

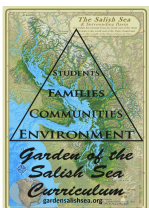
# **BPS 1st Grade Unit:**

## **Objectives**

The students will:

- Recognize patterns in order to identify clam species.
- Learn the function of different shellfish body parts.
- Observe phytoplankton under a microscope
- Learn about the role of phytoplankton in the food chain.
- Learn about the variety of foods that the Salish Sea provides.
- Taste dried seaweed.
- Identify clam species and record population data in a clam survey
- Explore local intertidal zone

Lesson	Time
<a href="#">Clam ID</a>	45 minutes
<a href="#">Oyster Anatomy</a>	15 minutes
<a href="#">Food Web Foundations</a>	15 minutes
<a href="#">Marine Foods and Resources</a>	15 minutes
<a href="#">Beach Exploration</a>	45 minutes



## Next Generation Science Standards

Performance Expectations		
1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.		
K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Constructing explanations and designing solutions Developing and using models	LS1.A: Structure and Function LS1.D: Information Processing ET S1.B: Developing possible solutions	Patterns Structure and Function Influence of Engineering, Technology, and Science on Society and the Natural World

## Lesson 1: Clam ID

### Subject

Clam Identification

### Objectives

The students will:

- Recognize patterns in order to identify clam species.

### Materials

- Clam ID kits (one per table group)
  - Each kit contains 3 of each species (Horse Clam, Eastern Softshell, Cockle, Manila, Native Littleneck, Butter Clam, and Macoma)
- Calipers (at least one per table group)
- Clam rings (at least one per table group)
- Clam ID guides (one per student)
- [Clam ID powerpoint](#) (and projector)



## Size/setting/duration

Full class in table groups/indoors/45 minutes

## Background

This lesson is a key way to introduce the students to clam identification before their clam survey at Birch Bay State Park.

## Procedure

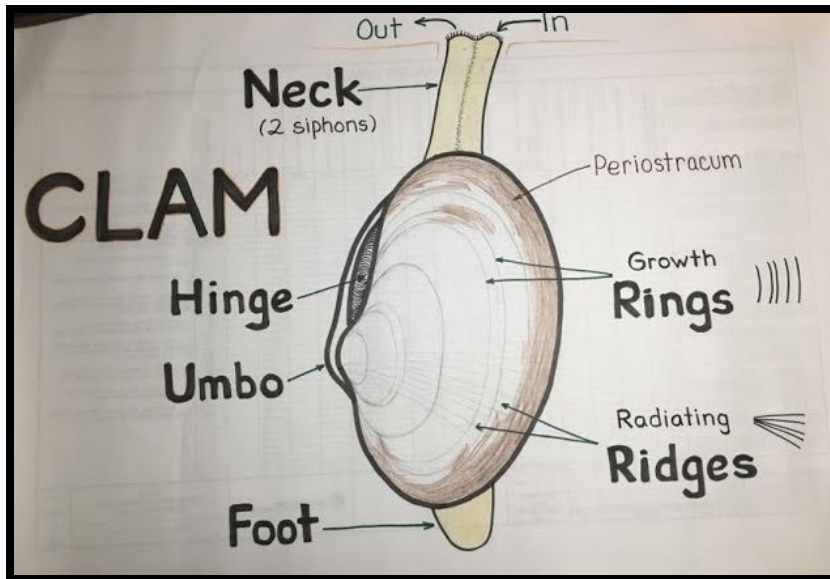
- Initial shell sort (10 minutes)
  - In groups of about 5 have students observe the sets of shells. Begin by having the groups work together to sort the shells by ones they think are similar.
  - Walk around with the groups and ask students what they are sorting the shells by and suggest some of the other ideas for how to organize the shells.
- Ask students how they sorted the shells (5 minutes)
- Once the whole class has organized the shells display this [powerpoint](#) on the screen and discuss the anatomy of shells. With each shell pattern, ask students to hold up one shell that has this characteristic.
- Shell Sort 2
  - After discussing the different shell characteristics, give students a chance to reorganize the shells using these patterns and use this time to point out to individual groups if there are any of the characteristics that they may be missing in their sorting.
- Shell ID
  - Once the class feels confident in their shell pattern recognition have each student choose one shell to observe and identify and handout the Shell ID worksheet.
  - Using the shellfish ID cards have students try to identify their shells, diagram them and label the dimensions of the shells.
  - Explain to students that these shells that they have been working with are the exoskeletons of the shellfish that are essential for them to continue living. What would happen if they didn't have their skeleton?
- Hand out Salish Sea Challenge or "Earth Day Helper"
  - This is a list of ideas for ways that you can have a positive impact on the health of your watershed and decrease the amount of CO2 you are releasing. Take these home and make a commitment with your families to be stewards of the Salish Sea and practice watershed healthy habits.



