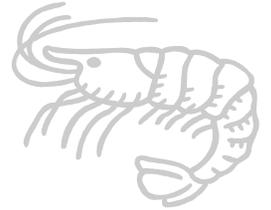


OKLAHOMA AQUARIUM

Guide to the Galleries Teacher-led Aquarium Tours

AMAZING INVERTEBRATES GALLERY



THE VARIETY OF LIVING ORGANISMS

What is biodiversity?

Biodiversity is all the different life forms that exist in an ecosystem, area or planet.

Why is biodiversity important?

Biodiversity shows us how healthy an ecosystem is, the more diversity, the healthier the system.

Why show invertebrates (animals without backbones) in the Aquarium?

94 - 97% of all life on Earth is an invertebrate.

INVERTEBRATES VS. VERTEBRATES

One major thing separates vertebrates from invertebrates: a backbone! Most of the life on Earth is invertebrates.

The animal kingdom is broken down into Phyla, which is basically organizing animals based on a common body structure. Even animals that we do not think of as being the same can be grouped in the same phyla because their body structure is similar. Such as a scorpion and a lobster which are both in the Phylum Arthropoda.

Almost every invertebrate phylum is found in the marine environment. So, in this gallery, we highlight some of these **Amazing Invertebrates**.

"VARIETY IS THE SPICE OF LIFE!"

One of the buzz words in environmental education and science is biodiversity. Biodiversity refers to the variety of living organisms on earth and that variety is tremendous! However, humans are causing extinction of other species at a rate of 250 times the natural rate. Without understanding the benefits of biodiversity, this number may not mean much.

Not only are the numbers of plants and animals on earth exciting to learn about, see and experience, but diversity of life has real value. People enjoy visiting zoos and aquariums for the chance to see wildlife that they might never see otherwise. Diversity has value simply for its beauty!

Second, conservationists and other wildlife enthusiasts value diversity because it is a part of the natural world. Ethically these groups feel that all organisms on earth have a right to live and people have the responsibility to ensure their survival. Their big question is "What right do we have to eliminate species from this planet?"

Finally, diversity of animals and plants is important for the health and economic survival of our species, humans! Diversity provides food, potential medicines, raw materials, and buffers against extreme environmental conditions. Without high levels of diversity our ability to pursue new food sources, chemical compounds, and other items to make our society thrive are inhibited.

EXHIBITS

As with all of our galleries here at the aquarium, we are constantly changing and evolving, but below you will find examples of some of the Phylum that we highlight in Amazing Invertebrates.

Phylum Porifera

Porifera, *from Latin: pore bearing*

Sponges are multicellular animals that live attached to the ocean floor or some other hard substrate. Sponges have no organs and until a few hundred years ago, because of their simple body structure, people thought they were plants. They get their scientific name from the tiny holes all over their body, which they use to pull water into their bodies. They then filter out the oxygen and food they need from that water and spit the remainder of it out through a larger hole called an osculum. Porifera are one of the simplest life forms

Phylum Cnidaria

Cnidaria, *from Greek: stinging thread*

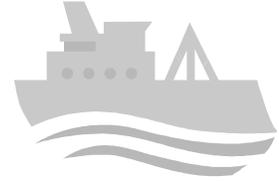
Cnidarians are made mostly of water and are bell-shaped with stinging tentacles arranged in a circle around a central mouth. This group includes sea jellies (formerly called jellyfish), corals, and anemones. Some of these animals, such as the sea jelly and sea anemone, are free-living while others, such as reef-building corals, are sessile and spend their entire lives attached to the substrate.



Phylum Arthropoda

Arthropoda, *from Greek: jointed foot*

All the creatures in this phylum are protected by a hard outer skeleton and have jointed legs at some point in their life cycle. Their hard outer skeleton (AKA exoskeleton) does not get larger once it has been formed, so to grow they must shed or molt their exoskeleton and make a new one. Most marine members of this group are crustaceans such as crabs, lobsters, and shrimp.



Shrimp Boat touch and feed station

The Shrimp Boat is an interactive station allowing students to both feed and touch animals from the phylum Arthropoda such as the Horseshoe Crab. The Horseshoe Crab has nine eyes and blue blood! Their copper based blue blood is very important for research in the medical industry.

