

SECTION

2

Marine Ecosystems

BEFORE YOU READ

After you read this section, you should be able to answer these questions:

- What abiotic factors affect marine ecosystems?
- What are the major zones found in the ocean?
- What organisms are found in marine ecosystems?

National Science Education Standards

LS 1a, 3d, 4a, 4b, 4c, 4d

What Are Marine Ecosystems?

Oceans cover almost three-fourths of Earth's surface! Scientists call the ecosystems in the ocean *marine ecosystems*. Marine ecosystems, like all ecosystems, are affected by abiotic factors.

TEMPERATURE

One abiotic factor in marine ecosystems is the temperature of the water. The water near the surface is much warmer than the rest of the ocean because it is heated by the sun. Deep ocean water is much colder.

Water temperatures at the surface are also affected by latitude. Water near the equator is generally warmer than water closer to the poles. The water at the surface is also warmer in summer than winter. ✓

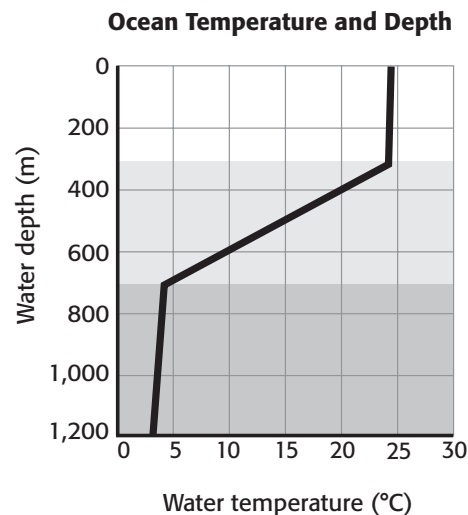
Temperature affects the animals in marine ecosystems. For example, fish that live near the poles have a chemical in their blood that keeps them from freezing. Most animals that live in coral reefs need warm water to live.

**STUDY TIP**

Compare Create a table comparing the abiotic factors and organisms for each marine ecosystem.

**READING CHECK**

1. Identify Where is the warmest surface ocean water?



Math Focus

2. Read a Graph About how much colder is ocean water at 600 m depth than at 400 m depth?

SECTION 2 Marine Ecosystems *continued***WATER DEPTH AND SUNLIGHT**

Two other abiotic factors that affect marine ecosystems are water depth and sunlight. The average depth of the oceans is 4,000 m, but sunlight does not reach deeper than 200 m. Producers that carry out photosynthesis, such as algae, can live only in water less than about 200 m deep. ✓

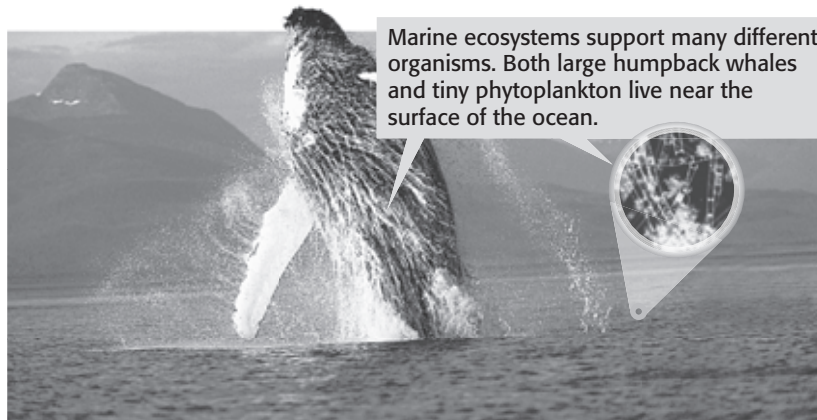
READING CHECK

3. List What are the three main abiotic factors that affect marine ecosystems?

TAKE A LOOK

4. Identify In the picture, which organism is the producer and which is the consumer?

Plankton are tiny organisms that float near the surface of the ocean. Many kinds of plankton are producers. These *phytoplankton* use photosynthesis to make their own food. They are the base of most ocean food chains. Large consumers, such as whales, feed on these tiny producers.

**What Are the Major Zones in the Ocean?**

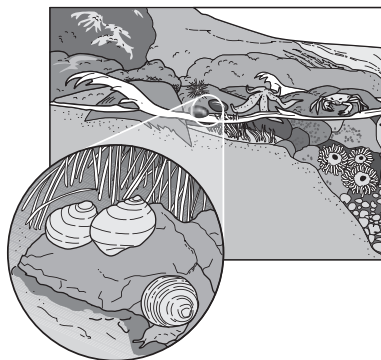
Scientists divide the ocean into zones. The divisions are based on things such as water depth, the amount of sunlight, and water temperature.

