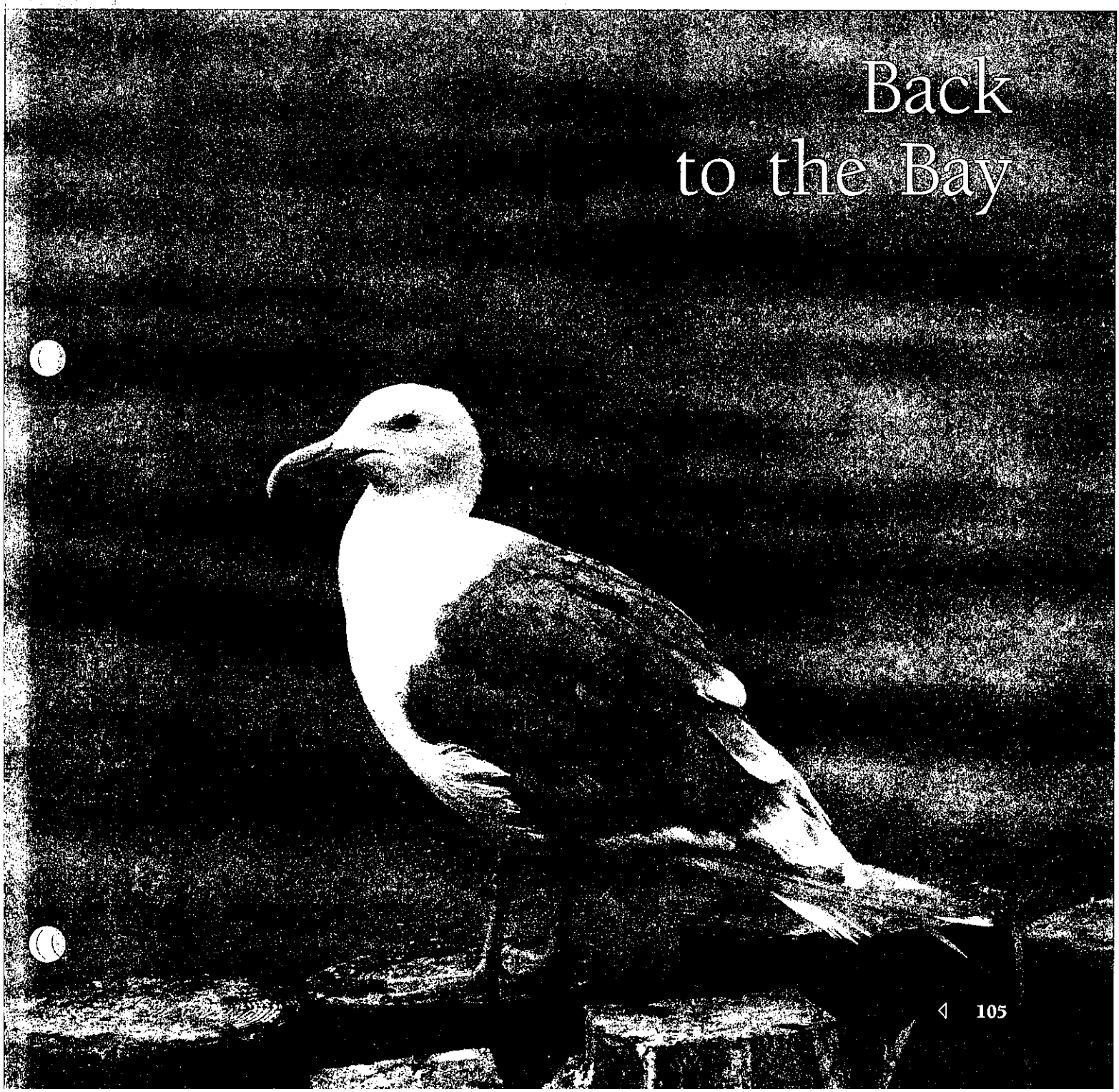
CHAPTER

Back to the Bay



Back to the Bay

Descended from oystermen and crabbers, Liam and Solana looked forward to their family reunion at Maryland's Chesapeake Bay. Although this section of the bay no longer supported commercial shell fishing, there was plenty to see.

