COLORADO DIVISION OF WILDLIFE

First Class Fish

Classifying Life on Earth

There is an amazing assortment of living things on earth. Life appears in all shapes, sizes, textures, and colors. Some organisms are tiny, the size of a single cell. Others, such as blue whales, are enormous and made of millions of cells. How can we make sense of the diversity of life?

One way to make sense of the variety of life found on Earth is by grouping or classifying similar organisms into categories. Classification helps us organize the information we have about organisms and understand the relationships between them.

The Five-Kingdom Classification Scheme

The **five-kingdom** classification scheme is one way to classify species. In this scheme, living things are grouped based on body structure, genetics, behavior, and other characteristics. This system of classification includes seven levels. They are—from largest to smallest—Kingdom, Phylum, Class, Order, Family, Genus, and Species. The smallest level—**Species**—is used to name each unique kind of organism; they share all characteristics and can breed and produce fertile offspring. The next level—Genus—includes organisms that are very similar and closely related. For example, grizzly bears and black bears belong to the same genus.

Each larger level is made up of species that have less and less in common. The kingdom is the largest and most inclusive category. The living things found in a kingdom may only share a few important characteristics. The five groups or kingdoms are animals, plants, fungi, protists and bacteria.

Animals, plants, and fungi are all many-celled organisms. Protists and bacteria are single-celled organisms. Fish belong to the animal kingdom.

Heterotrophs and Autotrophs

Animals and fungi are **heterotrophs**—they are organisms that must obtain their food by feeding on other organisms. Fungi usually feed on dead or decaying organisms. Fungi secrete digestive enzymes into their food source. Then they absorb the digested food into their bodies. Plants are **autotrophs**—they are organism that can capture energy from sunlight and use it to produce their own food.

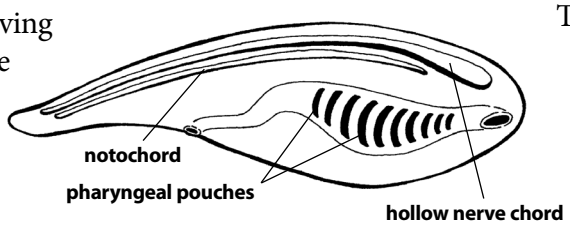
Each kingdom is further divided into large categories called **phyla**. The singular of phyla is **phylum**. There are about 35 animal phyla.

Phylum Chordata

Fish belong to the phylum Chordata. Animals in this phylum are called **chordates** and they share many characteristics. For at least some stage of its life, a chordate has:

- A hollow nerve chord along their back (like your spinal cord);
- A **notochord**—a slim and flexible rod that supports the body just below the nerve cord;
- A tail that extends beyond the anus; and
- Paired structures in the throat (pharynx) region called **pharyngeal pouches**. In fish, slits develop that connect these pouches to the outside of the body. These slits become gills that allow the fish to breathe in water.

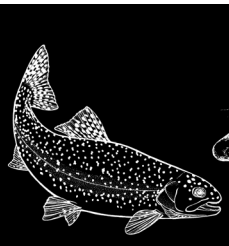
Chordate

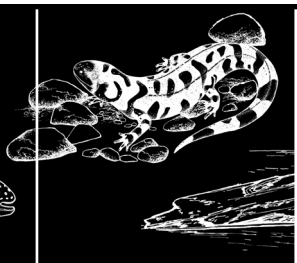


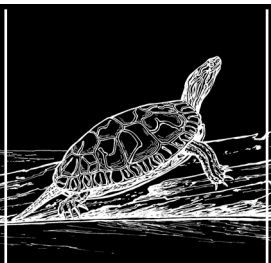
Vertebrates

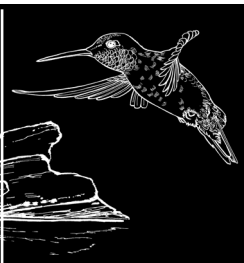
Some chordates have a backbone that encloses, supports and protects the spinal cord. The backbone can be made of bone or cartilage. All chordates that have a jointed backbone are grouped together in the sub-phylum Vertebrata—the **vertebrates**.

There are five groups of vertebrates. Each group is called a **class**! *Fishes were the first "class" of vertebrates to appear on Earth!* Later, amphibians, reptiles, birds, and mammals appeared. Here are the characteristics of species that are in each class:









Fish*	Amphibians	Reptiles	Birds	Mammals
Most have scaly skin	Moist skin	Dry, scaly skin	Feathers	Hair
Ectothermic	Ectothermic	Ectothermic	Ectothermic	Ectothermic
Breathe through paired gills	Breathe through paired gills when young and lungs when adult	Breathe with lungs	Breathe with lungs	Breathe with lungs
Limbs are two sets of paired fins	Limbs of adults are two sets of paired legs	Limbs of adults are two sets of paired legs	Limbs include one pair of wings and one pair of legs	Two pairs of limbs
Lay jelly-coated eggs in water to reproduce	Lay jelly-coated eggs in water to reproduce	Lay leathery-shelled eggs on land to reproduce	Lay hard-shelled eggs to reproduce	Usually give birth to live young

**There is more than one class of fish but this is a general list of fish characteristics.*

One characteristic that distinguishes groups of vertebrates from each other is the way that they control their body temperature. Most fishes, amphibians, and reptiles are ectotherms. An **ectotherm** is an animal whose body does not produce much internal heat—its body temperature changes depending on the temperature of its environment. An ectotherm can also be called a **poikilotherm**—an animal of varying heat. Please, though, don't call them cold-blooded!

