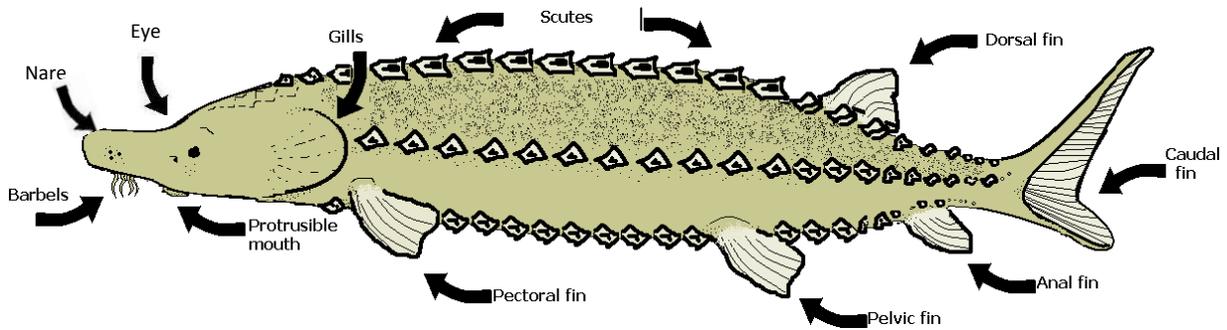


Topic/Lesson:	A Body of Knowledge
Subject:	Human anatomy and organ function
Author:	Tracy Bowen
Overview:	The human body is composed of different biological systems that are interrelated and dependent upon one another. Comparing human and fish anatomy, students will understand the structure and function of body systems and their inter-relationships.
Objectives:	Students will be able to: <ul style="list-style-type: none"> • Name and describe the function of five major organs. • Label organs in a diagram of the human body.
Background Knowledge:	Fish make up the largest of the vertebrate groups with over 20,000 species. Sturgeon have cartilaginous skeletons (as do a sharks); they belong to a subclass of fish known as Chondrostei. An understanding of fish anatomy is necessary to understand how fish are adapted to live in the water.
Materials:	Description of fish anatomy (PDF) Fish and human outlines; Internal and external fish diagrams (for reference); Glue, construction paper, wiggly eyes, scissors; Crayons or markers, fish anatomy diagram.
Vocabulary:	<p>Air bladder: also called swim bladder - clear, internal, inflatable bag that keeps a fish buoyant, or floating at a desired depth.</p> <p>Anterior: front of fish, toward the head.</p> <p>Caudal: the tail or tail end of a fish (or whale).</p> <p>Dorsal: top or back of a fish.</p> <p>Gills: red nubby arches under the operculum used to breathe in oxygen from the water.</p> <p>Lateral line: fish ears, a series of sensory pores located the length of both sides of a fish creates sensitivity to low frequency vibrations.</p> <p>Operculum: a bony flap-like gill cover, looks like the cheek of a fish.</p> <p>Posterior: rear of fish, toward the caudal fin.</p> <p>Roe: eggs; also called gametes - female sexual cells.</p> <p>Ventral: bottom or stomach area of fish.</p>

<p>Procedures:</p>	<p>Encourage students to talk about how fish live, move, and eat.</p> <p>Explain that all fish species are different and that there are many possible combinations of shapes, sizes, and colors. Some are long, others short, some fat, others skinny, some flat, others round, but all fish have the same basic body parts. Introduce basic external fish anatomy by explaining parts of a sturgeon on the “Fish Anatomy” and “Internal Fish Diagram” handout.</p> <p>Identify for students the dorsal fin, caudal fin, pectoral fin, pelvic fin, anal fin, mouth and eyes. For older students identify the nares (nostrils), gills, operculum, and lateral line. Discuss how the body parts help the fish move and find food.</p> <p>Have students discuss how human and sturgeon anatomy is different and how it is similar.</p> <p>Divide students (or allow students to divide) into two groups. Hand out the “Human Body” worksheets to one group, and the “Sturgeon Outline” worksheets to the other group. One group will create paper organs for the human model; the other will create paper organs for the sturgeon model. They can simply cut them out of colored paper or draw elaborate representations – let them decide.</p> <p>Allow students to design the parts, and glue their chosen pieces onto a background sheet. Have students label each body part. They can also color and add details such as scales, wiggly eyes, etc.</p>
<p>Conclusions:</p>	<p>Have students from the two groups trade off presenting specific organs and describing their functions. Have students from the other group point out and describe similarities and differences with the corresponding organs in the other animal.</p> <p>See Background section for supporting information.</p>
<p>Massachusetts Frameworks:</p>	<p>Life Science (Biology) #6. Identify the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, excretion, protection from disease, and movement, control, and coordination) and describe ways that these systems interact with each other.</p>
<p>Resources:</p>	<p>http://www.eduref.org/Virtual/Lessons/Science/Anatomy/ANA0007.html</p> <p>http://www.njmssc.org/Education/Lesson_Plans/Build_A_Fish.pdf</p> <p>http://www.utm.edu/departments/cece/old_site/seventh/7D3.shtml</p>

A Body of Knowledge: Fish Anatomy



Fish have special body parts that help them move freely, defend themselves, find food, breathe, and sense their surroundings.

