The Amazing Undersea Food Web

A Reading A–Z Level Z1 Leveled Book
Word Count: 1,785

Connections

Writing

Imagine being an oceanographer exploring the twilight zone. Write a journal entry about your findings, including details from the book.

Science

Choose one of the four ocean zones. Research to learn more about this zone and write a paper sharing your findings.

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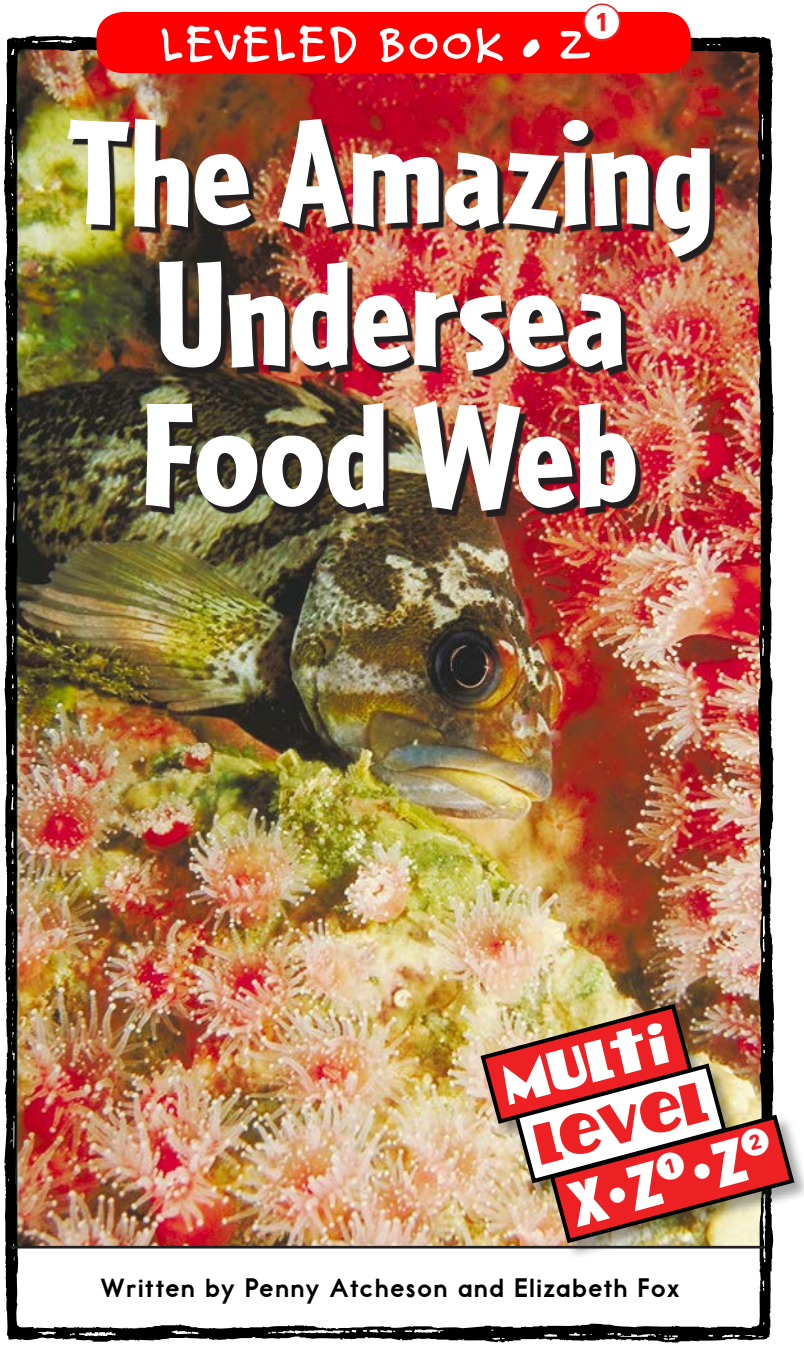

