



The Whitney Laboratory's

Traveling Aquatic Zoo

Teacher's Guide



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The Traveling Zoo

Background information:

Docents from the Whitney Laboratory will be bringing invertebrate animals to your school. Some of these invertebrates are the same animals kept at the lab for research. Scientists at the Whitney Lab are particularly interested in studying the biological processes within these simple marine organisms as a model for the more complicated systems of humans.

The docents will encourage scientific interest by guiding the questions of the students as they touch and observe the animals. We hope the students will experience the excitement of science as they discover the unique structures, strategies, and behaviors which allow for the successful survival of these animals.

Animals we may bring include:

blue crab	mud snail	slipper lobster
clam	murex	spiny lobster
conch	sea cucumber	whelk
fiddler crab	sea star	
horseshoe crab	sea urchin	

Objective:

For students to learn that every living organism must succeed at five activities to survive as an individual and as a species:

1. it must get food
2. it must get water
3. it must get air
4. it must protect itself
5. it must reproduce

Process skills include:

Observing; comparing and contrasting; inferring; classifying

Summary:

The scientists at the Whitney Laboratory understand that students best learn science by doing science. Scientists make careful observations, develop questions from those observations, make order of the knowledge gained from the research of their questions, and then present their findings to the scientific community. The docents of the Whitney Laboratory will use this simple methodology to help the students practice scientific exploration. In this way, they can communicate that science is understandable and accessible to anyone and everyone.

Procedure:

1. The students will form a large group for an introduction of the activity.
2. The students will break into two or three small groups and rotate through the animal stations. The docents will encourage the students to observe the animals and ask questions based on those observations.
3. The students-scientists will join together again in a large group to discuss their discoveries about the animals.

Discussion:

You may choose to extend this experience by conducting further discussion in your classroom. The following questions offer a starting point for the discussion. You can ask students to justify their answers to the questions with observations they made earlier.

1. Which animals can find food easily? Why?
2. Which animals might have difficulty in finding food? Why?
3. Which animal has an unusual mouth? What makes it so unusual?
4. Which animal has the best way to defend itself? Why?
5. Which animals stay put, and which animals are very active?
6. Based on your observations, which animal might be easily cared for at the laboratory? Why?
7. Based on your observations, which animal might be hard to care for at the laboratory? Why?
8. What is the most interesting thing that you learned by observing the animals? Why do you find this interesting?
9. Which animal seems to be most different from you? Why?
10. Which animal would you choose to be the subject of your scientific research? Why is this animal interesting to you?

This lesson supports the following Florida Sunshine Standard Benchmarks:

Grades Pre-K through 2

SC.F.1.1.1; SC.F.1.1.2; SC.F.1.1.4;
SC.F.2.1.2; SC.G.1.1.3; SC.G.1.1.4;
SC.G.2.1.1

Grades 3 through 5

SC.F.1.2.3; SC.G.1.2.5

The following three activities can be done before the Traveling Zoo comes to your school to prepare your students for the visit:

Activity 1. What do animals have in common?

In small groups or pairs:

1. Have the students list as many animals as possible in five minutes. For younger students, you can have them cut pictures of animals from magazines.
2. Each small group will choose three animals to focus on.
3. Each group will list things the animals have in common.

As a class:

1. Record on the blackboard the findings of each small group or lead a discussion using each group's magazine pictures.
2. Guide students in their discussion of common characteristics.
3. Lead students through increasingly more difficult reasoning in identifying common characteristics as more groups of animals are added.

Some students will focus on physical attributes; for example, these animals all have two ears or four legs or are covered with scales. Other students, perhaps with your assistance, will be able to discover that the animals have common requirements to sustain life; for example, the animals need to get air, water, and food, and they need to protect themselves and reproduce.

This activity supports the following Florida Sunshine Standard Benchmarks:

Grades Pre-K through 2

SC.F.1.1.5; SC.F.2.1.1; SC.F.2.1.3

Grades 3 through 5

SC.F.1.2.3

Activity 2. Let's play Crabitat!

