The Education Program at the
New Jersey Sea Grant Consortium
22 Magruder Road Fort Hancock, NJ 07732 732-872-1300 njseagrant.org

BUILD-A-FISH

OVERVIEW

Students learn about fish **anatomy** and morphology and discover how the shapes of a fish's parts are related to how the fish functions. Younger students can also assemble a paper fish from prepared parts.

OBJECTIVES

Following completion of this lesson, students will be able to:

- Identify the basic external **anatomy** of a fish
- Explain what each part is used for
- Understand how the shape of a fish's parts is related to the way it moves through the water.

GRADE LEVELS

K-8th grade

NJCC STANDARDS

Science Indicators:
5.1: End of Grade 4: A1, B1; 5.3: End of Grade 4: A1, A2, D1;
5.5: End of Grade 2: A1, A2, B1, End of Grade 4: A3, B1, B2,
End of Grade 8: B1, B2, B3; **5.7:** End of Grade 4: A1;
5.10: End of Grade 2: A1, End of Grade 6: B1
Visual Arts Indicators:
1.2, 1.3, 1.4
Mathematics Indicators:
4.2: 2A2, 2A3, 2A4, 2B1, 2B2, 2D1, 2D2, 4A2, 4A3, 4A5, 4B3, 4D2, 6A3,8B2**; 4.3:** 2A1, 4A1, 4C1, 6C1; **4.5C:** 3, 4, 6; **4.5D:** 3; **4.5E:** 2

MATERIALS

- Fish part templates included in this lesson plan,
- glue, construction paper, wiggly eyes, scissors,
- Crayons or markers, fish **anatomy** diagram, real or plastic fish.

PROCEDURES

Introduce a real fish or fish model to review the body parts of a fish. If the fish is plastic, pass it around for students to handle and observe up-close for about 5-10 minutes. Then ask the students what they know about fish. Encourage students to talk about how fish live, move and eat. Explain that all fish 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** of a fish by explaining parts of a generic bony fish. 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. Once the students have an understanding of the body parts, allow approximately 30 minutes for the students to create their own fish.

Distribute body parts or allow the students to cut out their own parts, and glue their chosen pieces onto a background sheet. Have students label each body part on their fish. They can also color and add details such as scales, wiggly eyes, etc. Students may also draw on the background what they think would be found in their fish's habitat. Assess project by asking students to describe or write about their fish. Students should include information about how their fish moves and eats. See Background section for supporting information.

BACKGROUND

Fish make up the largest of the vertebrate groups with over 20,000 species. They can be found in great variety in lakes, streams, oceans and estuaries. The most fish have skeletons made of bone and are called bony fish. Understanding fish **anatomy** helps us understand how fish are adapted to live in the water. They have special body parts that help them move freely, defend themselves, find food, breathe, and sense their surroundings.

Fish 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 named 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 and they help a fish move up and down, backwards, plus aid in the ability to swim and steer. The pair of bottom fins are 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. T**his fin keeps a fish on a steady course and gives balance. The tail fin is called the **caudal fin. T**his fin helps a fish propel through the water, pick up speed, and for some fish, to make turns. Visible and flexible spines and rays support the fins of 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 tells us the fish is a fast swimmer, the deeper the fork, the faster the fish. A fish with a rounded tail will be slow moving, although they are capable 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 find food. Some eyes are located on top front of the fish's head like a flounder, some on the sides, like a striped bas. 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 tell us where a fish finds food, how it eats and even where a fish may live. 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 them. 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.

Since fish do not have lungs they get oxygen with **gills,** a feathery structure located behind the eyes that allows a fish to "breathe." Water is passed over a fish's pair of **gills** and dissolved oxygen can be extracted from water and 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, alert the fish to approaching predators, or to change in direction if the fish is traveling in a school.

The skin of 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.

VOCABULARY

Anatomy- the separation of the parts of the organism in order to ascertain their position, relations, structure and function.

Anal fin- the rear bottom fin of a fish that helps give balance

Caudal fin- the tail fin of the fish that gives the fish thrust for moving forward and aids in steering the fish.

Dorsal fin- the fin on the back of the fish which helps keeps the fish on a steady course.