Classes of Fish—There are Three!

It's true that the first "class" of vertebrates were fish. However, those fish were very different from most modern fish. They were odd-looking, jawless creatures whose bodies were long and snake-like and covered with armored bony plates! They did not have fins. These jawless fishes were the ancestors of modern hagfishes and lampreys.

Being jawless has its drawbacks. Jawless fish can only eat small pieces of food that they can filter out of the water or suck up like a vacuum cleaner. It's tough for these jawless ones to eat other fish. They first must attach to the other fish with their sucker-like mouths. Then, they have to scrape through the skin of their victim with their rough tongue to get to the meat.

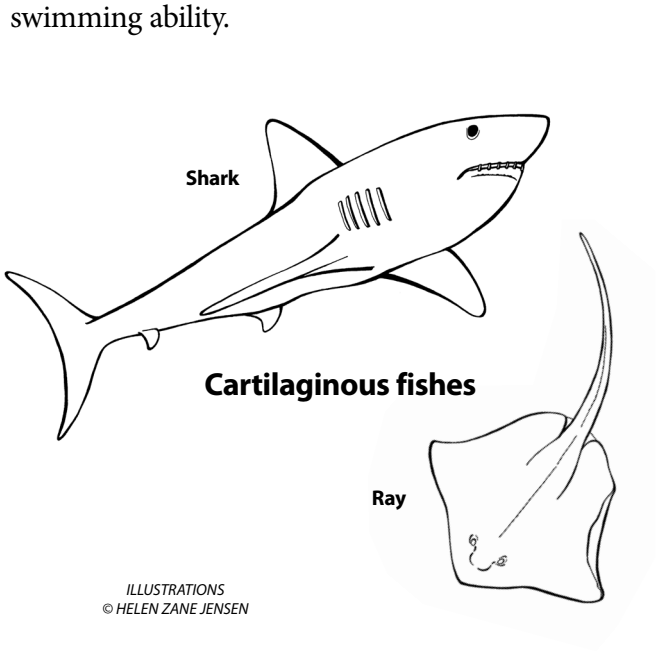
Over time, fish evolved jaws and paired fins—feeding adaptations that would help them become better predators. With jaws, they could eat many kinds of plants and animals. They could also defend themselves. Paired fines gave fishes more control of body movement and improved swimming ability.

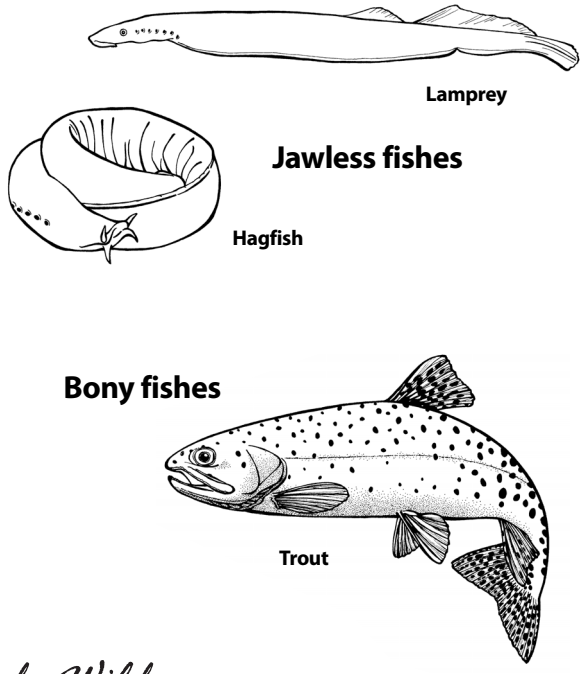
There are three classes of modern fish:

Jawless fishes—Jawless fish have no jaws and no paired appendages. Hagfishes even lack a true backbone; they just have a segmented notochord. Examples: Lampreys and Hagfish

Cartilaginous fishes—Cartilage, which forms your nose and outer ears, is a connective tissue that is flexible and strong. Cartilaginous fish have skeletons made of cartilage rather than bone, their teeth are not fused to their jaws, and their bodies lack a swim bladder. Examples: Sharks, Rays, Rat-Fishes

Bony fishes—Bony fish have a skeleton made at least partly of bone and usually have a swim bladder. A swim bladder is an air-filled organ that helps fish swim at different depths in the water. The fish adjusts the amount of air in the swim bladder to go up and down. Without a swim bladder, the fish would either sink to the bottom or float to the top of the water. There are many species of bony fish—this class makes up 96.2% of all living fishes. Examples: Trout, Bass, Salmon, Perch, Minnows, Carp, Goldfish





ILLUSTRATIONS
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Keeping Colorado Wild

The Colorado Division of Wildlife is the state agency responsible for protecting and managing wildlife and its habitat, as well as providing wildlife-related recreation. The Division is funded by hunting and fishing license fees, federal grants, and Colorado Lottery proceeds through Great Outdoors Colorado.

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