## Next Generation Science Standards

Performance Expectations		
<p>1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.</p> <p>K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.</p>		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
<p>Constructing explanations and designing solutions</p> <p>Developing and using models</p>	<p>LS1.A: Structure and Function</p> <p>LS1.D: Information Processing</p> <p>ET S1.B: Developing possible solutions</p>	<p>Patterns</p> <p>Structure and Function</p> <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p>

## Graphics & Worksheet



# Clam Identification Key

Adapted from King County Beach Assessment program

## Anatomy Terms

- Umbo
- Hinge
- Siphon
- Periostracum

## Things to Note:

### Shape:

Round vs Oval/Elliptical vs Triangular

### Patterns:

Concentric Rings vs Radiating Ridges

### Color

**Can you see a leathery hinge connecting the shells?** (Beside the Umbo, the leathery hinge is visible outside of the live clam or closed clam shell.)

**If no, go on to “A”**

**If yes, skip to “B”**



## A. No leathery hinge visible:



(hinge is hidden inside)

1. Outlines of both shells are mirror images of each other, flaps are present on the tips of siphons. It is a **Horse Clam**.



[two horse clam species: “Horseneck” (*Tresus nuttallii*) or “Fat Gaper” (*Tresus capax*). They are often *misnamed* “geoduck” when large, but these are *not* geoducks!]

2. Shells are not mirror images, one shell overlaps onto the other at the top; no flaps are present on the tips of siphons. The shell has elliptical shape. It is an **Eastern Softshell Clam**.



Both Eastern softshell and horse clams often have a brown-black papery skin (periostracum), on outer (newer) edge of shell, wearing off over time. When small, the shells may seem thin and fragile, when large (as large as an adult’s hand!) the shells can get thick and robust.

**B. Yes, leathery hinge visible** on outside of shell (**next page**)

(clam key continued, page 2)

**B. Yes, leathery hinge visible** on outside of shell



1. Shell is half circular, half like triangle, pointed on one end. Often has brown or black skin-like periostracum, which may flake off older parts of shell.

a. Has a more blunt point. Reddish-brown periostracum may cover whole shell or where flaking off, shell may look purplish-white. It is a **varnish clam** (or “purple varnish clam”, “savory clam”)

b. Triangular edge often more pointed, sometimes tip is curved up. Grayish Periostracum may be worn off or with just a little around edge... It is a **Macoma** (includes many species: “bent-nose”, “pointed”/”polluted”, sand, and Baltic macomas)



2. Shell is **mostly circular or oval, rather thick and strong**. Rings or ribs are easily seen on the shells. No periostracum

a. Shell has **heavy ribs**, shell is heart-shaped when viewed from on end. It is a **Cockle**. (aka. “heart-cockle”)

b. **Rings and ribs** are equally visible. Shells may have patterns of color



(1) Shell is elongated, oddly oval. there is a smooth, flattish groove where shells meet near the umbo (non-hinged side of umbo). It is a **Manila clam**. (also called “Japanese littleneck”)

(2) Shell is rounded, there is no pit near the umbo – more of a ridge that continues all the way to umbo. It is a **native littleneck clam**



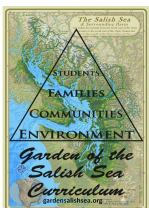
3. thick oval shell, rounded on both ends, has faint rings. Plain chalky white or stained gray from mud. Live clams have a noticeably strong leathery hinge. It is a **butter clam**.



## Classroom Clam Shell Sort

Sort out the shells given to your group. Divide them up by common characteristics. In the space below, for each clam, record the attributes, and write a brief description with a diagram of the clam. Be sure to label any identifying features.

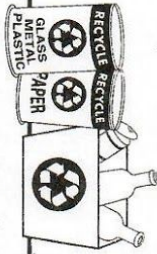
Description:	Drawing of Shell
Color: _____ Shape: _____ Markings: _____ Bigger than 1.5 inches? Yes      No Type of Clam: _____ _____	
Color: _____ Shape: _____ Markings: _____ Bigger than 1.5 inches? Yes      No Type of Clam: _____ _____	



Name: \_\_\_\_\_

# Be an Earth Day Helper Every Day

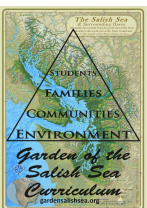
Keep track of all of the ways you can help the Earth this week. Draw a ✓ next to each way you helped. Then, write anything else you can do to help the Earth.



MY LEARN-ALONG PAGE  
SCHOLASTIC NEWS  
Reading a Chart

	Monday	Tuesday	Wednesday	Thursday	Friday
I helped recycle cans and paper.					
I turned off the water while I brushed my teeth.					
I put litter in the trash.					
I took care of a plant or a tree.					

One other way I can help the Earth:



# Salish Sea Watersheds Challenge

## ***Be a Salish Sea Steward!***

### ***RECORD YOUR ACTIONS & YOUR FAMILY'S ACTIONS AT HOME***

***Discuss actions you AND your family will DO to keep our waters clean?***

***Use the table on the back of this sheet to tally each time you DO your action.***

***Are you meeting the Challenge?***

### **Scoop the Poop! Pet and livestock waste pollutes water if allowed to RUN OFF, spreading disease and causes algal blooms.**

- o Scoop it! Bag it! Trash it! I WILL carry a bag and clean up after my dog on the street and in the yard.
- o I WILL encourage my cat to use a litter box, scoop the poop, bag it, and empty into the trash (not the compost bin).
- o I WILL keep livestock away from creeks and ditches and scoop the poop.
- o I WILL discourage wildlife by securing garbage cans, keeping pet food inside and not feeding ducks and geese

### **Septic Sense! WE WILL maintain our septic system. Failing systems can cause, property damage and water contamination.**

- o Keep septic system in top working order. Have it inspected regularly and get my tank pumped when needed.
- o Spread out laundry and dishwasher loads to prevent overloading my septic system.