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euphotic zone *(n.)* the top ocean zone, which contains almost all of the ocean's life (p. 10)

faults *(n.)* cracks in Earth's crust along which movement occurs (p. 20)

photosynthesis *(n.)* the process by which chlorophyll in plant cells transforms sunlight, water, air, and nutrients into food (p. 6)

phytoplankton *(n.)* single-celled algae that live in a body of water (p. 5)

snorkeling *(n.)* the act of swimming using a short, curved tube that extends above the water's surface and allows the swimmer to breathe while under water (p. 13)

submersibles *(n.)* small vessels that can operate underwater, especially at deep levels (p. 21)

trenches *(n.)* cracks in the seafloor; long ditches (p. 9)

zooplankton *(n.)* microscopic animals that live in a body of water (p. 8)

The Amazing Undersea Food Web

Written by Penny Atcheson
and Elizabeth Fox

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Focus Question

How are animals from the four ocean zones connected by the undersea food web?

Words to Know

abyssal zone
accumulation
anemone
aphotic zone
bioluminescence
chlorophyll
disphotic zone
euphotic zone
faults
photosynthesis
phytoplankton
snorkeling
submersibles
trenches
zooplankton

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Correlation

LEVEL Z1	
Fountas & Pinnell	W–X
Reading Recovery	N/A
DRA	60

Glossary

abyssal zone *(n.)* the part of the aphotic zone that includes the deep ocean floor (p. 19)

accumulation *(n.)* a piling up of material over time (p. 12)

anemones *(n.)* plantlike, marine animals whose tentacles often look like flower petals (p. 12)

aphotic zone *(n.)* the bottom ocean zone, which receives no sunlight (p. 19)

bioluminescence *(n.)* the light or the emission of light created by a biochemical process within a living thing (p. 19)

chlorophyll *(n.)* a substance in plant cells that transforms water, air, sunlight and nutrients into food (p. 6)

disphotic zone *(n.)* the middle ocean zone, which receives very little sunlight and contains no plants and few animals (p. 15)

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So you see, even though phytoplankton are only at the top of the ocean, we're at the center of the food web, supporting all other life in the sea. Whether you enjoy the ocean for the beauty of coral reefs, the mystery of the abyssal zone, or some tasty fish and chips, you have us phytoplankton to thank.

