

LESSON 9

Title: Clam: It's a Shore Thing – Field Trip - Session 1 of 3

Subjects:

- Career and Educational Development, Science, Health and Physical Education, History, ELA, Math, Social Studies

Grade level(s): pre-K-12+

Standard(s):

Maine Learning Results

- Career and Educational Development. Interpersonal Skills (A3.pre-k to diploma.a,c)
- ELA. Informational texts (A3.3.c); (A3.3.e); (A3.6.e); A3.9-diploma.b); Research (C1.3-5.a,c,d)(C1.6-8.g); (C1.9-diploma.a,c); Listening (E1.3-diploma.c); (E1. 9-diploma.a); Speaking (E2.3-8.d); (E2. 9-diploma.a)
- Health and Physical Education. Cooperative Skills (I1.pre-k to diploma.a-d); Responsible Behavior (I2.pre-k to diploma)
- Math. Data (B1.4-8.a,b); (B1.9-diploma); Measurement and Approximation (B1.4-diploma.a,b); (B1.9-diploma.a,b,c); (B2.3-6); (B2.7.1a, 1b); (B2.8-diploma.3)
- Science. Scientific Inquiry and Technological Design (B1.3-diploma.a); (B1.3-diploma.b); (B1.3-diploma.c); (B1.3-diploma.d); (C1.3-diploma.a)
- Social Studies. Taking Action Using Social Studies Knowledge and skills (A3.3-diploma)

Common Core:

- ELA. (V.3-12.6); (SL.3-12.1c); (SL.3-5.1); (L.3.5b);(L.3.5b)
- Science and Technology. (R.6-12.4); (R.7-12.4)

STEM Skills

Brief Description:

In three class sessions, one at the tidal flat and two in the classroom, the students will identify the major parts of the clam's shell, study the life cycle of the clam, and learn about the inner clam anatomy, using live clams, pictures, diagrams and a 3-D clam "pillow" (if available).

Adaptations for different age level/abilities:

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Younger students may do Lesson 9 (Session 1) only. If the Instructor wishes to use Lesson 10 (Session 2) and Lesson 11 (Session 3) with the younger students, the Instructor could select which parts of the external and internal anatomy and the life cycle to focus on depending on the age of the students and the Instructor's comfort level. DEI staff has observed younger students being engaged in projects that on the surface seemed quite difficult.

Objectives/goals:

After the completion of the activities, the students will:

- identify the main parts of a clam (external anatomy)-session 1
- recognize the parts of a clam's shell-session 1
- observe how a clam uses its foot to move-session1
- observe how a clam uses its siphons-session 1
- become familiar with the clam's habitat*-session 1;
- have an understanding of the life cycle of a clam-session 2
- have an understanding of the life cycle of a clam-session 2
- identify the main parts of a clam's internal anatomy-session 3

*The lesson activities involving live clams can occur in the classroom, but if the class has access to a tidal zone, the observation of the clam and its motion could occur on a field trip there. The Instructor could transport clams or take a chance on finding them with a clam hoe and bucket. DEI suggests a call to the local marine warden to make sure the latest laws are followed during the trip. (A local clam harvester may agree to go with the group or meet the class at a tidal flat, if a clam license is necessary for this work.) If the students are able to make a trip to the tidal area, many other related activities and observations could occur at the same time: shell collecting, shore plant collecting/observing, bird observation, animal observation, marine life/activity observation, observation of tidal rise/fall, possible predator sightings, etc. See the other lessons titled "The Shore Thing" for more activities.

Time needed: One class session, depending on the age of the students.

Keywords:

The words for Lesson 10 (Session 2) and 11 (Session 3) are included here for the Instructor's convenience

Session 1 - External Anatomy: anterior end, excurrent siphon, foot, growth rings, hinge ligament, incurrent siphon, invertebrate, left valve (shell), mollusk, posterior end, siphon, stress ring, umbo

Session 2 – Life Cycle: adult clam, egg, fertilization, juvenile clam, late pediveliger, pediveliger, spat, sperm, trocophore, early veliger, veliger

Session 3 - Internal Anatomy and Digestive System: anterior adductor muscle, anus, crystalline style, digestive gland, digestive system, esophagus, excretory pore, excurrent siphon, foot (pedal), gill, gonad, heart, hinge line adductor scar, incurrent

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siphon, intestine, labial palp(s), mantle, mouth, nephridia (excretory gland), posterior adductor muscle, rectum, shell, stomach, style sac, visceral mass/visceral cavity

Additional general terms: anterior adductor muscle scar, bivalve, chondrophore, dorsal, muscle scar, pallial line, periostracum, plankton, posterior adductor muscle scar, straiæ, umbo, ventral

Materials Needed:

