Where Do Snails Go?

Black nerites (*Nerita picea*) are small (about 2-4 centimeter) snails that are abundant in the splash zone to the tide line. These littoral (dwelling in the intertidal zone) snails live on rocky shores, where they move in and out of the water, grazing on the algae on rocks. These snails often stay up where they are occasionally wet by the waves, and can tightly seal themselves to the rocks, preventing them from drying out. The snails are easy and safe to collect and handle and this experiment can be conducted on a field trip or in the classroom.

Strand : The Scientific Process	Standard 1: The Scientific Process: SCIENTIFIC INVESTIGATION: Discover, invent, and investigate using the skills necessary to engage in the scientific process **Benchmark SC.1.1.1** Collect, record, and organize data using simple tools, equipment, and techniques safely **Benchmark SC.1.1.2** Explain the results of an investigation to an audience using simple data organizers (e.g., charts, graphs, pictures)
	Standard 2: The Scientific Process: NATURE OF SCIENCE: Understand that science, technology, and society are interrelated **Benchmark SC.1.2.1** Explain why people create technological devices
Strand: Life and Environmental Sciences	Standard 4: Life and Environmental Sciences: STRUCTURE AND FUNCTION IN ORGANISMS: Understand the structures and functions of living organisms and how organisms can be compared scientifically **Benchmark SC.1.4.1** Describe how living things have structures that help them to survive
	Standard 5: Life and Environmental Sciences: DIVERSITY, GENETICS, AND EVOLUTION: Understand genetics and biological evolution and their impact on the unity and diversity of organisms **Benchmark SC.1.5.2** Describe the physical characteristics of living things that enable them to live in their environment

BASIC PROCEDURE (for field or classroom)

1. Students can safely collect nerites from the rocky shores around the island. Remind them to carefully watch for waves. For the classroom, they can be collected a day or two ahead of time and kept in a bucket with a little seawater and some algae or fish food for food. The bucket must have a lid with small air holes. Snails will crawl out of an open container.
2. Set up your experimental plate where the ocean is out of sight to avoid attraction of the snails to water splashes.
3. Place all the snails on the plate at the same time; they should be placed as near the center of the testing ground as possible. Record their location after one to five minutes.
4. Try carefully adding some seawater to the experimental arena. It should cause a change in the behavior of the snails, because they will be more likely to move when they aren't worried about drying out.
5. Turn the plate around, and time the snails for another one to five minutes (use same amount of time as before) and record their location; if shadow or wind is a factor, they may move to the other side.
6. Using your portable light source, shine the light on the plate, and observe what the snails do. They will probably move away from the light.
7. Place the snails on the plate colored black and white and time them for five minutes. Do they go to either color in greater numbers? They usually gravitate toward black rocks.
8. Place the model snail or empty shell at one end of the plate. Give the other snails five minutes and see where they go. This is to determine if there is any component of location copying to their movements.

Sample Instructions to give to students:

At the beach there are two kinds of rocks. Some rocks are white. These white rocks come from coral. Some rocks are black. These rocks come from lava. There are snails living on the rocks. Today we are going to try to figure out where snails go and how they decide to go there. Your job is to be a scientist and do some experiments to answer our questions about snails.

First, look at the snails, and watch what they do. What do you notice about them? Can you draw a picture of the snails? **{Drawing pictures of the study animals enhance observation skills}**

You have a black and white snail test plate. **{A uniform testing ground should be initially used to examine general patterns of movement. A testing ground painted black and white can then be used to examine orientation to dark or light—ties in to heat loss and desiccation—White 5 gallon bucket lids partially**

covered with black electrical tape work very well as testing plates. Can also discuss dark lava rocks vs. light coral rock in terms of looking for shoreline} Put some snails on the platform and watch them. Have one of your teammates count to a minute and see where the snails are after one minute. Count the number of snails on black and on white. **{Quantifying- putting numbers to- data is an important skill for scientists}** Add some seawater to the plate. **{Adding seawater to testing ground prevents drying and makes the snails more likely to move}** Give the snails another minute and then count where they are again.

Where did they go? Why do you think they went there? Make a hypothesis (an educated guess based upon what you know) about why they went there. Can you think of other things that might make the snails move around? How would you do an experiment to test this? **{Using a portable light source also helps examine questions of heat and desiccation or a model nerite or empty shell can be used to look at location copying. Students may also notice some snails follow the others' slime trails.}**

What if you wanted to track a single snail? How could you make a map of where a snail went? Could you follow a snail over more than a few minutes or hours or even more than a day? **{A good way to make a map of snail movements is to put a drop of colored nail polish on the shell. A snail can be tracked for any amount of time, and its location recorded on a map of the area.}**

{To give students an opportunity to see how the snails use their muscular feet for crawling, put some snails on a clear glass plate or in a clear cup.}

Sample Questions for discussion (some possible answers included).

Questions

1. What did the snails do when initially placed on the rock? Did their behavior change when you added the seawater? Why or why not do you think this happened?
2. Why do you think the snails initially chose the locations they did?
3. What happened when you turned the rock around? Did they move to the other side? What factor do you think is causing them to switch from one side to the other?
4. How do the snails react to strong light? Do they move toward it? Away from it? Why do you think they are doing this?
5. Did the snails choose black or white colored rocks with more frequency? Why might the snails be choosing either of these colors more frequently?
6. What did the snails do when you placed the model snail at the end of the rock? Can you explain their behavior?

Answers

1. When placed on a dry rock, the snails will probably clamp down and not move as they are attempting to avoid desiccation (drying out).
2. Wind, shadow, following other snails, cooler part of the rock.
3. Sometimes when the rock is moved, the snails will turn and move to the opposite side. This may have to do with wind direction, or with sun position.
4. The snails will probably orient away from strong light, again, attempting to prevent desiccation.
5. Snails usually choose black rocks with more frequency.
6. To find the shoreline, usually composed of black lava rock. They may also be using camouflage; since they are black they want to be on black rocks. The heat properties of black and white are different and may also influence the snails' choice.
7. Snails usually don't seem to have much of a visual component to copying behavior or location. They may however still be copying based on olfactory (scent) or tactile (touch) cues (slime trails).

INTERDISCIPLINARY OPTIONS:

Language: Young students can read some brief instructions to begin the experiment, and learn some new vocabulary to discuss the snails. They also may write simple observations. Older students can read more background on snails, or write a research report. They can also write creatively, for example composing haikus, or writing stories from the snail's point-of-view.

Math: Young students can count the number of snails that go on black and white spaces. They can also subtract the number of snails on black space from the total number of snails to get the number of snails on white space and calculate percentages. Older students can do simple statistical tests comparing the selection by the snails.

Art: Students may want to draw what their snails look like. They can make maps of their snail testing plate or experimental design and where the snails go.

Social Studies: Pipipi are a popular food item for many local people. Students can study historic uses of these and other mollusks in Hawaii or in other cultures.

- List of Materials (provide for each student or student group):
- 5-10 Nerite (pipipi) snails *Nerita picea*
- Black and white testing plate (5 gallon bucket lid with two diagonally opossing quarters covered with black electrical tape- resembling the BMW icon)
- Seawater
- Flashlight or other portable light source
- Clear glass or plexiglass for students to observe snail crawling
- Colored nail polish
- Other equipment for creative experiment design:
    - Rocks, coral, gravel, sand
    - Empty snail shells
    - Other colored substrate besides black and white

Parts of a nerite