Gills- an organ that allows the fish to exchanges gases in the water such as oxygen and carbon dioxide, allows a fish to "breathe"

Lateral line- a row of sensory tubules along the side of a fish that allows it to sense pressure changes in the surrounding water.
Morphology- the study of the form and overall shape and how it relates to fish function.

Nare- the fish's nostril, a sensory organ that allows a fish to smell.

Operculum- the bony protective gill cover of a fish

Pectoral fin- a pair of fins located on each side of the fish that allows the fish swim backwards, stay in one spot, and move up and down or side to side. Helps steer the fish.

Pelvic fin- the forward bottom pair of fins that help stop a fish and helps fish swim backwards, stay in one place or move up and down in the water.

Scales- the skin of a fish made of bone and are shaped like shingles on a roof and help protect the fish.

EXTENSIONS

See Activity 2 attached to lesson plan.

Go further in depth about fish morphology. See NJMSC Fish Morphology Lesson Plan.

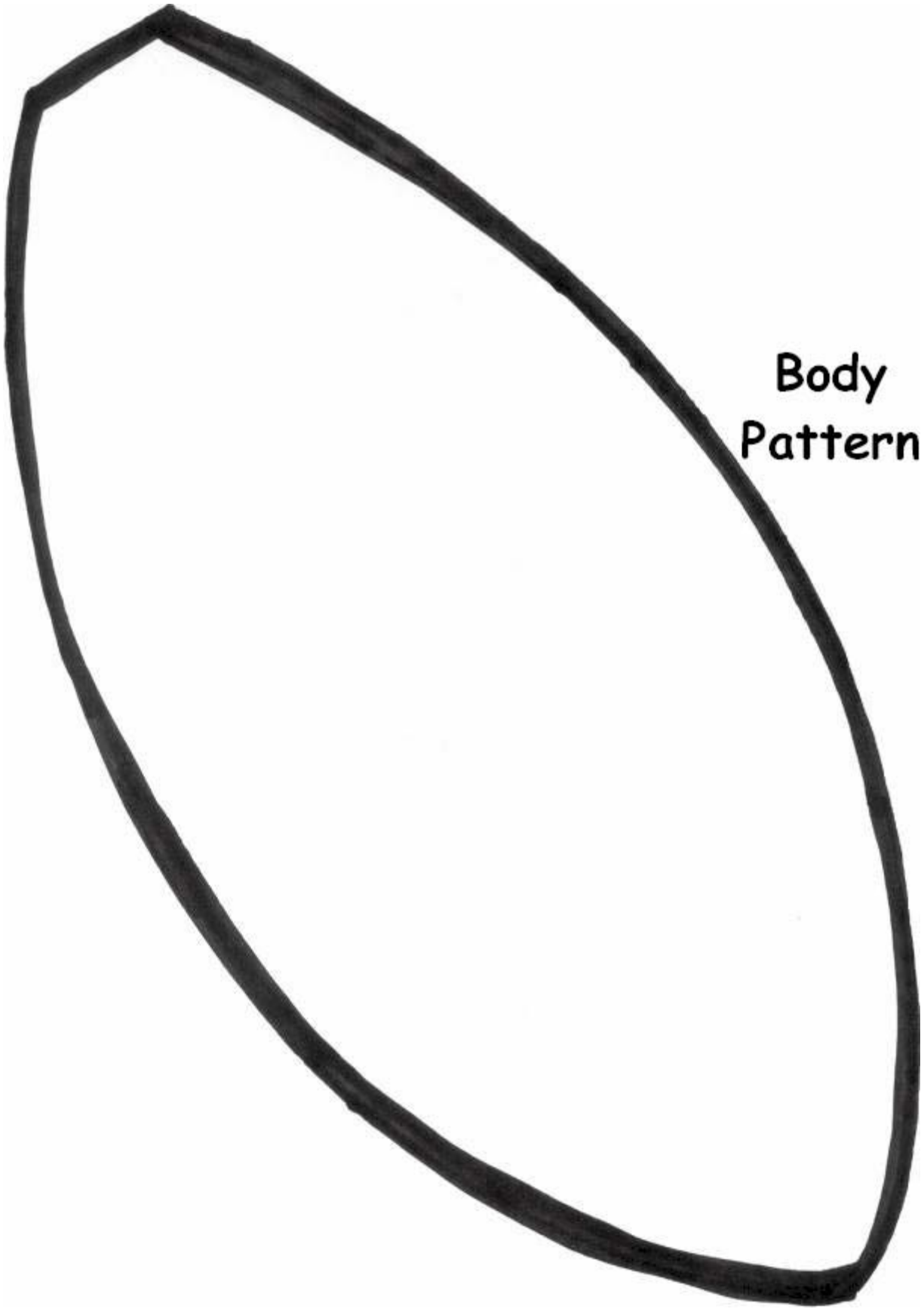
For a follow up assignment, have the children write a story on their fish.