Say It

Share Experiences In a group, discuss the abiotic factors and the living organisms you have seen or might see at the beach.

THE INTERTIDAL ZONE

The intertidal zone is where the ocean meets the shore. The organisms of the intertidal zone are covered with water at high tide and exposed to air at low tide.

**TAKE A LOOK**

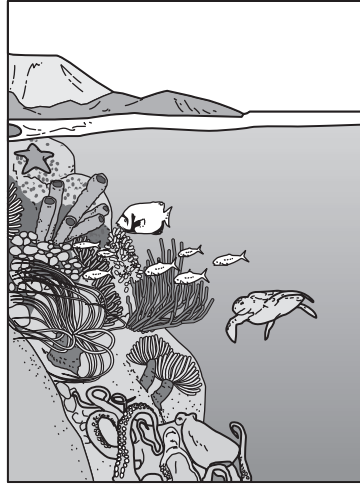
5. Explain Why is it difficult for many sea creatures to live in the intertidal zone?

The Intertidal Zone Sea grasses, periwinkle snails, and herons are common in an intertidal mudflat. Sea stars and anemones often live on rocky shores, while clams, crabs, snails, and conchs are common on sandy beaches.

SECTION 2 Marine Ecosystems *continued***THE NERITIC ZONE**

The neritic zone is further from shore. In this zone, the water becomes deeper as the ocean floor starts to slope downward. This water is warmer than deep ocean water and receives a lot of sunlight. Corals and producers thrive in this zone. Sea turtles, sea urchins, and fishes are some of the consumers of this zone.

The Neritic Zone Although phytoplankton are the major producers in this zone, seaweeds are common, too. Sea turtles and dolphins live in the neritic zone. Other animals, such as corals, sponges, and colorful fishes, contribute to this vivid landscape.

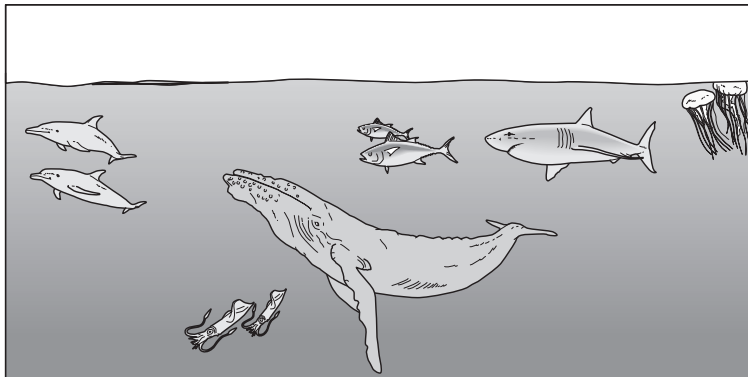
**TAKE A LOOK**

6. Identify What are the two main kinds of producers in the neritic zone?

THE OCEANIC ZONE

In the oceanic zone, the sea floor drops off quickly. The oceanic zone extends from the surface to the deep water of the open ocean. Phytoplankton live near the surface, where there is sunlight. ✓

Consumers such as fishes, whales, and sharks live in the oceanic zone. Some of the animals live in deep waters, where there is no sunlight. These animals feed on each other and on material that sinks from the surface waters.



The Oceanic Zone Many unusual animals are adapted for the deep ocean. Whales and squids can be found in this zone. Also, fishes that glow can be found in very deep, dark water.

**READING CHECK**

7. Explain Why do phytoplankton need to live near the surface?

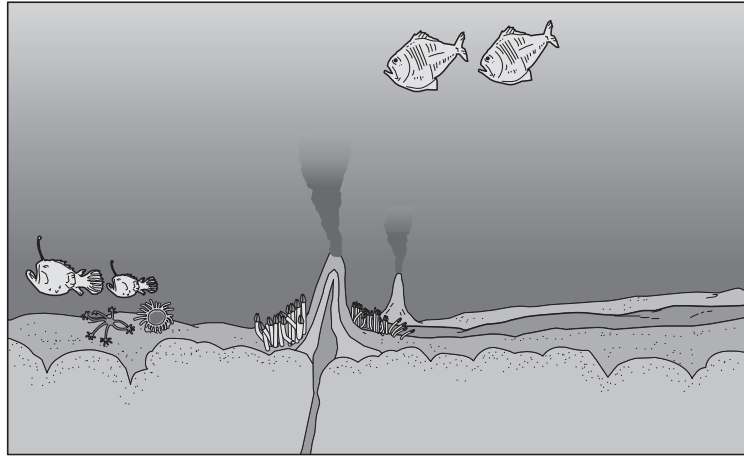
TAKE A LOOK

8. Explain How can the consumers that live in deep waters survive if there are no producers present?

SECTION 2 Marine Ecosystems *continued***THE BENTHIC ZONE**

The benthic zone is the ocean floor. It does not get any sunlight and is very cold. Fishes, worms, and crabs have special features to live in this zone. Many of them feed on material that sinks from above.

