

Ocean Motion

Driftwood Education Center



Class Description:

Explore the world of marine vertebrates and invertebrates in our lab. Students will be able to handle such animals as crabs, sea anemones, and mollusks in our touch tank. An in depth study of these animals and their adaptations will be supplemented by a group fish dissection.

**Appropriate for all grade levels
Can tailor most classes to High School Students**

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Table of contents and outline:

I. Pre-class set-up

1. Defrost fish
2. Gather dissection materials together
3. Gather activity materials you need for OM room

II. Introduction, overview, and assessment

1. What are our objectives?
2. What is scientific classification?

Concepts 1 to 3 – Outcome 2

III. Main Objectives

1. Dissect and compare
2. Phylum discussion and activity
3. Explore the tank room

Concepts 1 to 3 – Outcome 1 to 3

IV. Conclusions and Wrap-up

1. Review classification and dissection

V. Clean Up

VI. Additional Information and help

1. Fish dissection anatomy

S. Carolina Performance Standards met

5th Grade: Inquiry IB1 Compare, sort, and group concrete objects according to two attributes.

6th Grade: Same as 5th Grade

7th Grade: Life Science 1C Living systems at all levels of organization demonstrate the complementary nature of structure and function.

8th Grade: Life Science IA1. Observe, describe, and examine the diversity of organisms over time including differences and similarities based on kingdoms, phyla, classes.

Florida

Florida Performance Standards met:

SC.5.L.14.2 Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.

SC.5.L.15.1 Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

SC.5.E.7.2 Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

SC.6.N.1.1 Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.6.L.15.1 Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

SC.7.N.1.1 Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.7.L.15.3 Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.

SC.8.N.1.1 Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.912.L.15.6 Discuss distinguishing characteristics of the domains and kingdoms of living organisms.

SC.912.L.15.7 Discuss distinguishing characteristics of vertebrate and representative invertebrate phyla, and chordate classes using typical examples.

SC.912.L.17.2 Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.

Concepts:

Focal points of this class are:

1. Classification and identification are the first step to understanding.
2. Animals have special adaptations that make them unique and help them survive in their environment.
3. There is usually one distinguishing characteristic that determines an animal's phylum.

Outcomes:

Upon completion of this class, students will be able to:

1. Understand why dissections are important, and develop a curiosity towards creatures of the sea.
2. Learn to identify animals based on multiple characteristics, adaptations, and information.
3. Learn how to handle, touch, and observe live vertebrates and invertebrates.

Georgia Performance Standards met

1. S5CS1. Students will be aware of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.

2. S5CS8. Students will understand important features of the process of scientific inquiry.

1. S6CS2: Students will use standard safety practices for all classroom laboratory and field investigations.

1. S7L1. Students will investigate the diversity of living organisms and how they can be compared scientifically.

2. S7L5. Students will examine the evolution of living organisms through inherited characteristics that promote survival of organisms and the survival of successive generations of their offspring.

National Standards met:

NS.K-4.1 SCIENCE AS INQUIRY

As a result of activities in grades K-4, all students should develop

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

NS.K-4.3 LIFE SCIENCE

As a result of activities in grades K-4, all students should develop understanding of

- The characteristics of organisms
- Life cycles of organisms

NS5-8.1 SCIENCE AS INQUIRY

As a result of activities in grades 5-8, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

NS.5-8.3 LIFE SCIENCE

As a result of their activities in grades 5-8, all students should develop understanding

- Structure and function in living systems
- Regulation and behavior
- Diversity and adaptations of organisms
- Earth's history

NS.9-12.1 SCIENCE AS INQUIRY

As a result of activities in grades 9-12, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

NS.9-12.3 LIFE SCIENCE

As a result of their activities in grades 9-12, all students should develop understanding of