Phylum Mollusca

Mollusca, *from Latin: soft body*

Molluscs are soft-bodied animals with a hard external shell, an internal shell, or with no shell at all. It is an extremely diverse group, containing three major classes or subgroups. The Gastropods, which includes snails, abalone, limpets, and chitons, are all of the snail-like animals with a slimy foot and single shell. The Bivalves, such as clams, oysters, mussels, and scallops, are animals whose soft body is protected by two hard shells connected by a flexible hinge. The Cephalopods have a brain and, with the exception of the nautilus, have eyes with a focusable lens. The nautiloids are also the only members of this group with an external shell. However, other Cephalopods, such as octopods, cuttlefish, and squid, have no external shell.

Phylum Echinodermata

Echinodermata, *from Greek: spiny skin*

Echinoderms are ocean creatures that have a rough, spiny skin to protect them from their harsh environments. It is a highly varied group of animals such as sea stars (formerly starfish), brittle stars, basket stars, sea biscuits, sea urchins, sea apples, and sea cucumbers. All these animals possess what is known as radial symmetry. Which means you can cut them like a pie and all the pieces will be almost identical.

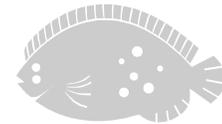
EXTREME FISHES GALLERY

THE EXTREME THINGS FISH CAN DO!

The Extreme Fishes gallery highlights some of the incredible and extreme adaptations that marine life utilize to survive in the fish eat fish world.

These animals have developed many different behavioral, physical, and physiological adaptations that allow them to survive in their aquatic environment. From senses to coloration, specialized ways of feeding, swimming, and unique relationships with other marine animals, these fishes have many extreme adaptations.

An adaptation is a special modification, physical or biological, of an organism that allows it to survive more easily in surrounding environmental conditions. Fishes are adapted in many ways that allow them to live, grow, and survive in varying marine and aquatic environments. They have fins that may be modified for different methods of swimming or moving around. Body shapes vary from species to species, allowing the fish to move more easily through the open water, maneuver through tight areas in the coral reefs, or out-swim a predator. Coloration patterns may serve to camouflage a fish or make it stand out, advertising for a service or attracting a mate. All adaptations serve the same purpose: to give that fish species a certain edge in a world where competition for mates, food, and space is very stiff.



VARIATIONS AND NATURAL SELECTION

Variation within a species exists as a result of genetic influence. For example, while people are all members of the same species, they are different heights, have different eye colors, and various shades of skin. All animals within a species have these varying physical **traits** that are passed on from one generation to the next. In some cases, these and other characteristics may be beneficial to survival.

In extreme conditions, having certain traits might make a difference in the ability of an animal to live in its environment. An animal with a particular trait will survive and reproduce, while those without that trait will not. The surviving animal is left to pass that trait on to subsequent generations. After many generations, all the animals in that group will possess that trait or adaptation. The process by which environmental conditions select individuals with favorable characteristics to survive and pass the traits to the next generations is known as natural selection.

Adapting to environmental conditions is a slow process in most cases; however, extreme and rapid changes in the surrounding environment can expedite this process. In fact, here at the Oklahoma Aquarium, we adapt too! Our exhibits, layouts, and programs change as we progress through time and respond to the environment and our guests needs and suggestions!

EXHIBITS

Exhibits in the Extreme Fishes Gallery are typically arranged by the type of adaptation that animal exhibits.

Body Form

The shape of a fish is determined by where it lives, what it eats, and how it swims. The fish in this gallery demonstrate many different body types: fusiform (most fish), depressed form (flat fish), globiform (odd, boxy shaped fish), and anguilliform (snake-like or eel-shaped fish). Fusiform, which is the most common, is the basic torpedo shape that most people associate with fish. Depressed form fish tend to live on the bottom, while globiform fish usually live on a reef where they can hide. Anguilliform fish are common in a variety of environments where they can maneuver around obstacles or wriggle into a hiding place.

