Fish in a Bottle

Objective

Students will build fish ecosystems, observe and write about changes they observe

Background

There are many kinds of fish. Some have bones, but others have only cartilage. Some fish can only live in oceans (salt water), and some can only live in fresh water. In Oklahoma we have no bodies of salt water but we have plenty of fresh water lakes and rivers. In fact, Oklahoma has more man-made lakes than any other state. We have over 1 million surface acres of water and 2,000 more miles of shoreline than the Atlantic and Gulf coasts combined.

Most fish grow in natural conditions like rivers and lakes, but in some places there are actually fish farms. Fish farming is called "aquaculture." The increasing cost of fishing natural waters and the rising demand for fish has contributed to an interest in aquaculture. It is one of the fastest growing segments of US agriculture.

Aquaculture has been around for centuries. It may have been practiced in China as early as 2000 BC. The Romans built fish ponds during the 1st Century AD, and during the Middle Ages fish pond building by religious men, was widespread throughout Europe.

The channel catfish is the primary species of farm-raised fish in the US. The top commercial catfish-producing states are Mississippi, Arkansas, Alabama, and Louisiana. Catfish farming is a very small part of total agricultural production in Oklahoma, even though the grandparents of most of the channel catfish raised in the US are probably from Oklahoma. The majority of all the channel catfish stock farmed in the US originated near the Denison Dam on Oklahoma's Lake Texoma. These fish were captured in 1949 by the Arkansas Game and Fish Commission in pools formed in the Red River behind Denison Dam after its construction. The fish were spawned in the Arkansas state hatchery system and were the basis of broodstock for some of the earliest catfish farms. These fish were also some of the founder stocks in federal hatcheries and research institutions in Alabama, Arkansas, Louisiana, and Mississippi, where most of the catfish farming in the US takes place.

Any body of water that can be confined or controlled is a potential fish farm. Some land that is unsuitable for other food production purposes may be adaptable to fish farming.

Channel catfish can be classified in one of four groups while at the farm: brood fish—the fish that produce offspring; fry—the newly hatched fish; fingerlings—young catfish; and marketable fish. Catfish are usually marketed when they are about 18 months old, after they have reached

Oklahoma Academic Standards

KINDERGARTEN
Speaking and Listening: R.1,2,3,4; W.1,2. Reading and Writing Process: R.1,3; W.1,2. Critical Reading and Writing: R.4; W
Life Science: 1-1. Earth Science: 3-1

GRADE 1
Speaking and Listening: R.1,2,3,4; W.1,2. Reading and Writing Process: R.1,2,3; W.1,2. Critical Reading and Writing: R.4,5; W.2
Life Science: 1-1

GRADE 2
Speaking and Listening: R.1,2,3,4; W.1,2. Reading and Writing Process: R.1,3; W.1. Critical Reading and Writing: R.5,7; W.2
Life Science: 4-1

GRADE 3
Speaking and Listening: R.1,2,3; W.1,2. Reading and Writing Process: R.1,3; W.1. Critical Reading and Writing: R.7; W.2
Life Science: 1-1. Life Science: 4-3,4

between 1 and 1 1/2 pounds.

The life of a farm-raised catfish begins with the careful selection and mating of two genetically superior catfish. Once eggs are laid and fertilized they are placed in controlled hatching tanks. Their water and food are monitored around the clock.

After 18 days the baby catfish are strong enough to be transferred to the outdoor ponds. Varying in size from five to 20 acres, these ponds are four to five feet deep and are fed by a flow of cool water.

The young fish are fed twice daily. Their food is made from soybeans, corn, wheat and fish meal.

When they are ready for harvest, the catfish are seined out of ponds (caught with nets) and placed in aerated tank trucks for live shipment to the processing plant.

The channel catfish does not have scales. Its color depends on the color of the water where it lives. In clear water it may look almost black. In muddy water it may be a light yellow.

Catfish move around mostly at night— just after sunset and just before sunrise. During the daytime they hide. Like other animals, channel catfish need oxygen to live. They use oxygen for energy production and to help build all the various parts of the body. In water there is only about 25 percent as much oxygen as there is in the air. To get oxygen, fish must use more energy than those of us who breathe air. For this reason, fish have well-developed breathing organs called gills. Gills work kind of like our lungs. They take oxygen from the external environment and get rid of toxic gaseous waste—carbon dioxide. Water passes over the gill surface where oxygen diffuses into the blood and carbon dioxide diffuses out. Fish that are stressed or are pursued by a predator need more oxygen than fish at rest.