- Biological evolution
- Interdependence of organisms
- Behavior of organisms

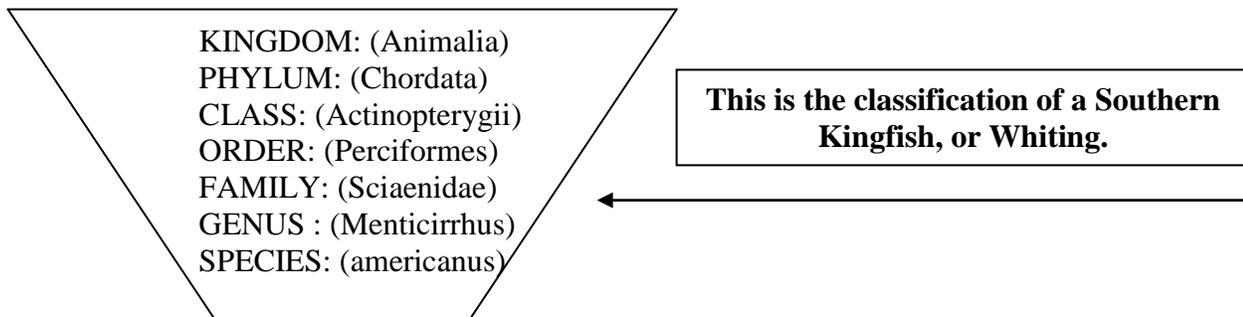
I. Class Set-up

1. Set-up classroom board and decorate. Have tank cards out ready for class.
2. Check the tanks to make sure there is no rotten food or small dead fish in the tanks. They need to be cleaned of any debris before each class.
3. Empty any trash that may be in the room before and after each class period.
4. If you are splitting this class make sure there are multiple rooms set up for dissection.

II. Introduction, Overview, and Assessment

1. What do your students know?
2. What is a Phylum? A Class? Why does it all matter? In this class we are going to explore the importance of this and what it means. Today we are going to explore the classification of sea creatures and the adaptations that help them survive.
3. You have a few different options when you teach this class. Depending on your student's grade level and your initial assessment, you could take this class in a number of directions. Ideally, you want them to come away with information on phyla, dissect a fish, and to see, touch, and compare as many organisms as possible.
4. Let's learn about the ways scientists classify animals.

All organisms are broken up into different categories. Think of an upside down triangle. Organisms are classified from **very general to more specific**. To do this scientists use the following system:



By using a classification system of this kind, scientists can learn to understand the differences in species. Animals could look exactly the same on the outside but have completely different internal anatomy or skeletal structure. Look alone does not determine that species are the same. *Chordata* just means having a cord, which refers to the notochord and nerve cord present. Going to the next level (Class) will then determine what type of skeleton this fish has. Therefore, it is important to know that properly identifying a species is the first step to understanding it. Once we understand a species we can learn about its behavior, ways it can help humans, or for humans to understand different ways to protect organisms and to stop environmental impacts on them. Explain to the students that later into the class you will be learning about phyla more in depth and to remember that term.

III. Main Objectives

Dissection

1. Before getting the fish out, you can discuss the external anatomy of fish. An activity you can do to introduce the subject matter is to draw an oval on the board. Tell students they need to make it into a fish by drawing all the external anatomy features on the oval. They can draw fins, scales, eyes, etc. Discuss the name and function of each part, and then review these functions and names while the dissection fish is out at a later time.

2. Before bringing out the fish, make sure to talk to the students about why scientists dissect. They can help humans develop medicines and gain insight to cure diseases and help us learn more about ourselves and what our body structure is like. They help us properly identify animals and lead to an appreciation for how these animals survive. Dissections also provide clues to population sizes of both predator and prey.
3. It is also important to talk with them about respecting the animal during the dissection.
4. Obtain the two fish (whiting) with scissors on a tray. Gather students on floor or around a table and have them split into 2 groups. Each group of students will dissect their own fish, but you will be facilitating the dissection as a whole class.
5. Important parts to identify:

EXTERNAL ANATOMY:

- a) **Fins:** pectoral (leveling), pelvic (steering), anal (steering and reproduction in some fish), dorsal (steering and dynamics), and caudal (speed)
- b) **Lateral Line:** This is how the fish feels movement. There are a series of microscopic tubes that go to sensory nerves near the spine that help the fish feel small vibrations in the water.
- c) **Eye:** Sight
- d) **Scales:** Notice the teeth like projections that are used for protection from parasites and predators
- e) **Mouth:** Students can use a scissors to open the mouth wider to look at the sharp teeth and the tongue. Whiting are benthic feeders, eating shrimp, crabs, and mollusks.
- f) **Nares:** used for smell

INTERNAL ANATOMY: SEE APPENDIX for a guide.

Parts you should definitely cover

- a) **Liver:** Filtration of impurities from food
- b) **Spleen:** Filtration of impurities in blood, also helps to create blood and supplies some of the livers fluids for filtering
- c) **Swim Bladder:** Controls buoyancy. In Southern Kingfish, juveniles have this organ, but in adults it is vestigial. When you are dissecting the fish, if you see a filmy membrane close to the spinal cord, that is the vestigial swim bladder. The reason it is vestigial in adults is because they are benthic feeders, and so since they spend a lot of their time on the ocean floor, they have no need for a swim bladder to regulate their buoyancy.
- d) **Stomach:** Digestion of food, open stomach up to see contents. You should see RUGAE which is the lining of the stomach that is rough to increase digestion surface area and helps the stomach expand to fit more food.
- e) **Heart:** Blood circulation, notice the proximity of the heart to the gills. Quick oxygen transfer to blood from gills. 2-chambered heart.

