



Lesson 7: How do mud snails find food?



Focus Question:

Can a mud snail smell its food?

Objectives:

- To investigate marine snail behavior in regard to feeding.
- To learn to set up an observational experiment.

SC Science Standards:

5-1: The student will demonstrate an understanding of scientific inquiry, including the foundations of technological design and the processes, skills, and mathematical thinking necessary to conduct a controlled scientific investigation.

6, 7, 8-1: The student will demonstrate an understanding of technological design and scientific inquiry, including process skills, mathematical thinking, controlled investigative design and analysis, and problem solving.

Purpose:

This is a lab-based activity in which students investigate senses through the feeding behaviors of mud snails and design their own test apparatus.

Time Duration: 2 hours

Materials:

Per student group:

- 3 mud snails (Note: Contact vendors such as Carolina Biological to purchase living mud snails. You could collect from the wild, but please contact DNR about permits and other regulations.)
- Salt water (20-25 o/oo) that can be collected from the ocean or made with artificial seawater salts purchased from an aquarium store. Note: Table Salt will NOT work.
- Construction materials to build the testing apparatus (2 versions listed below)
- Student Lab Sheet (Appendix 3)

Building a Test Apparatus- Version 1 (Appendix 1):

- Ruler or measuring tape
- Duct tape
- Permanent marker
- Scissors and box cutter

- Two 20 or 24 oz plastic bottles (all must be identical)
- 1 Gallon Milk jug
- 1 tube of silicone sealant with nozzle

Testing Apparatus- Version 2 (Appendix 2) :

- PVC Pipes
- Silicone Glue
- Saw



Mud Snail Background

Thousands of Eastern Mud Snails (*Ilyanassa obsoleta*) scour intertidal mud flats at low tide. Mud snails are mollusks that live in shallow, intertidal estuarine waters ranging in salinities from 10-32 ppt and water temperatures from 13-22° C (mid 50-70° F). During low tide, this snail leaves a grooved trail behind as it crawls over the mud's surface searching for food.

The mud snail grows up to four centimeters in length and depends on its sense of smell to find food. It uses a siphon to bring in water and keen sensing cells identify potential food smells in the environment. The snail feeds on a range of food sources--algal mats from the surface layers of the mud, worms that live in the mud, and scavenges on dead fish, crabs and other animal remains. Ducks, shorebirds, crabs and some fish feed on the mud snail. In this investigation, you will observe and analyze the behavior of the mud snail in a Y-Test Apparatus when food is placed on one end of the Y.

Student Engagement

A. Use a KWL Chart to organize ideas.

"K" What you know?

Brainstorm with students how marine animals find food (sight, sound, shape, smell, electrical fields, etc). Write in "K" Column.

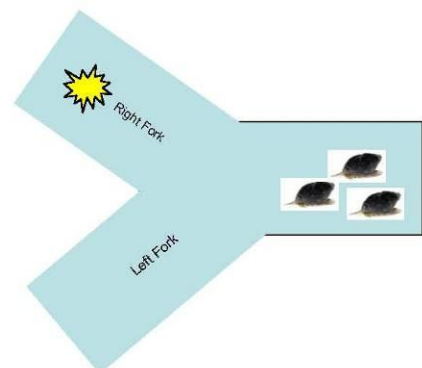
Pass around mud snails for students to observe or have students observe snails in the aquarium. Can they identify the siphon? Brainstorm ideas from students on its habitat, protection, etc. Their answers should reveal what they know about adaptations.

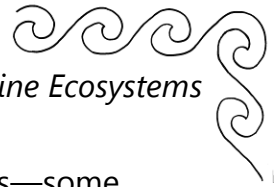
"W" What you want to know? Record any questions that students have about how any animal finds food, even themselves. What makes finding food in intertidal areas challenging to mud snails.

"L" What have you learned? Complete this column at end of lesson.

B. Student Challenge: Building & Testing Apparatus

Design an experiment that will allow you to investigate if mud snail can "smell" food in water. How you would you build the apparatus?





