



SCIENTIST IN RESIDENCE PROGRAM™

Science Unit: Marine Biodiversity: Global Ocean to the Salish Sea **Lesson #3 Comparing Clams and Mussels (Dissection)**

- Summary: Students dissect clams (which live in the sand) and mussels (which attach to rocks) and compare their anatomy to learn about adaptations.
- Lesson type: Animal dissection
- Grade level: Presented to grade 3; appropriate for grades 2 – 10 with age appropriate modifications
- Duration of lesson: 90 min
- Developed by: Jonathan Kellogg (Scientist); Andrea Teschner and Gillian Wilson-Haffenden (Teachers)
- Developed for: Lord Kitchener Elementary
- School Year: 2016-2017
- Notes:
- Check in advance for students with shellfish allergies.
 - Students must thoroughly wash their hands immediately after the dissection with soap and a large volume of warm, running water.
 - Students should work on a clear, clean surface. Desks should be properly cleaned after the dissection with hot, soapy water.
 - Clams and mussels need to be purchased ~4 days in advance of intended lesson date.
 - Save and clean shells if doing Lesson 6 in this unit, Ocean Acidification.
 - Very helpful to have extra adults to assist with preparation, supervision and clean-up.

Connections to BC Curriculum

Living things are diverse, can be grouped, and interact in their ecosystems; Demonstrate curiosity about the natural world; Biodiversity in the local environment; Transfer and apply learning to new situations; Knowledge of local First Peoples and ecosystems; Identify questions about familiar objects and events that can be investigate scientifically; Suggest ways to plan and conduct an inquiry to find answers to their questions; Consider ethical responsibilities when deciding how to conduct an experiment; Make observations about living and non-living things in the local environment

Objectives

Students will:

- a) find that clams and mussels are live animals;
- b) practice simple anatomy skills, observation, delicate manipulation, and structure identification;
- c) compare basic anatomies of organs in two similar, but different mollusks



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Materials

- Enough clams and mussels so students may share one of each species
- Paper plates
- Toothpicks
- Pocket knife
- Document camera and projection

Background Information for the Teacher

Clams and mussels are both common in the intertidal zone along the BC coast. However, they occupy two different environments with clams living just beneath the sand surface and mussels attaching themselves to rocky or other hard surfaces. Both clams and mussels are mollusks and so they share similar anatomy, however they also have specialized structures allowing them to adapt to their habitats.

Since this lesson depends on live animals from a local fish monger, advance purchase is necessary. Buy live shellfish 4-5 days ahead of the lesson and store them sealed in plastic in the refrigerator. The animals will have died but remain fresh.

Vocabulary

- **Bivalve** – a mollusk characterized by two shells connected by a hinge
- **Clam** – a kind of mollusk that lives in a sandy habitat
- **Mussel** – a mollusk that lives attached to hard surfaces
- **Shell or valve** – the hard protective covering of the soft clam or mussel body
- **Umbo** – the hinge connecting the two valves or shells
- **Mantle** – the mollusk organ that makes the shell
- **Foot** – muscular organ that may allow the mollusk to move; is present, but non-functional in the mussel
- **Gill** – respiratory organ of both clams and mussels
- **Adductor muscle** – two muscles (posterior – towards the siphon, and anterior – towards the foot) which allow the two shells to open or close tight
- **Siphon** – Flesh that extends from the mollusk shell into the surrounding water when feeding. Divided into the incurrent siphon (away from the umbo) and excurrent siphon (closer to the umbo). This organ is longer in clams than in mussels.
- **Byssal thread** – strong thread-like material secreted by mussels to attach themselves to hard surfaces
- **Filter feeder** – a method of feeding used by marine animals where water is filtered for its plankton nutrients



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Classroom Set-up

- Arrange students into groups of 1-2 at their desks. Use of a document camera and projector will help students follow along.

Lesson Detail

Introduction

Building on the previous lesson, ask students to recall the features of mollusks. They have a soft body, or mantle, a radula, or scraping tongue, in many, a nervous system, and a muscular foot, in many.

How many students have ever seen a clam? A mussel? Do they know which is which? Where and how do each of them live?

Activity

Before distributing the bivalves to the class, remind them that these are animals who should be treated with respect.

1. Distribute the plates, toothpicks, clams and mussels to the class. Have students examine the outside of each animal. What do they notice and wonder about these creatures? Why are they coloured differently? (Camouflage) What are the lines on the shells? (Growth lines, not annual) How do they feel? How was the animal oriented in its natural habitat? What are the threads on the mussel?
2. Choose one of the mollusks to walk the students through the exterior anatomy of the bivalves. If you have never done a clam dissection before, here is a helpful YouTube that walks through all the major anatomy: <https://www.youtube.com/watch?v=C-3GqvLswc8>. Compare the exterior anatomy between both mollusks before opening them to examine the interior structures.
3. Open the clams and mussels. If possible, insert a dull flat metal object, like a nail clipper file, in between the valves. Then the teacher or adult can slice the adductor muscle on either side of the clam, mainly on the posterior side of the mussel, and the shells will easily open. If needing the knife, be careful not to slice too deeply or from one side to the other as that will destroy internal structures beyond recognition.
4. Walk students through the interior anatomy pointing out features and functions that both mollusks have in common: stomach, gills, foot, mantle, adductor muscles. And those features that are different: foot has different texture and appearance between the two, prominent siphon on the clam (highlight the incurrent and excurrent siphons), byssal threads on the mussel, adductor muscles are differently sized, and reflect how the two valves open differently in each organism.

Closure Discussion

1. Examples of questions to help students share their results and observations...
 - a. What adaptations did the clam have to help it survive in its environment? What about the mussel?
 - b. What structures are similar to humans? What are different?



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2. Coastal First Nations communities gardened for clams along the coast from Alaska to northern Washington. Recent estimates of the Quadra Island shoreline show that over 80% of the possible clam habitat was modified to enhance clam production. Here is a short movie that describes clam gardens and the first restoration of one garden on the southern BC coast. <https://www.youtube.com/watch?v=22Nytmxw2Z8>
3. Also, the geoduck (pronounced gooey-duck) is a highly valuable clam that is native to BC and WA waters. Growing on average to 0.7 kg, but up to over 7 kg and 2 m long, these bivalves can live to 168 years of age. They sell for over \$330 /kg in China and some other Asian countries. Given the high value of the flesh, it is one of the most regulated industries in BC and WA.

Extensions of Lesson

- Ask students to sketch and label their clam anatomy
- Collect algae and eelgrass specimens to identify structural differences in intertidal marine algae and plants to further highlight adaptations to the intertidal environment.
- Save and clean the shells (steaming them helps free the tissues) for use in the ocean acidification lesson.

References

In addition to the YouTube videos linked above:

Amsel, Sheri. "Clam Anatomy Labeling Page" Exploring Nature Educational Resource ©2005-2017. March 24, 2017 < <http://www.exploringnature.org/db/view/3456> > (and a completed image is also available with quick Google image search of "exploringnature.org clam")

Geoduck Song <https://campsongs.wordpress.com/2013/06/15/geoduck/>

Adapted from Scientist in Residence unit Discovering Life in Local Habitats lesson 5 – Beach life: Clam Dissection. <http://scientistinresidence.ca/science-lesson-plans/discovering-life-in-local-habitats/>