***Cover any other areas that you feel will increase the students knowledge, including the reproductive system, brain, or muscular system.

6. Clean the fish up by removing all the valuable, nutrient rich meat. Fillet it, and put it into baggies for feeding the aquariums.
7. Feel free to feed the tanks with the fillets at the end of class if it is a feeding day. Look at the weekly feeding checklist to see which tanks haven't been fed yet.

Phylum Discussion and Game (30 mins)

1. You have a few different options in how you introduce the five phyla and it depends on your preferences and time. The five phyla to discuss will be Chordata, Mollusca, Arthropoda, Cnidaria and Echinodermata.
 - a. Option one: White board game. (This is most appropriate for 5th grade and older). You will need five different colors of markers and a large white board. Tell the students to think of 3-5 different kinds of ocean animals. After they have been given some time to think, go around the room and have them individually name an animal. Write the animal species names in a specific color, based upon which phylum they are in. For example: all Chordates might be written with the blue marker while all Mollusks might be written using the orange marker. Make sure each marker is used (each phylum is represented) at least once, and then let the students figure out which color the animals should be written in after a round or so.
 - b. Option two: Shortened white board activity/discussion - Write the phylum names up on the board and discuss different characteristics for each phylum. Once you have done so, ask the students to give you animals that would fall under each phylum.
2. No matter which option you choose be sure that you are going over the common characteristics of each phyla and discuss the types of animals that would be characterized under each. This is essential for the Phylum Race. The following characteristics for each phylum should be discussed:
 - a. **Chordata:** Chordates have a notochord and are bilaterally symmetrical. They also have a post anal tail. If students ask, you can point out that this is absent in humans and primates, however it is present in embryonic development. This phylum includes all vertebrates.
 - b. **Mollusca:** Mollusks have a muscular foot for movement and a long spiny tongue called a radula. They all have a soft body with an outer mantle (soft on cephalopods but attached to hard outer shells on gastropods and bivalves). There are three common types: Cephalopods (squids and octopuses), bivalves (oysters and clams) and gastropods (snails).
 - c. **Cnidaria:** Cnidarians have stinging cells called nematocysts and contain a ring of tentacles. They also have radial symmetry. They come in two general body types: medusa (jellyfish) and polyp (anemone). If students ask, coral is a polyp in its adult stage and a medusa in its juvenile stage. The coral medusas will float around as larvae and then attach to something in adult life where they will then become a polyp.
 - d. **Arthropoda:** Arthropods will have jointed appendages and compound eyes on stalks. They also have a hard exoskeleton and bilateral symmetry.
 - e. **Echinodermata:** Echinoderms have radial symmetry and spiny skin. They also move by using tube feet.
 - f. If you have older students and time, you can discuss the phylums **Porifera** and **Cnetophora**, but these will not be present in the phylum race so you do not need to go into major detail.
3. **Phylum Race OR Create an Animal (15-20 min)**
 - a. Phylum Race for 5th grade and up
 - i. Use your discretion. If your fifth graders were struggling with your phylum talk, maybe do the create an animal game instead. Middle and high school however should be able to complete this activity.

- ii. This game requires space and should be done in the Big Room or outside in the field or basketball courts.
 - iii. Break the students up into two groups and hand out half of the phylum characteristic cards to each group. Make sure each student has at least one characteristic card.
 - iv. Place the names of the phylum cards in between both groups (in the middle of the room). Then have the students gather at opposite ends of the room.
 - v. The goal of the game is for the students to run to the middle of the room, one by one, and place their characteristics by their correlating phylum name. As the student is placing their card down, the instructor needs to check if it's in the correct phylum. If it is, the student will receive a high-five from the instructor, signaling they are correct and they can run back to their group. The next student from their team can then run up to place their card down. If the student is incorrect, they need to run back to their team and try again in a couple of turns.
 - vi. There are six cards for each phylum, and there is an answer sheet for the instructor to use if necessary. Whichever team can finish first is the winner.
 - vii. After all characteristic cards have been placed down, bring all the students to the middle. Give each couple of students a phylum and its characteristics. Then go around the circle and let each group of students present their phylum and the characteristics that go with it.
- b. Phyla game for younger students (4th and under): Create An Animal - use paper, colored pencils, crayons or markers. Have the students draw an original animal. They need to be able to tell you four things about it through a presentation:
- i. What it eats.
 - ii. Where it lives.
 - iii. What is its name?
 - iv. What are some special things that help it survive?

Presentations are at the instructor's discretion and not all students need to present to the class. Discuss similarities and differences to real animals or other animals students created. Talk about how we could put them into different categories like scientists do with classification.

