ADAPTATIONS OF FISH IN UTAH LAKE

This lesson plan has been created as a resource for seventh grade teachers to teach the new core standards to their students. It integrates science standards in a meaningful and fun way. To see which specific standards are addressed, please refer to them below.

OBJECTIVE:

Students will be able to identify adaptations in fish that help them survive in their environment.

STANDARDS ADDRESSED:

7th Grade Science

Standard 4: Students will understand that offspring inherit traits that make them more or less suitable to survive in the environment.

Objective 2: Relate the adaptability of organisms in an environment to their inherited traits and structures.

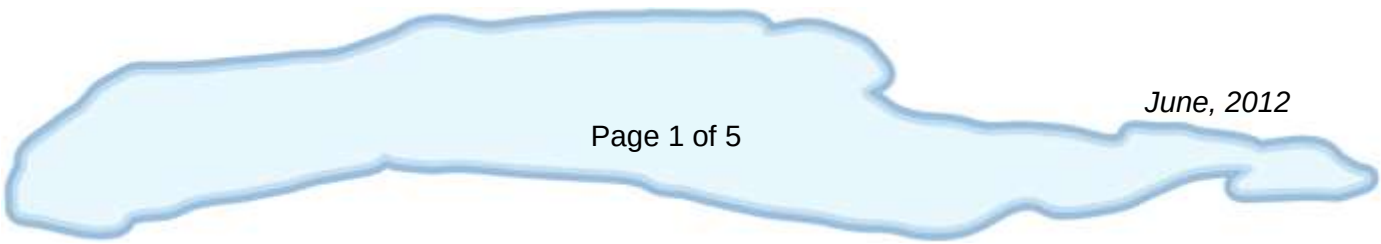
a. Predict why certain traits (e.g., structure of teeth, body structure, coloration) are more likely to offer an advantage for survival of an organism.

b. Cite examples of traits that provide an advantage for survival in one environment but not other environments.

d. Relate the structure of organs to an organism's ability to survive in a specific environment (e.g., hollow bird bones allow them to fly in air, hollow structure of hair insulates animals from hot or cold, dense root structure allows plants to grow in compact soil, fish fins aid fish in moving in water).

TEACHER BACKGROUND:

Adaptations are traits an organism possesses that allow it to survive and reproduce in its environment. Because adaptations are based on genetic information, they can be passed from parent to offspring. Adaptations may improve the survival and reproduction of an organism in one environment, but the same adaptation could be detrimental in another environment. For example, fins allow a fish to swim easily in water, but the same fins would make it difficult for a fish to move on land. Some fish, such as trout, are adapted to cold water and cannot live in warm water lakes such as Utah Lake. This lesson explores adaptations of Utah Lake fish and how those adaptations have allowed different fish to thrive as the ecology of the lake has changed.



ADAPTATIONS OF FISH IN UTAH LAKE

General fish adaptations:

- Fins help the fish to swim.
- Spines stiffen the fins to aid in swimming.
- Lighter underside coloration masks the fish from being seen from below, whereas a dark coloration on the back camouflages the fish from above the water.
- Gills allow the fish to absorb oxygen from the water.
- Some fish are streamline-shaped, like suckers and trout allowing the fish to swim faster to avoid predators or swim upstream to lay eggs.
- Some fish are disc-shaped, like bass and perch, making the fish harder to swallow.
- Large pelvic fins support bottom-dwelling fish.
- Small pelvic fins aid swimming in open water.

Adaptations in Utah sucker and June sucker: A comparison of feeding style.

The Utah sucker is a bottom feeder. It has several interesting adaptations to allow it to feed on the bottom of the lake. It has small papillae (little sensory bumps) under its lips. These papillae give the Utah sucker an advantage because it uses the papillae to find its food in dark, muddy conditions. The Utah sucker will then suck up the mud a mouthful at a time and filter the mud for food. Utah suckers do not have gill rakers.

June suckers do not have papillae. It is a middle column feeder. The June sucker has specialized gill rakers. Gill rakers allow the fish to catch both phytoplankton and zooplankton in the water column. The gill rakers then move the plankton to the mouth. In this way, the June sucker can feed in the water column. The scientific name of June sucker is *Chasmistes liorus.* Liorus means smooth margin. See supplemental materials for pictures and diagrams of gill rakers.

Adaptations in June sucker and common carp: A comparison of reproduction.

The June sucker's reproductive system is designed to produce about 20,000 eggs a year. The June sucker will wait until the high flows of water in the tributaries ebb (flow away from the shore) and will then enter the tributaries to lay its 20,000 eggs in June. The high numbers of eggs produced help ensure that at least a few offspring will survive. The June sucker lays eggs on gravel; this requires them to swim up rivers to find a suitable spawning area.

The common carp's reproductive system is designed to produce about 10,000 eggs at a time, several times during the year. The common carp can lay eggs every two weeks, producing approximately 40,000 eggs a year. The lower amounts of eggs produced allow the carp to produce eggs more often, this helps ensure if conditions are not right for larval survival, conditions may be right later in the year. The common carp begins producing eggs in April through the end of July. Because carp lay sticky eggs that easily attach to vegetation, they do

not need to spawn up a stream where gravel can be found. They can lay eggs on the shores of the lake making survival in Utah Lake more likely.

