
OYSTER BEDS

FOR THE TEACHER

Discipline

Biological Science

Themes

Patterns of Change

Key Concept

All scientists, including student scientists, need to make careful observations and communicate them clearly in order to learn about the natural world.

Synopsis

Students will make observations about oyster shells and communicate their observations to other students with words or drawings.

Science Process Skills

observing, communicating, comparing, organizing, relating, inferring

Vocabulary

naturalist
invertebrate
mollusk
bivalve
valve
hinge

plankton
crystalline style
larvae
spat
filter feeder
gills

mantle
shell midden
native species
wetlands
habitat
pollution

MATERIALS

For INTO the Activities:

pictures of people using their five senses
pencils
writing surfaces (cardboard or book)
paper
optional shell collection
shell pictures and books
brainstorming poster for class cluster diagram

For THROUGH the Activities:

For each student:

one oyster valve (half a shell) of a matching set**

pencil

3x5 index card

**Since matching pairs are critical to the success of the activity, be sure to buy them live yourself and shell them without breaking either valve.

For BEYOND the Activities:

folk tales or myths about the sea

Lewis Carroll poem “Walrus and the Carpenter”

INTRODUCTION

Naturalists and scientists use many skills when trying to understand how animals live and why they behave the way they do. The depth of their understanding is only as keen as the questions they ask and the accuracy of their observation skills. A good naturalist has to have very perceptive senses and a great deal of patience in order to understand the natural world and the creatures that live in it.

Sharing observations with others is very important in the field of science. Adding new information to what we already know about our planet is important for its long-term health. Clear ways to communicate observations are almost as important as the observations themselves. Scientists need to be skilled in writing, drawing, and giving oral presentations, in order to communicate their discoveries. For centuries the languages of science have been Latin and Greek. Whenever a new plant or animal is discovered it is given a Latin or Greek name as well as a common name. This has been a way to make sure that everyone, no matter where they are, is speaking about the same organisms.

One of the organisms that scientists, food-lovers, writers, poets, and a vast number of other individuals have been sharing information about for several thousand years is the oyster. Oysters belong to the group of invertebrates (animals without backbones) called mollusks (from the Latin word Mollusca meaning soft-bodied). Oysters are one of the bivalved (animal with two shells and a hinge) mollusks along with clams, mussels, and scallops. The shells or valves of the oyster serve to protect its soft body within.

**INTO
THE ACTIVITIES**

Classroom Observations

Using magazine clippings, chalkboard sketches or overhead projector drawings of each of the five senses (seeing, hearing, touching, smelling and tasting),

discuss with students what an observation is and how they use their powers of observation all of the time.

Have students in pairs find ways to use each of their senses e.g., look at how the desks are arranged or how the books are organized, touch the textures of the walls or other surfaces, smell the chalk dust or a classroom plant, taste the water in the drinking fountain or some other classroom item, listen to the noises coming from the playground or the next classroom. Have them join another pair and share at least two examples of each kind of observation.

Communicating Observations

Discuss the various forms of human communication, giving examples of each; e.g., talking, writing, drawing, composition of poetry or songs, pantomime, etc. Have students in pairs use at least 3 different forms of communication to tell each other what they had for lunch that day. Have students talk about whether or not they were able to clearly understand what their partner was trying to communicate.

Take students outside, preferably to a grassy area with trees and plants. Give each pair of students a pencil, a writing surface, and a piece of paper. Ask them to choose their own spot from which to make observations and use their paper and pencil to communicate as many of them as they can in the allotted time. Have them exchange papers with another pair and see if they can understand what the other pair was trying to communicate. This could also be done in class with students making observations of marine science posters, magazines, photos, videos and audiocassettes.

Back in the classroom talk about whether or not everyone's observations were something that they perceived with their senses, or if some of them were thoughts they had at the moment or value judgments they had made. Talk about the difference between expressing our feelings about something and actually observing something through our senses. If someone wrote about how they thought a tree was pretty or that they liked how the sky looked, those were thoughts or feelings. If they wrote that the tree was dark green with small pink flowers on it and that the sky had large puffy white clouds in it, those were observations.

Shell Setting

Create a classroom display of different kinds of shells. Have books and pictures of shells available for student use. Encourage students to bring in shell collections they might have at home.

