Oyster Reef in the Classroom –
A Hands-On Laboratory Approach

Grade Level: 7

Subject Area: Life Science

Virginia Standards of Learning: LS.4, LS.7, LS.8, LS. 11

Objectives:
Students will:

- Understand the importance of oysters and oyster reef habitats to the Chesapeake Bay
- Examine and identify organisms living in the oyster reef community
- Understand how organisms utilize the oyster reef

Summary:
Students will examine different species found on an oyster reef in the Chesapeake Bay. Students will use a microscope and a dichotomous key to help them determine the different organisms being viewed. Students will draw conclusions based on the observed adaptations of the organisms about how the organism utilizes the oyster reef. Students will practice scientific sketching and become familiar with how to use a field guide and dichotomous key.

Vocabulary: adaptation, habitat, community, dichotomous key

Materials:

- 1 habitat cage, contents to be divided amongst students (see attached building instructions)
- 1 small tub per table/group

<u>For each pair of students you will need:</u>

1 compound microscope
1 glass culture dish
1 dichotomous key (included)
1 <u>Life in the Chesapeake Bay 3rd edition</u>, Alice Jane Lippson and Robert L. Lippson
or 1 field guide (included)
1 notebook to write and sketch findings
cable ties

Compiled in 2012 by education staff at the Chesapeake Bay National Estuarine Research Reserve in Virginia for use in the B-WET *Chesapeake Studies in the Classroom* program

Background Information:
Oysters are an important part of an estuary ecosystem. Not only do oysters help the Chesapeake Bay by filtering the water, they also provide a habitat for many other species by forming oyster reefs. Oyster reefs are formed in the intertidal zone when oysters grow on a hard foundation or substrate, such as dead shells. This process forms

clusters of oysters which join together creating an elaborate three-dimensional group. The structure of an oyster reef provides a place for many estuarine species to seek refuge from predators and provides a habitat for organisms that thrive in brackish water. An oyster habitat cage seeks to replicate the habitat of an oyster reef. Shells are added into a wire mesh cube, which is then placed on the bottom of a shallow estuary. Overtime, organisms begin to attach to the oyster shells and grow, which results in attracting other organisms to the habitat cage. The habitat cage can easily be removed from the estuary during a low tide cycle, and taken into the classroom for a period of time while the students closely examine the species found within the "oyster reef."

Procedure: (60 minutes)
Preparation:

1. To open the habitat cage, cut the cable ties off from one side of the cage.

2. Place a tub with shells taken from the habitat cage on each lab table.

3. At each work station have a microscope, culture dish, dichotomous key, Life in the Chesapeake Bay, and a notebook placed so that the pair of students may use the materials for the activity.

4. If available, hang posters of the Chesapeake Bay or oysters around the room.

Introduction (5-10 minutes)

1. Discuss general characteristics of the Chesapeake Bay. Have the students share what information they already know about the bay. Be sure to explain that the Chesapeake Bay is an estuary, a semi-enclosed body of water where the rivers meet the sea. Because the Chesapeake Bay is an estuary, it has brackish water, a mixture of salt and fresh water. Animals that live in the Chesapeake Bay must be able to thrive in brackish water.

2. There are many unique habitats found along the Chesapeake Bay. Have the students list a few (oyster reef, salt marsh, mud flat, sea grass bed, etc.). Explain that they will be closely examining an oyster reef community by using microscopes, a dichotomous key, and a field guide. Have students define community. Be sure students understand that community is a group of organisms living and interacting with one another in a particular environment. By the end of the lab, students should be able to describe how the

organisms living in the oyster reef function as a community, and why oysters and oyster reefs are important to the Chesapeake Bay.

3. Explain how to use a dichotomous key. Choose an organism that most students are familiar with, for example an oyster, and work through the dichotomous key step by step as a class. Be sure everyone practices how to use the key. Review microscope and lab safety. Remind students that they are handling glass, shells, and live animals which could be sharp, and need to be handled with care.

Activity (40 minutes)

1. Students will place a shell from their tub onto their glass dish at their work station. Students will then place the dish on the stage of the microscope, and turn on the light of the microscope. Students will focus their microscope onto an organism found on the oyster shell. Students may want to add water onto their dish to view animals such as anemones or fish. While animals can be under the microscope for short periods of time, students should not leave the animals under the light of the microscope for a long period of time as it can get very hot.

