

breeding, currents, productivity, reproductive success, upwelling

MATERIALS

- teacher guide to boom and bust scenarios
- scratch paper for students

Optional

- slides or pictures of seabirds and ocean scenes depicting diverse productivity cycles

INTRODUCTION

All seabirds must return to land to breed, and most choose islands because of their protection from land-based predators. To feed their growing chicks, birds depend on a nearby supply of abundant fish or other food sources. If the ocean is unproductive due to variation in currents and upwelling patterns, birds may alter their behavior during the breeding period. Some will fly long distances to find food; others will change food sources. Still others will simply abandon their eggs or chicks and do the best they can to survive themselves.

"Boom or bust" species are seabirds that depend on food resources close to their breeding areas. On the Farallon Islands, these include Pelagic Cormorants, Pigeon Guillemots, and Tufted Puffins. These species cannot travel long distances for food. They begin each breeding season as if there will be enough food. If food is bountiful and birds are successful, it is a "boom" year. If food is scarce, birds will usually abandon the next generation before risking their own survival. They will then simply wait until next year to try again. This is a "bust" year. The birds do not need to produce eggs every year to keep the species going. They alter their behavior to adapt to unpredictable food supplies, even though some years are not successful in reproductive terms. Variations in currents and upwelling have been going on in the ocean for a long time but seabirds are generally long-lived and can afford to and usually do skip some breeding years.

INTO THE ACTIVITIES

Do a Partner Parade using some of the following questions:

1. What do you budget your time on during the day? How do you decide how much time to give each activity?
2. Do you have a daily, weekly or yearly money budget that you must stay within?
3. How much time and energy do you invest in your homework everyday?
4. Are there things you would like to do, but you can't find or afford the time to do them? What sort of activities do you often have to give up?
5. How do you decide when to give up something that is costing you too much time or energy?
6. What sort of activities have you seen birds or other animals participating in?
7. How do animals decide whether or when to do certain activities?
8. What are some signals in the environment that can act as clues?

THROUGH THE ACTIVITIES

Explain to the class that each student represents a boom-or-bust seabird that can afford to spend up to 50 time/energy points during the breeding season. They should not spend more than 50 points in their breeding effort or they will risk their own survival to the next year. Tell them that there are 10 weeks in the breeding season.

Read the events describing the first week of the Boom or Bust Outline. Then ask;"Are you willing to invest in this week's breeding effort?" Be sure to ask this question before you tell the class how many time/energy points will be required for the week. Students respond with "boom!" if they choose to

continue the breeding effort, or "bust!" if they choose to quit. (Or you can have students raise their hands if they wish to continue. Liven up the game by having students stand up as long as they are "booming" and sit down as soon as they decide to "bust".) They must not spend more than 50 points. Announce the number of time/energy points required for the weekly breeding investment.

Continue the above procedure for each of the stages described on the outline. Students should keep track of the total number of points spent and how many they have left, so they can decide whether to continue the effort for each week of the season.

Students who quit before spending 50 points in bust years (e.g., years 1 and 3) are winners. Students who successfully fledge their young in boom years (e.g., year 2) are winners. After playing each of the three scenarios, reinforce and discuss the seasonal development of the marine food web.

Optional

Use slides or pictures from books to show the seabirds described in the activity and the physical and productivity changes occurring in the ocean as the drama unfolds through the different scenarios.

BEYOND THE ACTIVITIES

Investigate the life history strategies of various seabirds including the boom or bust species. Compare and contrast different life history strategies for different seabirds.

Compare population fluctuations for other types of marine animals such as whales, plankton, fish. Why is it difficult to get accurate information on population size?

Based on an activity from Point Reyes Bird Observatory Education Department