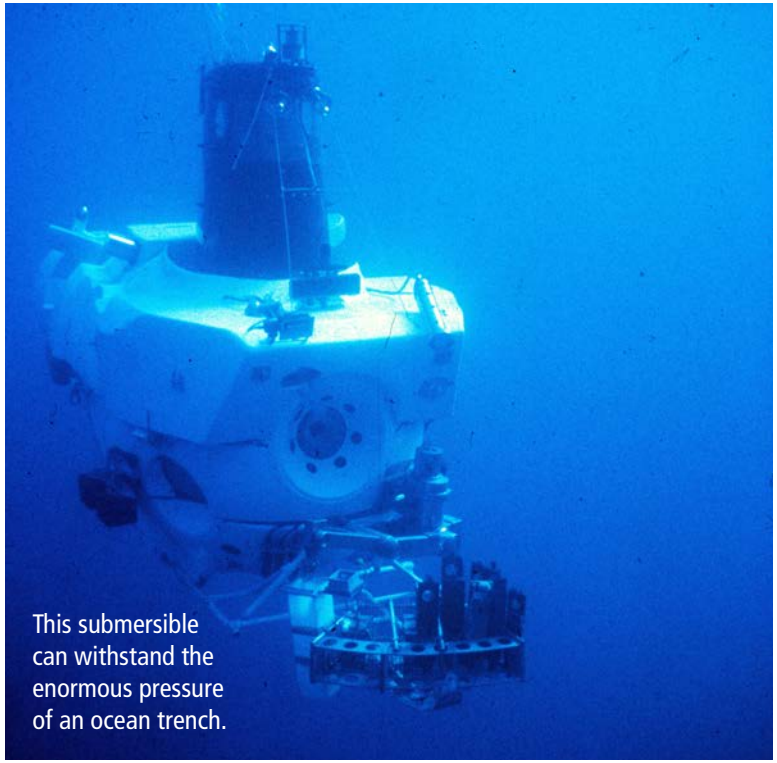
Table of Contents

Let Me Introduce Myself

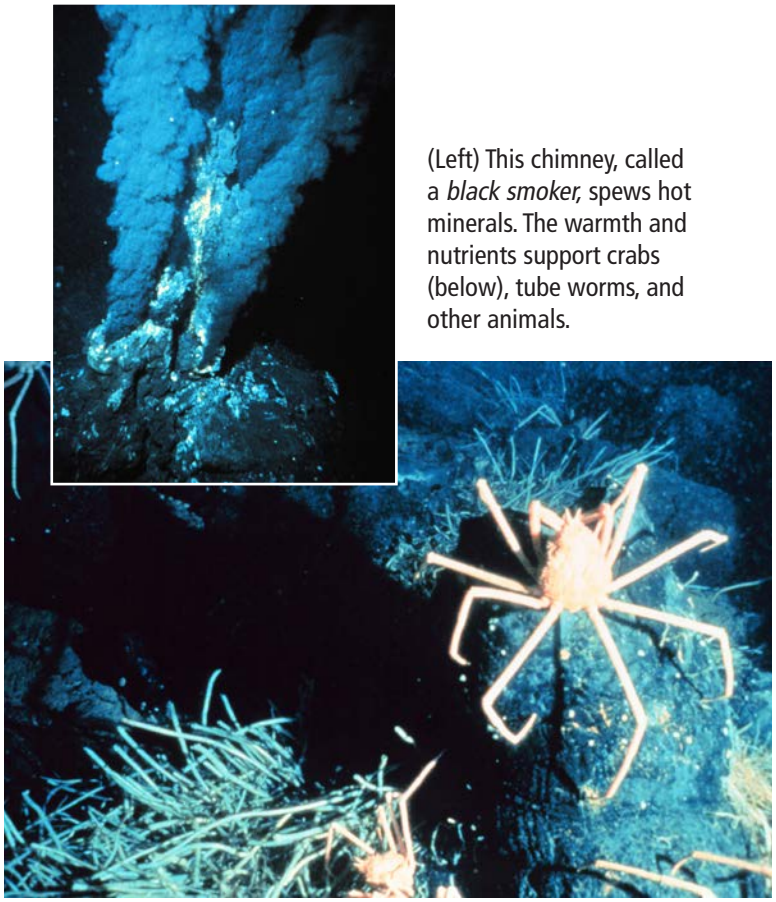
The ocean, where I live, is an enormous buffet table for everything in it and for many land animals, including humans. When you think of the ocean food web, you might think of fierce great white sharks devouring their prey, or enormous blue whales gulping tons of krill. Or you might think of giant stands of seaweed being devoured by everyone, like an underwater salad bar. But did you know that more than 90 percent of all sea creatures end up being eaten by other sea creatures? That means that almost every organism in the ocean ends up getting eaten by another sea creature at some point or other. And almost every sea creature eats other sea creatures.

The blue whale is the largest animal on Earth.

Animals living in this zone have taken advantage of the warmth and nutrients. Special kinds of bacteria can use these nutrients in the same way that phytoplankton use sunlight. Tube worms, shrimp, and giant clams can all be found feeding on these bacteria around the openings, or chimneys. These chimneys were only recently discovered. Only a few **submersibles**, or submarines, have been built strong enough to withstand the enormous pressure at the bottom of a trench.

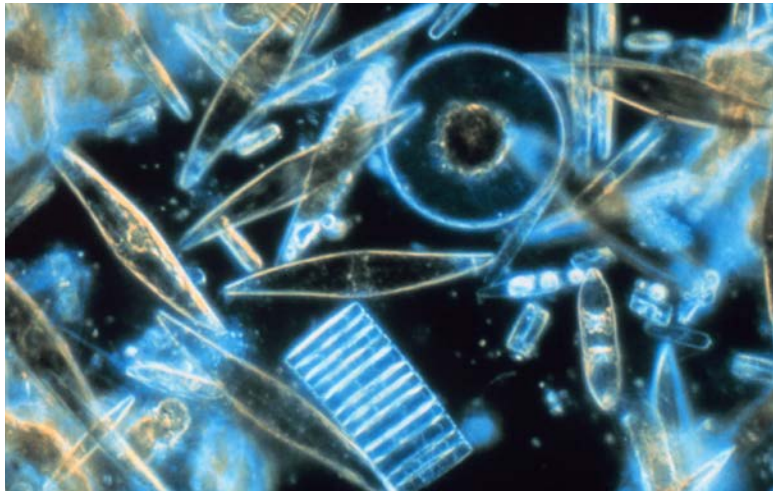


This submersible can withstand the enormous pressure of an ocean trench.



