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ARTICLE-A-DAY™

Life in the Oceans

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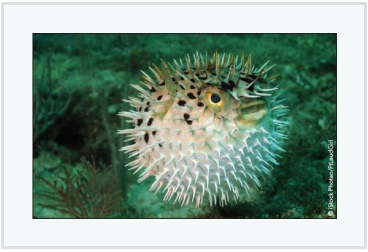
Who Wants a Spiny Snack?

This article is provided courtesy of the American Museum of Natural History.

Not many animals! How the spiny puffer stays safe in the ocean

A shark glides through the warm water, searching for its next meal. It spots an ordinary brown fish swimming slowly in the clear waters ahead.

But as the shark approaches, PUFF-PUFF-PUFF! The fish puffs out into a round, spiny ball. The startled shark swims away. The pufferfish is safe for now — at least until the next shark or big fish swims by.



The ocean can be a dangerous place for small fish like the puffer. Its waters are full of predators like sharks, squid, and bigger fish that eat small fish. But pufferfish have adaptations that protect them from predators.

All animals have adaptations to stay alive. An adaptation is a body part or behavior that helps an animal live in its environment. Predators have adaptations that help them hunt. A shark's powerful, torpedo-shaped tailfin and sharp teeth are two adaptations.

Other animals have adaptations that provide protection from predators. These animals may be fast enough to escape predators. Or they might use camouflage, special patterns or colors that help them hide in their environment.

Can you find the flounder?

But some animals don't run or hide. They have bodies that are hard to eat. Just picture the sharp spines of a porcupine, hedgehog, or sea urchin. Few predators are large or tough enough to make a meal of those animals!

Porcupines have long sharp spines that protect them.

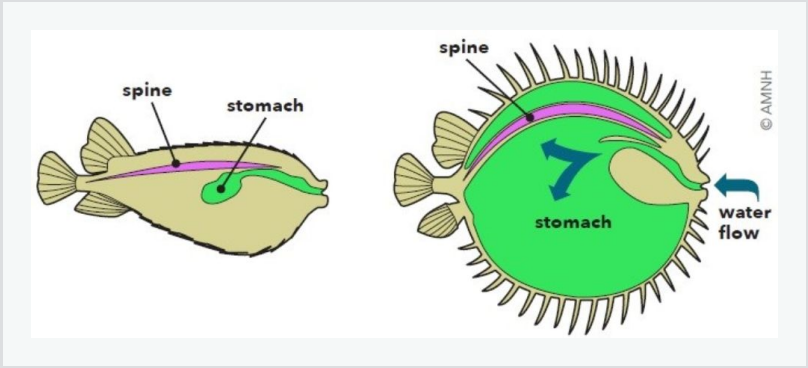
Some toads and snakes have their own way to discourage predators. They puff themselves up to look larger. The bigger an animal, the harder it is to catch and eat. Pufferfish combine both of these adaptations. They puff up AND they have long, sharp spines.

A pufferfish's skin is hard and covered with sharp spines.

Swimming along, a pufferfish looks like any other fish. But when it is threatened, it swells up suddenly like a big balloon. When this happens, it's easy to see why some people call it balloonfish. But this fish is no soft, squishy balloon. Its skin becomes rigid, with sharp spines sticking out in all directions. Usually these spines lie flat against the side of the fish. When the fish puffs up, the outer skin stretches out and pulls the spines up.

How does the pufferfish make this amazing transformation?

Despite its nickname, it doesn't blow itself up with air like a balloon. Instead, it fills up with water. The fish pumps a huge amount of water through its mouth into its stomach. Filled with water, its stomach becomes almost one hundred times larger. The stomach can expand like this because it's usually crumpled into many tiny folds. As water rushes in, the stomach unfolds. To make room for the swelling stomach, other organs like the liver and intestines are pushed to the side.



A spiny puffer can change from an ordinary-looking fish into a menacing spiny ball in a few seconds. Then only the biggest animals dare to eat it. The ocean may be full of dangers, but adaptations like sharp spines and puffing up help keep the puffer safe.

A Sea of Questions

This text is provided courtesy of OLogy, the American Museum of Natural History's website for kids.

What kinds of questions do scientists ask when they study an ocean ecosystem? Good question! Read this page to see some questions I asked about a tropical mangrove ecosystem.

How Do Mangroves Interact With Other Ecosystems?

