

Oceans

A Reading A-Z Level W Leveled Book
Word Count: 1,509

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Connections

Writing

Research to learn about another biome. Create a Venn diagram comparing that biome with the ocean biome. Use the information in the Venn diagram to write an essay comparing the two biomes.

Science

Create a three-dimensional model of the ocean floor and label significant features. Present your work to your class.

Reading A-Z

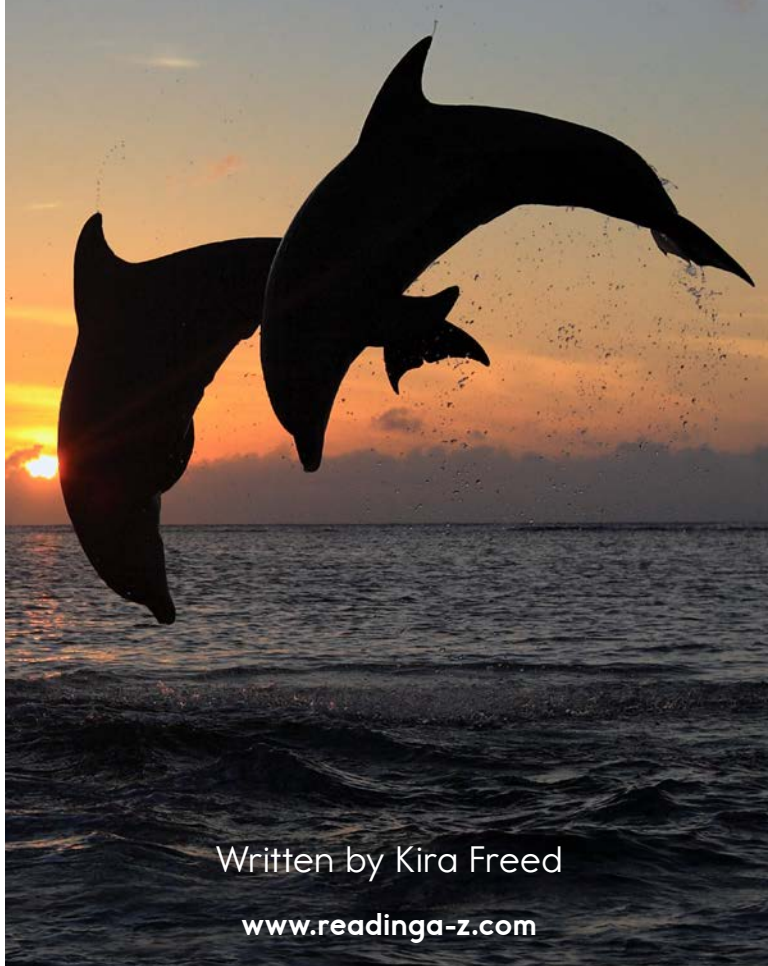
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Focus Question

What are the features of the ocean biome?

Words to Know

adaptations	marine
algae	plateaus
biomes	salinity
currents	seamounts
evaporation	tides
fascinating	trenches

Cover: Kelp forests are one of the most productive ecosystems on Earth. This one is in the Pacific Ocean near California.

Title page: Bottlenose dolphins leap out of the Atlantic Ocean near Honduras.

Page 3: Green sea turtles swim in the Pacific Ocean near the island of Borneo.

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Correlation

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Fountas & Pinnell	S
Reading Recovery	40
DRA	40



Waves crash on the Indian Ocean.

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A Vast, Hidden World

The ocean is a vast and mysterious place. A quick glance from the deck of a ship might make you think you're in the middle of nowhere. The endless water may seem lifeless on the surface, with nothing but dark, choppy waves stretching out in every direction. In truth, the ocean is filled with life, movement, and color. **Marine** organisms range in size from single-celled green **algae** to enormous colonies of seagrass and from microscopic viruses to blue whales—the largest animals ever known to have lived on Earth.

The ocean is also home to mountain ranges, active volcanoes, huge **plateaus**, and deep **trenches**. This endlessly **fascinating** world still has much left for humans to explore. It is also one of Earth's most important **biomes**, affecting everything from weather and climate to global food supplies.

The Ocean Biome

Different types of environments cover Earth's surface. These regions and the communities of plants and animals that live there are called *biomes*. Deserts, rainforests, and rivers are examples of biomes. So are oceans.

Many factors play a part in creating Earth's biomes. For land biomes, two important factors are latitude—how far north or south of the equator a location is—and elevation, or height above sea level. Both help determine how warm or cool a place is.