### **On the Water!**

- o WE WILL make sure the valve on the boat's holding tank is kept in the closed position.
- o WE WILL never dump the holding tank into the water. WE WILL always use the pumpouts provided at the marina.

### **Pounding the Pavement!**

- o I WILL NOT dump toxic materials down storm drains or on the ground.
- o WE WILL leave buffers of native vegetation at the base of hills and along the water's edge.
- o WE WILL position gutters so that they drain rainwater onto grass or garden beds, away from impervious surfaces.
- o WE WILL use pervious spaced paving stones, bricks, sand or gravel in our driveway and walkways.
- o WE WILL minimize impervious surfaces when remodeling or building.

### **I WILL Conserve Energy & Reduce my Carbon Footprint!**

- o I WILL ride a bike or walk instead of driving.
- o I WILL turn off lights, appliances, and computers.
- o WE WILL put high energy-using items like water heaters on timers.
- o WE WILL buy local products and foods, **support our local farmers.**
- o WE WILL plant trees, vegetation, and cover crops.

### **WE WILL Reduce, Reuse, and Recycle!**

- o WE WILL minimize the use and purchase of plastics.

**In the city or on the farm - Let's do this together!**



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# **Lesson 2: Oyster Anatomy**

## **Subject**

Form and Function

## **Objectives**

The students will:

- Learn the function of different shellfish body parts.

## **Materials**

- Live tank
- Dissected clam
- Dissected oyster
- Dissection kit
  - Atlas gloves (2 pr)
  - Shucking knives
  - Scalpel
  - Hammer
  - Labels
  - Paper plates
  - Hand sanitizer
- Hand lenses (3)
- Giant magnifiers (2)
- Dissection flip cards

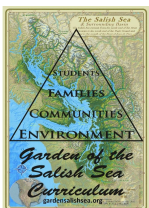
## **Size/setting/duration**

One third of class/Birch Bay State Park BP Heron Center/15 minutes

## **Background**

Students have already compared and contrasted shells of different clam species. This lesson takes a look at the internal anatomy of live shellfish.

## **Procedure**



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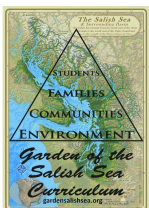


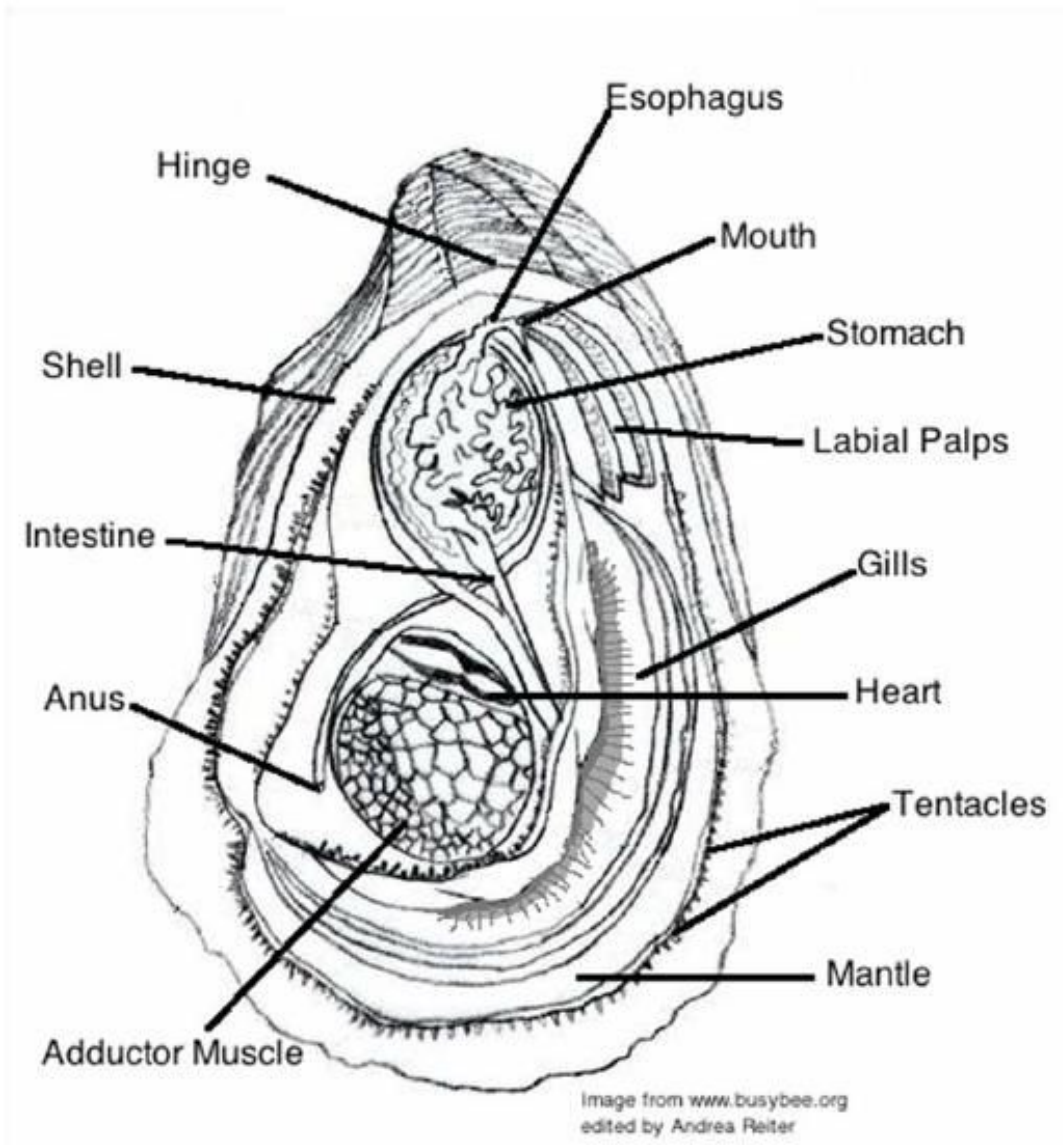
- Have students observe the live tank which has both clams and oysters. Unlike the shells that they have seen previously, students can observe the gills of the oysters and siphon of the clams.
- Show students dissected clams and oysters that are labelled. Using the graphic of the labelled oyster students can read the functions of the different body parts. Shellfish are filter-feeders. Show students the gills which enable shellfish to filter the water to eat.
- Ask students to compare the anatomy of the clams and oysters and make observations as they fill in their worksheets.