Air Breathing

Some fish have adapted to living and breathing out of water. The lungfish use their air or swim bladder, a device most fish use to control buoyancy, as a primitive lung. Lungfish can survive out of the water for up to 3 years! Mudskippers, cannot actually breathe air, but have a special pocket behind their eyes to store water. Blinking causes the water to run from the pocket to the mudskipper's gills, keeping them moist and allowing the fish to breathe out of water.



Coloration

Fish use different coloration to communicate, defend their territory, attract mates, and avoid predators.

Camouflage

Camouflage describes how body shape and color patterns allow animals to blend in with their surroundings. Some fish blend in to avoid predators, while others blend in to be better predators; when your prey cannot see you, they cannot escape you. See if you can find the Stonefish. They are the most venomous fish in the world and unfortunately they are so good at camouflage, they are sometimes stepped on by people. That makes for a bad day at the shore!

Schooling

A large group of the same species of fish swimming together is called a school. Fish school together for protection, reproductive benefits, and to cut down upon water turbulence as they swim. 85% of all fish school at some point in their life cycle, usually as juveniles, safety in numbers! Schooling fish use their lateral line system to all move as a unit. The lateral line is a group of very sensitive "hair cell" organs that allow fish to "feel" their surroundings by detecting movement and vibrations.

Locomotion

Fish move in various ways by using different fins. Fish can use a variety of fin movements to swim in different ways. Some fish do not use their fins to swim at all; they might walk on their fins, fly through the air with them, or even modify their fins into a suction device to hold on to other fish, eliminating the need to swim at all.

Feeding Strategy

Many fish have adapted their bodies and their behaviors to help them get food. The shape and placement of a fish's mouth tells a lot about what a fish eats. For example, a fish with a mouth on the bottom of its head is going to eat food below the fish and a fish with a mouth on the front of its head is going to eat what it finds in front of its head.

Defense

In order to survive, an animal must develop defenses for protection against predators some fish have poison or even spines to deter predators. Stonefish possess both a sharp barb and deadly venom. The Pufferfish can inflate its body so that a predator cannot engulf or swallow it and they are highly poisonous to eat. Porcupinefish take the swelling and poison of the pufferfish and combines them with painful spines.



Sight

Fish certainly see the world differently than we do. Many fish rely heavily on sight and have specially modified eyes. For example four-eyed fish have eyes with a split lens, the top half of which can see above the water into the air and the bottom half can see below the water.

Other fish do not bother with eyes at all. There are many deep water fish that live where there is little or no light so they have adapted to have no eyes at all!

Sixth Sense

Fish have developed a sixth sense to help them detect vibrations, pressure changes, and even electrical impulses. They have a line running down their body called the lateral line organ which is responsible for this ability. Some fish use electrical impulses to find their way around.

Symbiosis

Symbiosis describes two organisms that live together and affect one another.

Anemonefish (AKA clownfish) and anemones live together, benefiting one another. The anemone gains protection from predators and is, therefore, able to reach sizes it might otherwise not be able to attain. At the same time, the anemonefish gains protection from predators, too. The stinging cells of the anemone do not harm the anemonefish however; they are painful or poisonous to other fish.

Do you wonder why the Moray Eel does not eat the Stripped Cleaner Shrimp? It is because the shrimp is his own personal toothbrush, eating the small parasites that grow in the eel's mouth and on its body!

EXTREME AMAZON!

The second largest river in the world is home to approximately 4000 different species of fish, this is more species than are found in the Atlantic Ocean! The Amazon River provides 16% of the world's fresh water. Everyone has heard of the piranha, but believe it or not there are 20 different species of piranha and all but 4 species eat nuts and berries! In our Extreme Amazon, you will find pacu which are an omnivorous cousin of the piranha, catfish, peacock bass and even iguana!

Kids (and brave adults) can crawl through a tunnel that runs under the exhibit and pop up in a bubble where they are surrounded by the life in the Amazon!

MARVELS AND MYSTERIES GALLERY

Our Marvels and Mysteries gallery is where we showcase some of what we think are the "coolest" aquatic animals. They are the ohh's and ahh's of the Aquarium!

