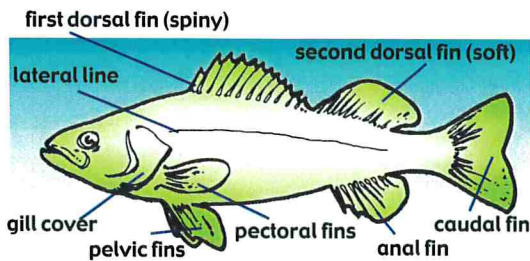


Living in Water: Fish Anatomy

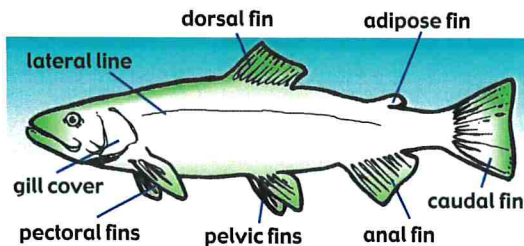
Fish are adapted for life in water. Even though there are many different shapes and sizes of fish, they have many characteristics in common.

Pennsylvania's fish can be grouped according to two different body types: Spiny-rayed and soft-rayed. Rays are found in fish fins. They support the fin. Muscles move the rays, which, in turn, move the fin.

Spiny-rayed fish have hard, and sometimes sharp, spines in one of the two dorsal fins. The other dorsal fin has soft rays. Yellow perch are spiny-rayed fish.



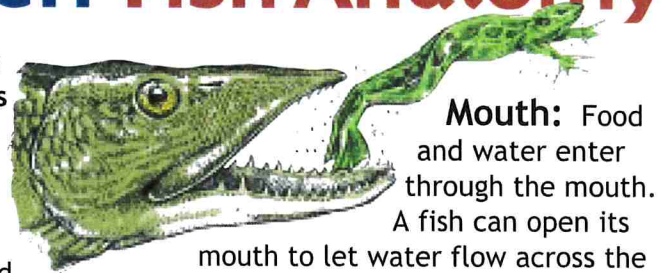
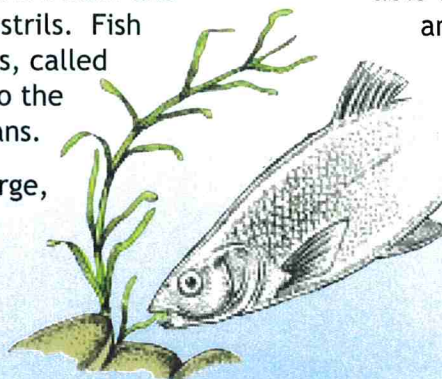
Soft-rayed fish don't have stiff, hard spines. They also have only one dorsal fin. Soft-rayed fish also have a small, fatty fin on the back, called an adipose fin. Trout are soft-rayed fish.



Fins: While their dorsal fins may be different, soft-rayed and spiny-rayed fish do have similarities in their other fins.

Head: A fish's head has a mouth and openings for eyes and nostrils. Fish have two pairs of nostrils, called nares. The nares lead to the olfactory, or smell, organs.

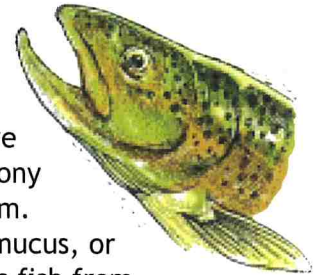
Eyes: All fish have large, round eyes. This gives them a wide field of vision.



Mouth: Food and water enter through the mouth.

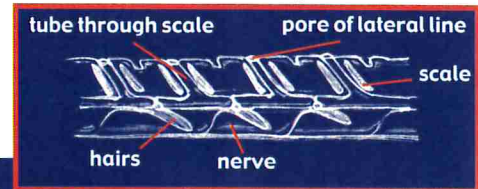
A fish can open its mouth to let water flow across the gills without opening its throat to swallow.

The mouth of a fish is adapted to what it eats and where that food is found.

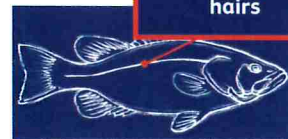


Scales: Most fish have overlapping scales or bony plates that protect them. Scales are covered by mucus, or "slime," which protects fish from infection and helps them swim faster.