### Next Generation Science Standards

Performance Expectations		
K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
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### Graphics & Worksheet





Gills – breathing and filtering. Beating cilia move water across the gills

Mantle – membrane that secretes calcium carbonate, which forms the shell

Tentacles – sensory organ, feels things

Hinge – part of the oyster that allows it to open and close

Adductor Muscle – closes shell

Heart – pumps oxygen and nutrients to other parts of the body

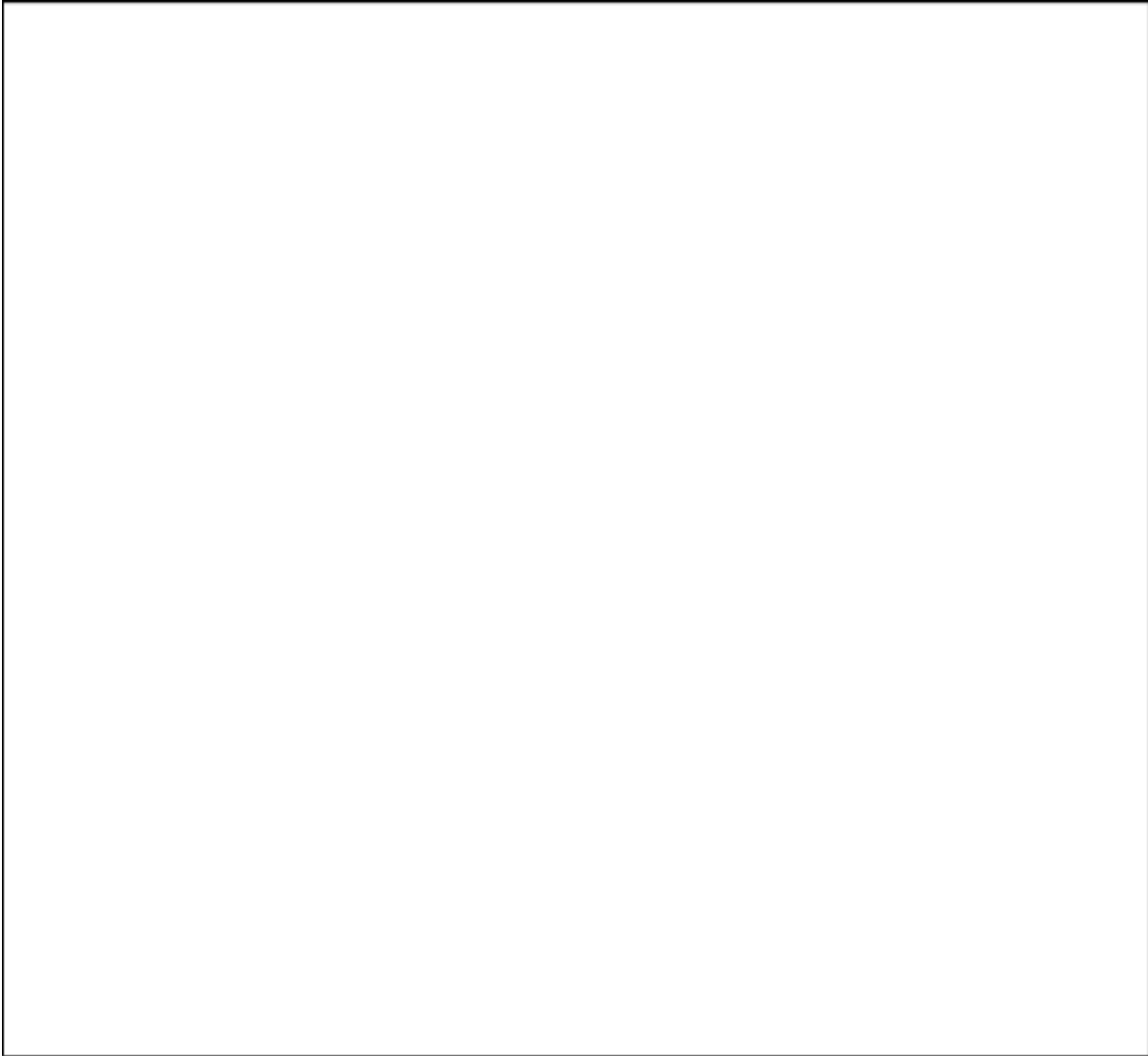
Labial Palps – sorts food (like fingers)