REFERENCES

New Jersey Marine Science Consortium, Fish Morphology and Anatomy Lesson Plan, NJMSC, 2001.

MARE; Marine Activities, Resources and Education; Regents of the University of California, 1994.

REV. 11/11/10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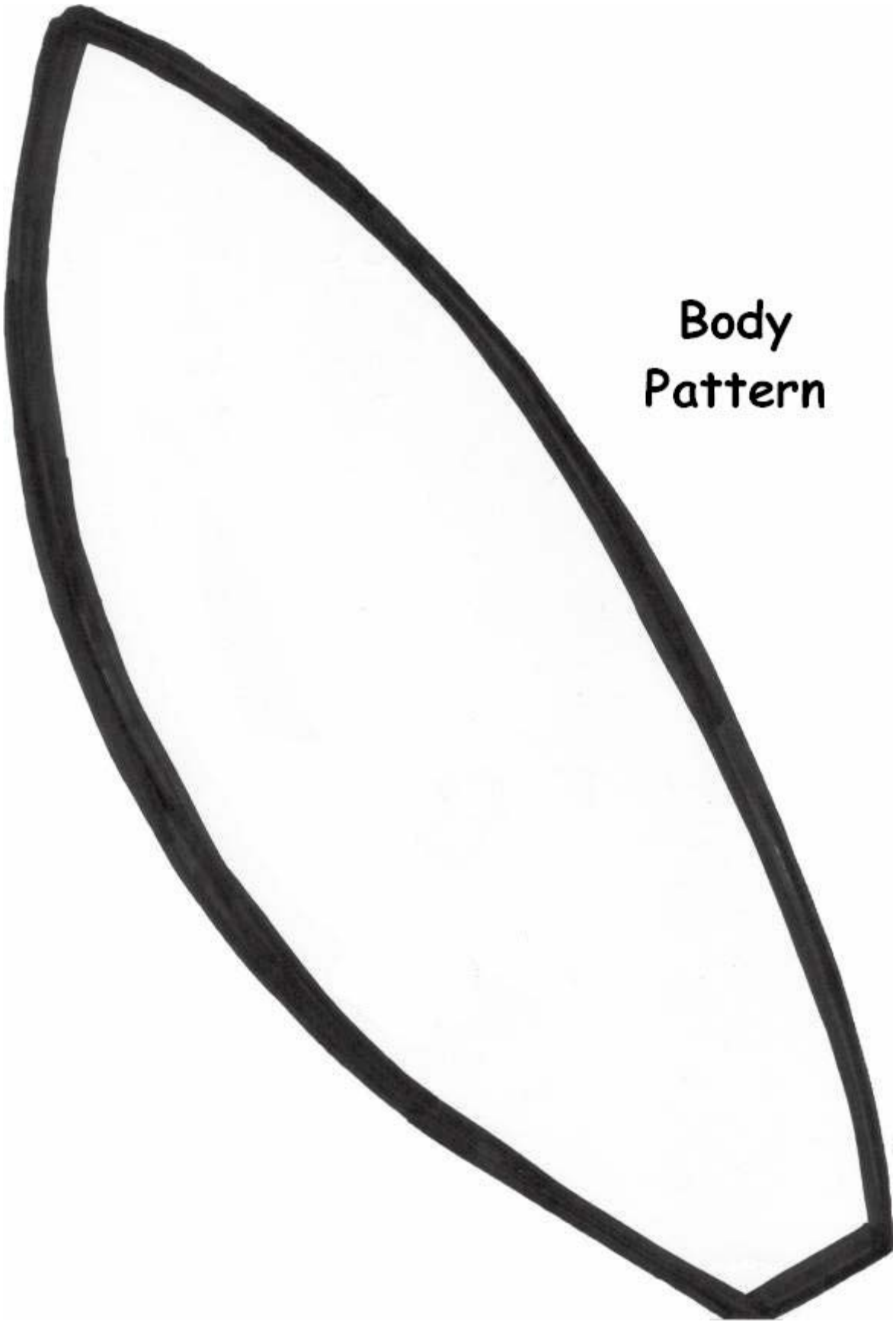
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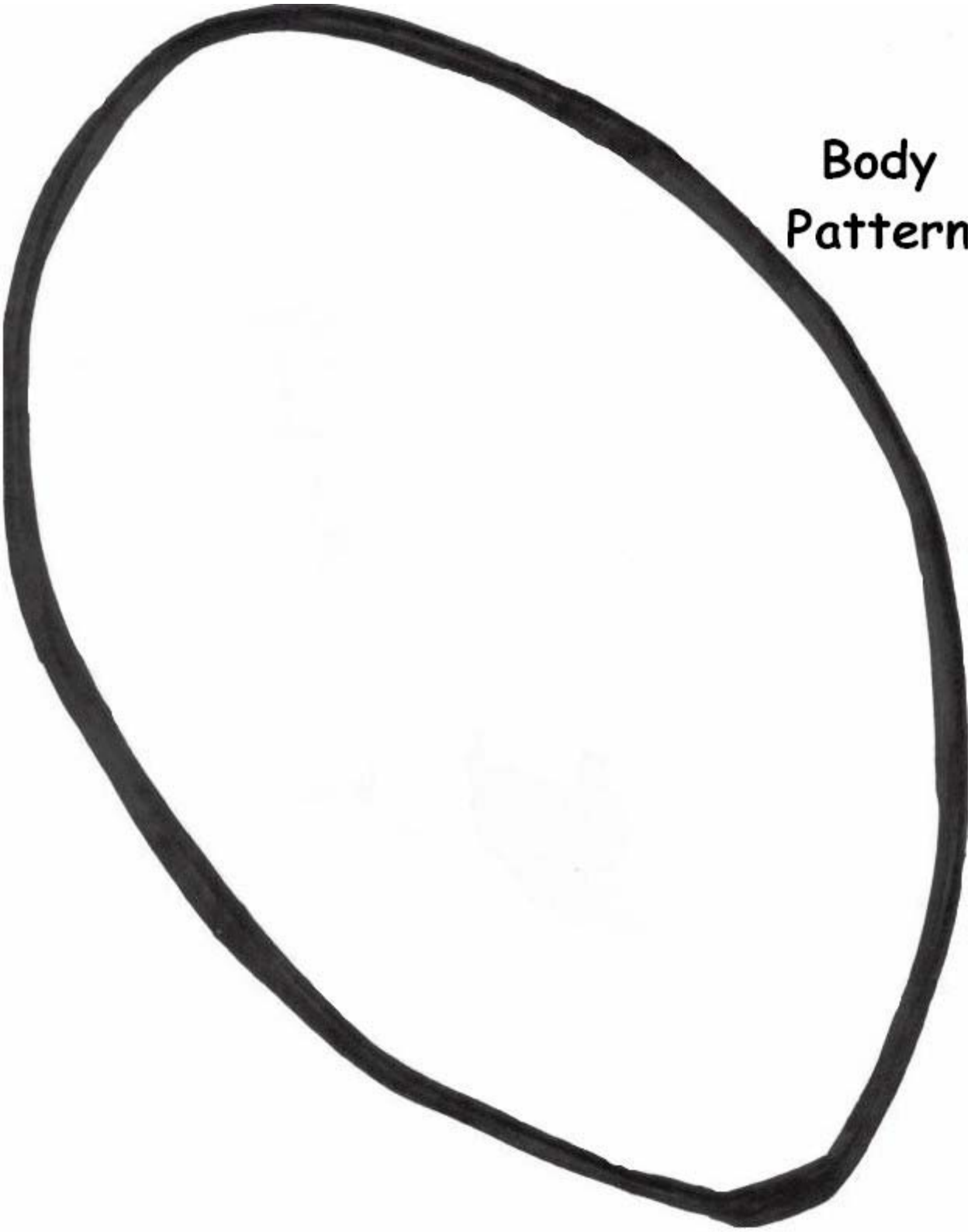
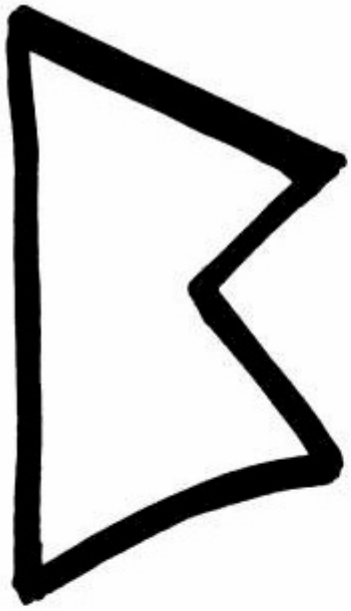
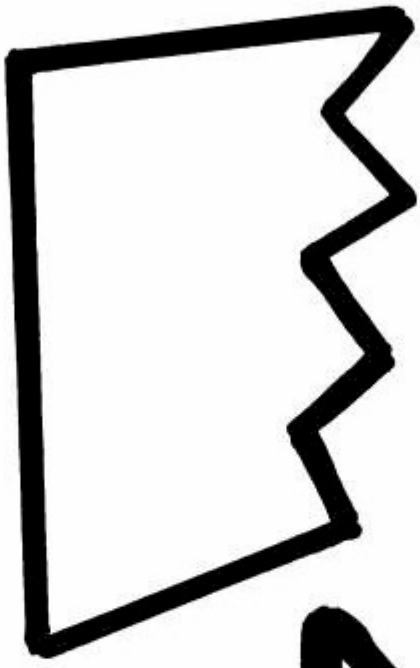