Lateral line: On both sides of nearly all fish is a line of pores called the lateral line. These pores are openings of tiny tubes that go through the scales into the body. At the ends



Lateral Line



of each tube are tiny hairs connected to nerves. Sound

waves (like those from your lure) enter the tubes and make the hairs dance.

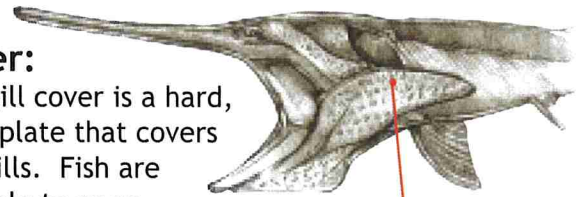
Gill

cover:

The gill cover is a hard, bony plate that covers the gills. Fish are able to open

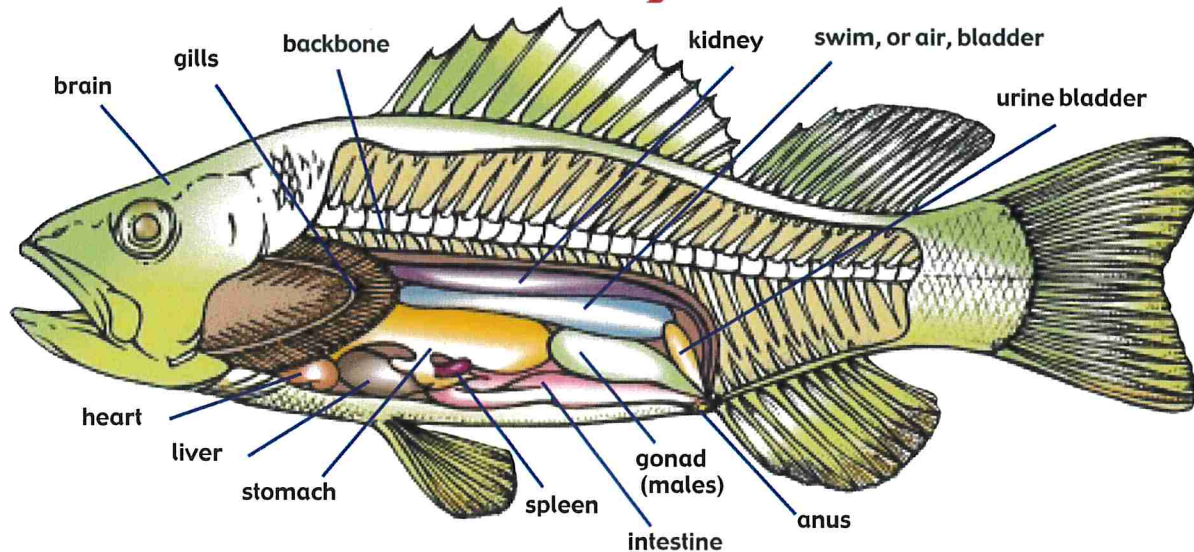
and close this plate, pumping water

across the gills. This plate also protects the gills, in the same way that your ribs protect your lungs. Another name for this cover is the "operculum."



Operculum

Internal Anatomy



Head: Fish have a bony skull that protects the brain and gills.

Backbone: Fish have backbones. The backbone goes from the skull through the body to the tail. Since fish live in water, bones don't have to support the entire body weight. Bones support muscles and give the fish its shape.

Brain: Fish brains are small, compared to their body shape. The brain of a trout you catch is about the size of a large pea. The brain of a fish is very different from a human brain. Fish brains have large lobes for smell, and, depending on the species, sight. Human brains have lobes for those things, but other parts, like where we think and reason, are much larger.

Spinal cord: The spinal cord is inside the backbone and connects the brain to the organs, muscles and other nerves.

Ribs: Attached to the backbone are rows of thin ribs. These ribs protect the fish's internal organs.

Heart: Fish have a two-chambered heart. Human hearts are four-chambered. Blood is pumped by the heart into the gills. Blood returns to the heart after going through the organs and muscles.