Other June sucker information:

Best predator avoidance is a habitat in which to hide. Another is a flat belly so it can lie on the bottom making it less conspicuous to predators.

Other carp information:

Carp have large scales that protect the fish.

Adaptations in June sucker and white bass: A comparison of shape.

June suckers have a long, slender body. Unfortunately, this slender shape makes the fish very vulnerable to predation. The June sucker body shape is not set up to protect itself against predation. In order to ensure fish survive, the Division of Wildlife Resources stock the June sucker into Utah Lake when they have reached a length of at least 8 inches. At this size, they are only vulnerable to the larger fish in the lake.

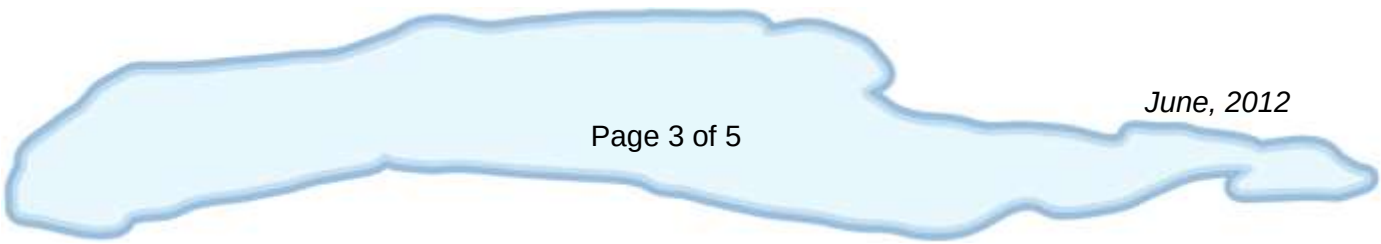
The white bass is the second most predominant species in the lake behind carp; it is also a carnivore. Its body shape is very deep; meaning bulged in the middle or humped. Its shape makes it so they don't fit down the mouth of a predator. When a white bass is three inches long it has developed a hump large enough to prevent predation. Fish biologists consider this type of body shape to be more evolutionarily advanced.

Adaptations in walleye:

The walleye is so named for its very large eyes. These eyes have the ability to see well in darker conditions, giving the walleye an advantage in a turbid lake like Utah Lake. Walleye is a predatory fish, consuming fish, and occasionally crustaceans. Walleye have very large teeth. These teeth are used for grasping its prey and swallowing. The coloration of walleye is all lighter in color allowing the fish to swim in open water.

Adaptations of channel catfish:

Channel catfish are omnivorous. They eat anything, alive or dead. Acute sense of smell helps them to respond to odiferous food. Channel catfish have barbells (whiskers) that help the fish sense food in murky water. They have flat bellies so they can lie on the bottom and be less conspicuous to predators.



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Adaptations of rainbow trout:

See general fish adaptations. Rainbow trout are not found in abundance in Utah Lake because they have colder water requirements. Their body is adapted to fast flowing water.

Adaptations of black bullhead catfish:

Black bullhead catfish feed day and night on the bottom and are omnivorous. The mouth is located under the snout giving the fish the ability to feed on the bottom.

TEACHER MATERIALS:

- Understand Teacher Background information above
- Key to Anatomy of a Fish handout

STUDENT MATERIALS:

- Anatomy of a Fish handout
- Piece of paper
- Fishes of Utah Cards

PROCEDURE:

1. Students should be paired or seated at tables.
2. Teacher reviews anatomy of a fish with the students using the handout. Discussion should be focused on the structural adaptations. For example, the gill raker of June sucker filters water to catch the plankton. Walleye have large teeth to hunt prey.
3. Use the June sucker as an example to identify its adaptations as a class.
4. Pass out the Fishes of Utah cards and recording sheet, assign groups of three or four, and have the students make a list of the adaptations they observe about the fish on the cards.
5. Have each group discuss other places the fish might survive.
6. Invite a group to share the adaptations they observed, allowing comments from other groups.
    - The following information and questions may be useful in class discussion.
        - Students will present one fish to the class, explaining possible purposes for the adaptations.
            - Walleye in Utah Lake actively feed and gain weight during the late fall, winter and spring, but lose weight during the summer because they

cannot feed. Why is this? Where in the lake would you expect to find walleye during the spring? Where would you expect to find them during the summer? Why is this?

- What season of the year would you expect channel catfish (a warm water fish) to be most active?
- White bass have large eyes while catfish have small eyes. What does this tell you about their feeding habits and prey? White bass have a flat body, while catfish have a large bulbous head on a rapidly narrowing body. Compare the ability to swim (speed and endurance).
- Catfish have a poisonous spine at the front of their dorsal fin. How does this help them survive?

