

CSI: Clamshell Investigation

OVERVIEW

Students will learn about the predator/prey relationship that exists between moon snails and clams.

OBJECTIVES

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

- explain how moon snails eat and where the holes in clam shells may come from;
- draw conclusions from the data collected (4.4, A1 & A2);
- use math and graphing to find if there are relations to a clam's size and its likelihood to have holes from a moon snail (4.2, D 1, D 4, 4.4, B 2).

GRADE LEVELS

3rd - 5th grades

NJCC STANDARDS

Science Indicators: 5.1: 1, 2, 3, 4; 5.2: 1, 2, 5.5: 1, 3, 5; 5.6: 1, 2, 3, 4, 5, 8; 5.7: 1, 2, 3, 4, 7, 8; 5.9: 1; 5.12: 1, 4.

Mathematics Indicators: 4.1: 1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13; 4.2: 1, 2, 3, 4, 5; 4.3: 1, 3, 4, 6, 7; 4.4: 1, 3, 5, 4.7: 2, 3, 4, 5, 10; 4.9: 1, 2; 4.11: 1, 4, 5, 6; 4.12: 1, 3, 4, 5, 7.

MATERIALS

- moon snail shells, surf clam shells,
- empty bags for student collections on-site,
- shells (some with holes and ones without holes obtained on a beach walk),
- clam shell collection data sheet (optional and included in this lesson plan)
- rulers, graph paper, crayons, pencils, glitter, glue, and string.

PROCEDURES

Pre-visit activity: Using background information included in this lesson plan, introduce students to moon snails and surf clams and their predator/prey relationship--or have students research this information for themselves. To extend this research, have students find out where and how this relationship fits into the marine food web and do some background research into the marine food web. Clams are filter feeders, depending on phytoplankton which forms the base of the marine food web. Phytoplankton is considered a producer getting its food energy solely from the sun. Clams and snails are both producers. Explain to students that they will be going to the beach to collect drilled clam shells for future investigation. Introduce students to data

collection sheets included in this lesson plan or have them design their own. Optional: Allow students to examine drilled moon snail and surf clam shells under microscopes.

On-site activity: If you opt to use data sheet included in this lesson plan, distribute sheets and have student enter weather and beach conditions. Collect data sheets for completion later.

Allow students to collect surf clam shells of different sizes on a beach walk. Remind them to collect shells with holes and some without holes and to only take one of each size to get a good sample. Remind students to take only empty shells. Supply shell collection bags as needed.

Post-beach walk activity: Break students into small groups. Assign each student a role in the group (recorder, speaker, artist, director, supplier, etc.) Allow 10 minutes for the groups to pool their collections and explore their clam shells. Tell the students to start looking at how the shells are different and have the person who is the recorder take notes on what is said about each shell. Allow students 30 minutes to sort and analyze all the shells. Have the students measure and collect data on each clam shell. This data can be entered into the data collection sheet included in this lesson plan. They should write down a description of each shell, for example, the shells' length, width, whether the shell has a hole or not, and how old they estimate the clam may be by looking at the growth lines on the outside of the shell. Once they have measured all the shells, have the students make a graph using their information. They can make a bar graph or line graph. The graphs should contain information on the size of the clam shell and if it has a hole or not.

BACKGROUND

Moon snails are univalves (one part shell) and are classified in the Naticidae family. They have moderately sized shells that when the animal body is fully expanded seems too large for their shell. The moon snail moves on its foot beneath the sand searching for clams. This snail has a large appetite and can eat several times a day. A typical mark that a moon snail has dined on another shell, typically a clam, is a neatly beveled hole several millimeters in diameter in the empty shell. The moon snail bores the small hole in the clamshell by using its *radula*. The radula is a tongue with teeth that is located in the head of the snail. The tongue is covered with rows of teeth, each row holding several teeth. The moon snail finds a clam by feeling with its foot beneath the sand. Once it finds a suitable clam, the carnivorous snail uses that foot to hold the clam while its radula or spiny tongue starts to drill a small hole into the clam shell.

Clams are bivalves, which mean that they are made of two shell halves, called valves, which are hinged together at the top. One or two large

muscles hold the shell halves together. The soft body of the bivalve is protected inside in the shells. Bivalves do not have a head or radula, but they do have a foot that is adapted for burrowing into the sand.