Students must build an apparatus to test the sensing abilities of their snails—some version of a Y-Design (Figure 1). Students may design and build their own apparatus or use one of the two designs in this lesson (Appendix 1 and Appendix 2)

After design has been decided, have students create a research question or a hypothesis. Why would you put in more than one snail? Would you repeat this experiment the same way again?

Here is a Sample Hypothesis: "***If*** food is provided in one fork of the Y, ***then*** a mud snail will move towards it. "

Procedures:

Step 1: Build apparatus of choice.

Step 2: Put about 2 inches of seawater in the Y-Test.

Step 3: Place a food source (tiny piece of fish or crab) as bait at the end of one path.




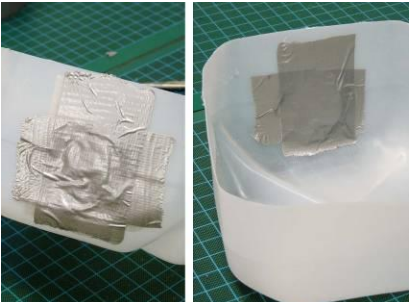
Step 4: Place 3 snails at the starting line in the apparatus. You may have to wait for them to start to move.

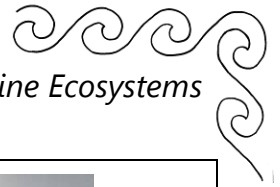
1. Using a stop watch, time any movement of the snail. Observe their direction and any behavior very carefully and take notes in your journal.
2. Record responses in data table on Student Lab Sheet.



Appendix 1: Building the Test Apparatus: Version 1

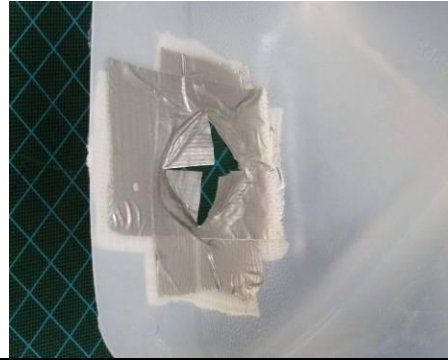
Y-Test Apparatus

<p>Step 1: Place small bottle to the bottom center of the gallon jug. Holding the bottle steady, trace the mouth of the bottle onto the jug using a permanent marker. Repeat on another adjacent side.</p>	
	<p>Step 2: Using a box cutter, carefully cut the circles on each of the two sides</p>
<p>Step 3: Cut off the top of the gallon jug in a straight line using a pair of scissors.</p>	
	<p>Step 4: Tape at least two pieces of duct tape over <i>each</i> hole (two on the inside in overlapping fashion, two on the outside). Press tape down to secure the seal. Note: you will need at least four pieces of duct tape.</p>



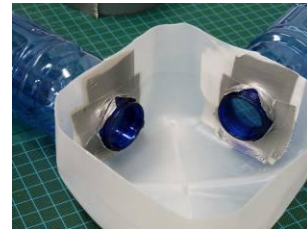
Step 5:

Cut an X shape in the center of the taped holes, large enough so the mouth of the bottles are tightly secured.



Step 6:

Insert the mouth of each bottle into the holes carved into the bottom of the milk jug.



This picture shows the Y forks cut too high in the milk container. Cut lower holes. You may need to add clean sand raise the level to the holes.


Step 7:

Cut a rectangle from the top side of each small bottle with box cutter. Note: This is to ensure that you have plenty of room to add or remove items from the bottle.

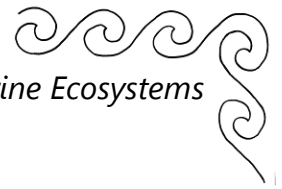




Appendix 2: Testing Apparatus Version 2

This design has three forks-A,B, and C. The PVC pipe has been sawn in half, revealing the forks. You can get PVC with two forks. A semi-circle of plastic has been glued to keep water in the container. The snails would be placed at the point with the Star and Food in one of the three  forks with triangle. .