7. Conduct assessment.

ASSESSMENT:

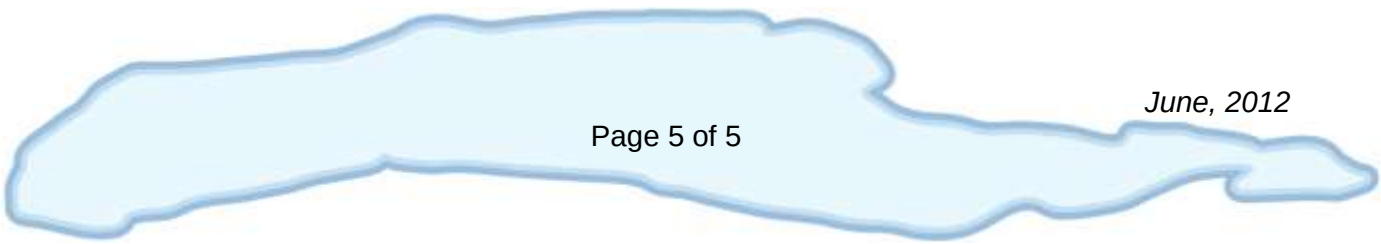
- Teacher will assess understanding as the students report their findings.
- Students may be required to hand in notes, if desired.

EXTENSIONS:

- Allow students to research other Utah fish, additional adaptations, habitat, etc.

ADDITIONAL REFERENCES:

- *Fishes of Utah: A Natural History* by William F. Sigler and John W. Sigler.
- Fish Field Guides (available by searching on line).



Label the Fish: Anatomy

Read the definitions, then label the fish diagram below. (Note: not all fish have all of the fins defined below.)

anal fin - the fin on the lower side of the body near the tail **caudal fin** - the tail fin **dorsal fin** - the fin on the upper side of the body **eye** - sight organs located on the head **gills** - fleshy organs that are used for breathing - they are located on the side of the head	**lateral line** - a series of sensory pores (small openings) that are located along the sides of fish - they sense vibrations in the water **mouth** - the part of the body which the fish uses to catch food - it is located at the front of the body **pectoral fin** - each of the paired fins on either side of the body, near the head **pelvic fin** - each of the paired fins on the lower side of the body, near the head