Like other food animals, fish provide us with protein, which our bodies need.

Materials

red pencils

blue pencils

(for each group)

two 2-liter soda bottles

dechlorinated water

goldfish or guppies

aquatic plants—elodea, duckweed

water snails

sand

Language Arts

1. Read and discuss background.
   —Ask students to share what they know about catfish.
   —Students will use their red pencils to cluster this information.
   —As you share background information, write some statements containing new information on the chalkboard. Students will cluster this information with the blue pencils.
2. Using chalk, crayons or colored pencils, students will draw pictures of the fish ecosystem in the aquarium and write about the activity. Possible subjects include:
   Did the fish live or die?
   Did the plants live, die or change color?
   Did the fish eat the plants?
   What kinds of fish lived in the ecosystem?
   What kinds of food did the fish eat?

Science

1. Hand out Student Worksheet A.
   —Students will fill in the blanks to identify the parts of a catfish.
2. Divide students into groups of four or five. Enlist the help of parents or older students to help each group build a fish ecosystem, as follows:
   —Cut the top off one pop bottle at the shoulder (where it tapers).
   —Cut the base off another bottle, and score it with holes. This is the cover.
   —Pour sand two inches deep into the bottom of the first bottle. Slowly add water (to minimize sand displacement).
   —Root three elodea stalks in the sand, and sprinkle a small amount of duckweed onto the water's surface.
   —Let the sand settle overnight. Next day, add two guppies and two snails.
   —Over the period of a week, students will record daily what they see. Has there been any population change? Plant growth? Color or changes in the water?
   —At the end of the week, the groups will report on changes in their ecosystems.
3. If you have a classroom aquarium, add a catfish (if you don't already have one).
   —Give the catfish a few days to adjust to its new environment.
   —Students will observe and record the behavior and movements of the catfish.
4. Students will answer the following questions:
   Does the catfish swim alone or with other fish?
   Does the catfish eat alone or with other fish?
   Does the catfish move around or stay in one place?
   If it stays in one place, where does it like to stay?
5. Students will name characteristics of fish that make them different from humans and some that make them the same. Write the answers on the chalkboard.
   —Students will make Venn diagrams showing similarities and differences.
6. Students will produce algae, and study its growth.
   —Fill a clean, well-rinsed jar with water from a river or pond.
   —Cover the jar by carefully taping black paper with a one-inch square hole cut in it or paint it black, leaving a one-inch square hole.
   —Leave the jar in bright sunlight or shine a bright light on the side with the open space.
   —In 2-3 days remove the algae that has grown toward the light using an eye dropper and examine it under a microscope.
7. Create a simple indoor water garden in a large plastic container or galvanized tub (or anything that will hold water).
   —Place the water garden in a sunny area, and purchase aquatic plants from a garden center.
   —You will need grasses under the surface, floating plants on the surface, fish and aquatic snails, which work as a cleaning crew to remove algae from the water.

Vocabulary

aerate—to expose to or supply or fill to the limit with air
aquaculture—the cultivation of living things (as fish or shellfish) naturally occurring in water
aquatic—growing or living in or often found in water
brood fish—young fish, hatched or cared for at one time
cartilage—an elastic tissue which composes most of the skeleton of the vertebrate embryo and much of which is changed to bone later in life
fingerling—a small fish especially up to one year of age
fry—recently hatched fish,
gill—an organ (as of a fish) of thin plates or threadlike processes for obtaining oxygen from water
oxygen—a reactive element that is found in water, rocks, and free as a colorless tasteless odorless gas which forms about 21 percent of the atmosphere, that is capable of combining with almost all elements, and that is necessary for life
seine—a large fishing net kept hanging in the water by weights and floats
stock—to provide with

—To keep algae growth down, make sure 70 percent of the water is covered by plants, which deprive algae of the sunlight it needs to grow.
—Place concrete blocks or bricks in the bottom of the container to raise aquatic plants to the correct height.
—Add water.
—Before adding plants, allow the water to stand overnight so the chlorine will dissipate.
—Set plants, in their pots, on the bricks so the tops of their containers are under the surface of the water.
—Add submerged grasses after placing the container plants.
—Once the pond has mellowed for a week, add snails and a few fish.
—Keep the water level topped off.
—If the miniature ecosystem is working properly, there should be no need to remove the water for cleaning.
—Students will observe the water garden and record their observations.
—Students will change variables, predict what will happen, observe and record observations (changes in light, adding or removing fish, plants, etc.)