Background information:

An animal's habitat is its home. An animal must be able to find in its habitat those things which satisfy the basic requirements for life. An animal needs food, water, air, shelter, and enough space to find those necessities.

The blue crab is one of the animals in the Traveling Aquatic Zoo. This animal is a carnivore that eats small fish, snails, and other small prey. Clean water with lots of oxygen is important to the blue crab. Portions of the Chesapeake Bay in the states of Maryland and Virginia sometimes become anoxic (without oxygen), which causes the blue crabs to crawl out of the water in search of oxygen. This is called a crab jubilee. While a crab jubilee may be joyful for those wishing to catch crabs, it really indicates that crabs are gasping for breath because of a lack of oxygen in the water.

Water requirements vary during the life of the crab. For instance, the female seeks ocean saltwater for releasing eggs but travels to areas close to freshwater rivers and streams for molting and mating. When it molts its exoskeleton, the blue crab seeks shelter in the submerged aquatic vegetation close to shore for protection from predators.

Procedure:

The students will play a simple game, Crabitat, in which each student represents one element of the habitat.

1. Make cards labeled with one of five words: crab, food, water, air, and shelter.
2. Give each student one card.
3. Each student will look at the card in silence, and then all students will swim or crab walk around the room.
4. At your signal each student should move to the nearest corner.
5. Help the class analyze each corner of the "habitat" to decide whether it provides the elements necessary for crab survival. A habitat is an animals' address; at this address the animal must be able to satisfy the requirements for life. Each crab student must find students that represent food, water, air, and shelter in the corner.
6. Those crabs that are unable to find all of their requirements will die or swim to a new corner. However, as the game progresses to the last corner, the remaining habitat may reach its carrying capacity, thereby forcing a die off of the crab population.

This activity supports the following Florida Sunshine Standard Benchmarks:

Grades Pre-K through 2

SC.G.2.1.1

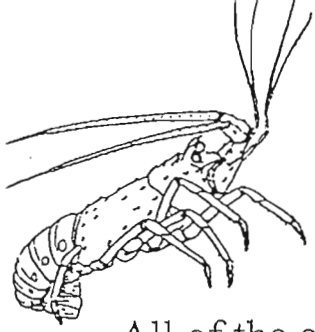
Grades 3 through 5

SC.G.2.2.2

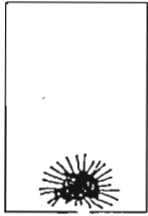


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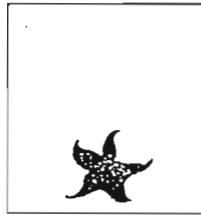
Shape Search



All of the animals in the Traveling Aquatic Zoo have escaped. Can you help us put each animal back in the right tank? Look closely. Match the animal to its shape. Draw a line from the animal to its container.



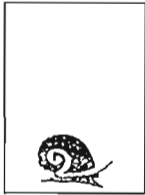
sea urchin



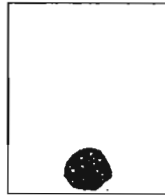
sea star



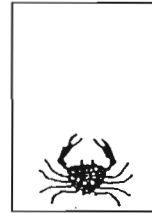
sea cucumber



snail



clam



crab



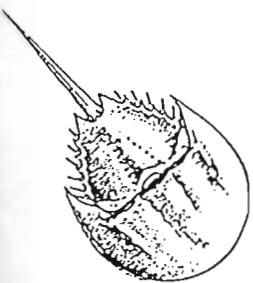
lobster



horseshoe crab



whelk



The following three activities go with the animal activity sheet. You may copy that page as necessary.

Activity 4. Where does the animal live?