Gills: Fish have gills instead of lungs. A fish takes in water by opening its mouth. Fish "pump" water across their gills by moving the

gill covers (operculum). Along the way, the blood takes in oxygen and gives off carbon dioxide through the gills. Bones called gill arches support the gills. Gill arches are the curved, white bony structures you see when you look at the gills.

Give Me Some Air!

Some fish require more oxygen than others. Trout need lots of oxygen. Trout live in colder water because more oxygen is found there. Other fish, like carp and largemouth bass, don't need as much oxygen. They can live in warmer water.

Stomach and intestines: As in humans and other animals, these organs help digest food. Nutrients are removed and wastes are passed "down the line" to the fish's anus.

Liver: Fish livers are large. The liver filters blood, removing toxins taken in from the environment.

Kidney and urine bladder: As in other animals, these organs collect salts and eliminate waste from the fish.

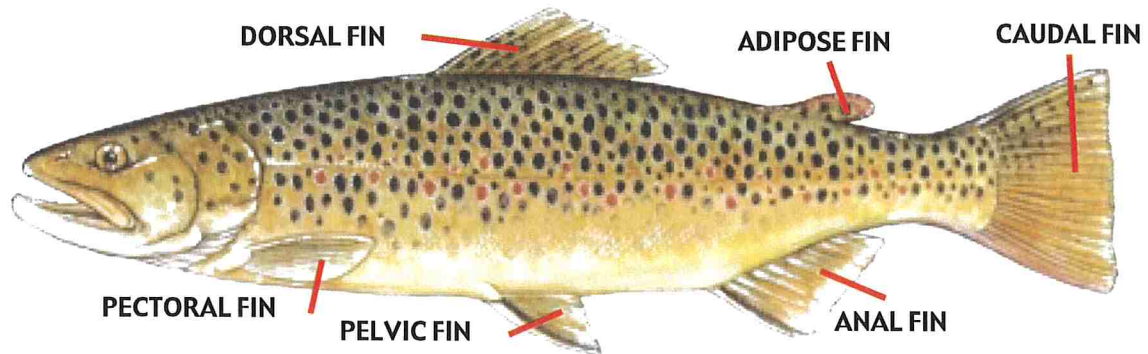
Air bladder: Why don't fish sink to the bottom? It's because they have an air bladder. This air bladder helps the fish float upright, in one place, without sinking. The air bladder also magnifies sounds and helps them hear. Some fish species use the air bladder in the same way that we use our lungs: They can gulp air when they stick their heads out of the water.



How Fish Swim

Fish swim to breathe, eat and move in the water.

Fish muscles look like sideways W's, called myomeres (pronounced *my'-oh-mears*). The muscles contract from side to side and front to back. The fish's body pushes against the water and moves the fish forward.



Fins help fine-tune swimming. The caudal fin, or tail fin, increases speed. The pectoral and pelvic fins steer up or down. They also help fish turn and stop. The dorsal fin and anal fin keep the fish upright in the water—as the keel on the bottom of a sailboat keeps it upright.

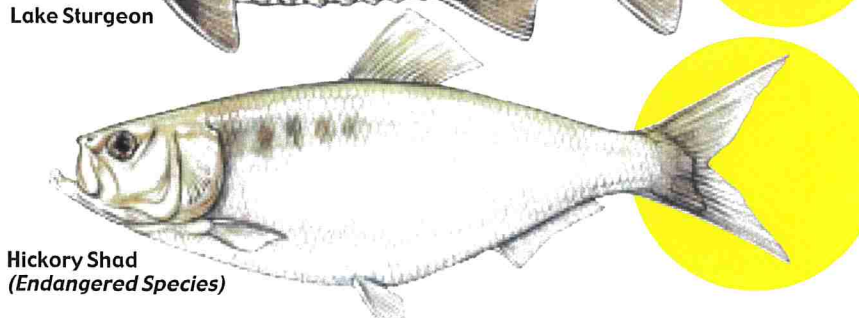
Fish Tails

The caudal, or tail, fin adds an extra forward kick to the fish's swimming. Tail shapes vary depending on how the fish swims or where it lives.



