Section 1

Terms to Learn

ecology
biotic
abiotic
population
community
ecosystem
biosphere

What You'll Do

- Distinguish between the biotic and abiotic environment.
- Explain how populations, communities, ecosystems, and the biosphere are related.
- Explain how the abiotic environment relates to communities.

Everything Is Connected

Look at **Figure 1** below. An alligator drifts in a weedy Florida river, watching a long, thin fish called a gar. The gar swims too close to the alligator. Suddenly, in a rush of snapping jaws and splashing water, the gar becomes a meal for the alligator.

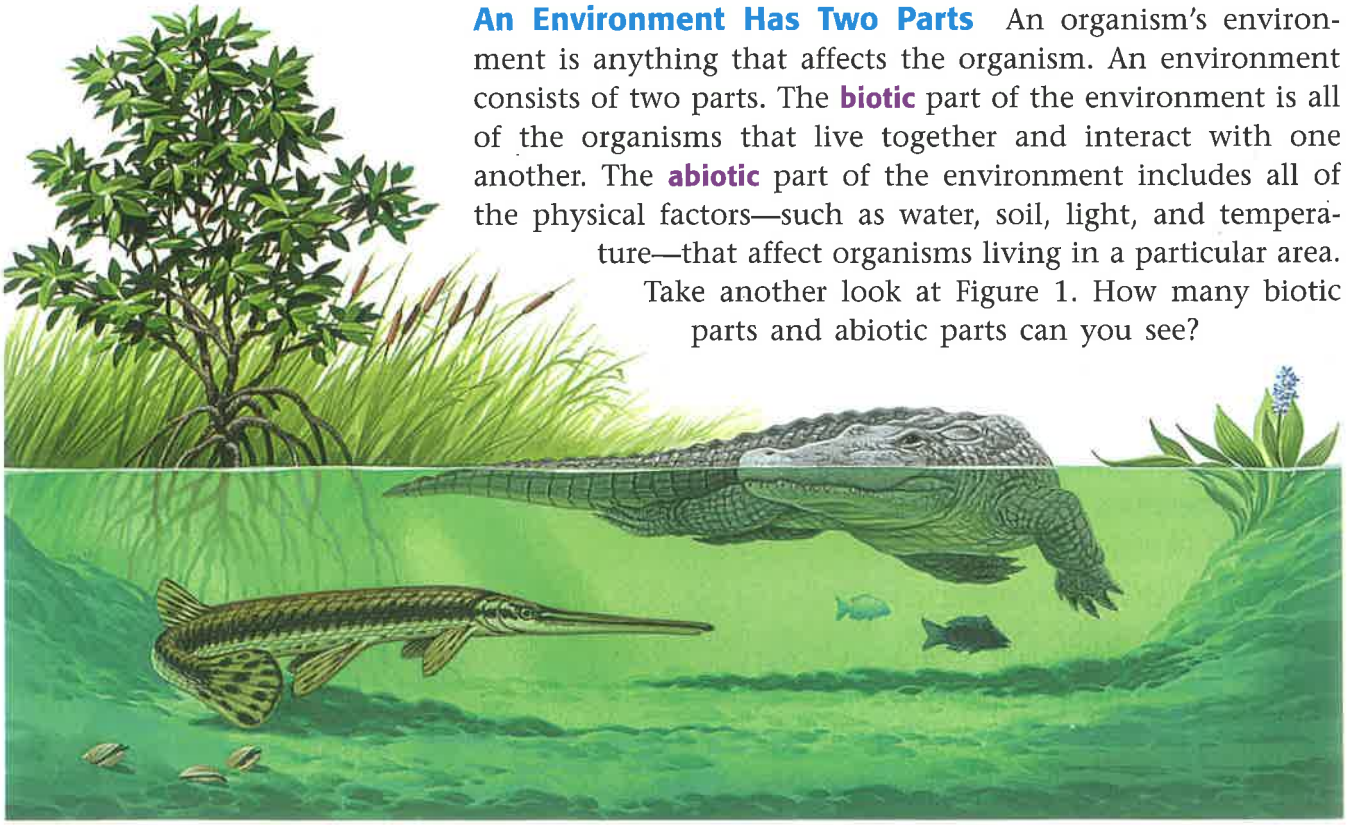
It is clear that these two organisms have just interacted with one another. But organisms have many interactions other than simply "who eats whom." For example, alligators dig underwater holes to escape from the heat. Later, after the alligators abandon these holes, fish and other aquatic organisms live in them when the water level gets low during a drought. Alligators also build nest mounds in which to lay their eggs, and they enlarge these mounds each year. Eventually, the mounds become small islands where trees and other plants grow. Herons, egrets, and other birds build their nests in the trees. It is easy to see that alligators affect many organisms, not just the gars that they eat.