Silent Mingle

- Where have you seen shells before?
- Describe the prettiest shell you've ever seen.
- What types of animals have shells?
- What do you think animals use

shells for? • Have you ever eaten an animal with a shell? • What would you like to know about shells and the animals that make them?

Have students sit down with their last partner and make notes about what was discussed in the Silent Mingle.

Brainstorming and Cluster Diagram

The class brainstorms the results of their Silent Mingle notes into a cluster diagram.

THROUGH THE ACTIVITIES

Preparation

Set up plastic bags of oyster shells for your class ahead of time. Assemble one bag of shells for each group of 5-6 students. The bag should contain 1/2 of an oyster shell (one valve) for each student in the group. Place the other matching halves of the oyster shells in another bag which will be given to a nearby group. Mark each pair of bags with colored stickers or tie them together so that you remember which bags have matching shells.

Remind students that they will be using some of their observation skills that they used in the Into activities; e.g. seeing, hearing, tasting, smelling, touching. Review the methods for communicating these observations; e.g. telling about it, writing about it, drawing a picture, tracing an item, composing a song or a poem, etc.

Observing Your Shell

Have students work in groups of 5-6 with all the groups about the same size. Give each group a bag that contains an oyster valve for each student. The matching shells should be in another groups bag close by.

Ask each student to take an oyster shell from the bag and examine it for 2 or 3 minutes. Have students return their shells to the bag. Have one student gently mix up the shells in the bag and then gently dump them back out on the table.

Ask students to pick out the shell they had previously examined.

Communicating about Your Shell

When students have relocated their shells, give them an index card. Ask them to examine their shells once again. This time ask them to communicate 4-5 observations on the index card, reminding them that their written or drawn communications need to be clear enough that someone else can understand them. They shouldn't write their names on the cards.

When students have finished their observations, have them place the shells back in the bag. Have one student in each group collect the cards when everyone is done (a time limit of 5 or 10 minutes should be sufficient). Cards and shells should be kept together, but don't put the cards in the bag.

Using Observations as Clues

Have each table switch cards and shells with their paired groups. Have a student randomly distribute the cards among the group. Ask students to first examine the card and then try to locate the shell it describes. Students can work together or as a group, but everyone has to agree that all the cards are correctly matched for a group to be finished.

Have students find the other half of their oyster shell. Direct them to look for it among their paired group. If they are having trouble, you may want to have those students who have found their matching shells sit together and observe their completed oyster shell while you help others find their matches.

Have all students sit with the person holding the other half of their shell. Give each pair of students a piece of paper and ask them to make some hypothesis about their oysters' life history by answering the following questions.

1. What sort of habitat did this animal live in?
2. Did it move? _____ If so, how?
If not, how do you know?
3. What did it eat?
4. What adaptations do oysters have for catching prey and avoiding predators?
5. What other animals do you think live with oysters?
6. What other animals might be related to oysters?
7. If they grow approximately one inch a year, how old was their oyster when it was harvested?

8. Make a list of other questions you still have about oysters.

Oyster Information

Read the background information in the following article "Oyster Talk" to your students. In small groups, have students discuss what they learned about oysters. Have each group brainstorm five things they learned about the adaptations of an oyster. Have the groups share their information with the class as you write them on a class poster.

Oyster Talk

An oyster belongs to the group of invertebrates (animals without backbones) called mollusks. Most mollusks have hard shells and a soft unsegmented body. They are members of one of the oldest and largest groups of animals. There are five major classes within the mollusk group. Oysters are one of the bivalve mollusks (animal with two shells and a hinge) along with clams, mussels, and scallops. The streamlined squid is the fastest member of the mollusk group.

Oysters begin their lives as part of the microscopic plankton world. As tiny larvae, they drift in the water for several weeks until they are ready to settle onto a mudflat or attach to rocks or other oyster shells. They are now called "spat". The spats are equipped with shells, called valves, which will serve to protect their soft oyster body within. On the inner surface of each valve is a soft layer called the mantle. The mantle surrounds the animal and actually takes calcium from the water to create the shell as well as coat any irritating sand grain that may form into a pearl. The hinge holds these shells together. Two muscles act as the oysters security system and controls the opening and closing of the shells. A cement-like substance, secreted from near the hinge, attaches the oyster for life to whatever substrate it is growing on. The shells themselves are not symmetrical like a clam or scallop shell . One half is flattened and acts as a lid for the bottom, cup-shaped shell. This cupped shell is well designed for the sedentary lifestyle of the oyster. When the tide is low, the oyster closes its shell to protect itself against predators and the drying affects of the sun.