# Oyster Exploration

## Live Tank

Draw a picture of at least one organism in the live tank.



How do clams and oysters eat? \_\_\_\_\_

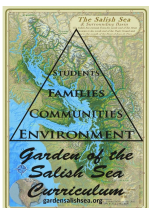


# Oyster Dissection



In the box, make a scientific drawing of the oyster.  
Find and label at least 3 body parts.

\_\_\_\_\_



# **Lesson 3: Food Web Foundations**

## **Subject**

Phytoplankton

## **Objectives**

The students will:

- Observe phytoplankton under a microscope
- Learn about the role of phytoplankton in the food chain.

## **Materials**

- Microscope with computer
- Phytoplankton sample

## **Size/setting/duration**

One third of class/Birch Bay State Park BP Heron Center/15 minutes

## **Background**

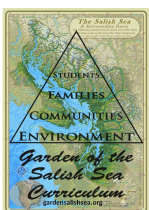
Phytoplankton are essential to life in the ocean since they act as the base of the food chain. Students get an introduction to these microscopic organisms which are food the shellfish they have learned about.

## **Procedure**

- Show students plankton under the microscope. Plankton are small organisms that drift with the ocean current. Phytoplankton are the base of the food chain. Just like plants on land, phytoplankton are green because they make their own energy from the sun.
- Students will draw the phytoplankton that are under the microscope.

## **Next Generation Science Standards**

Performance Expectations





Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts

**Graphics  
Worksheet**



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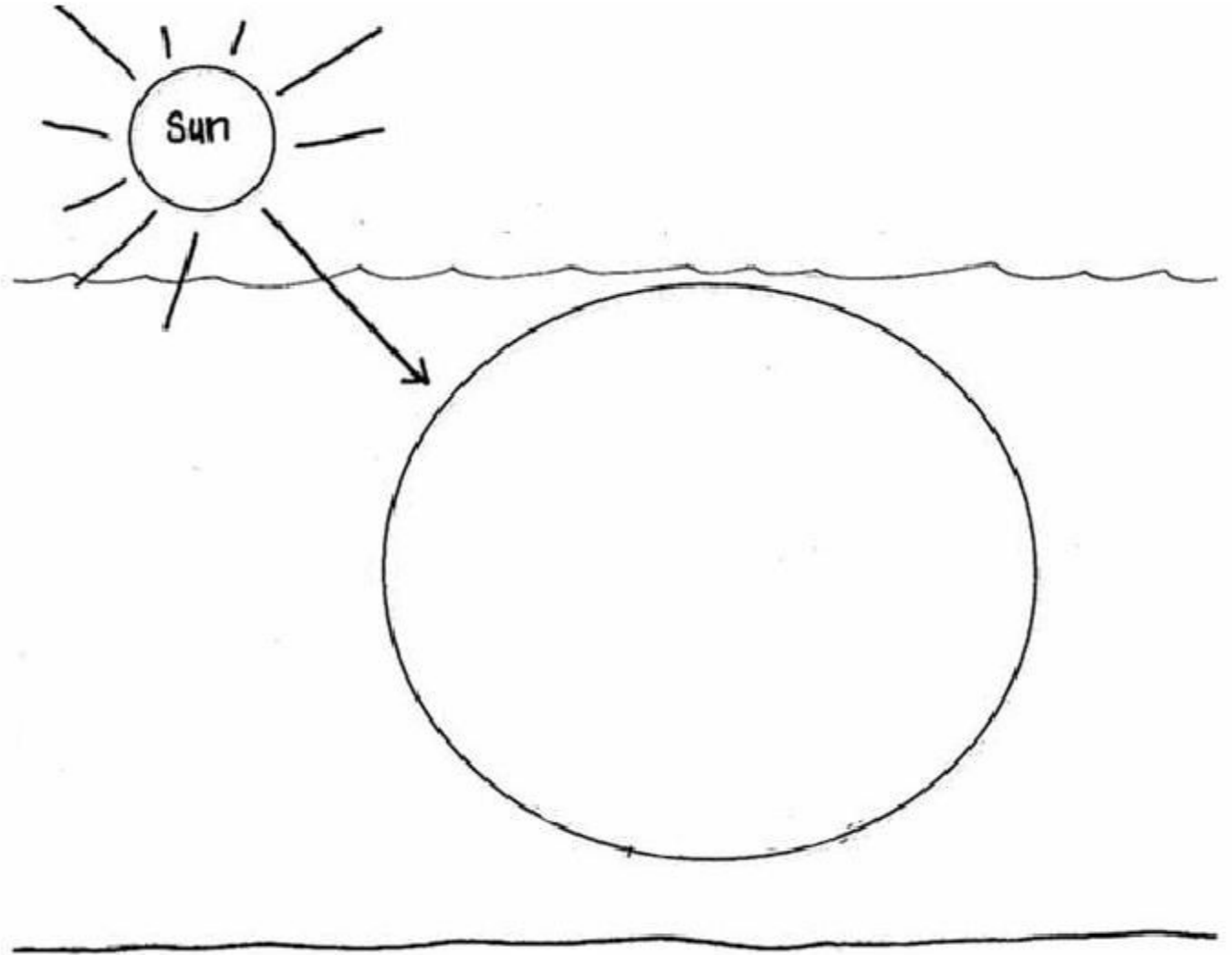