(Left) This chimney, called a *black smoker,* spews hot minerals. The warmth and nutrients support crabs (below), tube worms, and other animals.

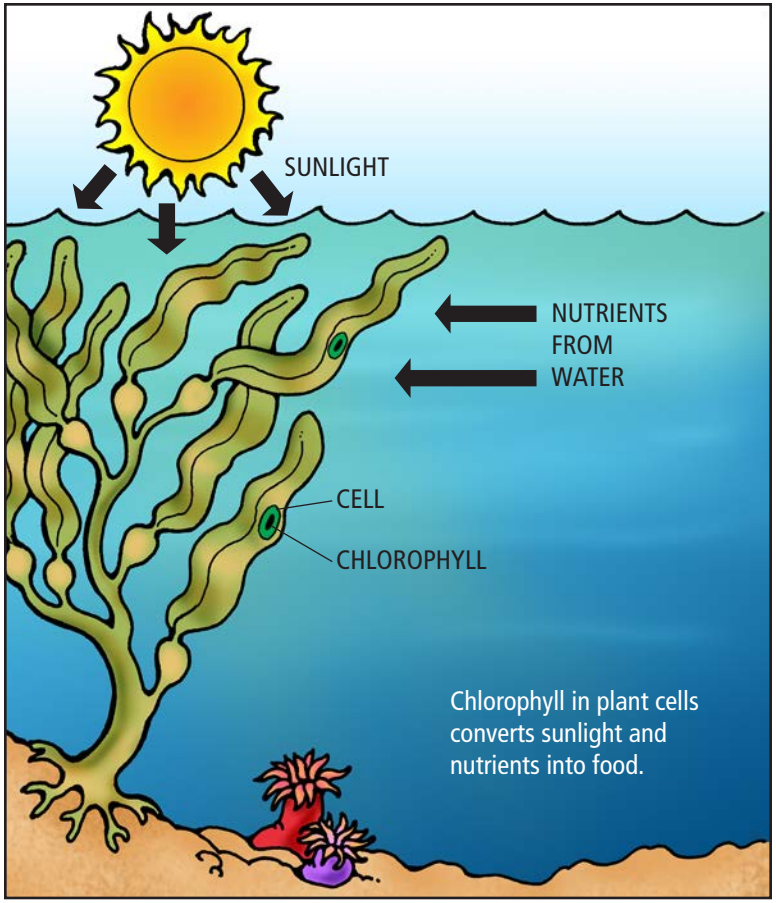
Ocean trenches occur along **faults** where large plates of the Earth's crust come together. The colliding plates create canyons and cracks of up to 10,000 meters (32,808 ft) deep. You would think that nothing could survive at the bottom of a trench in the darkness, cold, and pressure. But openings at the bottom of the trenches spew hot water and minerals from deep within the Earth.



These microscopic phytoplankton are called *diatoms.*

But there are little organisms that almost always get eaten but do not actually eat anything themselves. They are the most microscopic species in the ocean, yet they form the center of the ocean's food web. Some people might think it's a raw deal to be food for everybody else, but I find it to be quite a powerful job.

Let me back up and introduce myself properly. **Phytoplankton** (FY-tow-plank-ton) is my name. I'm an algae, which is almost like a very tiny plant. But unlike plants, I have no roots, so I'm not attached to the ground or sea floor. I'm free to float around with the ocean currents. I prefer to remain near the surface of the sea, since I'm quite fond of sunlight, and I can be found in every ocean on Earth.



Like plants, I make food through a process called ***photosynthesis***, rather than eating it. I use **chlorophyll** to capture the Sun's energy and use it to convert minerals and nutrients from seawater into food. Just as in plants, chlorophyll makes me green. But I'm so tiny that you can only see the color when there are billions upon billions of us in one place.

The Midnight Zone

This totally dark region of the ocean contains 90 percent of the ocean's water, but almost none of its life. It extends from 1,000 to 5,000 meters (3,280–16,404 ft) and below. The pressure is so great that it can crush almost anything, including most submarines, and the temperature is near freezing. But there is some life in the midnight zone, or **aphotic** (ay-FOE-tic) **zone**, if you look closely.