Studying the Web of Life

All living things are connected in a web of life. Scientists who study the connections among living things specialize in the science of ecology. **Ecology** is the study of the interactions between organisms and their environment.

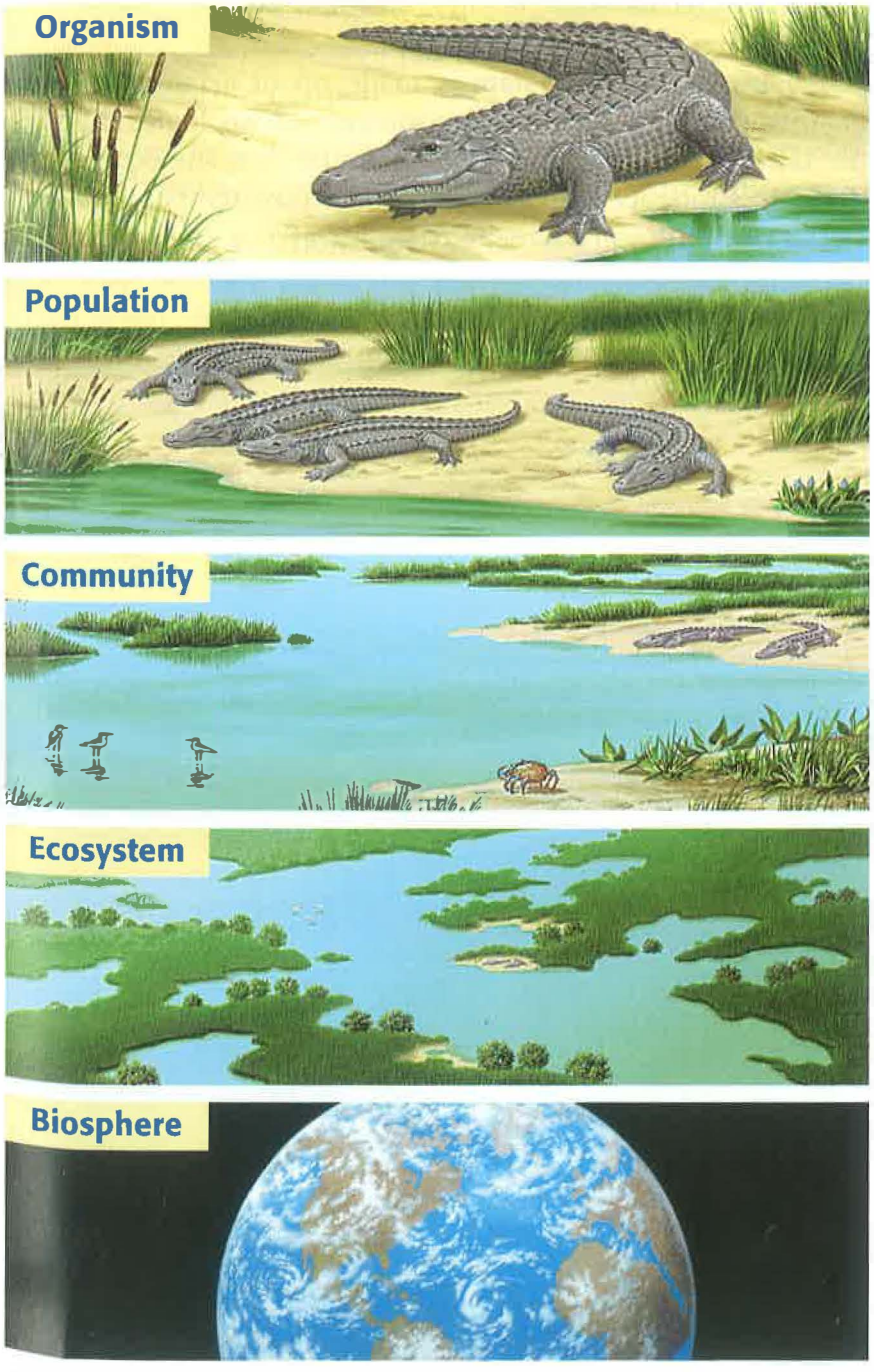
An Environment Has Two Parts An organism's environment is anything that affects the organism. An environment consists of two parts. The **biotic** part of the environment is all of the organisms that live together and interact with one another. The **abiotic** part of the environment includes all of the physical factors—such as water, soil, light, and temperature—that affect organisms living in a particular area. Take another look at Figure 1. How many biotic parts and abiotic parts can you see?