Many young fish find shelter in the mangrove forests until they grow up and move to deeper waters. The roots provide places to hide from their enemies.

What Makes the Mangrove Different from Other Ecosystems?

The mangrove ecosystem is a special forest found in warm, coastal regions. The trees take root in the ocean while their leaves stay above water. This makes them the perfect home for both land and marine plants and animals!

How Have Mangrove Trees Adapted to Live in Salt Water?

Mangrove trees live in water that's 10 times saltier than that which would kill most other land plants. Why? Their roots filter most of the salt out of the seawater.

Are Mangroves Endangered Ecosystems?

Mangroves are among the most threatened habitats in the world. More than half of the original mangrove forests have been lost, and the remaining forests are damaged.

Any Questions?

Now that you've explored some of the questions scientists ask, investigate another ocean ecosystem, and ask:

- How are organisms within the ecosystem important to one another?
- What makes this ecosystem special?
- How do organisms adapt to living in this ecosystem?
- How is this ecosystem connected to neighboring ones?
- Is this ecosystem endangered?

What's the Big Idea about Marine Biology? Creatures and Ecosystems in the Ocean

This text is provided courtesy of OLogy, the American Museum of Natural History's website for kids.

There Are So Many Ways to Live in the Sea

Forests and prairies are examples of ecosystems on land. An ecosystem is a community of living things. Members survive by interacting with each other and with their environment. At first glance, the ocean seems like one big ecosystem.

Look below the surface and you'll see that there are lots of different kinds of ocean ecosystems — more than on land — all teeming with life. Ocean ecosystems depend on each other for survival.

Photo Credit: courtesy of NOAA, Heather Dine (top); courtesy of Florida Department of Environmental Protection (bottom)

Ocean Layer Cake

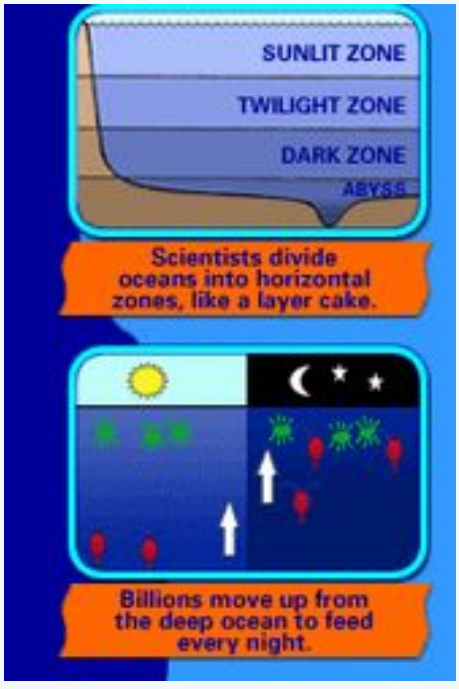


Illustration Credit: Eric Hamilton (top); courtesy of Debbie Steinberg, Virginia Institute of Marine

In the ocean you see a much greater variety of creatures if you move up or down than by moving from side to side.

The sunlit zone, near the top, is rich in life. Algae bloom here, providing huge quantities of food for the animals that live here, and for the billions of deep-sea animals that rise to feed here every night and then return to the deep at dawn. This vertical migration is the largest mass movement of life on Earth. And it happens every night!

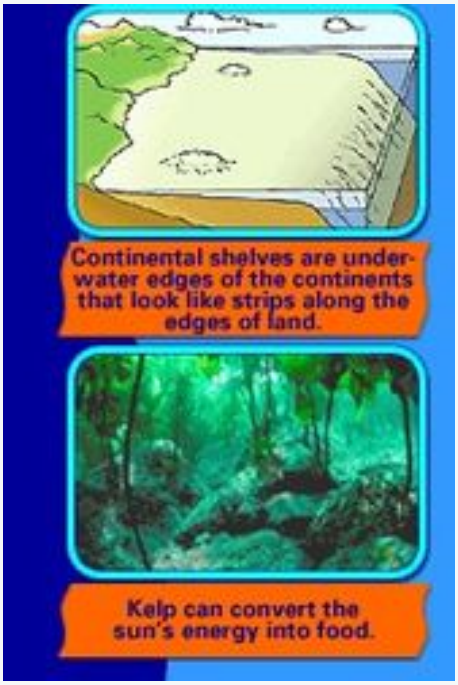
As you dive deeper, to the colder, darker twilight zone, there's less life. Zooplankton and sea snow provide most of the food for the animals that live here.