While waiting in line to purchase tickets for a boat tour of the bay, Liam and Solana heard a series of screeches. They scanned the docks for the source of the mayhem. A large gull that had settled on a covered boat hurriedly flew away midway through the screeches. After several more seconds, the noise stopped.

"What *was* that?" Solana asked. "It sounds like birds are being attacked, but I don't see anything." Liam just shrugged and pointed out a mallard still floating a few feet from the dock and a tern still sitting on the nearby pilings despite the noise. "Can't they hear? They'd have to be deaf to ignore that," Solana said.

The woman working at the nearby snack stand looked up and offered an explanation. "Well, it's a tape the marina owner is using to scare the gulls away. Seems like there's more every year. Gull droppings cause holes in the boat covers if they aren't cleaned quickly. We've tried everything to keep the gulls away.

The marina owner found an ad for this tape on the Internet. He says there are six different gull distress calls, which are all supposed to sound just like the real thing. The tape plays every couple of hours during the day. It worked great last summer, but lately some of the gulls seem to ignore it.

"The owner of the next marina over even keeps a few dead gulls out on the dock. He claims it keeps the tapes working, but I . . ."

"Look at that," Liam interrupted. "Someone used duct tape to block the speaker at this end of the dock."

Squinting her eyes to get a better look at the speaker, the woman nodded. "I bet the guy in the 22-foot Sea Ray did it," she offered. "He claims that it's the new landfill causing the gull problem in the first place, and we should get rid of that rather than disturb his peace."

"Well, at least the tape still seems to be working on him," observed Liam, laughing.

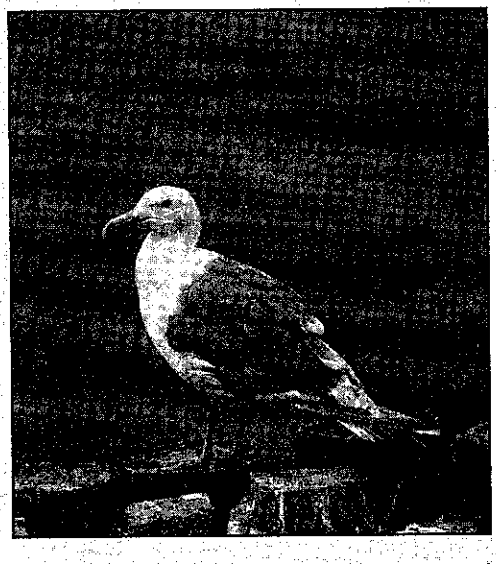


Figure 8.1 Gull populations often become a nuisance to people in areas such as marinas.

CASE ANALYSIS

1. **Recognize potential issues and major topics in the case.** What is this case about? Underline and list terms or phrases that seem to be important to understanding this case. Then list 3–4 biology-related topics or issues in the case.

2. **What specific questions do you have about these topics?** By yourself, or better yet, in a group, list the things you already know about this case in the "What Do I Know?" column. List questions you would like to learn more about in the "What Do I Need to Know?" column.

What Do I Know?	What Do I Need to Know?

3. Put a check mark by 1–3 questions or issues from the "What Do I Need to Know?" list that you think are most important to explore.

4. **What kinds of references or resources would help you answer or explore these questions?** Identify two different resources and explain what information each resource is likely to give that will help you answer the question(s). Choose specific resources.

Core Investigations

I. Critical Reading

Read Chapter 51: Animal Behavior, which discusses several kinds of animal behavior. Listed below are descriptions of various responses displayed by birds in the case. Answer the questions that follow each response. Provide examples from Chapter 51 to support your answers. As you complete this exercise, note that, behaviorally speaking, distress calls are similar to the alarm calls you read about in the text.