Many of the tiny animals that live here, such as the lantern fish, have little lights running up and down their bodies. The light comes from a special process called **bioluminescence**. This is the same process that produces light in fireflies. Jellyfish, squid, fish, and even bacteria are bioluminescent in this zone, where there is no sunlight. These lights make it possible for animals to see and communicate with each other. These lights also help them find mates or food, and they also make them incredibly beautiful. Some oceanographers divide the midnight zone into two additional zones: the **abyssal zone** and ocean trenches. The abyssal zone is totally dark, and it covers much of the ocean floor, including vast plains, mountains, valleys, and canyons.

Tiny bioluminescent animals glow beautifully in the pitch-black depths.

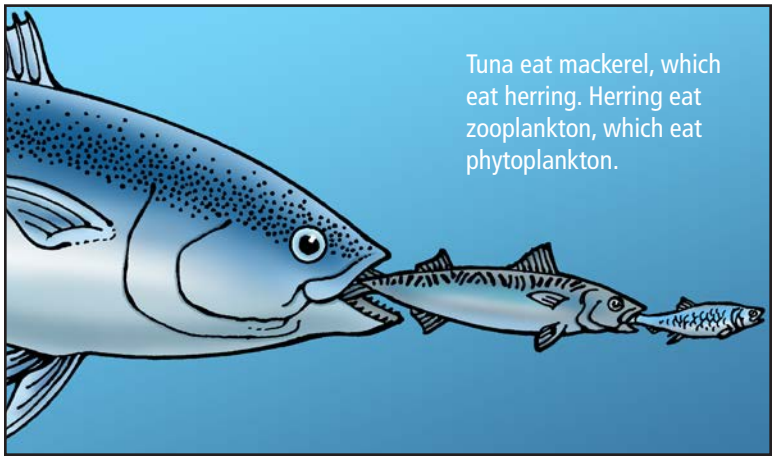
A phytoplankton and zooplankton bloom shows up as light streaks in this photo taken from space.

Fortunately, there are billions upon billions of us. Thousands of phytoplankton can be found in one cup of seawater. All that photosynthesis going on helps provide the Earth's atmosphere with well over half of its oxygen. We are also a good indicator of the ocean's health. Scientists can see large patches of phytoplankton from space. They can get information about the levels of pollution in the water when they see us struggling or dying off.

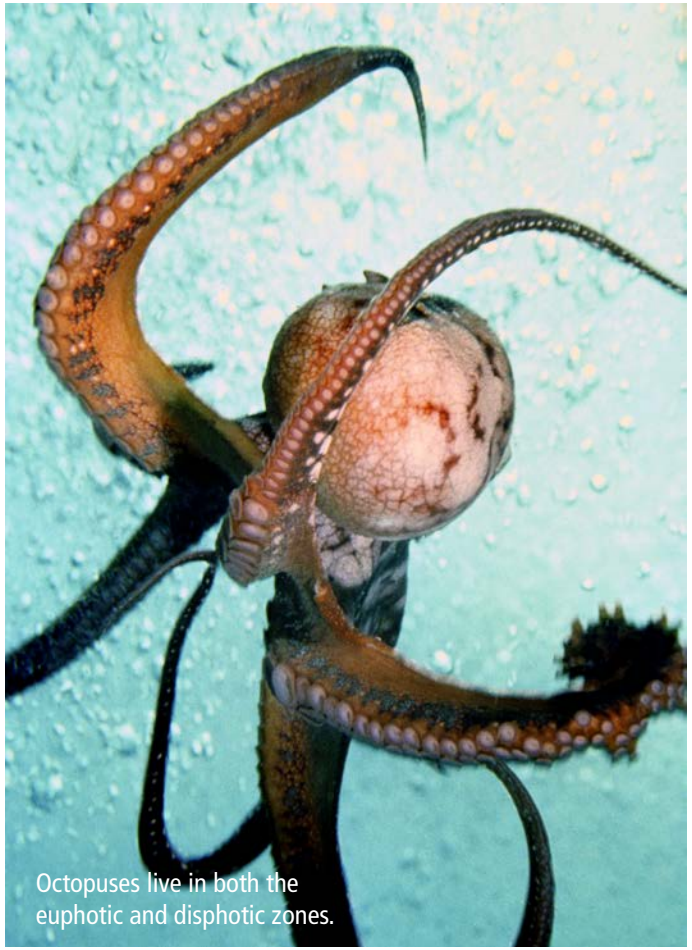
But in my opinion, our most important job is providing the center of the food web for the entire ocean. We feed all ocean life forms directly or indirectly, from the smallest creature to the largest.