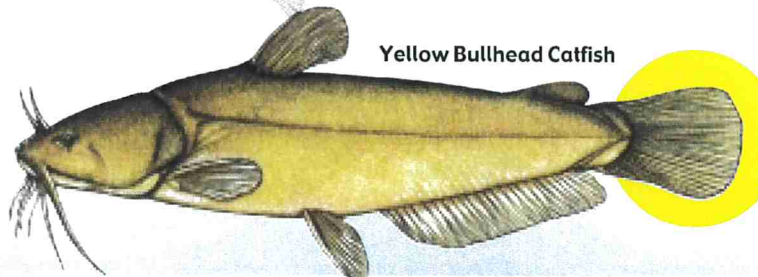
Lake Sturgeon

Crescent-shaped tails are suited for swimming fast for long distances.



Hickory Shad
(Endangered Species)

Fork-shaped tails are also suited for fast swimming, but they are helpful in making quick turns.



Yellow Bullhead Catfish

Rounded tails are built for swimming slowly.

Fish swim using their muscles, tail, fins and body shape.

Body shapes vary depending on how fish swim or where they live. Understanding this idea can give you clues to where a fish lives in the water.

Green Sunfish



Flattened disks: Fish like sunfish and perch are shaped like a flattened disk on their sides. This shape makes them hard to see (if you are a predator).

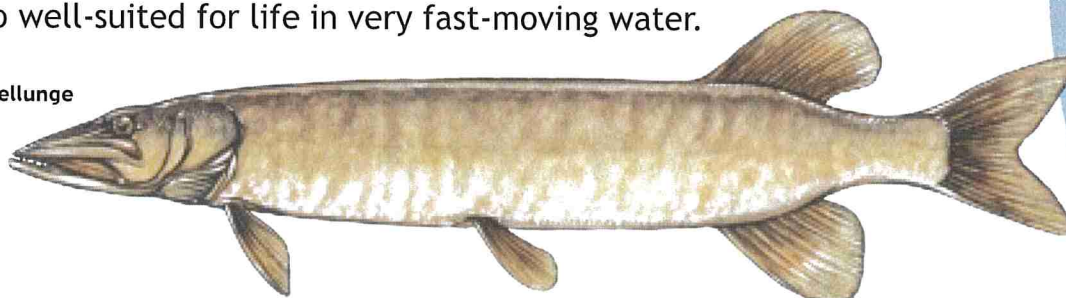
Horizontal disks: Catfish and sculpins are also flattened, but from top to bottom. This shape helps them stay on the bottom.

Slimy Sculpin



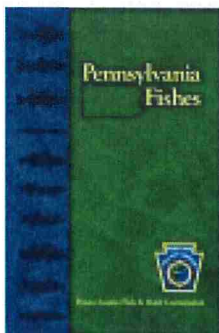
Torpedo: Muskies and trout have streamlined bodies. This shape helps them move quickly. Torpedo-shaped fish are also well-suited for life in very fast-moving water.

Muskellunge



Snakelike: Fish like eels have snakelike body shapes. Fish with these shapes slither, just like a snake! They swim quickly and are able to move quickly in different directions.

American Eel



Want to know more about Pennsylvania fishes?