Science (bottom)

Way down deep is the icy-cold dark zone, where signs of life are rare. The pressure of the water would crush a human. It's pitch-black here because no sunlight penetrates. The only light is provided by bioluminescence — glowing lights on animals' bodies.

Life on the Edge

Ecosystems such as coral reefs, mangroves, kelp forests, and estuaries are found along the continental shelves. Eighty percent of all sea life lives here. Why? Because shallow water and closeness to land provide the conditions needed to support large quantities of life: food, light, and shelter. Algae, like kelp and phytoplankton, contain green, brown, and red pigments that enable them to convert the sun's energy into food.

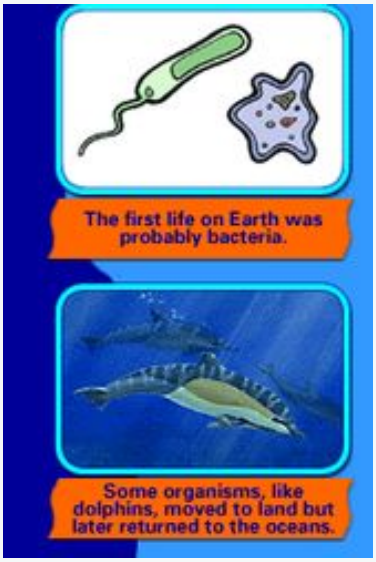


Credit: Eric Hamilton (top illustration); courtesy of Ian Skipworth (bottom photo)

What's the Big Idea about Marine Biology? Life in the Ocean

This text is provided courtesy of OLogy, the American Museum of Natural History's website for kids.

It All Started in the Ocean



Our planet is made up of five great oceans — the Atlantic, the Pacific, the Indian, the Arctic, and the Southern. They're all linked together, creating a huge body of salt water called the World Ocean that surrounds the continents and islands and covers about two-thirds of the earth's surface.

Scientists know — from studying tiny fossils — that life on Earth probably started in the oceans nearly 4 billion years ago. For most of Earth's history, life stayed and thrived in the oceans. About 500 million years ago, some living things, like our ancestors, moved out of the water and on to land, but most life stayed in the oceans.

Underwater Wonders

Life in the oceans is much more diverse than life on land; oceans have many more different kinds of organisms. They are full of the biggest, smallest, fastest, weirdest, coolest, and spookiest stuff: whales, phytoplankton, jellyfish, sponges, sea dragons, marlins, giant squid, hatchet fish, seaweed, starfish, sea cucumbers, manatees, coelacanths, and stingrays, to name a few.

Just How Do You Live in Water?

Sea organisms need special adaptations for life in water because:

- There's a lot less dissolved oxygen in water.
- Food gets scarce once you leave the continental shelves.

• As you go deeper, pressure increases.

• Water is denser and more viscous than air. It supports weight better, but it's more difficult to move through because it's stiffer.

• As light travels downwards in water, different colors (wavelengths) are absorbed at different depths. Below 2,000 feet, the ocean is completely dark.

What's the Big Idea about Marine Biology? The Oceans and Us

By American Museum of Natural History

This text is provided courtesy of OLogy, the American Museum of Natural History's website for kids.

Image Credit: Sean Murtha

We've always depended on the oceans: mostly for food, but also for oil, sand, and salt. We spend time at the ocean when we want to relax.

But over the years we've taken too much out of the oceans through overfishing. And we've put too much in: fertilizers, pesticides, motor oil, and trash pollute our oceans. Modern fishing nets often catch animals by mistake — like dolphins — when they mean to catch tuna. And these nets destroy the ocean floor.

There are ways that you can help protect ocean life. Be selective when eating seafood by avoiding species that are overfished. And if you have a home aquarium, fill it with fish that were raised to be pets, not wild fish.

It Takes All Kinds to Make a World

By American Museum of Natural History

This text is provided courtesy of OLogy, the American Museum of Natural History's website for kids.

To introduce you to the biodiversity in the ocean and to get you started on your investigations, I've picked just a few examples of marine life to show you at least one from each of the major groups that scientists use to classify life on Earth: true bacteria, archaea, protists, animals, plants and fungi.