# Food Web Foundations

Look through the microscope and at the pictures of microscopic organisms at your station.

What do you see? \_\_\_\_\_

Make a scientific drawing of your microscopic plankton below.



## Microscopic Plankton Enlarged

Connection: What microscopic organisms might an oyster eat? \_\_\_\_\_



# **Lesson 4: Marine Foods and Resources**

## **Subject**

Marine Foods

## **Objectives**

The students will:

- Learn about the variety of foods that the Salish Sea provides.
- Taste dried seaweed.

## **Materials**

- Marine food packaging
- seaweed samples

## **Size/setting/duration**

One third of class/Birch Bay State Park BP Heron Center/15 minutes

## **Background**

Connecting students to the resources that the Salish Sea provides helps give more context to why this ecosystem is so important. A variety of nutritious foods are grown in the intertidal zone and eaten by people around the world. Thus, foods found in the intertidal zone are important for our economy. In this activity, students will have opportunities to sample dried seaweed, observe a variety of products from the intertidal zone, and build (draw) a meal with food including ingredients from the intertidal zone/ Salish Sea.

## **Procedure**

- The oceans are filled with many different delicious foods! Show students examples of foods and ask students if they like them. Ask students if they like ice cream. Ice cream has carrageenan which is derived from red algae to make it thicker. Give students the option to taste dried seaweed.
- The Salish Sea is also very important to our economy. Shellfish aquaculture contributed [\\$184 million](#) to Washington's economy and 2,710 jobs in 2010.
- There are many other uses for shellfish. Shells can be used in paving, jewelry and decoration, as a soil amendment, and as a supplement for chickens.