Extra Reading

Hay, Barbara and Steven Walker, *The Bulldoggers Club: The Tale of the Ill-Gotten Catfish,* Roadrunner, 2012. Love, Ann, Drake, Jane and Pat Cupples, *America at Work: Fishing, Kids Can,* 2001.
Sill, Cathryn P., and John Sill, *About Fish, A Guide for Children*, Peachtree, 2005.
Wissinger, Tamera Will, and Matthew Cordell, *Gone Fishing: A Novel,* HMH for Young Readers, 2013.
Wright, Catherine, and Howard Fine, *Steamboat Annie and the Thousand- Pound Catfish,* Philomel, 2001.

Edible Aquarium

Make blueberry gelatin by adding 1 1/4 cups of cold water with ice cubes to a package of powdered mixture. Stir until thickened, and add gummy fish and fruit cocktail. Serve in individual clear cups.

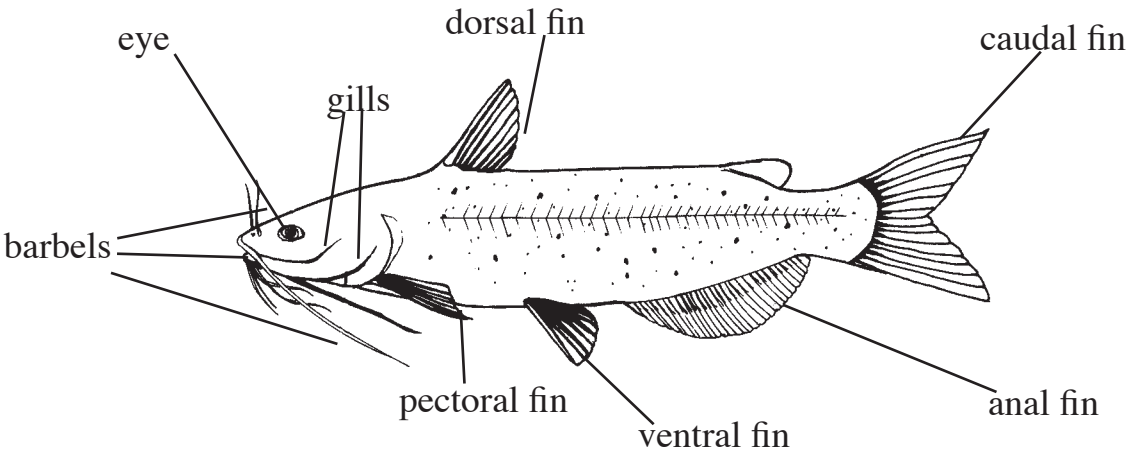
Ag in Your Community

Visit a fish hatchery, if you have one in your area.

Name_____

Fish in a Bottle

Catfish Anatomy



Fill in the blanks.

1. Slight organs located on the head. ___y____

2. Slender, whiskerlike sensory organs in the head. b____r ____ ____ ____ s

3. The fin on the upper side of the body. d ____ ____ _____ s _____ _____ fin

4. Fleshy organs used for breathing. ____ ____ l ____ ____

5. Each of the paired fins on either side of the body, near the head. p____c____ ____ ____ a ____ fin

6. Each of the paired fins on the lower side of the body, near the head. v____ ____ ____ ____ ____ a ____ fin

7. The tail fin. c____ ____ _____ d ____ ____ fin

8. Fin on the lower side of the body, near the tail. ____ n ____ ____ fin.

Oklahoma Ag in the Classroom is a program of the Oklahoma Cooperative Extension Service, the Oklahoma Department of Agriculture, Food and Forestry and the Oklahoma State Department of Education.