Want to learn more about this amazing watery world? Dive in and start exploring!

Image credits: courtesy of AMNH, Denis Finnin; Melanie Stiassny: courtesy of AMNH, Denis Finnin; Melanie Stiassny: courtesy of AMNH, Denis Finnin.

Melanie Stiassny has been fascinated by fish from the time she was a little girl living in London. Today, Melanie is an ichthyologist, a scientist who studies fish. At the American Museum of Natural History, she oversees everything that has to do with fish, from research and exhibits to scientific expeditions. Melanie travels to tropical areas around the world to collect and study fish.

Image credits: courtesy of NASA; Rosamond Kinzler: AMNH.

The Earth is our home. So far, it's the only place that we know of that has life. Everywhere you look on Earth there is life. This is possible because Earth has lots of water. It's also just the right distance from the Sun. Some people call Earth the "Goldilocks planet." It's not too hot (like Venus), and not too cold (like Mars), it's just right!

Image credits: AMNH, spectrum of life in Hall of Biodiversity; Eleanor Sterling: courtesy of AMNH.

Scientists have identified over 1.75 million species on Earth -- over one million of them are insects and spiders. There are many more yet to be identified! All living things are dependent upon one another for survival. This variety of life on Earth -- and its interdependence -- is called biodiversity.

Diversity of Life on Earth

True Bacteria:	10,000 known species, but there may be as many as 4 million!
Archaea:	Unknown number of species. These bacteria-like organisms were once thought to be rare. They are now estimated to be 50% of the species found in the open ocean — both the largest part of the ocean and the area that is still mostly unexplored.
Protists:	At least 60,000 known species. Though not a "true" group, these organisms are found in all habitats on Earth. Protists are the reason the ocean looks green near the shore.

Fungi:	Of the estimated 1,500,000 species of fungi, scientists have described just 60,000. Only 500 species live in the oceans, where they prefer coastal environments.
Animals:	About 1,000,000 described species. Animals are unique life forms because they have nervous systems (except for sponges), which enable them to feel and touch.
Plants:	Over 250,000 described species. There are three kinds of plants: red, green, and brown. These three groups, although all plants, are not closely related. Green plants are common on land, and mostly red and brown plants live in the oceans.

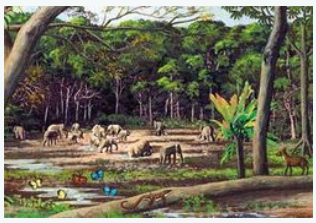


Image credits: Laura Friedman.

Animals and plants are usually adapted to survive best in particular environments, known as their habitats. For example, an Amazon river fish couldn't survive in the freezing waters of the Arctic Ocean. A habitat is a place where an animal or plant lives and grows. Over time, animals and plants develop features to help them meet the challenges of their environments.

It All Began in the Oceans

Hello. My name is Mark Siddall and I'm an Invertebrate Zoologist — I study animals without backbones.

Image credits: courtesy of AMNH, Mark Siddall; Mark Siddall: courtesy of AMNH.

It's no wonder that most people aren't crazy about leeches. These dark, slimy worms survive by sucking blood from other animals, or "hosts" -- including humans. But Dr. Mark Siddall thinks leeches are the most beautiful creatures on the planet. He studies how leeches live, move from host to host, how they affect biodiversity -- the variety of Earth's life -- and he works to protect them from extinction.

Did you know that most animals (more than 99%!) are invertebrates? And that many of these live in the oceans? The other 1% of animals is called vertebrates, animals with backbones, like you and me. Most vertebrates live in water as well. In fact, much of life lives in the oceans!

Image credits: scorpion, courtesy of California Academy of Sciences, Arie van der Meijden, garden slug, courtesy of California Academy of Sciences, William Leonard, jellyfish, courtesy of NOAA, Kip Evans.

Some people may call invertebrates spineless because they lack a backbone or spine! But these amazing creatures are the most abundant animals on Earth. Some invertebrates, like squid and leeches, have soft bodies, while others, like crabs, have a hard outer shell called an exoskeleton. Invertebrates are found in every ecosystem. Some, such as sponges, jellyfish, starfish, and crabs, live in the ocean.

Life actually began in the oceans — and for most of Earth history, has thrived in the oceans. First came true bacteria and probably archaea, followed by the protists. Plants, animals and fungi didn't appear until much later, and it is only in the last 360 million years that the first vertebrates, for example, moved onto land.