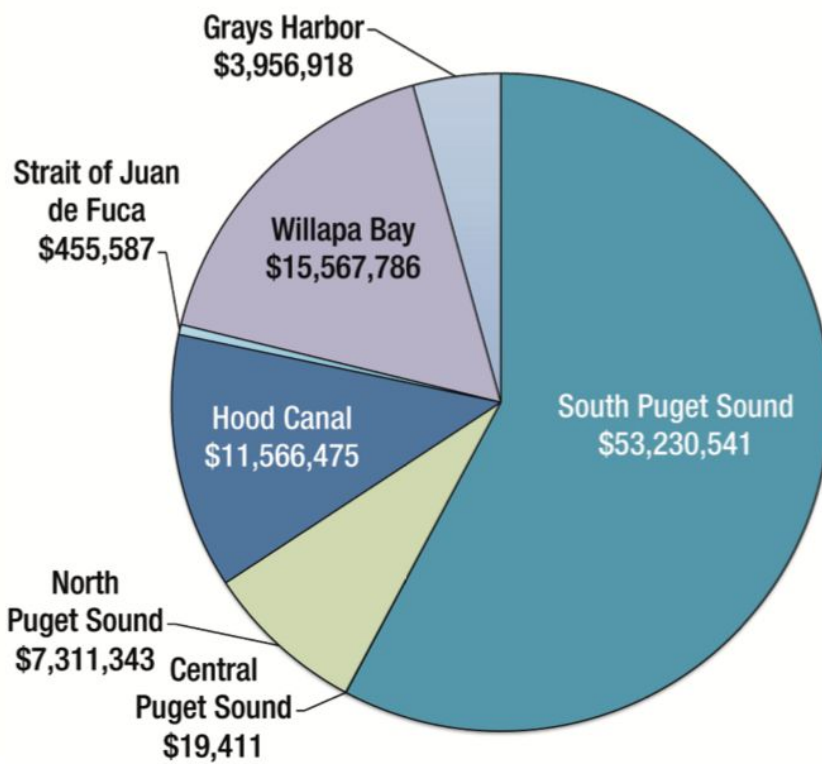


## Next Generation Science Standards

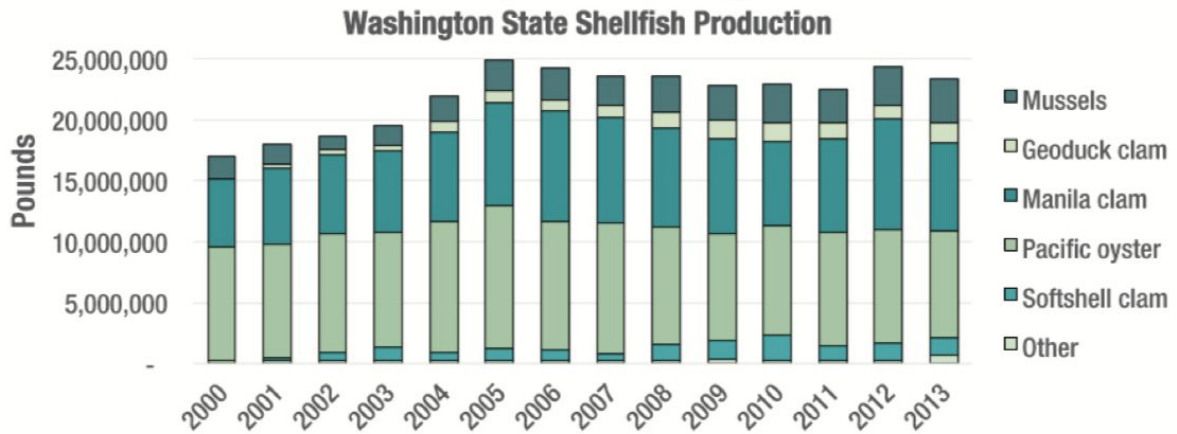
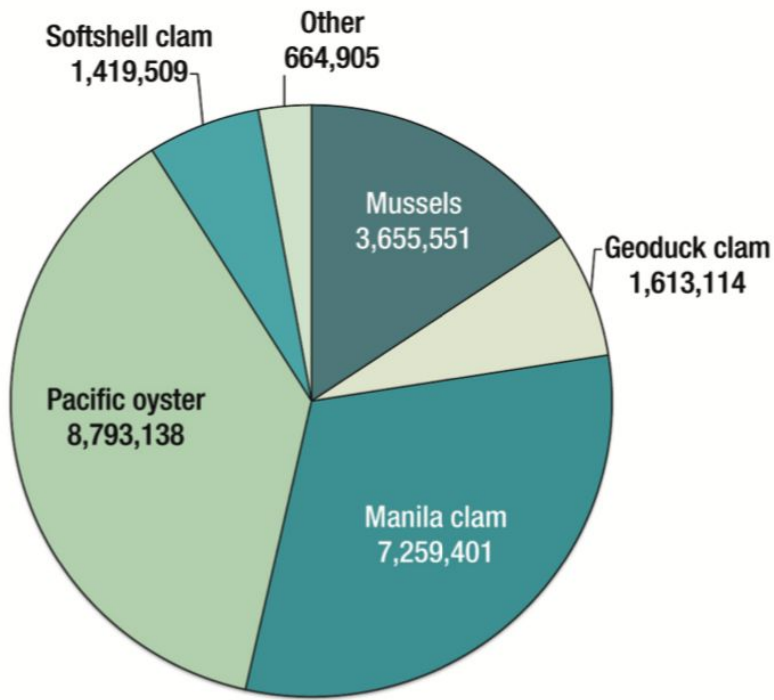
Performance Expectations		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts

## Graphics

**Value of Washington State Shellfish Aquaculture by Region, 2013**



## Washington State Shellfish Aquaculture Production by Species and Weight (lbs), 2013



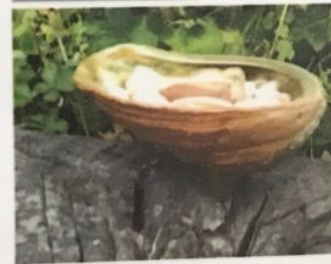
# Shellfish Utility



Oyster Shell paving



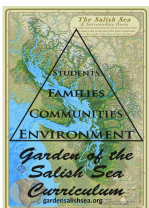
Jewelry,  
bowls,  
wind chimes,  
chandeliers,  
Other  
accessories