Session 1

- Empty clam shells for illustrating shell parts (Have for review of Session 1 concepts in Sessions 2 and 3)
- Clams (two for each student or group; a few extras in case a clam has been injured or dies- clams may be kept refrigerated until the lesson or may be kept in a cooler if transportation is required)(use clams for review of Session 1 concepts in Sessions 2 and 3)
- Saltwater and sand (These items can be brought to the classroom if a field trip is not possible)
- Bucket(s) or similar sized containers (such as empty and cleaned gallon milk jugs, liter plastic bottles, etc, that have had the top cut out, with the handle area intact). Prior to the lesson, students could be bringing these containers from home. If the lesson occurs in the classroom, two containers to every 3-4 children would be fine. If the lesson is on the tidal flat, let each child have two containers of their own. (The number of containers and clams will depend on the size of the group, but each learning station should have 1 or 2 clams to put into the saltwater container and one or two clams to put into the sand container.) Take a few extra containers for dipping out some salt water. Older students may be able to get this water for younger students. Discretion will need to be used depending on the student age, the tidal height, wave and wind action.)
- If the students will be traveling to the tidal area, a suggestion would be to make sure beforehand that water is easily accessed in this location. The Instructor would need to check a tide calendar.

Session 1 for the tidal field trip setting:

- Digital camera to take photos of activities (photos of students as they participate, the clam flat before and after; photos could be used later in a project presentation night or in the classroom to use as a basis for extension activities)
- Aluminum trowels that will not bend (or something similar to dig with so the students can get some sand for their buckets/containers.
- Transportation to a tidal flat
- Paper towels, wet wipes, sanitary gel, etc. for clean up use during the field experiment
- Sunscreen
- Plastic Garbage bags – 1 for each child to sit on coming home and a few for the empty containers and other tools

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- Boots and appropriate clothing
- Clam hoe and roller

The students will be more engaged with the real “thing”. If at all possible it would be appropriate to have some live clams for the students to touch and at least look at. A local clam harvester or dealer should be able to help. Supermarkets usually carry clams as well. Coastal communities have a ready supply of salt water, but it is important to note that clams cannot be left in un-aerated salt water for extended periods of time.

The Procedure:

Introduction

CLASS SESSION 1

The Instructor will explain that in today’s lesson, the students will get an up close and personal look at *Mya arenaria*, the soft-shell clam. The Instructor will allow the students to put sand in one of their buckets (containers). Have them fill the buckets about $\frac{1}{2}$ to $\frac{3}{4}$ full of wet sand, which will be similar to the clams’ natural habitat. Have the students fill the other container with salt water.

Using a live clam and an empty shell, the instructor can illustrate the parts of the shell – umbo, chondrophore, hinge ligament, anterior end, posterior end, growth rings, stress rings, etc. Show them the area where the foot comes out, and the area where the siphons are located. Explain that there are two siphons in a clam that act like straws. One siphon called the incurrent siphon draws water containing food into the clam’s body. Explain that the water has plankton in it, which is very small microscopic plant life that clams eat. The other siphon called the excurrent siphon expels waste. During spawning when the temperature rises to approximately 10° Celsius (50° F), the excurrent siphon expels eggs or sperm. Explain that there are male and female clams, and that the fertilization of an egg occurs outside of the clam’s body. Tell them that the spawning for clams in the natural environment in Maine occurs usually in May.

The students can each be given their clams to find the same parts of the shell, the foot area and the neck area.

Key Questions

What does the clam do when it is placed in the sand? In the water?

What parts of the clam can you see? Can you see the foot? The siphons?

What is the purpose of the incurrent siphon? Excurrent siphon?

How does the clam use its foot to move?

How many clam parts can you name?

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What happens when you touch the clam?

Main Activity

Show the students the parts of the clam that can be seen. Then have the students place one of their clams, siphon end up in the container that they filled with sand, and cover the clam with salt water. (This water should be gathered as mentioned above in the materials list)

Have the students place their other clam in the container they filled with salt water. The clam's foot and siphons may be easily visible in the water after a few moments.

Touching or moving the clams will probably stop such actions from taking place.

The Instructor will explain that the clam may attempt to burrow into the sand using its foot, which is light colored. (See photo) The students may see the foot change shape as it attempts to burrow into the sand. The clam will press its foot into the sand, as blood enters the foot it to swell and form a hatchet shaped anchor. The foot muscles will then contract and pull the clam down into the sand. This is the way it moves into the sand. As the water covers the clam, it may extend its siphons up into the salt water. They are located side by side. Remind them that the incurrent siphon will pull in water that contains the clam's food and the other, smaller excurrent siphon is used to expel waste. Remind them that the excurrent siphon is also used to release eggs or sperm during spawning.

The Instructor can have the students watch the clams for a few minutes, then transition to another tidal activity from the lessons "The Shore Thing," if time allows.

Conclusion

Have the students dump their clam containers and make sure all materials that have been brought to the beach are taken away – a good follow up to being stewards of the habitat.

Note: If permission has been given by someone in authority over the local clam flat (town officials, local clam warden, marine shellfish warden), some clams can be rinsed in salt water and transported back to a refrigerator in a plastic netted bag or bucket for use the next day in Session 2. Clams can be purchased locally at several places.

Assessment

The lesson concepts can be reviewed before leaving the tidal area, and then back in the classroom in Class Session 2 or 3, the instructor will go into more depth on the life cycle and internal anatomy of the clam.