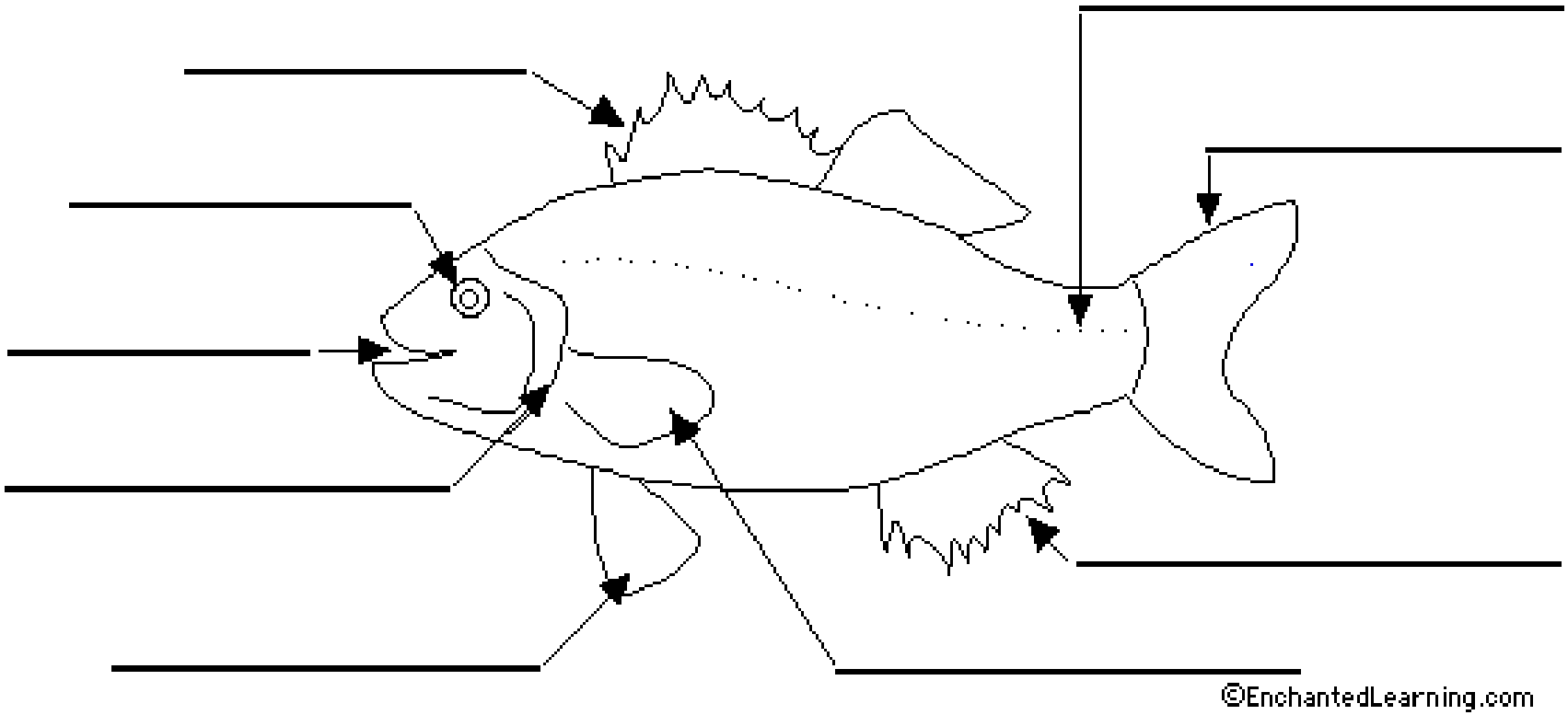
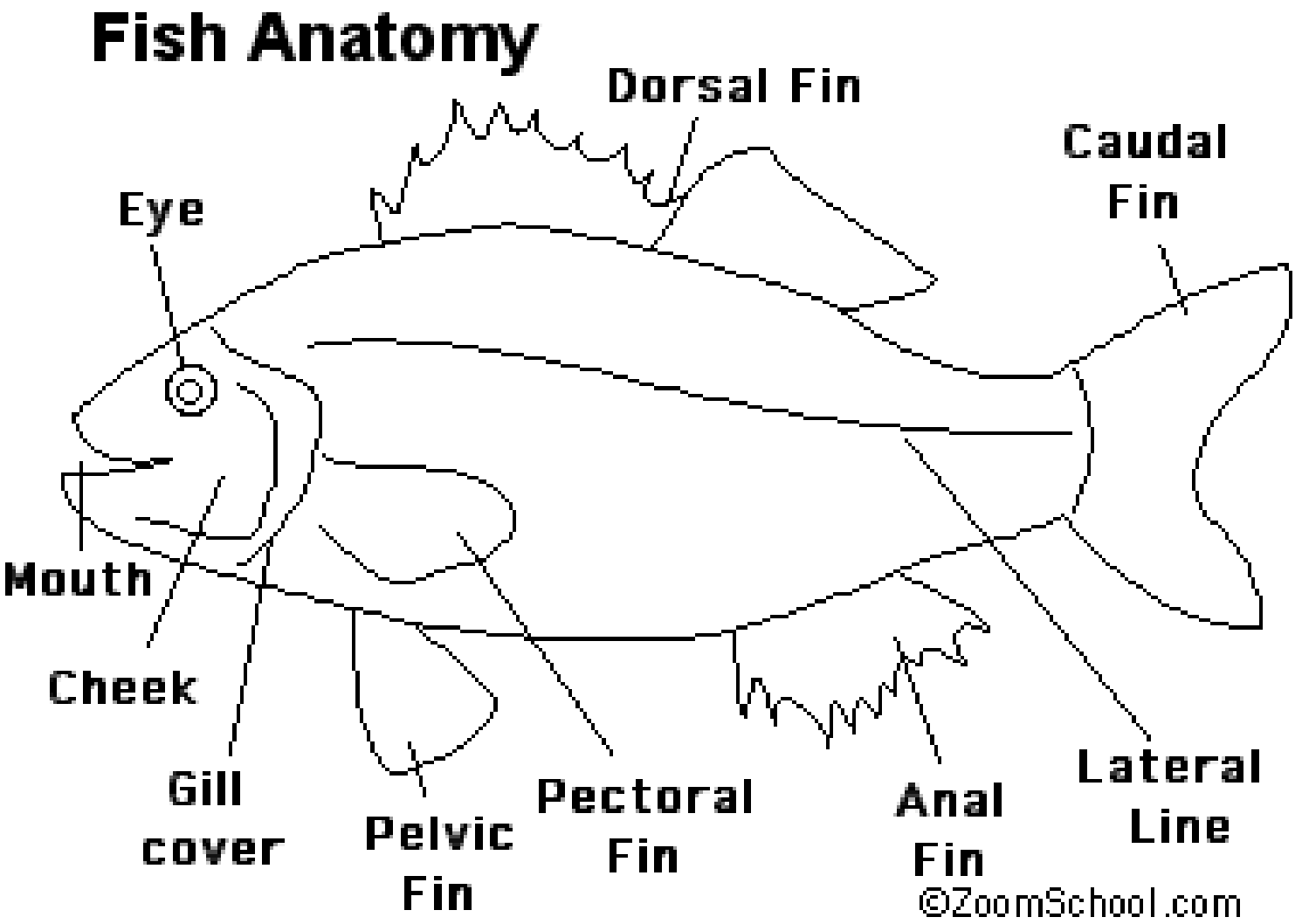