Body
Pattern

Bottom
Back

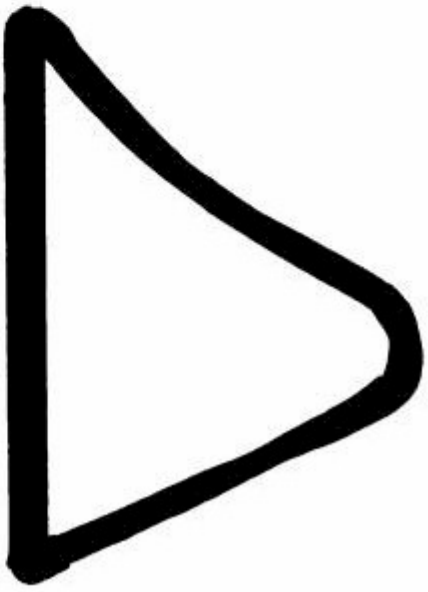
Anal
Fins

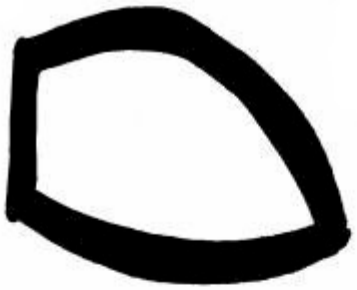


Dorsal Fins

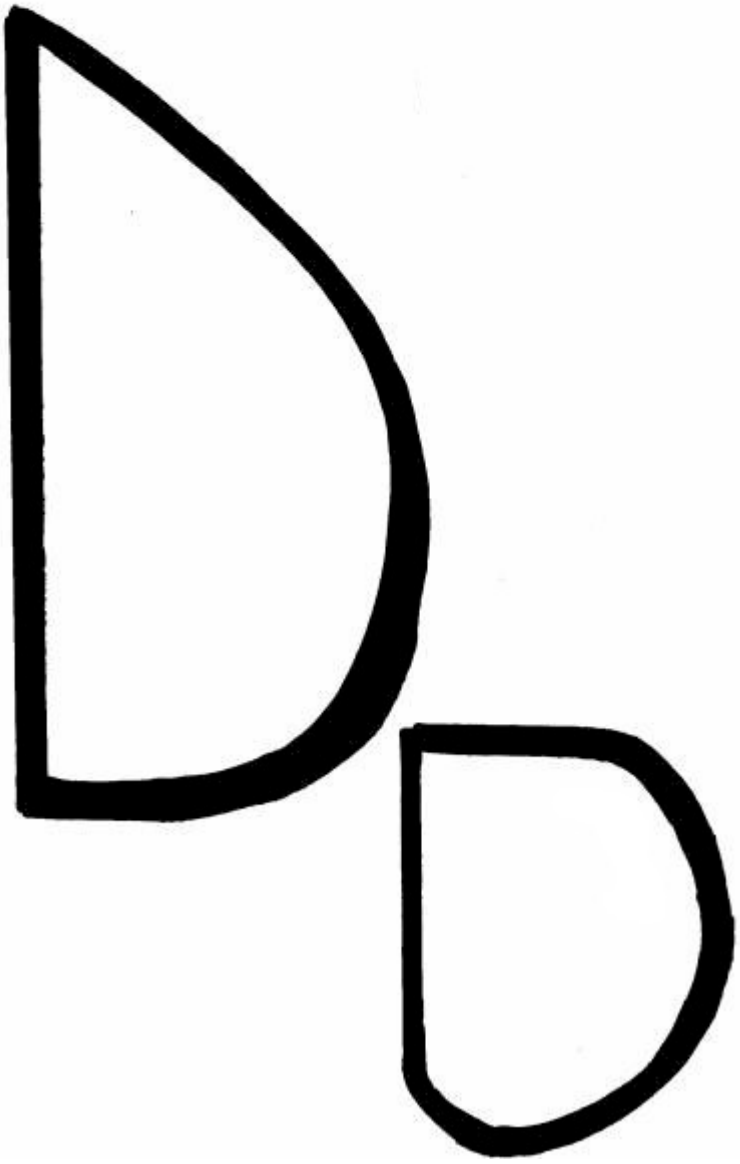


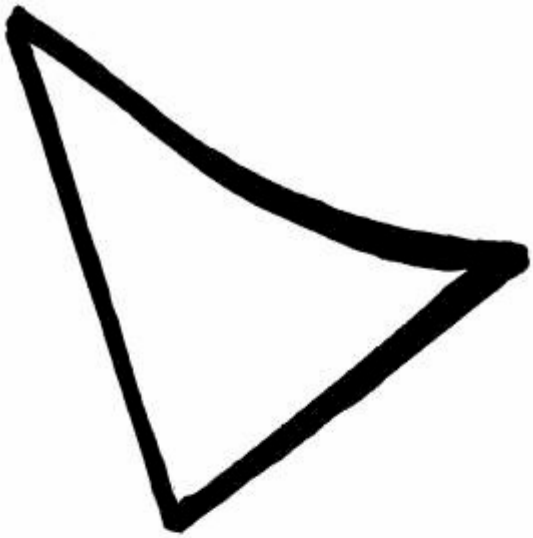
On Top
Fins

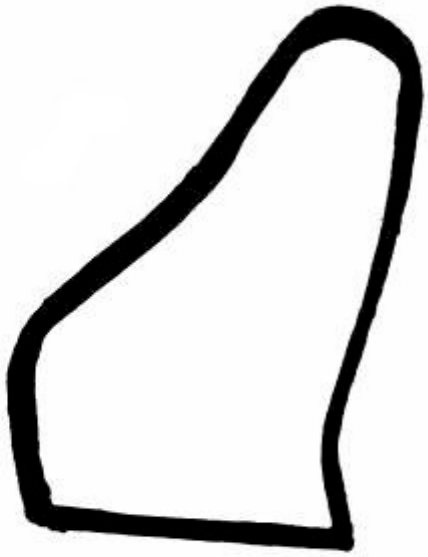




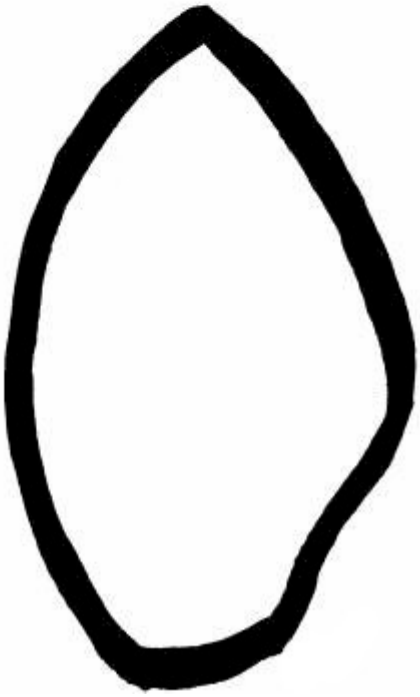
Bottom
or
Pelvic
Fins







Pectoral
Or
Side
Fins



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Build-A-Fish-Student Activity

Study the fish anatomy diagram (Class Osteichthyes), and answer the following questions.