Figure 1 *The alligator affects, and is affected by, many organisms in its environment.*



Organization in the Environment At first glance, the environment may seem disorganized. To ecologists, however, the environment can be arranged into different levels, as shown in **Figure 2.** The first level contains the individual organism. The second level contains similar organisms, forming a population. The third contains different populations, forming a community. The fourth contains a community and its abiotic environment, forming an ecosystem. Finally, the fifth level contains all ecosystems, forming the biosphere. Turn the page and examine **Figure 3** to see these levels in a salt marsh.

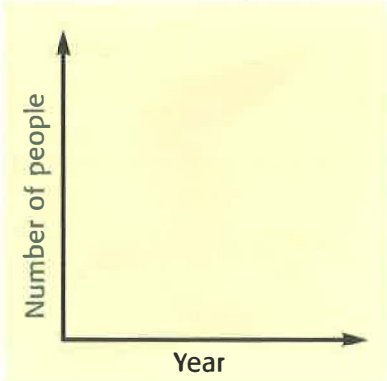
Figure 2 The Five Levels of Environmental Organization



QuickLab

The Human Population

1. Using a **sheet of graph paper,** a **pencil,** and a **ruler,** draw and label a graph as shown below.



2. Plot the following points on your graph:
   (1800, 1 billion people)
   (1930, 2 billion people)
   (1960, 3 billion people)
   (1975, 4 billion people)
   (1987, 5 billion people)
   (1999, 6 billion people)
3. Draw a line connecting the points.
4. Answer the following questions in your ScienceLog.
   a. What does the curve that you have drawn indicate about human population growth?
   b. Do you think the human population can continue to grow indefinitely? Why or why not?