1. Only one species of gull leaves the area when the tape plays.
   a. Explain the gulls' response.

   b. Do you think this response is primarily learned or primarily genetic? Explain.

   c. Could the call be categorized as a signal? Explain.

2. A year later, the same species of gull remains when the tape plays.
   a. What might account for the change in the gulls' response?

   b. Do you think this response is primarily learned or primarily genetic? Explain.

   c. Speculate on what kinds of behavior this response might be.

   d. How does this behavior exemplify the "cry wolf" effect? Explain this in terms of a cost-benefit analysis.

3. The same species of gull resumes its response to the tape when dead gulls are displayed in the immediate area of the sound.
   a. What might account for the change in the gulls' response?

   b. Do you think this response is primarily learned or primarily genetic? Explain.

   c. How does this behavior reflect associative learning? Is it negative or positive reinforcement?

   d. Can this behavior be interpreted as altruistic? Explain.

4. Birds other than this gull species ignore the taped distress calls.
   a. What might account for the observed behavior in the other birds?

   b. Researchers switched young of one species of bird with those of another. The young birds responded to the signals of the new species. Do you think this response is primarily learned or primarily genetic? Explain.

   c. What evidence do you have from the case to support the idea that calls are species specific?

5. You observe that some gulls continue to respond to taped distress calls when *no* danger is present. Do you think that these gulls are more or less fit than those that stop responding to such calls? Explain.

II. Design an Experiment

Design an experiment to examine the following question. Is the response to distress calls (moving away from the area) learned in herring gulls?

Materials: You will have access to newly hatched, juvenile, and adult herring gulls. You also will have a tape of herring gull distress calls.

The following additional resources may help you with this activity:

Web/CD Chapter 51 Investigation, How Can Pillbug Responses to the Environment Be Tested? *and Lab Topic 1 of* Investigating Biology *by Morgan and Carter.*

1. Restate the question being studied as a testable hypothesis.

2. Describe the experiment.
   a. What will the treatment(s) be? Which animals will receive each treatment?

   b. What will you measure as the response to the treatment?

3. List three variables that you will control.

4. Describe the experimental results that would support your hypothesis.

III. Biology in Advertising

Examine the advertisement for a gull distress call recording in Figure 8.2 and answer the following questions.

Gull Gone Marina Mate

Searching for a way to safely keep gulls away from boats, docks, and the shore? Order Gull Gone today and reduce the damage caused by overpopulation of these pests.

- Distress calls from seven gull species including Herring Gull, Laughing Gull, and Ring-Billed Gull.
- Select only the distress calls you need.
- Program the calls to a specific schedule or just set on random play.
- Speaker volume adjustable. Effective up to 200 feet away.
- Operates on photocell only; operational during active period for gulls.
- Includes booklet on maximizing effective bird pest control.
- Field tested—effective in driving gulls away when operated as recommended.
- Audible Range: 100–110 dB (decibel).
- One-year unconditional money-back guarantee.
- UL and CE listed. Made in the USA.
- Shipping wt.: 7 lb

Contact us at: gullgone@marina.com for more information.

To order call: (555) 555-0099

Figure 8.2 Advertisement for "Gull Gone."

1. What are three biological claims in this advertisement?

2. Choose one of the claims and briefly describe an experiment that would test its validity.

3. Is there any behavioral significance to the product's feature that allows for playing distress calls in random sequence?