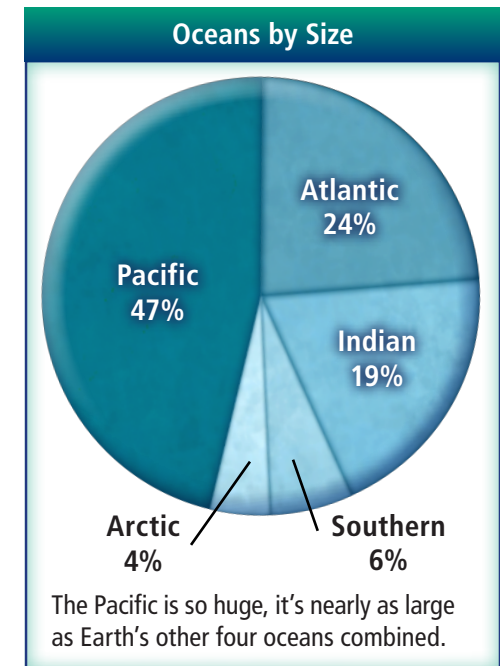
For water biomes, one of the most important factors is whether they contain salt water or fresh water. In this book, you'll learn about the ocean biome, which covers about 70 percent of Earth's surface and contains salt water.



Four or Five Oceans?

Long ago, schoolchildren only learned about four oceans: the Pacific, Atlantic, Indian, and Arctic. During that time, scientists debated whether there were four or five oceans. In 2000, the International Hydrographic Organization, which surveys and charts Earth's oceans and seas, officially added the Southern Ocean to the list of oceans. It surrounds Antarctica and extends north to the latitude line at 60° south. Not all countries recognize the Southern Ocean, and some schoolchildren still learn that Earth has only four oceans.

Oceans make up 97 percent of the planet's water. They are the largest bodies of water on Earth. We often talk about oceans in the plural because we've named different sections of them. However, since all the oceans are connected, in fact there is only one.



Smaller areas of the ocean that are partly surrounded by land are known as seas, gulfs, and bays. They also contain salt water.

Water and Air

Although Earth's oceans all contain salt water, they differ in many other ways. At a basic level, regions of the ocean can be classified according to Earth's three main climate zones: tropical, temperate, and polar. The tropical zones, which surround the equator, are the warmest, and the polar zones, which are near the poles, are the coldest. However, many other factors also play a part in ocean features.

Water moves in **currents**, both on the ocean's surface and deep below. Currents may carry warm water to cold regions or cold water to warm regions. Surface currents are caused by blowing wind as well as Earth's rotation on its axis. Deep currents form as a result of differences in temperature and **salinity**, which is the amount of salt in the water.

Wind is the most common cause of ocean waves. Waves may also form as a result of **tides**, which rise and fall each day. Tides are caused by the Moon's gravity pulling on Earth.



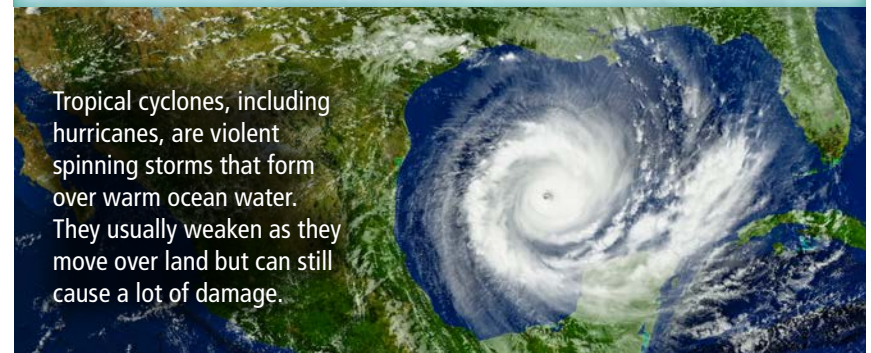
Because the Moon is so much closer to our planet than the Sun, its tidal effect on Earth is stronger.

The temperature of the ocean also varies a great deal from the surface to the seafloor. Water is warmer near the surface partly because it's warmed by the Sun. In addition, cold water sinks because it's denser than warm water. It's also under much more pressure.

The ocean affects weather and climate by absorbing most of the Sun's rays. It works much like a huge solar panel, especially in the tropical zones, and moves this heat around the world. Because of its enormous size, the ocean also helps drive the water cycle because of the amount of **evaporation** that takes place above it. This process sometimes creates huge storms.

Climate Change and the Ocean

The ocean absorbs carbon dioxide from the atmosphere, which helps lessen the effects of climate change. At the same time, the ocean is greatly affected by climate change. Rising temperatures and melting ice are altering weather patterns, ocean currents, coastal erosion, marine ecosystems, and more.