Appendix 3: Student Lab Sheet

1. State your Hypothesis or Research Question:

2. Materials

- a. Draw your apparatus and list the materials you used to build the Test Apparatus

- b. Describe your mud snails and how you are keeping them alive and healthy.

- c. How did you make or get seawater?

- d. What food did you use for this test?

3. Methods (Write down each step you followed for each trial run.)

4. Report your results by completing the data table.

Trial (Indicating food location) NOTE: Clean apparatus thoroughly between trials.	Observations			Total Time for snail(s) to move into fork
	Snail 1	Snail 2	Snail 3	
Trial 1. (Ex. Food in left fork of Y)				Snail 1: Snail 2: Snail 3:
Trial 2. (Ex. Food in right fork of Y)				Snail 1: Snail 2: Snail 3:
Trial 3: (Ex. No food in apparatus)				Snail 1: Snail 2: Snail 3:



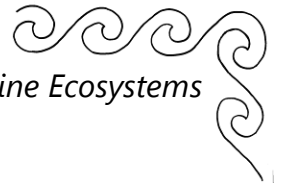
Results: Summarize what you observed from the three trials.

Conclusion:

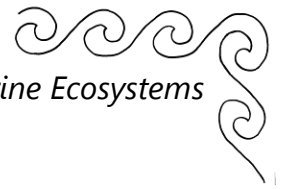
1. How did you account for variables that could affect the results of your investigation? (for example, light source in the room?) If you were to continue this investigation, what else would you do?

2. What additional questions do I have about mud snails? From your observations, what would you change if you repeated this investigations.

3. From your investigation, can mud snail "smell" a food source? What is your evidence?



Focus Question: How do mud snails find food?



Student Lab Sheet (Teacher’s Copy)

1. State your Hypothesis or Research Question:

Answers will vary

2. Materials

a. Draw your apparatus and list the materials you used to build the Test Apparatus

Answer will vary

b. Describe your mud snails and how you are keeping them alive and healthy.

Answer will vary.

c. How did you make or get seawater?

Example answer: We brought seawater from the coast.

d. What food did you use for this test?

Example answer: We cut up a fish bought from the fish market.

3. Methods (Write down each step you did.)

Answer will vary.

4. Report your results (fill in chart) *Sample Responses*

Trial	Observations			Total Time for snail(s) to move into fork
	Snail 1	Snail 2	Snail 3	
Trial 1. Food only in left fork of Y	<i>Moves to left fork in 3 minutes with siphon extended</i>	<i>Stuck out siphon and never moved</i>	<i>Stuck out siphon and moved to left fork in 5 minutes</i>	<i>Snail 1: 10 min Snail 2: 8.5 min Snail 3: never moved</i>
Trial 2. Food only in right fork of Y	<i>Moves to right fork in 2 minutes with siphon extended</i>	<i>Stuck out siphon and moved away from forks</i>	<i>Stuck out siphon and moved to right fork in 5 minutes</i>	<i>Snail 1: 8 min Snail 2: never arrived at food Snail 3: 8 min</i>
Trial 3: No food in either fork	<i>Moves toward other snails</i>	<i>Moved in a circle</i>	<i>Moved to right fork</i>	<i>Snail 1: never moved Snail 2: never moved Snail 3: never moved</i>



Conclusion:

5. How did you account for variables that could affect the results of your investigation? (for example, light source in the room?)
We put the Y-Test apparatus away from the windows and also put the shade down. We moved it from the air conditioning unit.

6. What additional questions do I have about mud snails? From your observations, what would you change if you repeated this investigations.
Answer will vary. How do snails move?

7. From your investigation, can mud snail “smell” a food source? What is your evidence?
Yes, as snails moved to the food source and not to the empty fork.

8. What variables may have affected the results of the experiment to give you unexpected outcomes?
Sample answer: Forgot to clean apparatus between trials, heat source, dead snail, etc.

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