1. Create one or more habitats - either drawings or shoebox dioramas. The habitat should depict elements that allow the animal to find requirements for survival (food, air, water, protection). This activity may require some additional research to ensure accuracy.
2. Have each student color an animal from the animal activity sheet (or have them draw their own) and insert it into a habitat.
3. Each student can present their addition to the class, describing the elements of the habitat used by the animal.

This activity supports the following Florida Sunshine Standard Benchmarks:

Grades Pre-K through 2

SC.F.1.1.1; SC.F.1.1.2; SC.F.1.1.4;

SC.F.2.1.2; SC.G.1.1.3

Grades 3 through 5

SC.G.1.2.5

Activity 5. Which animals can be grouped together?

1. Cut the animal activity sheet into cards for sorting.
2. Have pairs of students categorize the animals according to their own classification system of physical attributes.
3. Each pair of students can then play the Secret Sort game, in which they make guesses about how another pair of students has categorized the animals.

This activity supports the following Florida Sunshine Standard Benchmarks:

Grades Pre-K through 2

SC.A.1.1.1; SC.F.1.1.5

Grades 3 through 5

SC.F.1.2.3; SC.H.1.2.4

Activity 6. Who am I?

1. Cut the animal activity sheet into cards for sorting.
2. Read the following clues and have the students identify the appropriate picture card.

This activity supports the following Florida Sunshine Standard Benchmarks:

Grades Pre-K through 2

SC.F.1.1.4; SC.F.1.1.5; SC.F.2.1.2;

SC.G.1.1.3

Grades 3 through 5

SC.F.1.2.3

You will often find me lying on the floor of the ocean. My tentacles stretch out to trap bits of food that are floating in the water. When threatened I can pull my tentacles in tight, so that I look like a ball.

Who am I? (sea cucumber #4)

My protection comes from the spines covering much of my body. I am a scavenger on the bottom of the ocean, eating bits of food wherever they can be found. I flick my tail down to swim backward.

Who am I? (spiny lobster #2)

I like to move around in the tidal march with many other looking for bits of food on the ground. I dig into the ground for protection during high tide. Females pay attention to me when I wave my big claw.

Who am I? (fiddler crab #3)

The five teeth in my mouth look like the beak of a bird. I use them to scrape off bits of algae and other plants. You might want to play catch with me, but my spines will keep you away.

Who am I? (sea urchin #7)

My foot can work like a shovel to dig into the sand or it can work like an anchor to keep me there. Then up goes my tube to pump in the water which brings me both oxygen and food.

Who am I? (clam #6)

I carry a large, heavy shell everywhere I go. I like to eat clams. When in danger, I pull my soft parts up tight inside of my shell.

Who am I? (whelk #1)

I plow through the sand and muck looking for worms to eat. Some think that I use my tail as a weapon. It just helps me to steer as I swim or to turn over if I get stuck upside down.

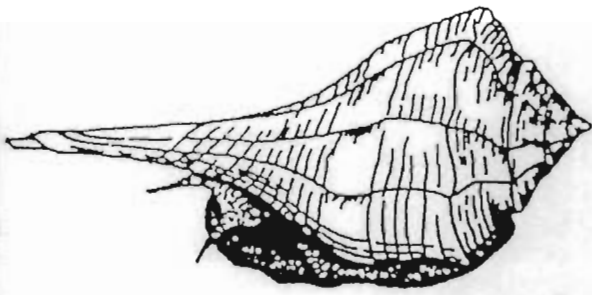
Who am I? (horseshoe crab #5)

Some say that I am a beautiful swimmer. I can swim fast because two of my legs are shaped like paddles. I catch fish with my two big claws. Watch out! I will pinch.