The Food Web

Here's how it works: think about a simple tuna fish sandwich. Tuna are relatively large fish, and they eat smaller fish called *mackerel.* To make 1 kilogram (2.2 lbs) of tuna flesh, the tuna had to eat about 10 kilograms (22 lbs) of mackerel. Those 10 kilograms of mackerel had to eat 100 kilograms (220 lbs) of an even smaller fish called *herring.* And those 100 kilograms of herring devoured a full 1,000 kilograms (2,200 lbs) of **zooplankton**. Zooplankton are microscopic animals. They include tiny animals such as krill, which look like little shrimp, and the larvae and babies of crabs, jellyfish, shrimp, and other fish. To support those 1,000 kilograms of zooplankton, 10,000 kilograms (22,000 lbs) of phytoplankton were eaten.

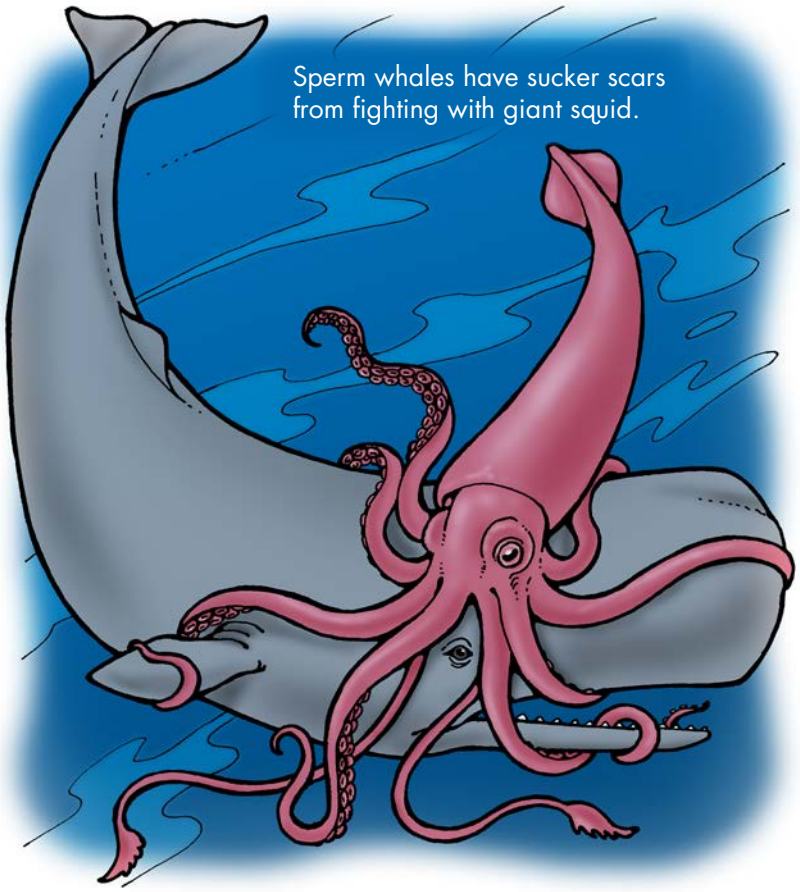


Tuna eat mackerel, which eat herring. Herring eat zooplankton, which eat phytoplankton.