Soil  
Amendments,  
Chicken  
supplements



## Worksheet



# Marine Food and Resources

## Your Ocean Menu:



Oysters



Fish



Crab



Ice Cream



Sushi

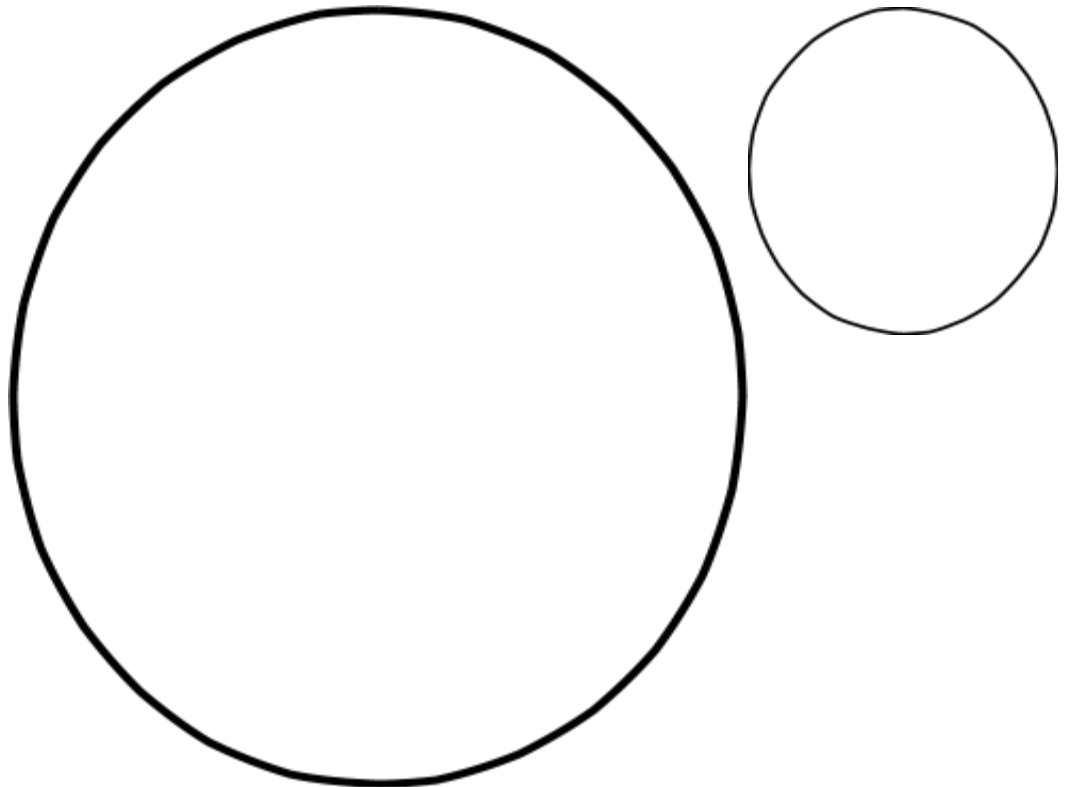


Sea Vegetables



Caviar

Can you draw and label a meal with at least three shellfish or sea vegetable foods chosen from the menu above?



# **Lesson 5: Beach Exploration**

## **Subject**

Intertidal Zone Field Studies

## **Objectives**

The students will:

- Identify clam species and record population data in a clam survey
- Explore local intertidal zone

## **Materials**

- Clam Survey
  - Shovels
  - Gloves
  - Clam ID cards
  - Clipboards
- Beach Exploration
  - Marine ID Guides

## **Size/setting/duration**

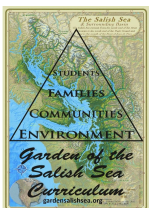
Full Class/Birch Bay State Park Beach/45 minutes

## **Background**

In this activity, students will be conducting a local clam survey. The clam surveys will help determine the health of clam populations. Students will learn how the surveys can also help estimate the health of clam populations over time.

## **Procedure**

- Clam survey (20 minutes)
  - Have holes pre-dug so that students are able to pull out the clams, identify them, and count how many of each species are in each hole.



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- These surveys are used to determine the health of clam populations over time by comparing the amount and variety of clams found in the clam surveys.
- Beach exploration (25 minutes)
  - Give students an opportunity for free exploration of their intertidal zone. Each chaperone should have a marine ID guide and the instructor can rove between groups answering questions and helping students identify the organisms they find.

**Next Generation Science Standards**

Performance Expectations		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts

**Graphics**

To download free field guides visit:

[NOAA Intertidal Zones Animals Field Guide](#)

[LiMPETS Field Guide](#)

**Worksheet**



# Beachfront Scavenger Hunt

Try to find these five different kinds of clam shells and check them as you find them

- o Native Little Neck Clam
- o Manilla Clam
- o Varnish Clam
- o Butter Clam
- o Cockle Clam



**Varnish clam**  
*Nuttallia obscurate*

Up to 3", with shiny brown coating on the outside, purple on the inside of shell.



**Manila littleneck clam**  
*Venerupis philippinarum*

Average size is 1-2", up to 2 1/4". Oblong shell has concentric and radiating lines. May have colored, patterned shells. Siphon tips are split. Found to 4" below surface.



**Native littleneck clam**  
*Leukoma staminea*

Average size is 1-2", up to 2 1/4". Rounded shell has concentric and radiating lines. Siphon tips are fused. Found 6-10" below surface.



**Cockle clam**  
*Clinocardium nuttallii*

Prominent, evenly-spaced ridges which fan out from the hinge. Mottled, light brown. Can grow to 5". Found just below surface.



**Butter clam**  
*Saxidomus giganteus*

Average size is 3-4", up to 6". Shells have no radiating ridges and are usually chalky-white. The siphon can be pulled into its shell. Usually found 12-18" below surface.

Did you find any other animals? If so, list them below.

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