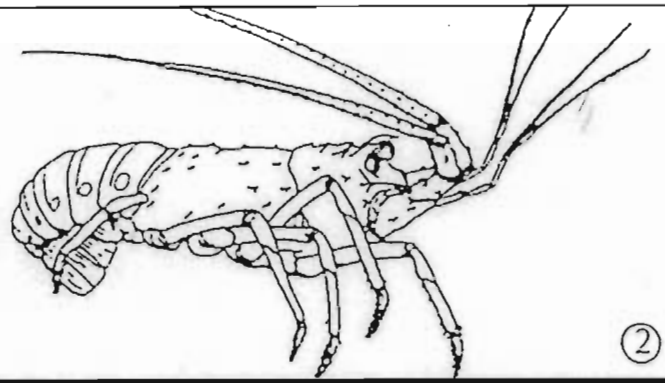
Who am I? (blue crab #9)

Tiny tube feet help me to get around. They can even pry open the shells of the animals that I eat. Each of my arms has a tiny eyespot at its tip. If I lose an arm, it just grows back!

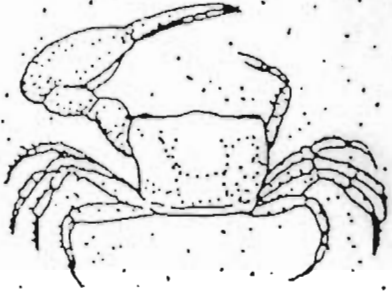
Who am I? (sea star #8)



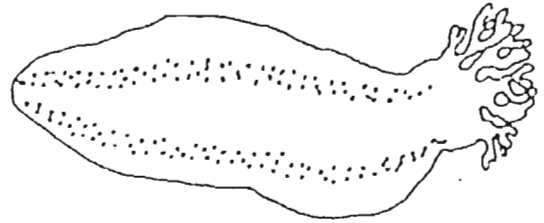
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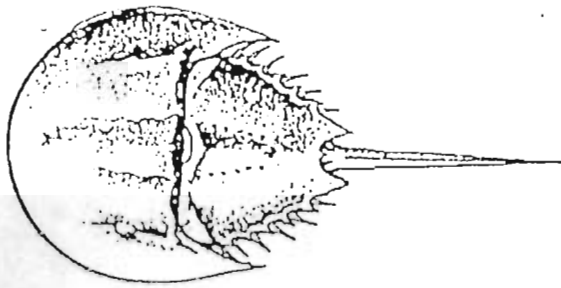
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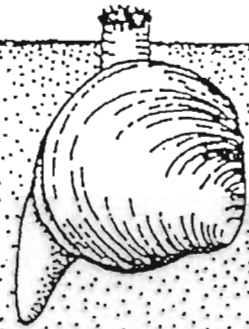
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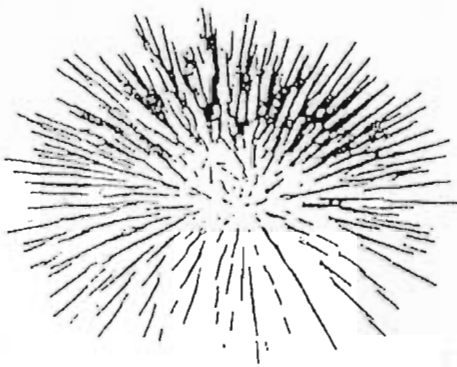
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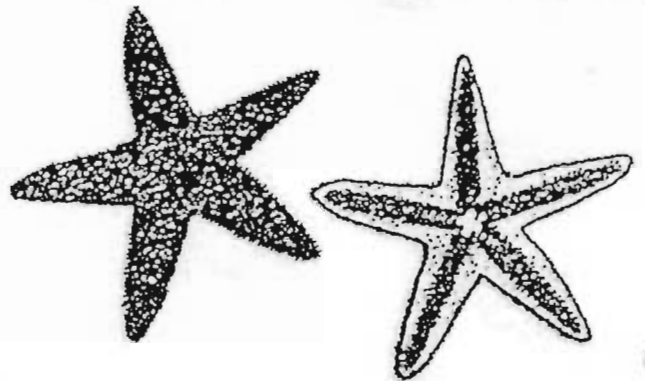
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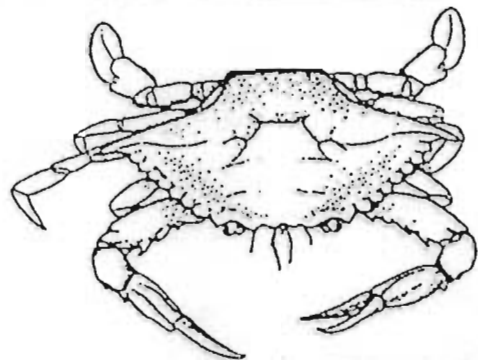
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You may want to try the following hands-on activity with your class.