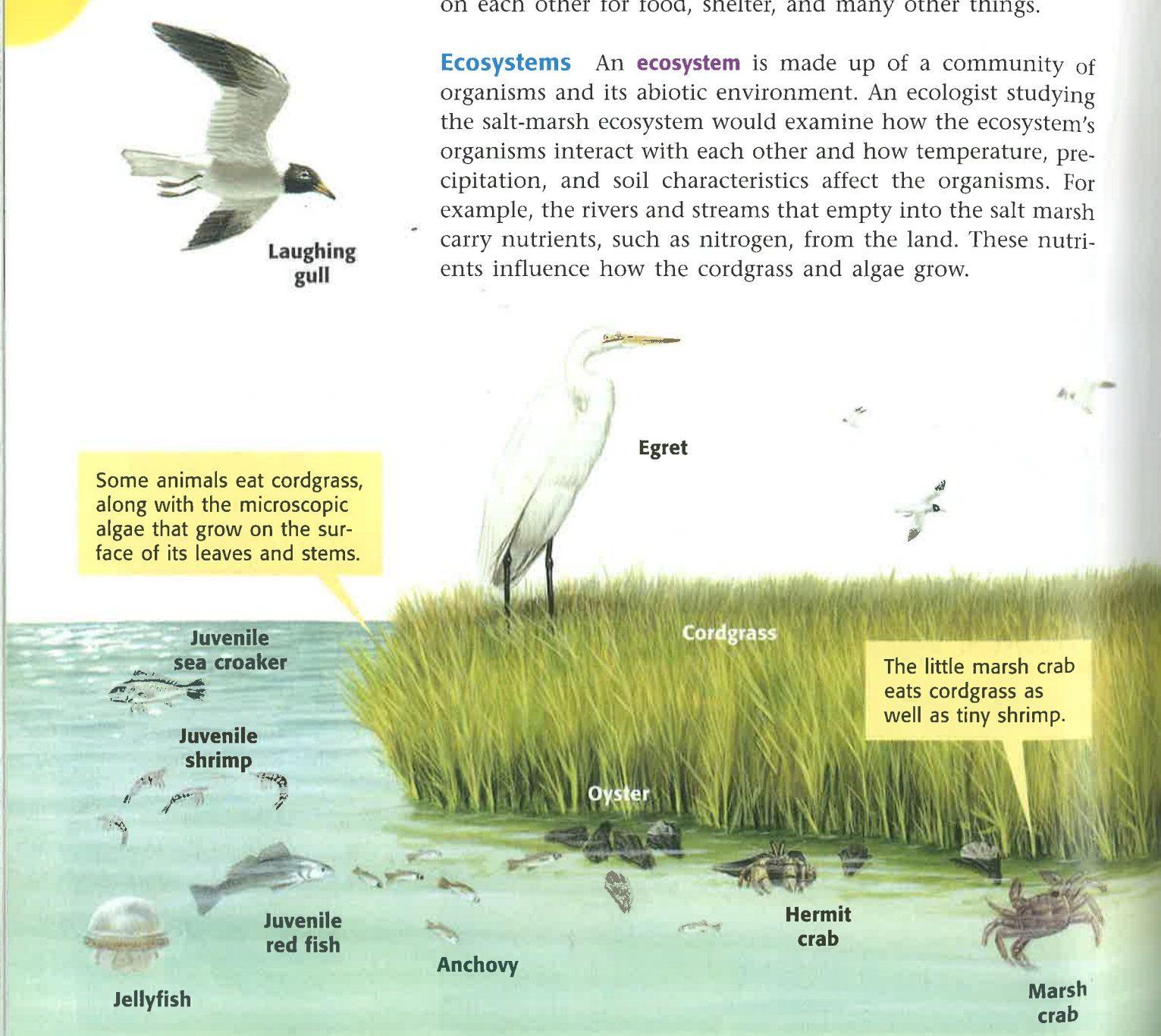
TRY at HOME

Figure 3 *Examine the picture of a salt marsh below. See if you can find examples of each level of organization in this environment.*

Populations A salt marsh is a coastal area where grasslike plants grow. A **population** is a group of individuals of the same species that live together in the same area at the same time. For example, all of the seaside sparrows that live together in a salt marsh are members of a population. The individuals in the population compete with one another for food, nesting space, and mates.

Communities A **community** consists of all of the populations of different species that live and interact in an area. The various animals and plants you see below form a salt-marsh community. The different populations in a community depend on each other for food, shelter, and many other things.

Ecosystems An **ecosystem** is made up of a community of organisms and its abiotic environment. An ecologist studying the salt-marsh ecosystem would examine how the ecosystem's organisms interact with each other and how temperature, precipitation, and soil characteristics affect the organisms. For example, the rivers and streams that empty into the salt marsh carry nutrients, such as nitrogen, from the land. These nutrients influence how the cordgrass and algae grow.



The Biosphere The biosphere is the part of Earth where life exists. It extends from the deepest parts of the ocean to very high in the atmosphere, where tiny insects and plant spores drift, and it includes every ecosystem. Ecologists study the biosphere to learn how organisms interact with the abiotic environment—Earth's gaseous atmosphere, water, soil, and rock. The water in the abiotic environment includes both fresh water and salt water as well as water that is frozen in polar icecaps and glaciers.

REVIEW

1. What is ecology?
2. Give two examples of biotic and abiotic factors in the salt-marsh ecosystem.
3. Using the salt-marsh example, distinguish between populations, communities, ecosystems, and the biosphere.
4. **Analyzing Relationships** What do you think would happen to the other organisms in the salt-marsh ecosystem if the cordgrass were to suddenly die?

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