Bivalves have a pair of tube-like organs called **siphons**, one of which is used for eating. The siphon brings water into the gills of the clam. At the gills, mucus traps food particles that are sent along a groove that goes to the mouth. Once at the mouth, there are fleshy pads called **palps**, which act like paddles to push the food into the mouth. Also the gills take oxygen out of the water so that the clams can breathe.

The second siphon excretes wastes and the leftover water.

The clams that are most commonly found on New Jersey's beaches are called surf clams. Surf clams are only partially embedded and can be easily dislodged to wash ashore by waves. The surf clam is triangular in shape overall and round at the three 'points'. The shell can vary in thickness, some clam shells are so thick they have been used as roadbed filler and some are so thin a seagull can peck a hole right through to eat the soft bodied clam.

Not all holes drilled into clam shells (or other shells for that matter) are the work of the moon snail. Oyster drills, another univalve, can also bore holes into its prey. The difference between oyster drill holes and moon snail drilled holes can easily be made by examining both through a microscope or good hand lens.

VOCABULARY

Radula – a tongue with teeth used for drilling holes in other shells.

Siphons – tube or straw like structure used to draw in food from the water and expel waste.

Palps – flap like structure that surround and guide food into the clam's mouth.

Predator – carnivores that capture & feed on prey.

Prey – an animal taken as food by a predator.

EXTENSIONS

Have the students share their graphs with the class. On the board write down all the information gathered and form a big classroom graph. Have the students start to make hypotheses about any trends they notice from the graph (i.e. – certain size shells have or have no holes). As an extension to this lesson, allow the students to choose one of the smaller clam shells and decorate them with the crayons, markers, glitter and glue. When dry, cut a piece of string and slip it through the hole to make a "Clam Shell Necklace."

REFERENCES

<http://www.assateague.com/moon-shl.html>

<http://www.seashellworld.com/page/S/CTGY/Moon>

http://www.mrandmrsfish.com/htmlsite/meet_snail.html

<http://north-carolina-sea-shells.blogspot.com/2006/05/shark-eye-moonsnail-polinices.html>

Coulmbe, Deborah A.; 1992; The Seaside Naturalist; Simon and Schuster; New York, New York; pp. 113-115.

Wernert, Susan J; 1982; Reader's Digest, North American Wildlife; Pleasantville NY; pp. 257.