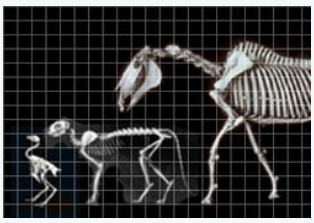


Image credits: cat skeleton, horse skeleton, courtesy of AMNH Department of Library Services, chicken skeleton, courtesy of AMNH, Roderick Mickens.

What do we have in common with sharks, bluebirds, lizards, and toads? We are all vertebrates, or animals with backbones. Vertebrates use their backbones for movement and support. Vertebrates share other traits as well: an internal skeleton, muscles, a protective skin, blood that circulates through vessels, and an advanced nervous system, including a head with a brain.

The 94-foot long blue whale is one of the Museum's star attractions. It's a replica of a whale

captured in 1925 off South Georgia Island at the southern tip of South America. The whale has been in the Hall of Ocean Life since 1969. Suspended from the ceiling of the Hall, the whale swims in a "virtual ocean." Above your head, blue light shimmers as if it's filtering down through water. Lights, video, and the sound of whales singing make you feel like you are right there, submerged in the middle of the ocean with the whale.

During the late 19th and early 20th centuries, hunters looking for whale blubber almost sent the blue whale *(Balaenoptera musculus)* into extinction. But thanks to a worldwide ban on whale hunting in the 1960s, blue whale populations have started to grow again.

Image credits: courtesy of Mike Johnson.

The blue whale is the largest animal ever to have lived on Earth. It's even bigger than the enormous dinosaurs that lived over 65 million years ago! Blue whales migrate long distances, traveling alone or in small groups called pods. These colossal creatures breed in warm southern waters during the winter and feed in polar seas during the spring and summer.

What's the Big Idea about Marine Biology? Mysteries of the Deep

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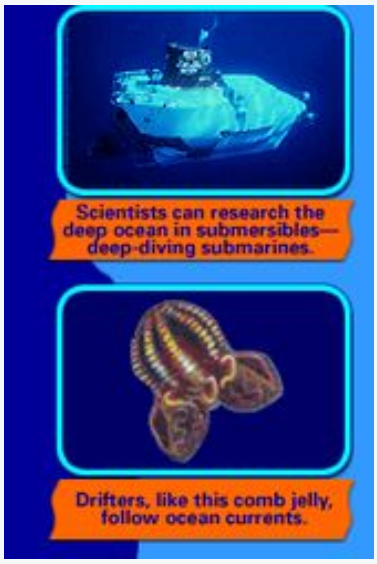

Photo Credit: (Top) AMNH (Bottom) Courtesy of Sean Murtha

Oceans absorb the heat from the Sun at the equator and distribute it around the globe, towards the poles, shaping our weather and climate. The pull of gravity from the Sun and Moon creates tides that in turn create ocean currents. Currents provide the means for ocean dwellers, from giant jellyfish to plankton, to move around.

Scientists know less about what's actually in the ocean than they know about the dark side of the Moon! But now, with scuba diving gear, submersibles, and satellites, we can start to investigate parts of the ocean that used to be beyond our reach.

Photo Credit: AMNH

Ninety-three million miles from Earth, a giant ball of hot gas brightens the sky. Nuclear reactions in the Sun's core create energy, which gradually flows to the Sun's surface. This energy reaches Earth in the form of sunlight. The Sun's heat and light warm Earth's surface, drive weather and currents, and make life possible on our planet. We experience the Sun's energy every time we feel its warmth on our skin or see with the aid of sunlight.

Photo Credit: AMNH

The deep sea is not an easy place to explore. To observe the ocean below 2,000 meters (or 6,562 feet), scientists must travel in deep-sea submersibles specially designed to endure the extreme pressure. Scientists from the United States use a submersible called the Alvin. Its successful missions have ranged from the first observation of hot-water vents to finding the Titanic.

Photo Credit: AMNH

Meteorites and asteroids have bombarded the Moon for billions of years, leaving deep craters on its surface. Without the forces of weather to remove them, the craters act as a record of all of these impacts. Many of its craters and mountains can be seen with the naked eye! In fact, some people think that these features resemble a man's face. What do you see when you look at the Moon?