

Made for Eating!

Sneak Peek

Students will study the parts of a fish to develop the understanding that the shape, form and structure of a fish's parts influence its lifestyle and behavior. The Flathead Catfish is a Florida invader, which is extremely successful mainly due to its voracious appetite. Students will identify the morphology of this fish and find out how this helps its success. This activity incorporates data analysis, writing skills, graphic arts and critical thinking.

Aligned with the following
Sunshine State Standards and
FCAT Benchmarks for grades
6-8:

SC.D.2.3.2 AA SC.G.2.3.4 AA

SC.F.1.3.7 CS SC.H.2.2.1 CS

SC.G.2.3.3 CS

AA = annually assessed

CS = content sampled

Objectives:

Students will:

- Identify the various parts of a fish.
- Describe the concept of fish morphology.
- Relate shape, form and structure of a fish's parts to their functions.
- Draw inferences about where and how a fish might live based on its morphology.
- Understand why the morphology of the Flathead Catfish, *Pylodictis olivaris*, makes it such a successful predator.

Materials:

- Rubber fish models (can be purchased from NASCO 1-800-558-9595) or several different kinds of whole frozen fish that demonstrate different shapes (flounder, skate or ray, an eel, a perch, sea bass, angel fish, tuna or mackerel) obtained from your local fish market, supermarket or from a nearby marine research facility. Once obtained, fish can be frozen and reused at your discretion.
- Tempera paint.
- Paint brushes.
- Colored markers.
- Newsprint paper, or other kind of craft paper.
- Newspaper.
- Fish anatomy diagram and fish morphology chart (included).
- Questions Worksheet.



Illustration from Canadian Museum of Nature

Background:

Invasive species are plants or animals that are not native to a particular area and cause ecological or economic harm. Animal invaders can out-compete native species by avoiding predators better or finding or capturing prey better. The bodies of animals provide clues about their competitive abilities, and fish provide several excellent examples.

Fish shape and *anatomy* helps us discover information about how a fish moves, where and how the fish lives, and how it has adapted to its environment. *Morphology* is the study of the structure and form of living things. Body shape, mouth location and size, tail shape and body color give us clues as to how animals live.

Body shape is a good indicator of how a fish moves and where it lives. Fish that are flat or *depressiform*, like a skate or flounder, flap their fins up and down to swim through the water in the same way a bird flaps its wings. Flounder normally live on the bottom of the sea floor. Meanwhile, fish that are long and skinny, or *filiform*, like an eel, slither through the water like a snake. Fish that are streamlined and have an oval or *fusiform* cross-section, like a tuna or striped bass, are fast swimmers and usually live in open water. A *compressiform* shape like that of angelfish looks thin when viewed from the front. This body shape is well designed for making quick turns and quick bursts of speed over short distances. Compressiform fish commonly live where there are many places to hide such as lakes or coral reefs.

The shape of a fish's tail also indicates how the fish moves and lives. *Rounded, truncated* or *emarginate* tails, like that of a killifish or minnow, are increasingly better for maneuverability and short bursts of speed with less drag. A *forked* tail, like that of a striped bass, is good for maneuverability and speed over longer distances. *Lunate*, or crescent shaped tails, like those found on a swordfish are not good for maneuvering but allow for great speed over long distances and are usually found on fish that live in the open ocean.

The size and location of the mouth tells us a lot about where a fish finds its food, what food it eats, and where it may live. Fish with a large mouth generally eat large pieces of food. Fish with a small mouth generally eat small items of food, such as *plankton*. If the mouth is oriented upwards, it is a surface feeder (or it feeds on prey above it) like a stargazer or stonefish. If the mouth is located in the middle front of the head, like a tuna,

we can assume that the fish feeds on prey directly in front of it. If the mouth is oriented downwards, it is a bottom feeder, like the catfish. Some fish have elongated tube-like mouths to reach into crevices. An example of this type is a butterfly fish.