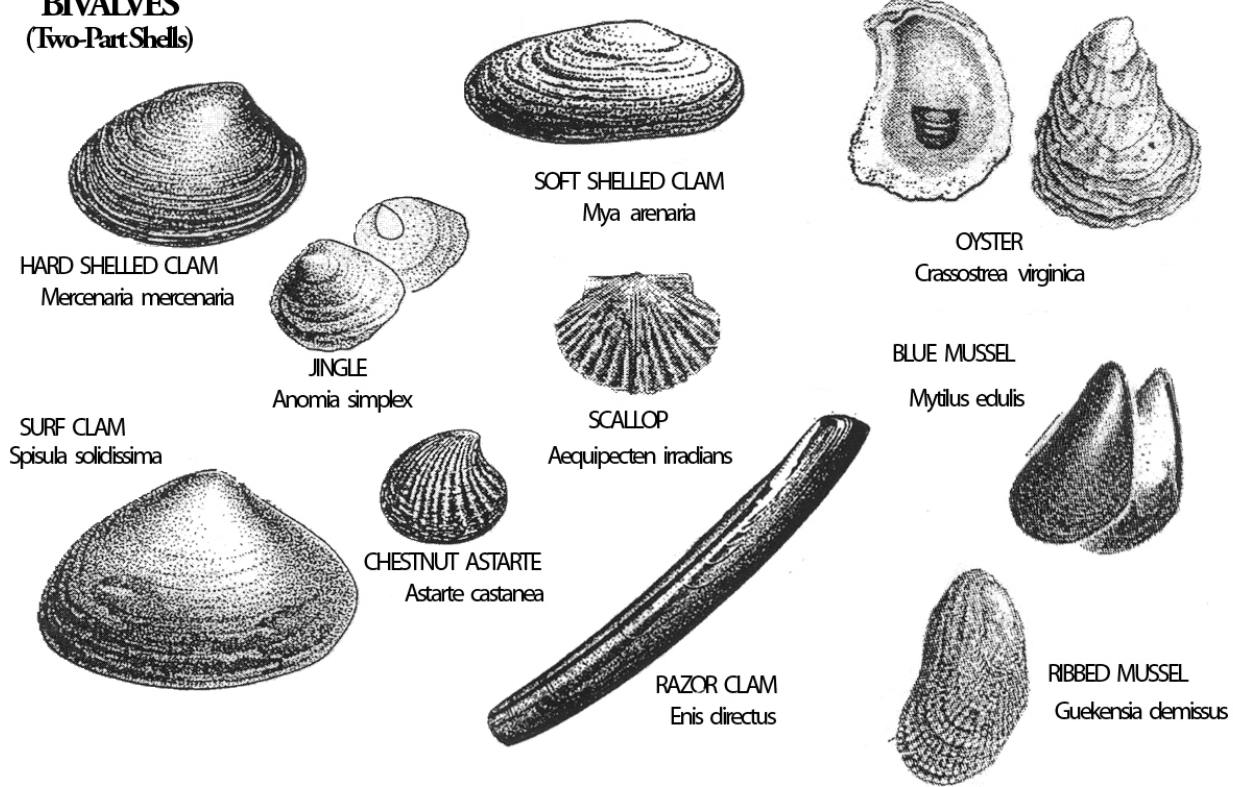
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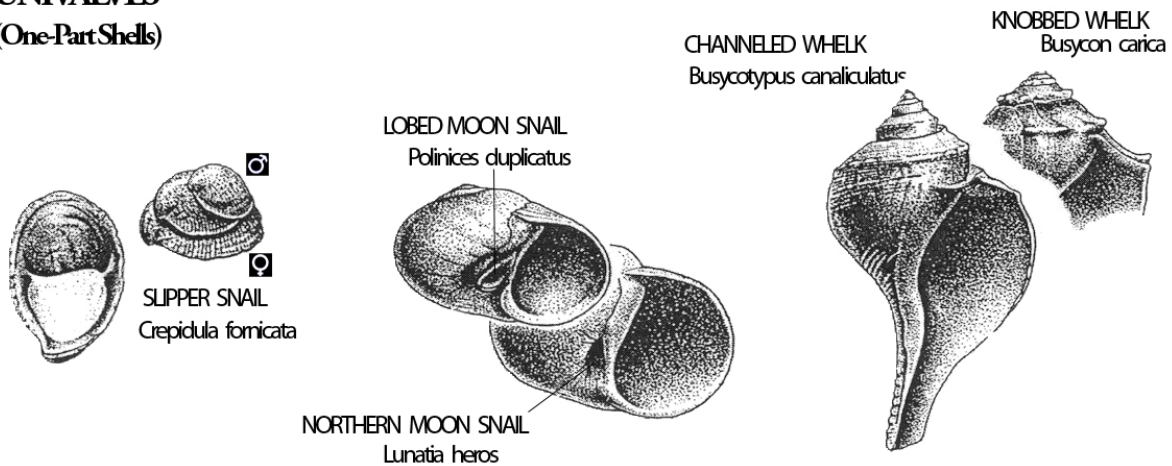
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Common Mollusks of the Jersey Shore

BIVALVES (Two-Part Shells)



UNIVALVES (One-Part Shells)



CLAM SHELL DATA COLLECTION SHEET

Group's Observer name _____ Location _____

Date _____ Time _____

Weather: Clear Partly Cloudy Overcast Rain Fog

Wind Direction: N NE E SE S SW W NW

Tidal Stage: Incoming HIGH LOW Outgoing HIGH LOW

Surface conditions: CALM LIGHT CHOP HEAVY CHOP SWELLS

Beach conditions: LOTS OF SHELLS SOME SHELLS

Clam #1 Length _____ Width _____ Hole No Hole

Clam #2 Length _____ Width _____ Hole No Hole

Clam #3 Length _____ Width _____ Hole No Hole

Clam #4 Length _____ Width _____ Hole No Hole

Clam #5 Length _____ Width _____ Hole No Hole

Clam #6 Length _____ Width _____ Hole No Hole

Clam #7 Length _____ Width _____ Hole No Hole

Clam #8 Length _____ Width _____ Hole No Hole

Clam #9 Length _____ Width _____ Hole No Hole

Clam #10 Length _____ Width _____ Hole No Hole

NOTES:

LOCATION PROFILED: _____

DATE: _____ **WEATHER CONDITIONS:** _____

TIME OF DAY: _____ **TIDAL STAGE:** _____

DATA COLLECTORS (name): _____