Activity 7. How much salt?

Background information:

The Whitney Laboratory is located near the ocean so that we have a source of seawater to keep the research animals alive and healthy. However, many animals found along the coast can survive in a variety of aquatic conditions. One of the varying conditions involves the amount of salt in the water. This is known as the salinity of the water.

Salinity may vary from location to location and from season to season. Salinity is measured in units of parts per thousand (ppt). The salinity of ocean water is approximately 35 ppt. Mixture with fresh water from rivers and streams dilutes the concentration of salt. This mixture of salt and fresh water is called brackish water. Brackish water is found in the coastal estuary. Each organism has a preferred salinity range, although animals such as the blue crab may seek out varying conditions during different life stages (See Activity 2).

Objective:

For students to learn that ocean water contains salt and that water from other sources may have less or no salt.

Materials:

seawater, freshwater, brackish water
three shallow dishes labeled with the three types of water
magnifying glasses

Procedure:

1. Collect saltwater (ocean), freshwater (bottled or tap), and brackish water (Intracoastal Waterway).
2. Have the students pour the same amount of water into each of the labeled dishes and place them in a warm or sunny spot.
3. When the water evaporates (turns to water vapor), have the students examine the dishes with magnifying glasses. You can have them taste the salt if you want.
4. Have the students describe the results in their science journal either in words or in pictures, or have them draw a picture to record the activity.

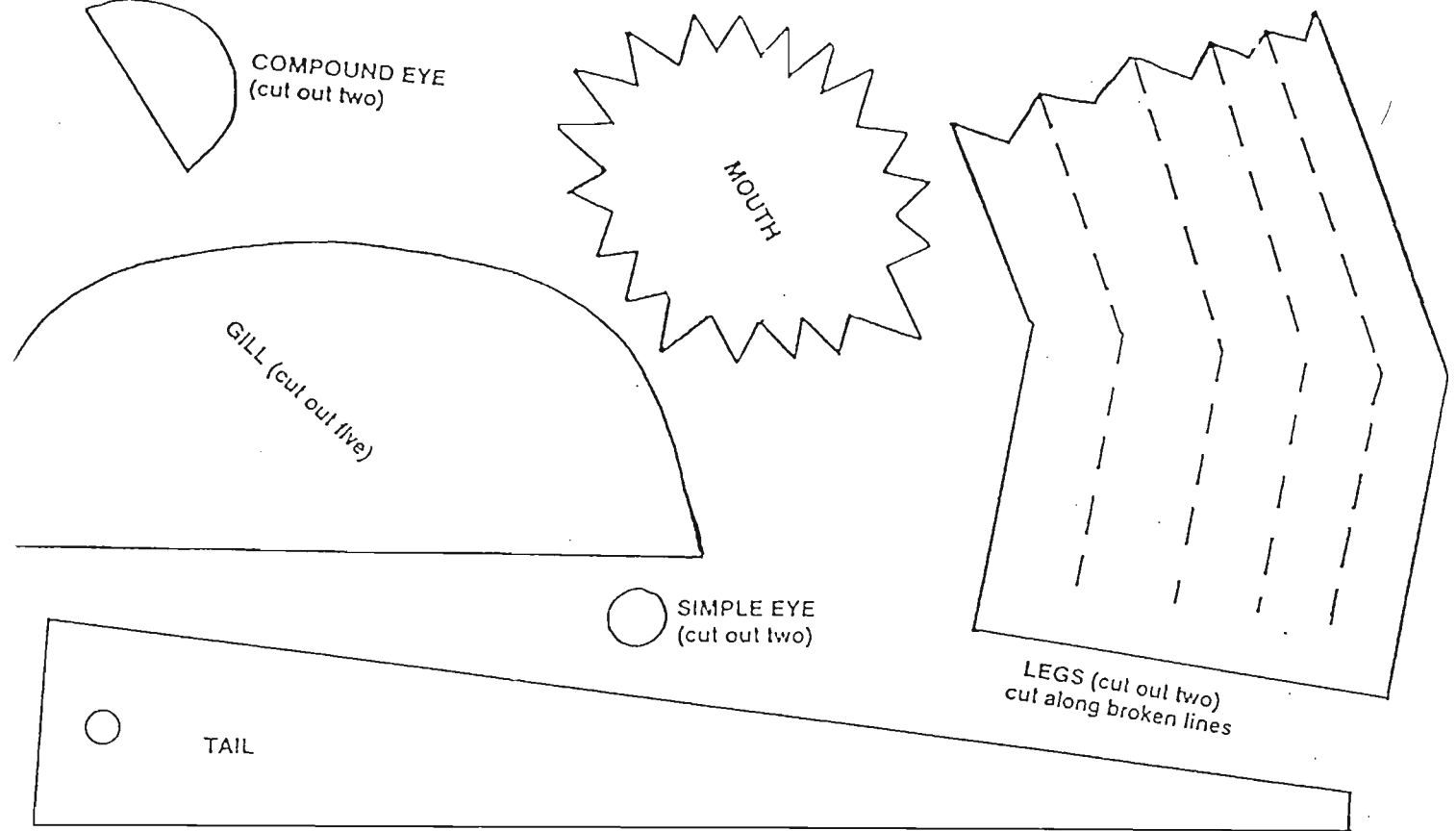
This activity supports the following Florida Sunshine Standard Benchmarks:

Grades Pre-K through 2

SC.A.1.1.1; SC.A.1.1.2; SC.A.1.1.3

Grades 3 through 5

SC.A.1.2.2; SC.H.1.2.2; SC.H.1.2.4

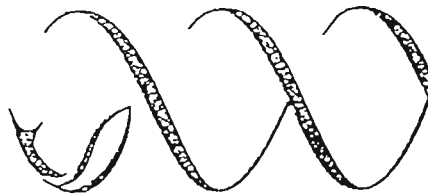


The horseshoe crab (*Limulus polyphemus*) is kept at the Whitney Laboratory for the study of the biochemical processes involved in vision. This amazing invertebrate has ten visual organs, including two compound eyes, two simple eyes and five rudimentary eyes, as well as photosensitive cells within the tail. Since the horseshoe crab often burrows into the floor of the ocean or the estuary for both food and protection, the tail may be used as a very simple periscope for perceiving light and dark.

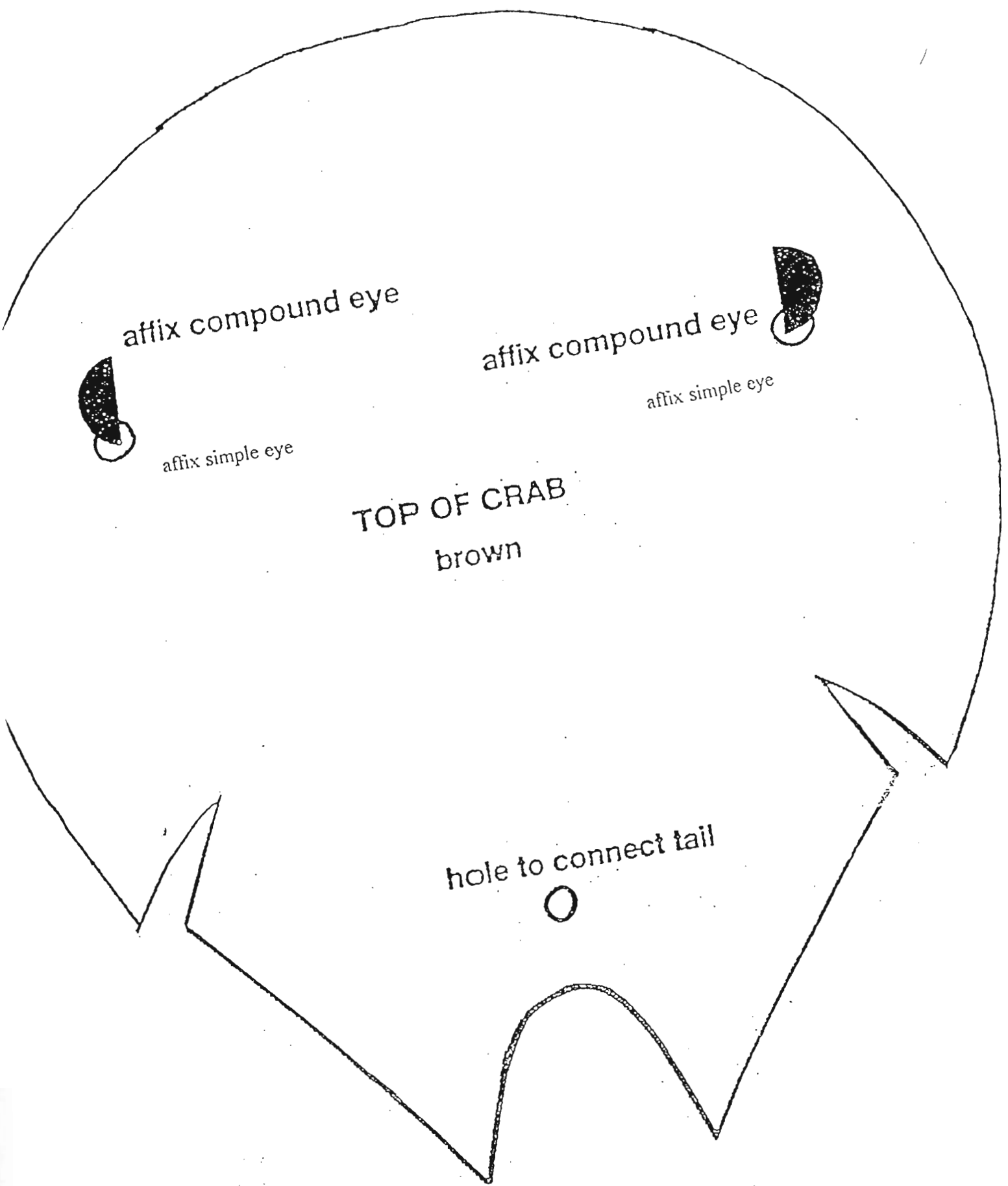
By piecing together this horseshoe crab puppet, the student will focus on parts of the anatomy of this interesting animal. The tail will be attached to the dorsal side (top) with a paper fastener for easy movement. This tail is used as a rudder for steering as the animal swims. The gills are located on the ventral side (bottom). They are known as book gills. The student will attach them across the body like the successive pages of a book. Movement of the gills helps the animal to propel itself upside down through the water. Ten jointed legs are also attached to the ventral side of the animal. Each pair of legs has a specialized function. Four pairs of legs are adapted for walking. The pair of legs nearest to the gills are adapted for pushing through sand and muck. These legs are also used to clean the gills. Spiny segments on the legs closest to the mouth help to crush food and move it to the mouth. Horseshoe crabs forage in the muck primarily for worms.



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affix compound eye

affix compound eye

affix simple eye

affix simple eye

TOP OF CRAB
brown

hole to connect tail

Limulus polyphemus (Horseshoe crab)

Pattern from NSTA's Science and Children, April, 1989