Oysters have gills and a respiratory system for absorbing oxygen and releasing carbon dioxide. They have a three-chambered heart, a liver, and a kidney, as well as a digestive system complete with a stomach and intestines. These animals are filter feeders. Their gills, in addition to helping them breathe, help them to eat by straining tiny floating plants called phytoplankton out of the water. Oysters have a crystalline "style". Thought to be the only rotating organ in nature, it wraps strands of food around itself when the oyster is feeding.

We know from shell mounds left by many cultures in Europe, North America and Asia that oysters have been widely harvested by humans since prehistoric times. They have been cultivated or farmed for several thousand years, first by the Romans as early as 97 B.C. and continuously by many cultures since that time. Native American people of the Pacific Northwest used oysters and clams as a staple food.

The history of oysters and the San Francisco Bay is a rich one. From the early to the mid-1800's, hundreds of thousands of pounds of oysters were taken from the wetland waters of California. By the turn of the century the oyster stocks were nearly depleted, leading to the virtual disappearance of the little native species (*Ostrea lurida*). With the completion of the transcontinental railroad in 1869, the transportation of live East Coast or American oysters (*Crassostrea virginica*) was made possible. Unfortunately, along with the imported oyster stocks came a great number of other animals that did not belong in the San Francisco Bay. The Bay has never fully recovered from this introduction of non-native species of clams, worms and barnacles. By the early 1900's it was clear that the American oyster was not able to successfully reproduce in our West Coast bays and estuaries. The oyster industry was nearly dead until the early 20's when Japanese or Pacific oysters (*Crassostrea gigas*) were introduced to the Pacific Northwest. The Pacific oyster has been very successful and once again the oyster industry is a thriving business. Today, the health of our wetland habitats where these important animals make their homes is threatened by pollution, dredging and filling for our many uses. Only 5% of the historical wetland marshes of the San Francisco Bay remain today. We need to preserve and protect wetland habitats so that oysters and other animals have homes in the future.

BEYOND THE ACTIVITIES

Illustrated Poems

Read this poet's opinion on the subject of oysters. John Gay, the 18th-century British poet offered:

The man had sure a palate covered o'
With brass and steel, that on the rocky shore
First broke the oozy oyster's pearly coat,
And risked the living morsel down his throat.

Ask students to discuss what the author was trying to convey. Did he communicate well? Were these scientific observations or feelings? Have students each take a different line from this poem and try to illustrate. Put them together to form a book. Have students try to create a cinquain or poem about oysters. Have students orally share their poems to see if another student can tell how they feel about oysters.

Extended Activities

1. Read a few myths or folk tales about sea creatures from different cultures. Have students create fictional stories or myths or folk tales about how the oyster got its shell. Have students volunteer to read their stories out loud or to one other person.
2. Have students read the Lewis Carroll poem, "The Walrus and the Carpenter" and act it out for the class.
3. Have students use the shell collections to continue their oyster study. Have them group them according to those they think are most closely related. Using books about shells, have students identify the five main groups of mollusks and then re-group the shells accordingly. Have each student take one kind of mollusk and research its life history.

Field Activities

Arrange a field trip to a wetland area. Have each student create a field journal prior to the trip (plain paper stapled together and a small pencil is sufficient). Give students the opportunity to use their newly honed observation skills in a natural setting. As part of your day's activities, have students spend 5-10 minutes quietly observing their surroundings and making journal entries. Encourage students to use their journals to communicate their observations any way they choose. Back in the classroom, have students break into groups to discuss what they observed. They can then share their journal entries.

Mini-Book on Wetlands

1. Have individual students create a mini-book which includes words and pictures of what they learned about oysters and wetlands. First have students fold an 8 1/2" x 11" sheet of paper lengthwise and then into thirds. Cut along two of the folds so a book is formed with three pages that open vertically.
2. With the book folded shut and only the cover showing, have students write a name for their book on the cover. Open the cover and on the first page write the author's name. Turn the title page and label the first section "wetland", on the second section "oysters", and the third section the name of something new they saw on their fieldtrip (e.g., Great Egret, pickleweed, etc.) Now flip up each section and draw a picture in each subsection and write text in the other.