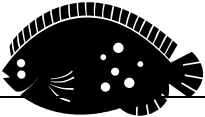
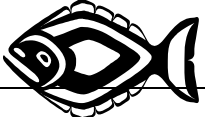

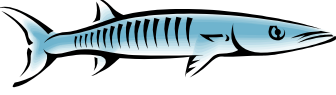
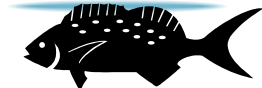
Procedure:

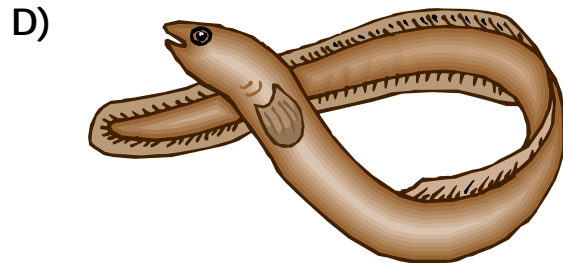
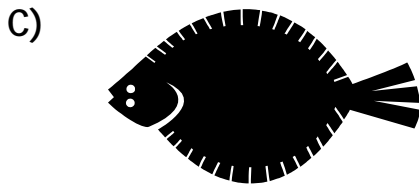
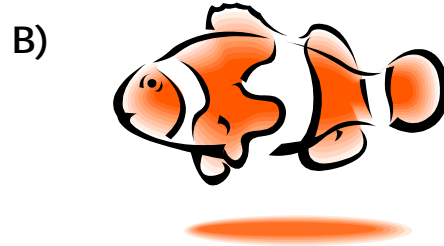
1. Review fish anatomy and explain that all fish have the same basic body parts. However, those parts may look different. Have students hypothesize why different body parts are shaped differently. Introduce the concept of fish morphology or how the form and shape of a fish and its parts influence function.
2. Students will spend approximately 10-30 minutes doing Gyotaku (Jee-oh-tāk-oo), the ancient Japanese art of fish printing using rubber models or real fish. If real fish are used, wash, blot dry and, if frozen, thaw slightly before printing. Lay fish flat on top of newspaper. Brush a thin layer of paint on the exposed side of the fish.
3. The best prints result from the least amount of paint while still attaining full coverage. Carefully lay a sheet of paper on top of the painted fish, and gently press paper down onto all parts of the fish to help pick up details. Slowly lift the paper to reveal the print and place aside to dry. Often a fresh coat of paint is not necessary before the next print.
4. Have students label the external anatomy of the fish and use the fish morphology charts to label the body shape of their fish and the fish's tail on their prints.
5. Have students compare and contrast the morphology of their fish and those in the prints that were made from other species of fish. Have students write a paragraph about their fish's possible behavior and habitat based on its shape and anatomy.
6. Have students review pictures of the Flathead Catfish. Have students describe the body shape and tail shape. Lead a discussion on why these voracious eaters are so successful in large part due to their morphology. Instruct students to draw a picture of the Flathead Catfish on scrap paper.
7. Lead a discussion about how the morphology of other invasive species in Florida might contribute to their success.

Body Shape

Cross section	Fish	Shape	Locomotion
	Tuna	Fusiform	Fast-swimming in open water
	Tautog	Compressiform	Capable of quick bursts of speed over short distances
	Skate/Ray	Depressiform	Swimming often resembles a bird's wings in motion
	Pipefish	Filiform	Undulates through the water in a snake-like manner

Caudal Fin (Tail) Shape

Shape	Function
Rounded 	Large surface area for acceleration and maneuvering, but creates drag that causes fatigue
Truncate 	Less drag than rounded tail, effective acceleration and maneuvering
Emarginate 	Less drag than rounded or truncate tail, effective acceleration and maneuvering
Forked 	Less drag due to less surface area, excellent acceleration and maneuvering
Lunate 	Less maneuvering ability due to rigid fin with less surface area, but excellent acceleration



**Using the information on the previous page,
answer the following questions:**

1. Which of the fish above swims the fastest in open water?
2. Which fish can make sharp turns?
3. Which fish is a great sprinter but not fit for a long distance marathon?
4. Which fish swims like a flying bird?
5. Which fish slithers through the water like a snake?
6. Which fish lives on the sea floor?

Glossary:

Anatomy – The study of the parts of an organism in order to ascertain their position, relationship, structure and function.

Compressiform – Body flat from side to side and tall and thin when viewed from the front.

Depressiform – Body flattened from top to bottom and wide and thin when viewed from the front.

Emarginate – Having a notched margin.

Filiform – Long, skinny tube-shaped body.

Forked – Having two or more branches or points.

Fusiform – Streamlined oval-shaped body.

Lunate – shaped like a crescent or quarter-moon.

Morphology – The study of organisms' structure or form.

Plankton – Small plants or animals that cannot swim strongly, so they drift with currents.

Rounded – Curved or shaped like part of a circle.

Truncate – Short and square or slightly rounded.