DIAGRAM OF A FISH

Fish Anatomy

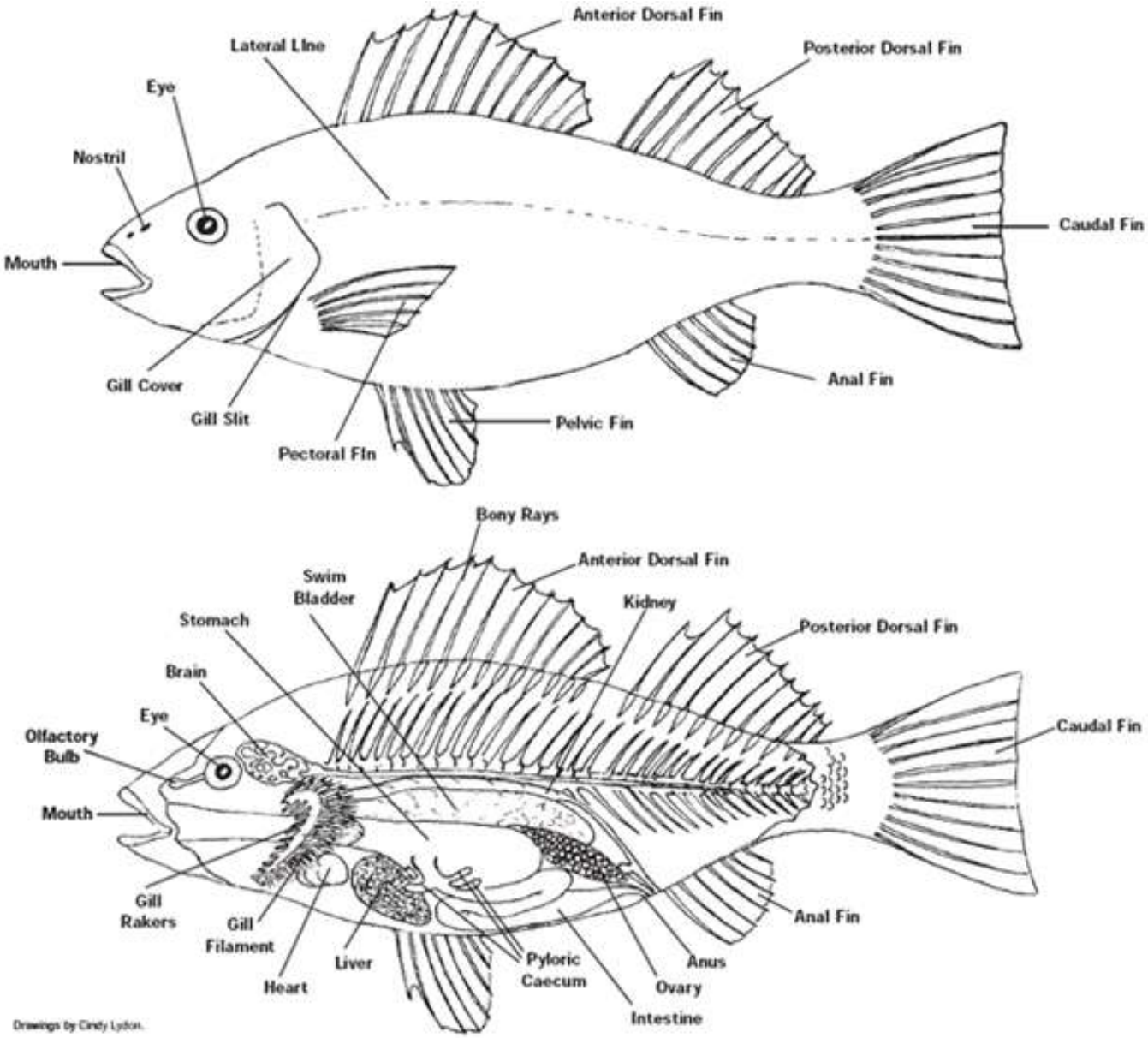


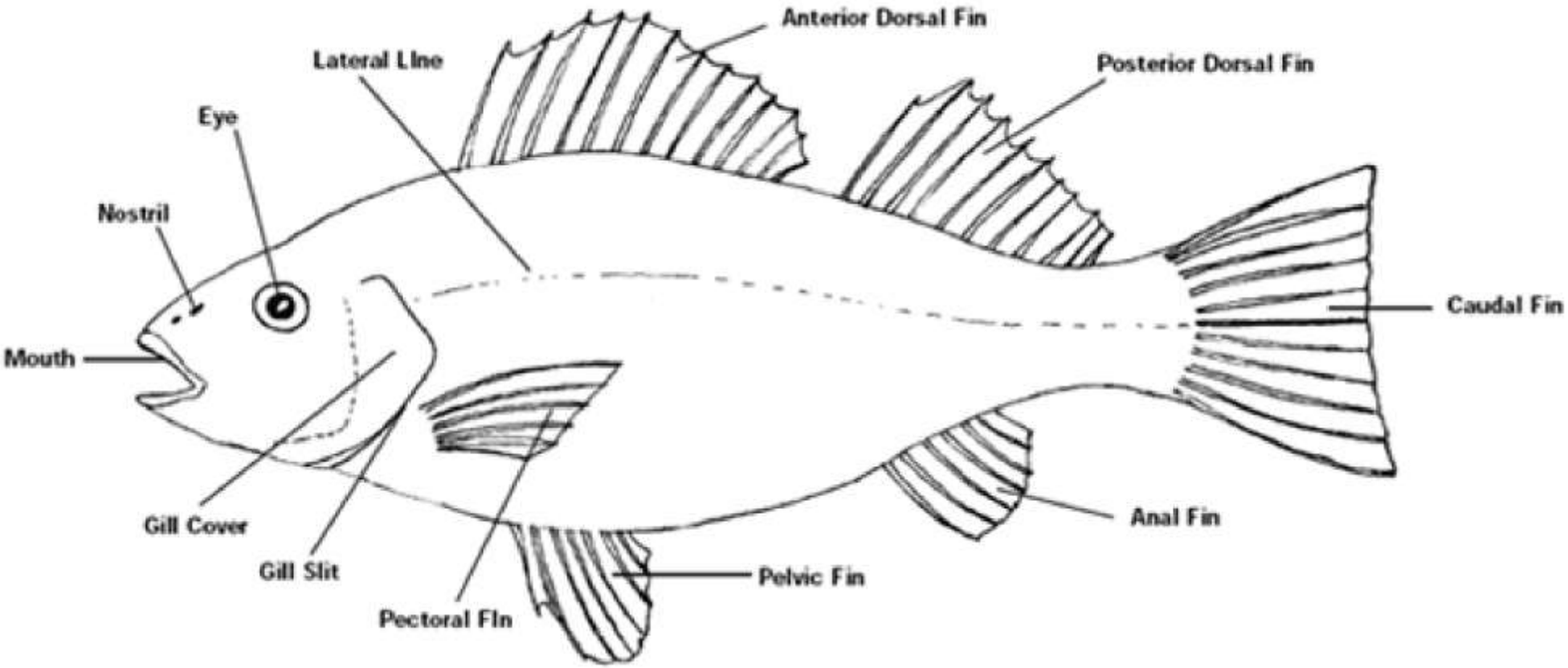
Fish Anatomy

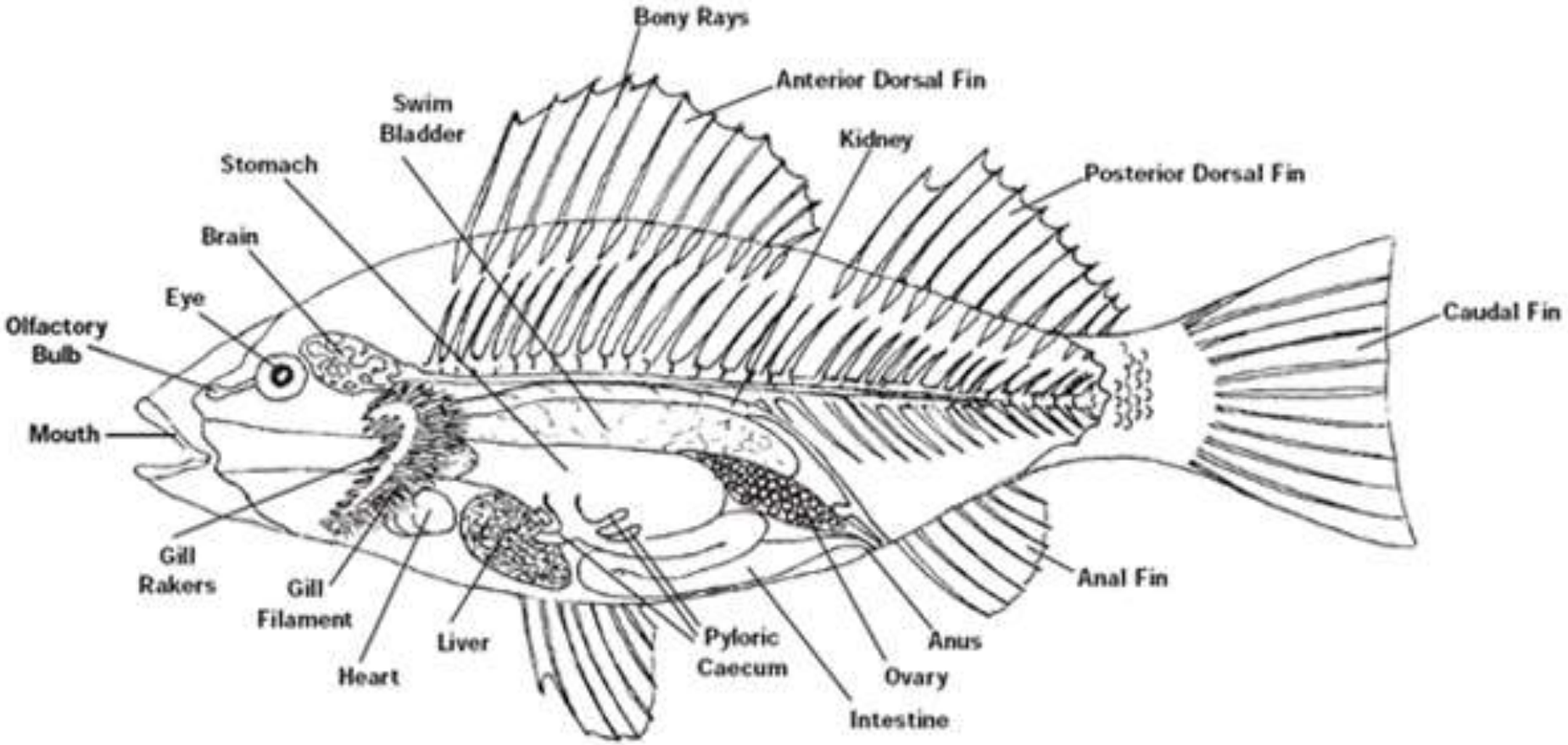
Fish are animals that live in water and breathe using gills. Water goes in through the mouth and out through the gills, which take oxygen from the water. Most fish swim by moving their tail (also called the caudal fin) left and right.