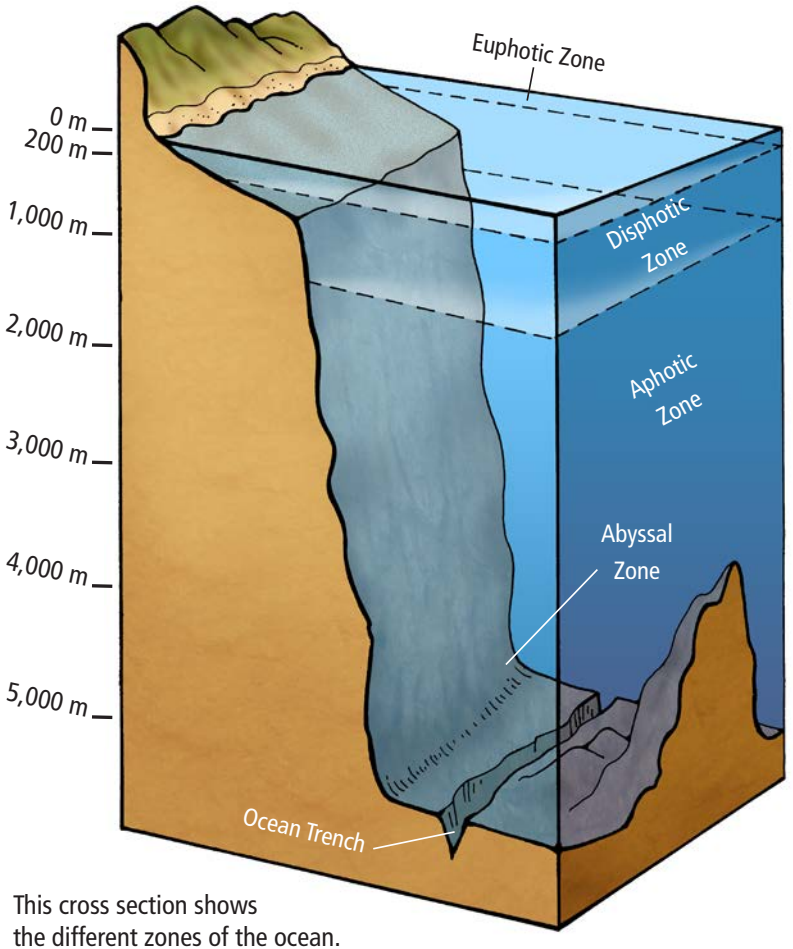


Octopuses live in both the euphotic and disphotic zones.

Many animals in this zone depend on a diet of what scientists call "marine snow," which is a nice name for dead phytoplankton and zooplankton! When we die, our bodies drift slowly down through the ocean layers like snow falling through the air. So even where we don't live, phytoplankton are eaten.



The famous giant squid also lives in this zone. Until fairly recently, no giant squid had ever been seen alive. The squids' bodies occasionally washed up on shore or were found in the stomachs of sperm whales. Though a few people have seen it at the surface, and a few scientists have seen it in the disphotic zone, the giant squid still remains a mystery.



This cross section shows the different zones of the ocean.

To give you an idea of just how much life I support, I'll take you through the ocean from the surface, where I live, down to the deepest **trenches** on the ocean floor.

Otters feed and live in the sunlit zone.

Life in the Sunlit Zone

The **euphotic** (yoo-FOE-tic) **zone,** or sunlit zone, is the top level of the ocean. It extends about 200 meters (660 ft) down from the surface. There's lots of sunlight here, so we phytoplankton, along with ocean plants, love it. Consequently, most of the animal species in the ocean can also be found here. Red and green algae, also known as seaweed, cover much of the shallow ocean floor in the euphotic zone. Enormous giant kelp grow in thick forests, almost like forests on land, and provide shelter for many sea animals. Sea urchins live in the protected waters at the base of the kelp, and sea otters feed on those urchins. Sea otters also wind long strands of kelp around their bodies while they sleep in order to keep from drifting away.

The Twilight Zone

As you go below the euphotic zone, the water begins to get darker, colder, and heavier. You are now entering the twilight zone. It begins at about 200 meters (656 ft) and goes to a depth of about 1,000 meters (3,280 ft). The pressure in this zone would crush a person, but the life forms that live here have adapted to the pressure. The twilight zone, also called the **disphotic** (dis-FOE-tic) **zone**, doesn't have enough light to support photosynthesis and plant life, but some animals do make their homes here. Others, such as whales, visit from the euphotic zone.