1. What part of the fish is used to propel through the water?

2. Which fins give the fish stability and keep it from rolling over?

3. Which fins are used as the fish's "brakes"?

4. Which fins help the fish move backwards and up and down in the water?

5. Which fin helps the fish steer?

6. Which part of the fish protects the gills?

7. Why is it that fish swimming together in a school never run into each other?

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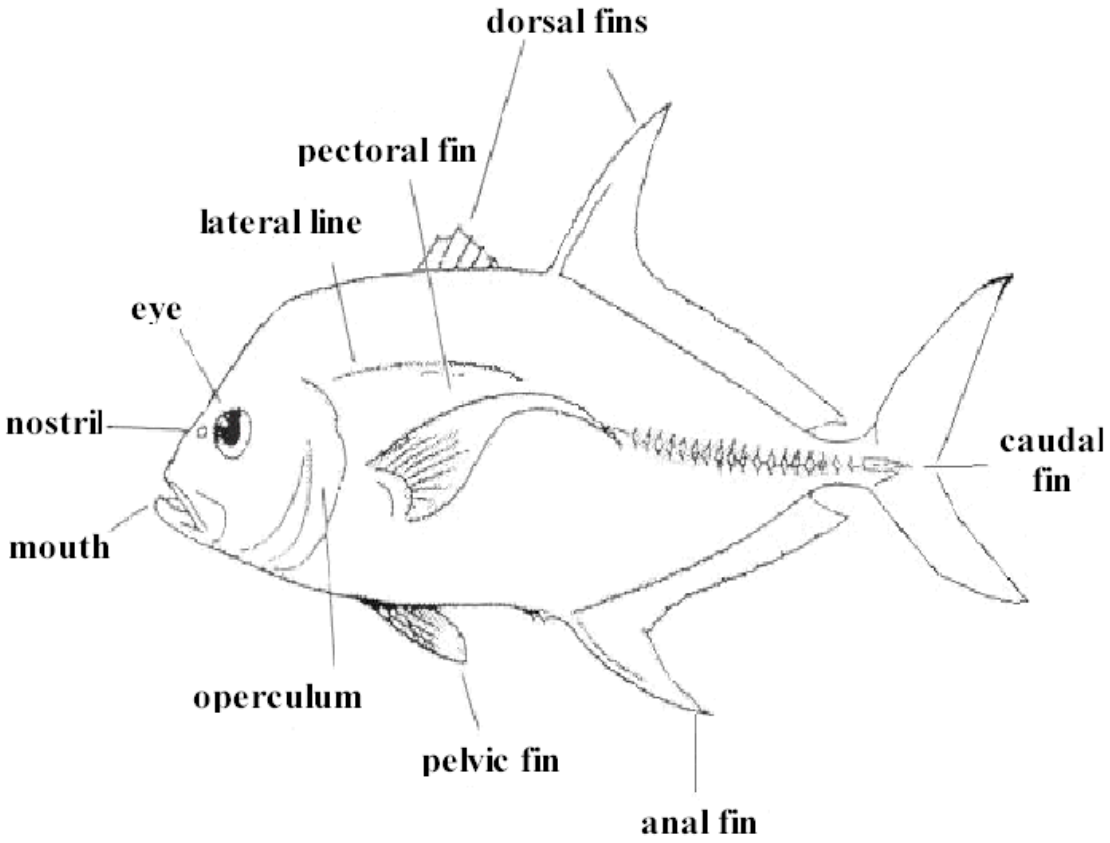
Build-A-Fish-Student Activity

FISH ANATOMY



CLASS OSTEICHTHYES

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Build-A-Fish-Student Activity-Answers

1. The caudal fin.

2. The dorsal fins and anal fin.

3. The pectoral fin and pelvic fin.

4. The pectoral fin and pelvic fin.

5. The caudal fin.

6. The operculum.

7. The lateral line allows the fish to sense changes in the pressure of the surrounding water and alert them to movement such as another fish turning.