SOME OF THE "Ohh's"! AND "Ahh's"! OF THE GALLERY

One of the most beautiful and graceful types of fish in the sea is the seahorse. The 40 species of seahorses on Earth have intrigued people around the world for centuries. Commonly found in warm waters at depths of 2 - 90 feet, seahorses appear to be a mixture of many kinds of creatures. In fact, their scientific name of *Hippocampus* is Greek for "horse animal".

Unfortunately, seahorses are in danger of extinction from overharvesting. Luckily here at the aquarium, our Potbelly Seahorses have lots of babies that we can trade and give to other zoos and aquariums!

Sea jellies and sea nettles are jellies are found throughout the world's oceans. They are, of course, related to the corals and anemones that you already met in the Amazing Invertebrates gallery. Jellies and nettles use nematocysts or stinging cells to inject either a mildly irritating or a deadly sting. The animal injects a nematocyst or stinging cell into its victim which releases a toxin under the skin. Some species of jellies such as the Box Jelly are extremely dangerous and deadly to humans. But some scientists feel that if we could get over the "gross" factor, jellies could end world hunger!

Aquarium guests who visit on a Monday, Wednesday or Friday at 2 PM are in for a special treat! That is when we feed our three freshwater animals of the Marvels and Mysteries Gallery. The Archer fish, which are native to Southeast Asia will actually spit a stream of water to knock insects and other prey into the water so that they can eat them. They have incredible eyesight and accuracy. The other two freshwater animals are native to the Amazon River Basin. The electric eel uses electrical charges to find, shock, and catch food. They can release up to 500 volts and 1 ampere which can be lethal to humans! Piranhas are famed for their ability to strip an animal carcass clean of all its flesh but they are rarely as dangerous as their reputation.

AQUATIC OKLAHOMA GALLERY

OUR GLOBAL IMPACT

Here in Oklahoma, we may think that our actions don't affect the world's oceans. Every drop of water on the planet is part of the hydrologic or water cycle; the continuous movement of water on, above or below the surface of the planet.

Our waterways are also directly connected. The Arkansas River, which flows right past the Aquarium, travels from the Rocky Mountains into Kansas, past us where it then flows into the Mississippi River. The Mississippi runs into the Gulf of Mexico where currents carry it to the rest of the world's oceans. So, improper use of chemicals in agriculture, industry or at our homes can cause pollutants to flow into our water systems and then be carried throughout the world. When you litter, it will all eventually end up in a waterway, so your actions in your community have a huge global impact. Here at the Oklahoma Aquarium, we feel that by protecting our precious water resources, we can help protect the environment.

"Think Blue to Go Green!"



OKLAHOMA FISHES

As you make your way through the Aquatic Oklahoma Gallery you will encounter many exciting exhibits! One of the more unusual exhibits is the Jurassic Fishes Exhibit. The Jurassic period occurred between 145 and 210 million years ago. But even today, Oklahoma waters still teem with this ancient history! The time of the dinosaurs was truly exciting, but came to an abrupt end for a still unknown reason. While the diversity of life on land was exploding, the life in the sea also moved forward. However, the fishes were rather primitive in form, behaviors, and physiology.

When the Jurassic period ended, so did many unusual forms of life. However, five or six primitive families of fishes managed to survive and continue to exist into the modern era. Representatives of four of these families - paddlefishes, sturgeons, gars, and bowfins - live in Oklahoma waters.

Some of the other animals you will encounter in this gallery are the suckers, catfish, bass, crappie, sunfish, turtles, non-venomous water snakes, alligators and frogs.

HAYES FAMILY OZARK STREAM

When you enter the Ozark Stream exhibit, you feel as if you are walking along the banks of an actual stream. This remarkable exhibit is built like a waterfall with different levels of tanks housing sunfish, smallmouth bass, and many other fish found in the Ozark streams. However, the stars of this gallery are the Aquariums only mammals; river otters, beavers, and raccoons! Both raccoons and beavers are nocturnal, so the best way to see them is to catch a feeding show. Check the feed schedule for times.

THE ECOZONE

71% of the planet is covered in water. The oceans comprise such a vast area of the planet, that they control climate and wind patterns. The Eco-Zone features exhibits which highlight some of the richest most diverse aquatic areas of the world. Areas such as kelp forests and coral reefs provide valuable protection to juvenile marine species. While areas such as coastal marshes help to "clean" water as it travels across land and into a body of water.