2. Students will use their dichotomous key to identify what organism they are looking at through the microscope. Once students have determined the identity of the organism, they should turn to the appropriate page in the field guide to verify that they are correct.

3. Students will write the name and sketch a picture of the organism in their notebook. Students will research their organism in the field guide and write down several adaptations or characteristics it has to share with the class.

4. Students will identify and repeat the above steps for at least three organisms living in the oyster reef (or as time permits).

5. As students identify an organism, have them write the name of the organism on the chalk board. Additional students should add to the list, but only with organisms not already listed on the board. This will create a comprehensive list of what the entire class was able to identify.

Wrap Up (5-10 minutes)

1. Have students volunteer to share what organisms they identified under the microscope. As students are sharing what they saw, ask them to describe what adaptations that organism may have that could help it survive in the oyster reef habitat.

2. Ask students the following questions:

a. Did you see more organisms then you thought you would? (*Hopefully the response is yes!*)
b. Was it easy or hard to find the organisms living on the oyster shell? (*Students should be able to explain that some organisms were easier to see then others, but by using a microscope they could see the organisms more clearly*.)
c. What external characteristics did a lot of the organisms share? (*Same color, relatively small, blend in with the oyster shell, etc.*)
d. What is the difference between sessile and motile organisms? Name an example of each. How does this affect their survival in an estuary? (*A sessile organism is one which is not free to move about; it is attached to the substrate, for example a barnacle or an anemone. A motile organism is able to freely move above, for example a polychaete worm or mud crab. Because sessile organisms cannot freely move about, they must have the ability to find food another way. Sessile organisms have adapted to this obstacle by finding food through processes such as suspension feeding or filter feeding. While motile organisms are able to freely move about the oyster reef, at times they may appear to be more exposed to predators than sessile organisms. Successful motile organisms in an oyster reef typically have excellent camouflage with the habitat*.)
e. What does the oyster reef provide for these organisms? (*Habitat, protection, food, place to reproduce, etc.*)
f. Why are oysters important to the Chesapeake Bay? (*Help to filter water, provide food for humans and other organism, provide a habitat for many organisms, help the economy, etc.)*

3. Leave time for any last minute questions.

4. Clean up!
    a. Have students put the shells and organisms back in the tub on their tables. Students will then dump their tubs back into the habitat cage located in a bucket in the classroom. Students will also rinse all glassware used and leave it to dry.
    b. Use cable ties to close the open side of the habitat cage. Place a bubbler in the bucket with the habitat cage until time allows for the habitat cage to be released back into the river. The habitat cage should be returned to the river as soon as possible.

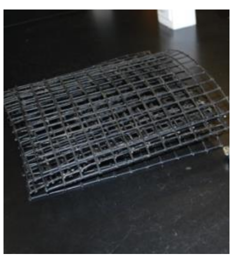
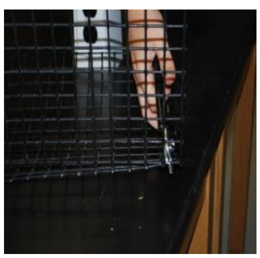
How to Build an Oyster Habitat Cage

Materials Needed:

- Plastic coated wire mesh
- Wire cutter or Electric Hacksaw
- Hog Rings (crimp fasteners)
- Hog Ring Crimpers
- Cable Ties

Procedure:

1. Cut the wire mesh into six, 12 inch by 12 inch, square sections. All sides of the square need to have a flat edge; cut off any extra material.
2. Use the hog rings and crimper to connect the squares together to form a cube. Leave one side of the cube open.
3. Place dead shell material into the habitat cage, ¾ of the way full.
4. Attach one edge of the remaining square to the cube using hog ties. Attach the remaining three edges of the square to the cube with cable ties. (This is the piece that will be removed when opening the habitat cage.)
5. Place the habitat cage on the bottom of a nearby shallow estuary (get permission). If desired, attach a rope and a buoy to the cage, so that it can be easily found. After a few weeks have past, organisms will start inhabiting the cage.