IV. Investigations of Population Growth and Control

A. Gull Population Growth *(Refer to Chapter 53 in your text for help with this exercise.)*

1. Review the data in Table 8.1.

Table 8.1 Increase in Number of Gull Mating Pairs in Selected Locations

Locations	Initial Observation Mating Pairs/Year	Final Observation Mating Pairs/Year	Gull Species
Kennedy Airport, New York, United States	15 pairs/1970	7,600 pairs/1990	Laughing Gull
Leslie Spit, Toronto, Canada	20 pairs/1973	80,000 pairs/1982	Ring-Billed Gull
Five Islands, Wollongong, New South Wales, Australia	3 pairs (est.)/1949	51,500 pairs/1978	Silver Gull
Mud Islands, Port Phillips Bay, Victoria, Australia	5 pairs/1959	70,000 pairs/1988	Silver Gull

a. Are the four gull populations all increasing in size at the same rate? Explain.

b. Which rates are the most similar?

c. While doing further research on gull populations, you discover that in 1985 there were 15,000 pairs of laughing gulls living in the vicinity of John F. Kennedy International Airport in New York City. How does this knowledge change your answers to 1.a. and 1.b.?

2. Consider reasons why differences in these gull populations occur. List three ways that the environment in which the birds live could affect their rates of reproduction.

3. Population growth is greatly influenced by environmental factors. The activities of a human population impact nearby gull populations. For example, the potential for collisions between aircraft and gulls ensures that officials at John F. Kennedy International Airport implement gull population control measures. List at least three other examples of human–gull interactions. For each example, explain whether the gull population benefits.

B. Control of Bird Populations: The Chicken or the Egg? If the ultimate goal at an airport location is to reduce gull population size to ensure human safety, should gull nests and eggs or adult gulls be removed? In this exercise, you will use a model to compare the effectiveness of these two methods.

1. Fill in the worksheet in Figure 8.3 to estimate the relative effectiveness of these two different population control methods.

The Chicken or the Egg Worksheet				
Find the differences in population growth resulting from two gull control methods.				
Assumptions				
Basic Population	**Enter**	**Method: No Control**	**Remove Adult Birds***	**Remove Nests and Eggs**
Adults = (2) (#nesting pairs) =	20	Nesting Pairs = 10	Nesting Pairs = 10	Nesting Pairs = 10
Total # eggs = (#eggs per nest) (#nesting pairs) =	30	Eggs per Nest = 3	Eggs per Nest = 3	Eggs per Nest = 3
Potential Population =	50	Survival of Adults = 90%	Survival of Adults =50%	Survival of Adults =90%
		Survival of Young Birds = 50%	Survival of Young Birds = 50%	Survival of Young Birds = 10%
Enter the values from the information above and perform the calculations.		**No Control**	**Remove Adult Birds**	**Remove Nests and Eggs**
Surviving Adults = (% survival) (#nesting pairs)(2)		(.90)(10)(2) = 18		
Surviving Chicks =(% survival)(#eggs per nest)(#nesting pairs)		(.50)(3)(10) = 15		
Surviving Population = Surviving Adults + Surviving Chicks		18 + 15 = 33		

*Note that the percentage of surviving young birds does not change when adult birds are removed because the adults are removed before they reproduce.

Figure 8.3 The Chicken or the Egg Worksheet. Use the provided equations to calculate surviving gull populations after implementing two types of gull control methods. This spreadsheet also is provided on the Case Book website as a functioning model. (Weisstein, 2004a)

2. Which of these gull control methods is more effective?

3. Which of these two control methods would you advocate? Explain your choice.

V. Explore the Environmental Conditions of the Chesapeake Bay

Liam and Solana spent 4 hours on their boat tour of the Chesapeake Bay, learning about its history, ecology, and geology. In this investigation, you will take a brief "armchair tour" of the Chesapeake Bay by exploring some of the environmental factors that affect its biological diversity. Go to the Case Book website for resources on Chesapeake Bay and further directions for the following activities.

A. Stressors on the Bay. Examine the animation. List three important stressors on the Chesapeake (see the Stressors on the Bay link on the Case Book website).

B. Cutter Marina. Examine the information about Cutter Marina, including the data charts and interpretation of each of the water quality variables measured. Describe and provide the values for three variables that indicate a healthy bay.