COASTAL HABITATS

As rivers meet the ocean, they first pass through a **coastal marsh** before joining with the sea. Animals that survive here must endure intense wave activity, shifting sand, and fluxes in the surrounding environmental conditions.

In the Southeastern portion of the United States, the coastal environment would probably include the mangrove swamps and **coral flats**, which provide habitat for fish nurseries. The coral flats provide habitat for developing young, a gathering place for fishes that are about to spawn, and ample food for young fishes and invertebrates, as well as for the smaller species that would not survive as easily in the open water. The very shallow waters of the continental shelf regions often form extensive coral flats dotted with eel grasses, patch reefs, and mangrove stands. Scientists estimate that over 75% of all commercially imported fish and shellfish species spend a portion of their lives in a coral flat environment.

The **rocky coast** represents the land-sea barrier in New England or along the West Coast of the United States. Crashing waves, hot sun, flooding, exposure to air, fluctuations in salinity - this does not sound like an ideal place to live! The animals that live there have to face constant changes, predation by animals both on land and in the ocean, and an overall harsh existence. Rocky coasts are where you find tide pools where you can spend hours exploring all the sea stars, anemones, urchins and other hardy animals that call the tidal zone their home.

Even further off the coast of the Pacific Northwest, the **kelp forest** serves as an important habitat between the land and deeper waters. Found in the cool, nutrient rich waters of the world, kelp forests provide habitats for thousands of fish and invertebrates. They offer two of the most essential components of life: food and shelter. Many open water fishes spend their early life hiding in the stands of kelp, the kelp fronds offer cover for many species of fish and a host of invertebrates.

Kelp forests are also invaluable to us as a species. We use products derived from kelp in many areas of our lives, Alginate which is derived from kelp is used to thicken everything from ice cream to toothpaste. Kelp products are also used in making the medicines that we rely on everyday.

Coral Reefs are among the most beautiful, complex, species-rich, biologically diverse ecosystems on earth. Reefs cover approximately 0.2% of the ocean's area and yet they provide home to one-third of all marine fish species and tens of thousands of other species. Over 700 species of coral have been described throughout the world. While some coral species are found in cooler waters of the sea, almost all reef-forming corals live in the tropical regions around the equator.

Coral reefs are the result of thousands of generations of corals living and dying on the reef. Juvenile coral settle, secrete a hard limestone skeleton called corallite, and then spend their lives attached to that one spot.

Reef ecosystems are just as important to people as they are to sea creatures! Coastal states and countries use them as resources for food and tourism. Coral reef fisheries yield approximately 6 million metric tons of fish annually, with one quarter of the total worldwide fish production found in developing countries with coral reefs. On U.S. reefs, over 500 commercially valuable coral reef fishes and invertebrate are under federal management.

Despite their importance, coral reefs have experienced widespread declines in coral species and live coral coverage worldwide over the last two decades. Changing landscape, environmental conditions, ocean uses, population growth in coastal areas, and increased popularity are some of the many problems facing coral habitats today.

Many countries and conservation institutions are now working together to protect these incredible natural resources. Through educational programs and direct support of field research and conservation programs and in cooperation with other institutions and agencies, the Oklahoma Aquarium will contribute to worldwide efforts in reef conservation.

The exhibits in this gallery are arranged in a circle. Going clockwise from the entrance they are arranged starting with a **cold water touch tank**, the rocky coast, and moving onto the kelp forest. There is also another touch tank with sharks and stingrays (the **shark and stingray touch tank** is open at certain times please check with the information desk or a volunteer). You will then move on to the Shark View Room and then to the under water tunnel (see The Oklahoma Aquarium Shark Adventure for accompanying information). Continuing on around the circle you will see the sandy beach exhibit, then on to the live coral exhibit which is the entry to the Jewels of the Caribbean exhibit, our artificial reef that highlights the fish species of the Caribbean. Finally in the center of this circular gallery you will see our coral flats exhibit.