They have fins for appendages. The different types of fins all play a role in helping a fish swim through water for a variety of activities. The top fin is called the **dorsal fin**; this fin gives a fish stability to keep it from rolling over and is used for sudden direction changes. The **pectoral fins** are a pair of side fins that help a fish move up and down, backwards, and aid in the ability to swim and to steer. The pair of bottom fins is called **pelvic fins**. They are used as “brakes” and also assist a fish when moving up and down. The back bottom fin is the **anal fin**. This fin keeps a fish on a steady course and gives it balance. The tail fin is called the **caudal fin**. This fin helps propel a fish through the water, pick up speed, and for some fish, to make turns. Visible and flexible spines and rays support the fins of the fish. The shape, location and size of a fish's fins are closely linked with its way of life. For example, a fish with a forked tail is a fast swimmer; the deeper the fork, the faster the fish. A fish with a rounded tail is slow moving, but capable of short bursts of speed. The study of the shape a fish's body parts and how they help a fish function is called fish **morphology**.

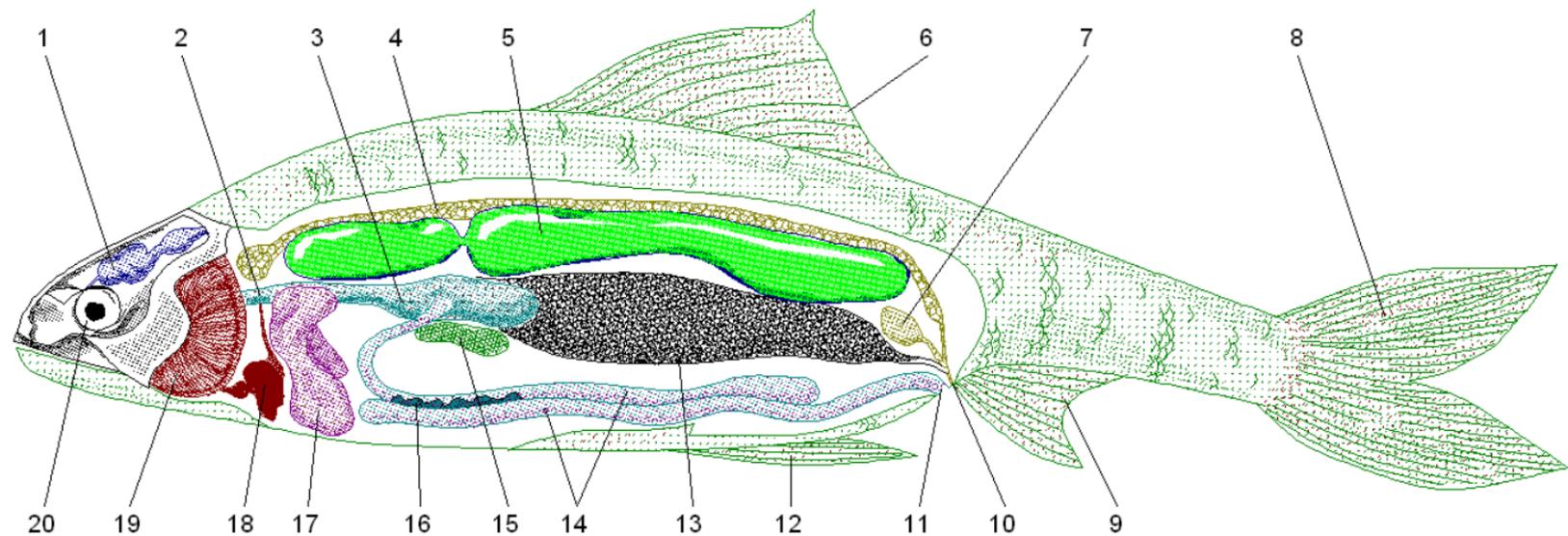
Fish also have eyes to locate predators or to find food. Some fish have eyes on the top front of the head like a flounder, some on the sides like a striped bass. Some fish eyes are very large, helping nocturnal fish see at night. Fish that can't see very well because they live in cloudy, murky water often use their sense of smell to find food. A fish's nose is called a **nare**.