C. Eyes on the Bay. The water quality of the Chesapeake is sampled daily at more than 100 sampling stations. These data are reported and compiled online at "Eyes on the Bay" (Figure 8.4) whose link is listed on the Case Book website.

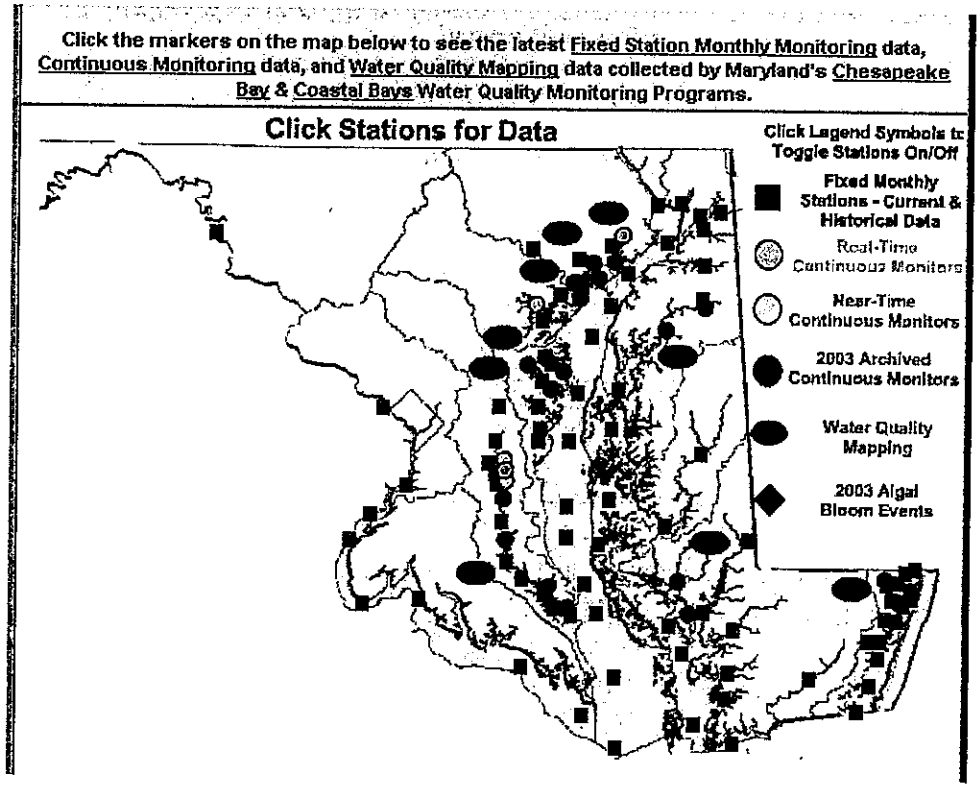


Figure 8.4 Eyes on the Bay.

1. At the Eyes on the Bay website, examine differences in salinity across the Chesapeake Bay by first switching to "full-screen map" and then running your cursor over the red square icons and reading the salinity data that appear on the left side of the screen.
   a. Describe what happens to salinity as you move from open ocean (the right and lower edges of the map) to the top of the Chesapeake Bay.

   b. Describe what happens to salinity as you move from the center of the Chesapeake Bay and up the Potomac River, which starts near the bottom center of the map.

2. Choose data from two stations, one from the upper Chesapeake Bay and one from the lower Chesapeake Bay near the ocean. Click on the icon to open the station's site. Look at the following variables during August: dissolved oxygen, water temperature, pH, and water clarity. Enter the data for each station in Table 8.2.

Table 8.2 Comparison of Data from Two Stations

Year _____

Month: August

Lower Bay station name:	Upper Bay station name:
Dissolved oxygen	Dissolved oxygen
Water temperature	Water temperature
pH	pH
Water clarity	Water clarity

3. Studies have shown there are major differences in types of organisms inhabiting different areas of the bay. How do the data you recorded in Table 8.2 help to explain this finding?