THE OKLAHOMA AQUARIUM SHARK ADVENTURE



THE OPEN OCEAN

The ocean is a lonely place to be! While the occasional animal swims through the vast expanse of the ocean, life is typically concentrated in the shallow areas, on the bottom of the sea, and near reefs (natural or artificial). Large fish, mammals, and invertebrates cruise the seas looking for their next meals, the majority of which must be large and able to swim fast if necessary. They have no cover to escape predators and rely on their ability of fight or flight to make their escape.

WHAT IS A SHARK

A shark is a type of fish that belongs to the class Chondrichthyes. What this means is that sharks and their closest relatives, skates and rays, lack a hard calcified skeleton. Instead, their skeleton is made entirely of a tough, flexible cartilage. Cartilage is the precursor to bone in embryonic development of vertebrates. As the animal matures, the cartilage is replaced by bone. In humans, some cartilage remains in our noses, ears, and in some joints (like our knees) however, in sharks, rays, and skates the adult skeleton is made entirely of cartilage.

There are over 450 species of sharks that have been identified and scientists have also named about 450 species of skates and rays. Compare this with the over 20,000 "described" bony fish species! The largest shark is the whale shark (approx. 40 feet) and the smallest shark, the dwarf lanternshark is a mere 5 - 7 inches! While all sharks fall in a size range somewhere in between those two, over half of all shark species are less than three feet in length when fully grown.

A LITTLE CHUNK OF THE OCEAN

The Open Ocean environment at the Oklahoma Aquarium is an approximately 500,000 gallon exhibit that features bull sharks and nurse sharks.

Sharks have a fearsome reputation as man-eaters, but in reality, they have much more to worry about from us than we do from them. There are approximately 60 shark attacks per year world-wide resulting in only about 5 deaths. In contrast, humans kill over 100 MILLION sharks annually, not because they are a threat to us, but because we remove their fins to make sharkfin soup. It may not sound good to many of us here in the United States, but it is considered a delicacy throughout parts of the world.

Why should we care about killing sharks to the point of extinction?

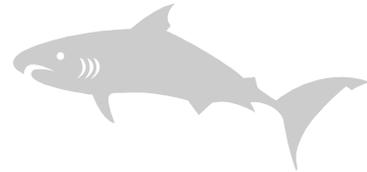
Sharks are the apex or top predatory fish in the ocean, when you disrupt their numbers; you affect all life in the ocean, all the way down the food chain to zooplankton (tiny animals) and phytoplankton (tiny plants).

Bull Sharks

The bull shark inhabits coastal waters in tropical and subtropical seas worldwide. These aggressive fish are the culprits in many shark attacks, as they are commonly found in the same waters as beach goers. They are considered the world's most dangerous shark due to the number of interactions they have with humans. This species of shark has even been documented swimming into rivers, as far as 1,700 miles up the Mississippi and over 2,500 miles up the Amazon!

The Oklahoma Aquarium is very proud to have the largest Bull Shark and the largest collection of Bull Sharks anywhere in the world!

The bull shark can be distinguished from other sharks because it has a stout body and short, blunt snout. Also, their second dorsal fin is about one third the height of the first dorsal fin. The Bull Shark has a gray to brownish-gray top or dorsal side and a paler underside or ventral side. The diet of a bull shark usually consists of fish, rays, birds, turtles, and dolphins or small sharks.



Nurse Shark

Nurse sharks are usually found on the ocean floor, they are easily distinguished by the barbels located near their mouths. These barbels are used to locate food along the ocean floor.

These nocturnal sharks will spend most of their days piled together resting until nightfall when they hunt for fish, shrimp, squid and crustaceans. Groups of up to 40 sharks will often return to the same spot each day to rest.

Nurse sharks can grow very large, up to 14 feet, but are usually only 7-9. They have a grey-brown body with a very long caudal or tail fin.

At the shark exhibit, you will have the opportunity to see the exhibit through a 25 foot acrylic viewing window. Then for an even more exciting view, you will be directed to the opening of an acrylic tunnel that walks you under the water, into an 18 foot, clear acrylic dome room in the middle of the tank, and then out the other side through another tunnel. The tunnel is sunken in, so the water level will start at approximately knee height however; actual water depth is about 13 feet.