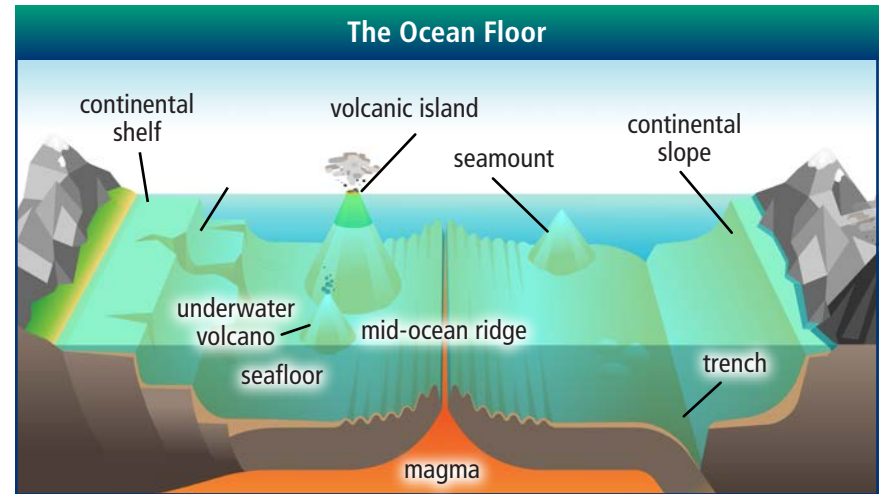
Ocean Landforms

Land along the edge of the ocean, called a *coast* or *shoreline*, may be sandy, rocky, or muddy. It lies next to shallow water located above slightly lower land called the *continental shelf*. Beyond this zone is the *continental slope*, a steep drop-off that leads down to the deep ocean.

The seafloor is always changing because of the movement of tectonic plates in Earth's crust, or rocky outer layer. Seafloor features include underwater volcanoes and **seamounts** as well as plateaus and plains. A notable feature of the seafloor is mid-ocean ridges, a system of mountain chains nearly 65,000 kilometers (40,390 mi.) long. This system formed and continues to change as a result of tectonic plates moving apart. Melted rock, called *magma*, fills in the space between the plates. The highest areas of the seafloor, which extend above the ocean's surface, have formed volcanic islands such as Iceland and the Hawaiian Islands.

Word Wise

Tectonic plates are huge pieces of Earth's crust that move as hot, weak rock moves in the mantle, the layer underneath the crust. The movement of these plates causes earthquakes, volcanoes, and many other changes in Earth's surface.



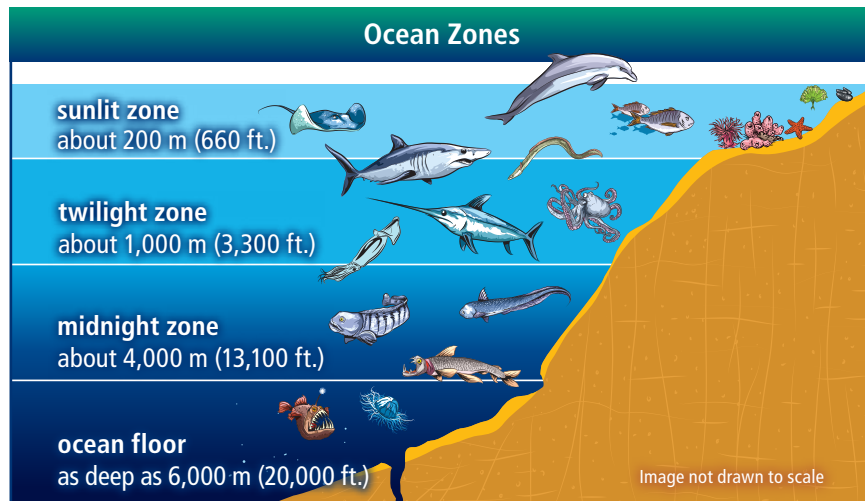
Another feature of the seafloor is trenches, which are the deepest parts of the ocean. They form when two tectonic plates move toward each other and the lighter plate pushes the denser plate beneath it. When this happens, a steep, long V-shaped valley forms in the seafloor. Some of the largest earthquakes ever recorded have been caused by this process. It also causes volcanic islands to form. Japan's islands as well as a group of islands off the coast of Alaska formed in this way.

Most trenches are located in the Pacific Ocean. The deepest among them is the Mariana Trench, which is located south of Japan near the Mariana Islands. Trenches are completely dark and near freezing. Water pressure is over a thousand times greater than it is on the ocean's surface.