Some organisms, such as angler fish, eat smaller fish. Other organisms, such as bacteria, are decomposers and help break down dead organisms.



The Benthic Zone Organisms such as bacteria, worms, and sea urchins thrive on the sea floor.

TAKE A LOOK

9. Describe What abiotic factors do organisms that live in the benthic zone need to adapt to?

Critical Thinking

10. Predict Consequences

How would humans be affected if there were no oceans?

What Are Some Marine Ecosystems?

Life on Earth depends on the ocean. The water that evaporates from the ocean becomes most of the rain and snow that falls on land. The ocean affects world climates and wind patterns. People depend on the ocean for food.

Many different kinds of organisms live in the ocean. They live in the many ecosystems in the different zones of the ocean.

THE SARGASSO SEA

Floating mats of algae in the middle of the Atlantic Ocean make up the base of the Sargasso Sea ecosystem. Many animals live in this ecosystem. Most of them are omnivores that can eat many different organisms.

POLAR ICE

The icy waters near the poles are rich in nutrients that support large numbers of phytoplankton. These producers can support many types of consumers. One of these is a small shrimplike organism called krill. Larger consumers, such as fish, eat krill. These consumers, in turn, serve as food for other consumers, such as seals.

SECTION 2 Marine Ecosystems *continued***INTERTIDAL ECOSYSTEMS**

Organisms in intertidal ecosystems must be able to live both underwater and in the air. Those that live in mudflats and beaches may dig into the ground during low tide.

On rocky shores, organisms have adaptations to keep from being swept away by crashing waves. For example, seaweeds use structures called *holdfasts* to attach themselves to rocks. Other organisms, such as barnacles, attach themselves to rocks with a special glue. Sea stars feed on these organisms. ✓

ESTUARIES

An **estuary** is an area where fresh water flows into the ocean. The water in an estuary is a mix of fresh water from rivers and salt water from the ocean. Organisms that live in estuaries must be able to survive the changing amounts of salt in the water.

The fresh water that flows into an estuary is rich in nutrients washed from the land. The nutrients in the water support large numbers of producers, such as algae. The algae support many consumers, such as fish and shellfish.

CORAL REEFS

Coral reefs are named for the small animals called *corals* that form the reefs. Many of these tiny animals live together in a colony, or group. When the corals die, their hard skeletons remain. New corals grow on the remains.

Over time, layers of skeletons build up and form a rock-like structure called a *reef*. The reef is a home for many marine animals. These organisms include fishes, sponges, sea stars, and sea urchins. Because so many kinds of organisms live there, coral reefs are some of the most diverse ecosystems on Earth. ✓



Coral reefs are very diverse marine ecosystems.

✓ READING CHECK

11. Describe How do organisms in intertidal ecosystems protect themselves from being washed away by waves?

✓ READING CHECK

12. Explain How is a coral reef both a living and a nonliving structure?

Section 2 Review

NSES LS 1a, 3d, 4a, 4b, 4c, 4d

SECTION VOCABULARY

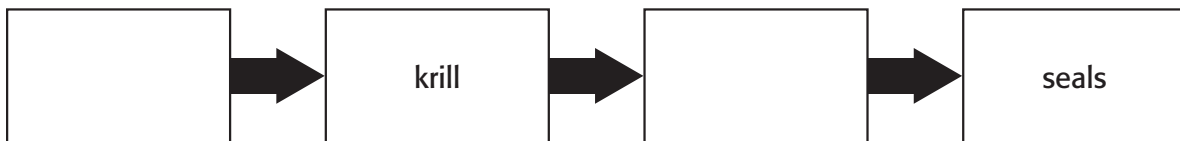
estuary an area where fresh water mixes with salt water from the ocean

plankton the mass of mostly microscopic organisms that float or drift freely in freshwater and marine environments

- 1. Describe** What unique abiotic factor do organisms in an estuary have to adapt to? What causes this abiotic factor?

- 2. Describe** What are some of the different kinds of producers found in marine ecosystems?

- 3. Apply Concepts** Complete this food chain that shows the flow of energy through a polar ice ecosystem.



- 4. Explain** Why are there few producers below 200 m in the ocean?

- 5. Identify** What abiotic factors make the neritic zone a good home for many different organisms?