Permanent residents include octopuses, squid, and strange-looking fish such as the hatchet fish and the viperfish. Many fish that live in this zone often have huge mouths with big, curved teeth. Because it is so hard to see, the fish don't hunt. Rather, they simply hold open their fearsome mouths, waiting for something to swim in. Many of them are black or dark red to blend in with the dark water.

This angler fish is small but scary.

If you visit a tide pool, you may get a glimpse of a spiny sea urchin.

One nondestructive way to sample ocean life in the euphotic zone is to look into a tide pool. A tide pool is a small pool of water that remains when the tide goes out. You can find mussels, sea stars, urchins, clams, barnacles, and snails. You might even see an octopus, or you may spot a hermit crab scurrying about in another animal's shell. You don't even have to get wet to see all the life that depends, directly or indirectly, on me and my fellow phytoplankton.

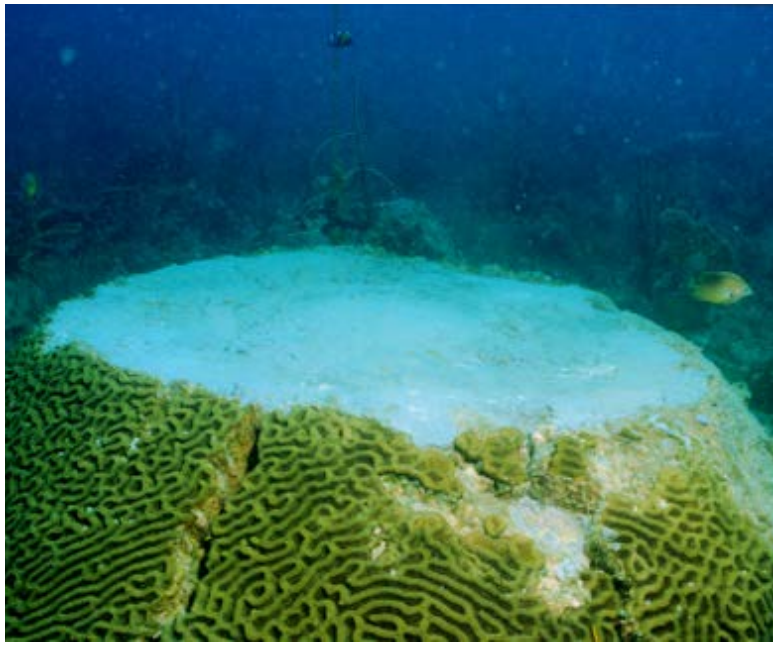
Almost all the seafood humans eat comes from the euphotic zone. Clams, mussels, and oysters live on shallow ocean floors. Lobsters and crabs scuttle about in coral reefs and among seaweed beds. Most species of fish, including salmon, tuna, mackerel, cod, and swordfish, stay up in the sunlight where there is plenty to eat and good light for hunting. Though there are squid and octopuses in the deeper zones, most of the ones that humans eat come from the euphotic zone.

Most familiar fish, such as this hammerhead shark, live in the euphotic zone.

Colorful coral reefs are the sunlit zone's most popular areas.

The euphotic zone is also home to coral reefs, which hold most of the ocean's plant and animal species. These fragile and beautiful areas are formed by the **accumulation** of the skeletons of small animals called coral polyps. They are found in clear, tropical waters where there is lots of sunlight. Sea fans, brain coral, clown fish, angelfish, lion fish, moray eels, sharks, shellfish, crabs, and lobsters all make the coral reef a colorful and busy place. **Anemones**—animals that look like beautiful flowering plants—catch zooplankton with their stinging tentacles. Jellyfish swarm in massive numbers, attracting the sea turtles that love to eat them. Coral reefs also provide a safe haven for the young of many creatures that will live in the open ocean as adults.

Humans love **snorkeling** and diving in the euphotic zone, especially around coral reefs. And they take thousands of tons of fish, both for food and for pets in tropical aquariums, from these surface waters. Unfortunately, all this human activity, along with pollution, threatens the well-being of coral reefs and other areas in the euphotic zone. Coral polyps are often killed by pollution, boat engines breaking them, or divers stepping on them, and once the corals die, all the other reef life suffers as well. Entire populations of fish can drop dangerously low from overfishing.



Boats, anchors, and divers can break coral.