Removing the habitat cage:

1. Wade into the water and pull the cage up from the bottom of the estuary.
2. Immediately place the cage into a bucket containing some water from the estuary.
3. Take the bucket with the cage back to the classroom, and add a bubbler to the bucket until you are ready to use the cage with your class (The cage should not sit for longer than a few days in the classroom

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Oyster Reef Lab
Dichotomous Key

1.	a. Plant	Go to Step 2
	b. Animal	Go to Step 3
2.	a. Green, flat seaweed-looking plant	***Sea lettuce (p. 57)***
	b. Dark red plant with rounded branches	***Tapered Red Weed (p. 58)***
	c. Long blades of green grass	***Eelgrass (p. 175)***
3.	a. Vertebrate (Backbone)	Go to Step 4
	b. Invertebrate (No backbone)	Go to Step 7
4.	a. Has large suction cup on underside of body	***Skilletfish (p. 253)***
	b. Does not have suction cup	Go to Step 5
5.	a. Fish with eyes close together, two dorsal fins	***Naked Goby (p. 253)***
	b. Slimy, striped body with big mouth pointed up	***Oyster Toadfish (p. 251)***
	c. Fish with deep, broad head, single dorsal fin	Go to Step 6
6.	a. Two branching tentacles over eyes	***Feather Blenny (p.253)***
	b. No tentacles, but stripes down body	***Striped Blenny (p. 253)***
7.	a. Has a shell (crab's exoskeleton doesn't count)	Go to Step 8
	b. Has no shell, or has an exoskeleton	Go to Step 12
8.	a. Univalve (one shell)	Go to Step 9
	b. Bivalve (two shells on a hinge)	Go to step 10
9.	a. Sessile, attached to another organism	***Slipper Shell (p. 52)***
	b. Motile, large dark-colored spiraled shell	***Mud Snail (p. 64)***
	c. Small (~¼ inch), light-colored spiraled shell	***Two-sutured Odostome (p. 50)***
10.	a. Sessile shells (attached and stationary)	Go to Step 11
	b. Can burrow in the sand (not sessile)	***Hard clam (p. 46)***

Created by: Sarah McGuire, Education Coordinator, Chesapeake Bay National Estuarine Research Reserve in Virginia

11.	a. Shells are rough and not symmetrical	***Oyster (p.47)***
	b. Shells are symmetrical and ribbed	***Hooked mussel (p. 47)***
12.	a. Sessile organisms (attached to shell; may move)	Go to Step 13
	b. Motile organisms (free-moving)	Go to Step 17
13.	a. Has a hard outer covering with hole at top	***Barnacle (p. 98)***
	b. Has no hard outer covering	Go to Step 14
14.	a. Lacy, chain-like pattern encrusted on shell	***Lacy Crust Bryozoan (p. 112)***
	b. No lacy pattern	Go to Step 15
15.	a. Red spongy material	***Red Beard Sponge (p. 103)***
	b. Not spongy material	Go to Step 16
16.	a. Multiple tentacles (dark green striped blob)	***Green-Striped Anemone (p. 105)***
	b. Multiple tentacles (white or pinkish blob)	***White Anemone (p. 105)***
	c. Grape/eyeball structure with two siphons	***Sea Squirt (p. 101)***
17.	a. Type of crab	Go to Step 18
	b. Not a crab	Go to Step 19
18.	a. Small brown crab living in crevices of shells	***Mud Crab (p. 249)***
	b. Has spines, swimming paddles, and blue claws	***Blue Crab (p. 156)***
	c. Triangle-shaped, slow-moving with long legs	***Spider Crab (p. 158)***
19.	a. Type of worm	Go to Step 20
	b. Not a worm	Go to Step 21
20.	a. Pink/Red worm with many appendages	***Polychaete Worm (p. 75)***
	b. Whitish, round, flat worm	***Oyster Flat Worm (p. 97)***
	c. Striped worm living inside white tube on shells	***Limy Tube Worm (p. 248)***
21.	a. Small, shrimp-like organism swimming on side	***Amphipod (p. 68)***
	b. Delicate, almost transparent shrimp	***Grass Shrimp (p. 154)***
	c. Thin, skeleton-like, swaying like an inchworm	***Skeleton Shrimp (p. 110)***

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