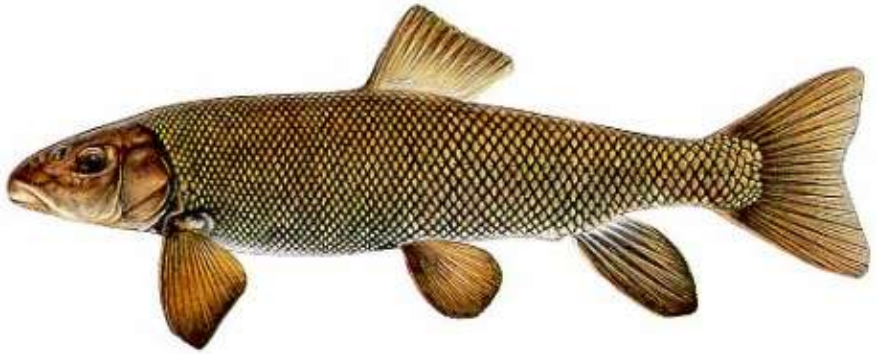
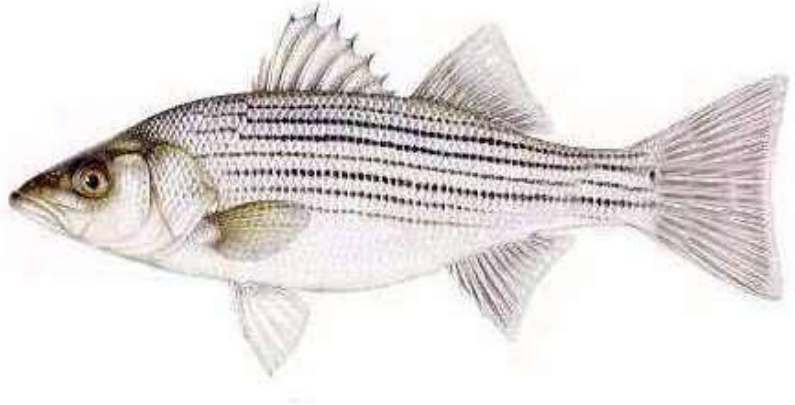
There are many kinds of fish; some have bones but others, like sharks and rays have no bones, only cartilage.

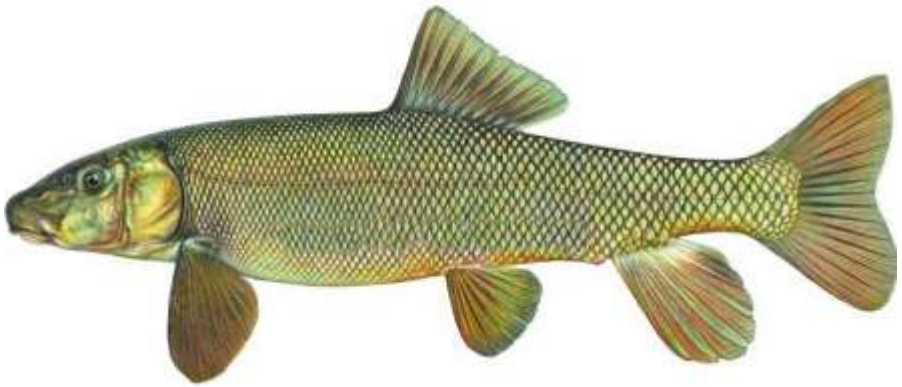
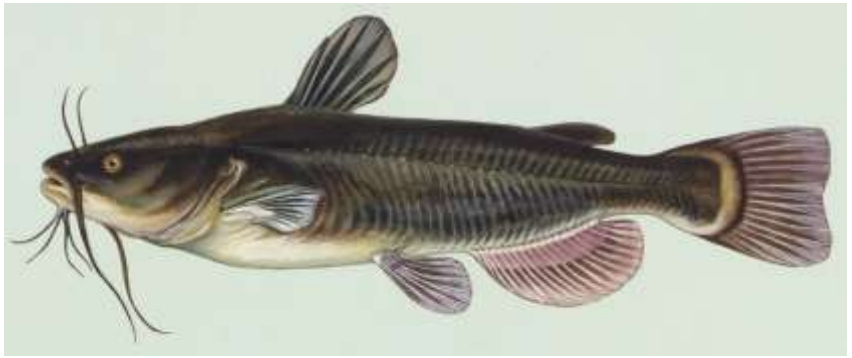
The biggest fish in the world is the Whale Shark; it is a shark but not a whale. The whale shark is up to 46 feet (14 m) long and weighs up to 15 tons.