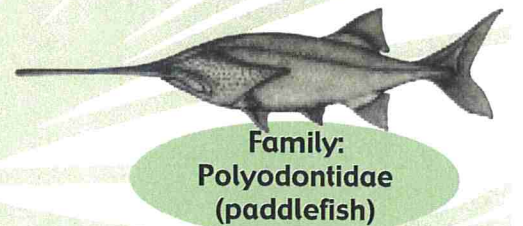
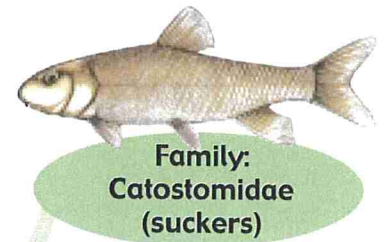
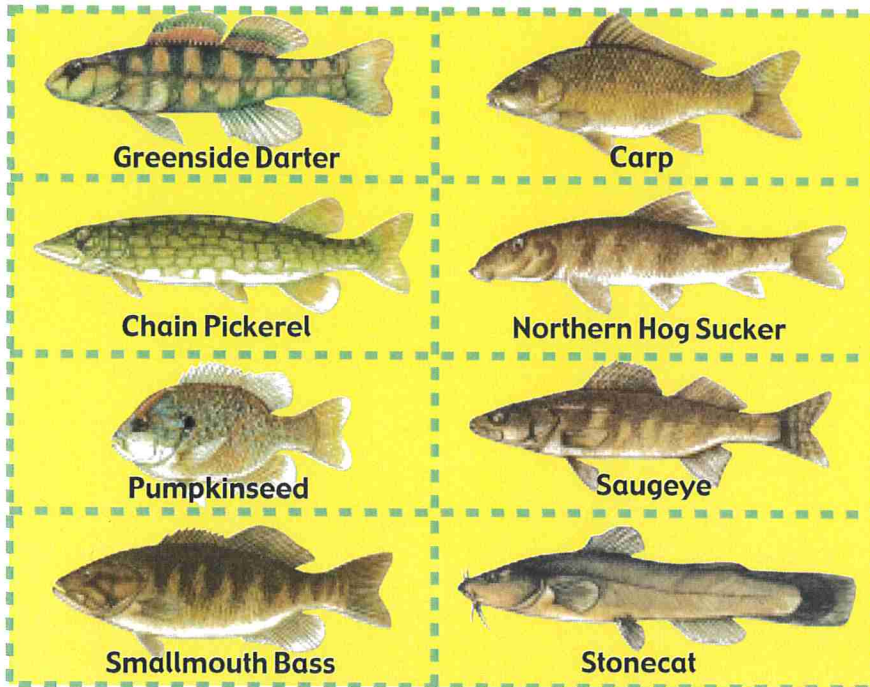
Pennsylvania Fishes is a 170-page full-color book that contains information and identification details on Pennsylvania's fishes. The book sells for \$9.43 plus 57 cents PA state sales tax and \$3.00 shipping and handling (total of \$13).

Please send orders to: PA Fish & Boat Commission, Educational Media Services, P.O. Box 67000, Harrisburg, PA 17106-7000.



Pennsylvania

Fish are just as different from one another as we are different from other mammals. There are three different types, or classes, of fish. Cartilaginous fish (Chondrichthyes) have skeletons of cartilage and include the sharks, rays and skates that live in the ocean. Jawless fishes (Agnatha) also have skeletons of cartilage, but they lack jaws. Bony fishes (Osteichthyes) have skeletons of bone. Scientists place different groups of fish in these classes into "orders"



Which families do the fish above belong to?



Class: Chondrichthyes (cartilaginous fishes)
Not found in Pennsylvania

Class: Agnatha (jawless fishes)

Class: Osteichthyes (bony fishes)

Kingdom: Animalia (animals)

Phylum: Chordata: (spinal cord)

HOLD THIS SECTION UP TO A MIRROR TO REVEAL THE ANSWERS:

SMALLMOUTH BASS - Family: Cyprinidae
GREENSIDe DARTER - Family: Percidae
CHAIN PICKEREL - Family: Esocidae
PUMPKINSEED - Family: Centrarchidae
NORTHERN HOG SUCKER - Family: Catostomidae
CARP - Family: Cyprinidae
SAUGEYE - Family: Percidae
STONECAT - Family: Ictaluridae

Fish Family Tree

and then into "families." The easiest grouping of fish to learn is the fish family. That's because members of a fish family share very similar features or life cycles.

There are over 400 fish families throughout the world. Pennsylvania has more than 20 families. Some fish in these families are common. Others are rare. Some are just plain weird-looking. For now, here is a "big picture" look at those families you might encounter while fishing in Pennsylvania:



Family: Salmonidae
(trout and salmon)



Family: Moronidae
(temperate basses)



Family: Sciaenidae (drums)



Family: Cottidae (sculpins)



Family: Percidae
(perches)



Family: Osmeridae
(smelts)



Family: Gasterosteidae
(sticklebacks)



Family: Amiidae
(bowfins)



Family: Esocidae
(pikes)



Family: Cyprinodontidae
(killifishes)



Family: Centrarchidae
(sunfishes)



Family: Ictaluridae
(catfishes)



Family: Gadidae
(burbots)



Family: Clupeidae
(herrings)



Family: Anguillidae (eels)