Zones and Organisms

The ocean is divided vertically into zones by the amount of sunlight they receive. The surface receives the most sunlight, and darkness increases with greater depth. In addition to varying light, the zones have different temperatures, pressures, amounts of oxygen, and mineral nutrients.

The sunlit, or surface, zone makes up only about 5 percent of the ocean's depth. It receives enough sunlight for photosynthesis, the process by which plants and certain other organisms make their own food using sunlight, air, and water. Microscopic algae called *phytoplankton*, along with seagrass and giant kelp, another type of algae, are the ocean's main photosynthesizers. They are crucial to all life on our planet because they produce at least half of Earth's oxygen.



Phytoplankton are also the foundation of many ocean food chains. They and other photosynthesizers provide food for a huge variety of animals, either directly or indirectly. These animals include sea jellies, crustaceans, fish, seabirds, sea turtles, and marine mammals such as seals and whales. Because of photosynthesis, this zone is home to about 90 percent of all ocean life.

Coral reefs are also found in the sunlit zone. These huge undersea communities, which are made of the built-up skeletons of hard corals, support an incredible number of organisms. Algae living with the corals produce food for them as well as for reef fish and other animals.



Most coral reefs are found in the sunlit zone because most corals depend on algae, which need sunlight for photosynthesis.

The twilight zone is located beneath the sunlit zone. It receives some sunlight but not enough for photosynthesis, so it contains no plants or other photosynthetic organisms. The sunlight it receives isn't enough to warm the water, which is always cold.

Animals in the twilight zone include squid, octopuses, sperm whales, and certain kinds of fish. Creatures in and below this zone have **adaptations** for dealing with the increased darkness, cold, and pressure. Some glow, while others have no eyes and depend on senses besides vision.

The midnight zone makes up about 90 percent of the ocean. It is completely dark and near freezing all the time. Sea cucumbers, gulper eels, and unusual fish are among the animals that make their homes here. We know very little about this zone because it is so hard to explore.

Trenches are part of the midnight zone. Conditions in trenches are harsh, but a small number of organisms live here, too. Bacteria are the foundation of food chains. Instead of sunlight, they use hydrogen sulfide gas to produce energy.

Glow-in-the-Dark Animals

Some animals that live in the twilight and midnight zones have adapted to the dark by glowing. Some are bioluminescent; they make their own light by means of a chemical reaction in their body. Others are biofluorescent, which involves taking in blue light, changing it, and giving off different colors of light.



This pyrosome flashes brightly in the water around Hawaii. It is bioluminescent.



A fishing crew in Alaska loads their catch of silver salmon.

People and Oceans

Scientists study the ocean to learn about Earth's landforms, weather, climate, animals, and much more. This biome is such a fascinating place that it would be easy to think its main value is to satisfy scientific curiosity. However, it also provides an enormous amount of food for people around the world—so much so that overfishing has become a serious problem. It also supplies ingredients for medicines used to treat cancers, ease pain, and help wounds heal. In addition, the ocean has allowed people to travel by water since ancient times.

People also appreciate the ocean for the recreational opportunities it offers. These include scuba diving, snorkeling, surfing, boating, fishing, and whale watching as well as visiting distant islands.

Treasures from a Hidden World

The next time you wander along a beach examining seashells, stones, and bits of seaweed, take a moment to appreciate the ocean and the treasures it brings. Think about how deep it is and the organisms and landforms it contains. Where did each interesting thing that washed up onshore come from? What was its journey like?

Most of us only get to experience a small part of the ocean. The sparkling surface of the water hides a world as fascinating and complex as any biome on land. From the sunny upper layer to the cold, dark depths of the ocean's trenches, there will always be new and amazing things to discover.



A sperm whale disappears into the Pacific Ocean near New Zealand.

Glossary

- adaptations** (*n.*) changes in an organism or species that allow it to survive better in its environment (p. 13)
- algae** (*n.*) living organisms that grow in water and make their own food but are not plants (p. 4)
- biomes** (*n.*) communities of plants and animals that occupy a specific type of habitat (p. 4)
- currents** (*n.*) air or water that flows in a certain direction (p. 7)
- evaporation** (*n.*) the change of water from a liquid to a gas due to an increase in temperature (p. 8)
- fascinating** (*adj.*) very interesting (p. 4)
- marine** (*adj.*) of or relating to the sea (p. 4)
- plateaus** (*n.*) large raised areas of flat land (p. 4)
- salinity** (*n.*) the amount of salt in water (p. 7)
- seamounts** (*n.*) mountains underneath the ocean that were formed by volcanic activity (p. 9)
- tides** (*n.*) the rising and falling of the ocean produced by the gravity of the Moon and Sun (p. 7)
- trenches** (*n.*) long, narrow cracks in the seafloor (p. 4)