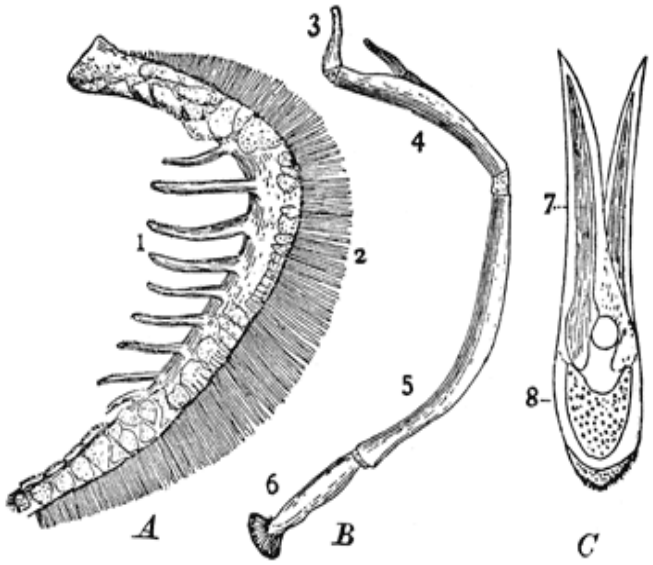

Anterior Dorsal Fin
Lateral Line
Posterior Dorsal Fin
Eye
Nostril
Caudal Fin
Mouth
Gill Cover
Anal Fin
Gill Slit
Pelvic Fin
Pectoral Fin

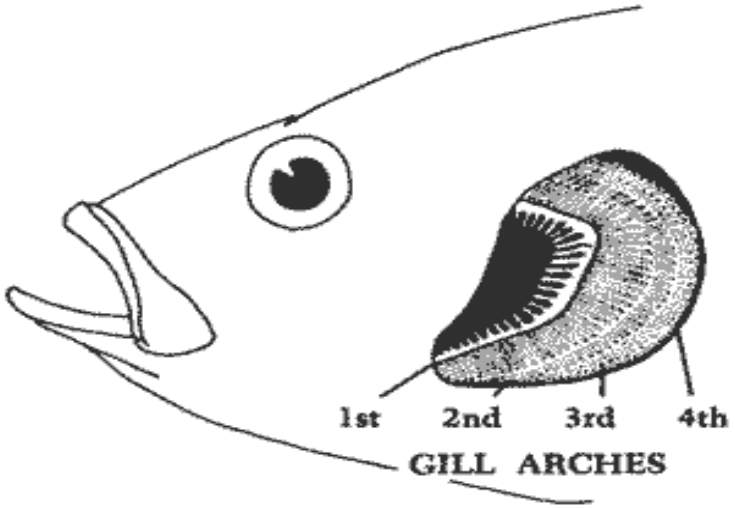

Bony Rays
Anterior Dorsal Fin
Swim Bladder
Kidney
Stomach
Posterior Dorsal Fin
Brain
Eye
Olfactory Bulb
Caudal Fin
Mouth
Gill Rakers
Gill Filament
Anal Fin
Liver
Heart
Pyloric Caecum
Anus
Ovary
Intestine

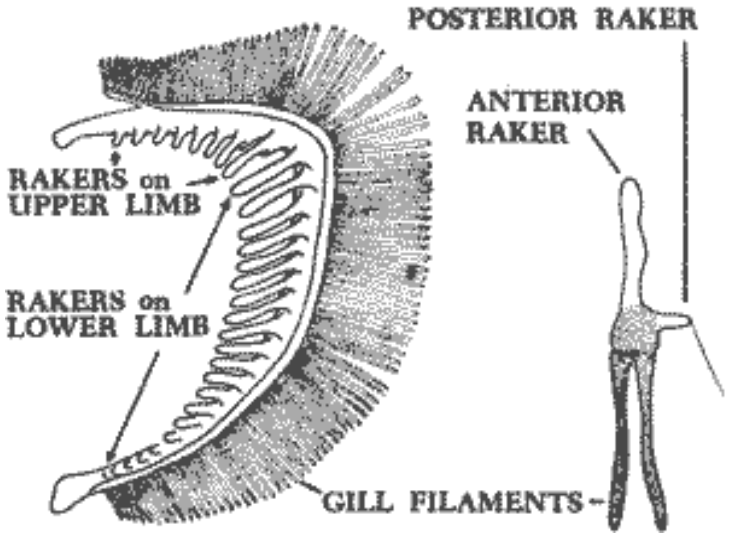
JUNE SUCKER 	**WALLEYE** 
WHITE BASS 	**CARP** 

UTAH SUCKER 	**CHANNEL CATFISH** 
BLACK BULLHEAD 	**RAINBOW TROUT** 

SAMPLES OF FISHES' MOUTHS WITH GILL RAKERS







SAMPLES OF FISHES' MOUTHS WITH GILL RAKERS