The shape and location of the mouth may give clues to where a fish finds food, how it eats and even where a fish may live in the water column. A mouth located at the top front of the head, pointing upwards, indicates the fish eats at the top and is a surface feeder. A mouth located in the middle of the head in the front indicates the fish finds food directly in front of it. A mouth located on the bottom front, pointing downwards, would mean the fish is a bottom feeder. The mouth size and shape may indicate the size of prey (food) the fish can eat, for example, a fish with a small tube-like mouth may eat small invertebrates or plankton.

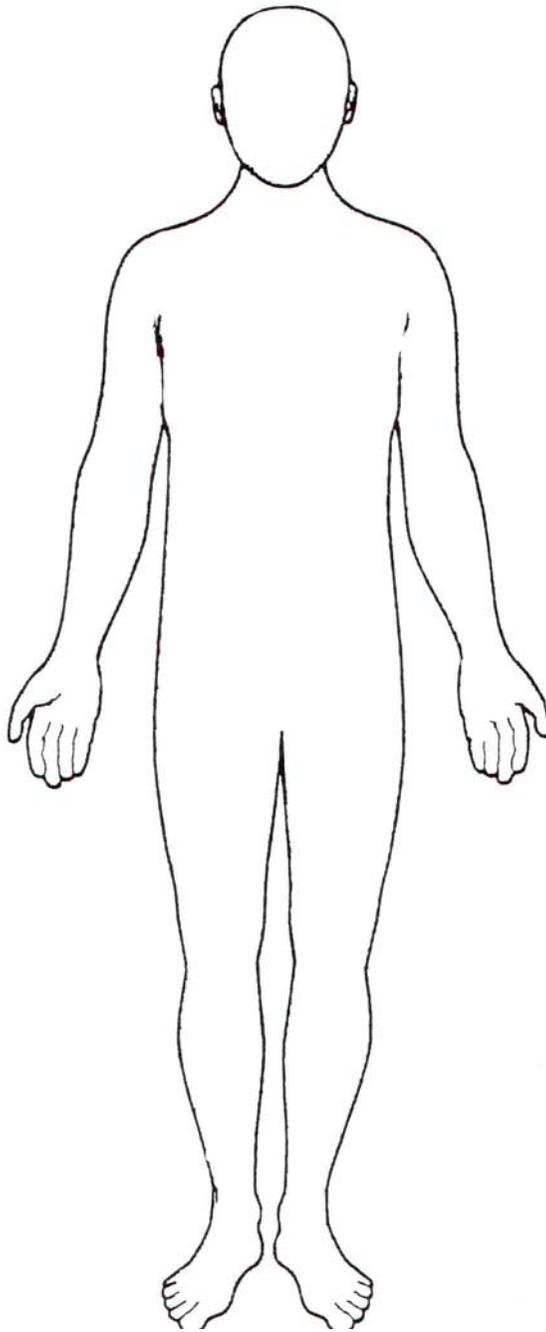
Fish do not have lungs; instead, they use **gills**, a feathery structure located behind the eyes, to get oxygen. Water is passed over a fish's pair of gills and dissolved oxygen is extracted; carbon dioxide is released. Bony fish have an **operculum**, a hard bony protective structure to protect their **gills**.

The **lateral line** system helps a fish feel movements in the water. The line, actually a row of tiny tubes in the skin, begins behind the gill cover and runs along the side of the body to the tail. Tiny hairs in the **lateral line** system help fish sense vibrations. This can aid the fish in finding food, and alert the fish to approaching predators or to change direction if the fish is traveling in a school.

The skin of most fish is covered with **scales** that look like shingles on a roof. Fish scales are made of bone; they are waterproof and help protect the fish. Fish scales have many different sizes and shapes.



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|---|--------------|----|-----------------|----|------------|----|----------|
| 1 | BRAIN | 6 | DORSAL FIN | 11 | ANUS | 16 | PANCREAS |
| 2 | ESOPHAGUS | 7 | URINARY BLADDER | 12 | PELVIC FIN | 17 | LIVER |
| 3 | STOMACH | 8 | CAUDAL FIN | 13 | GONAD | 18 | HEART |
| 4 | KIDNEY | 8 | ANAL FIN | 14 | INTESTINE | 19 | GILLS |
| 5 | SWIM BLADDER | 10 | UROGENITAL PORE | 15 | SPLEEN | 20 | EYE |



Right

Left