Ocean Motion Room (15 min)

1. The point of the Ocean Motion room is for students to learn the species of animals Driftwood has and to explore the room.
2. **Tank species identification (8 min)**
 - a. Give each student a tank ID card and start with the large tank. Ask the students to look at the animals in the tank and raise your hand if you are holding an ID card for those animals.
 - b. The students who have an animal in that tank may then tell the class what the name of that animal is, and if there is time, one interesting fact. Ask the students what phylum each animal is in as a review!
 - c. Continue to walk around the room visiting each tank and end at the touch tank in the center.
3. **Touch Tank/Exploration (7 min)**

- a. Once all the presentations are complete, have the students **WASH THEIR HANDS**. Spend some time at the touch tank letting students hold live whelks, touch anemones, and hold sea stars. Let them look and explore. Answer any questions the students come up with.
- b. Let the students explore the room on their own with no requirements. Let them look at the dry touch tank and look at the tanks once again. By looking and touching, students will develop questions that guide their own learning.

IV. Conclusion

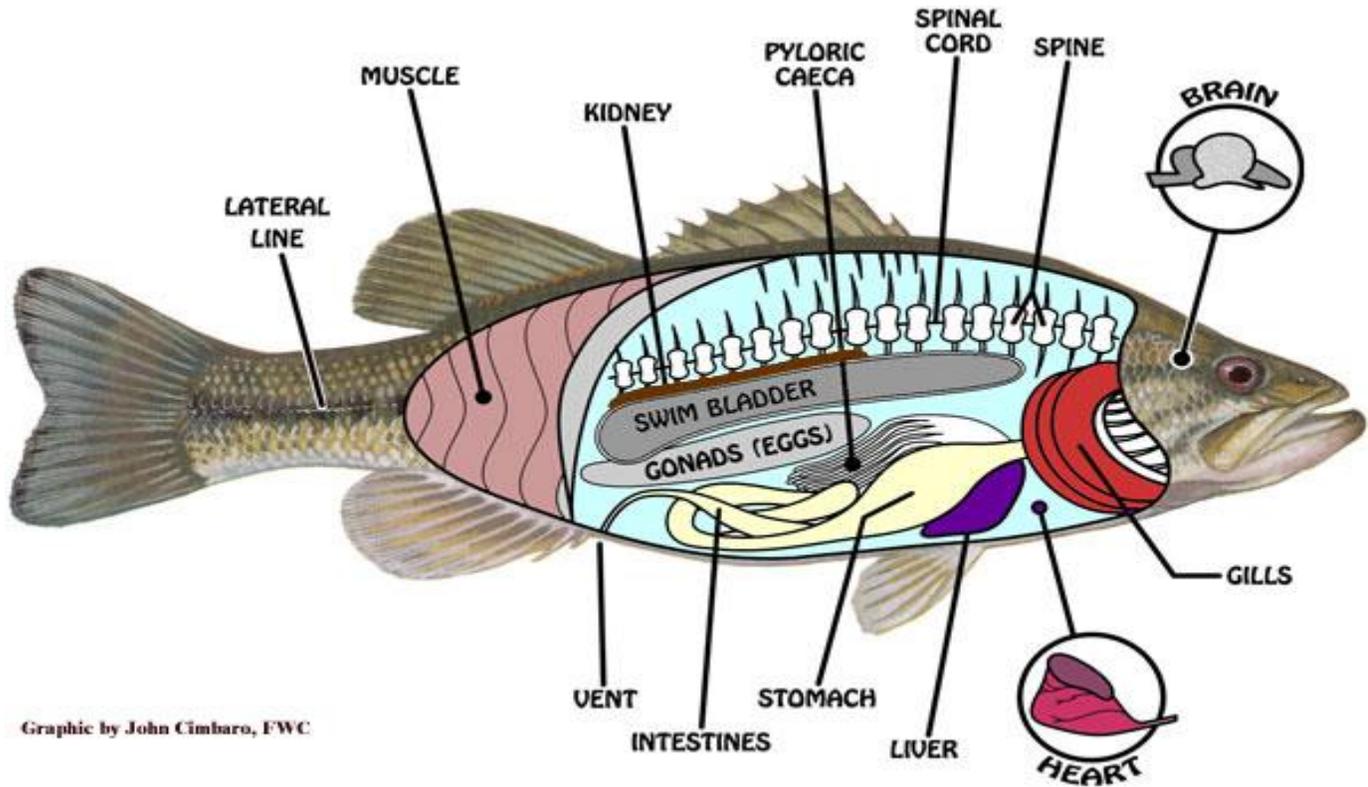
1. Review why scientists dissect and ask them what they learned during the dissection.
2. On the board, review with students what KPCOFGS means. Have them come up and write the proper names in by the corresponding letter as a review. Remind them that identification is a key step to understanding species diversity.

V. Clean Up:

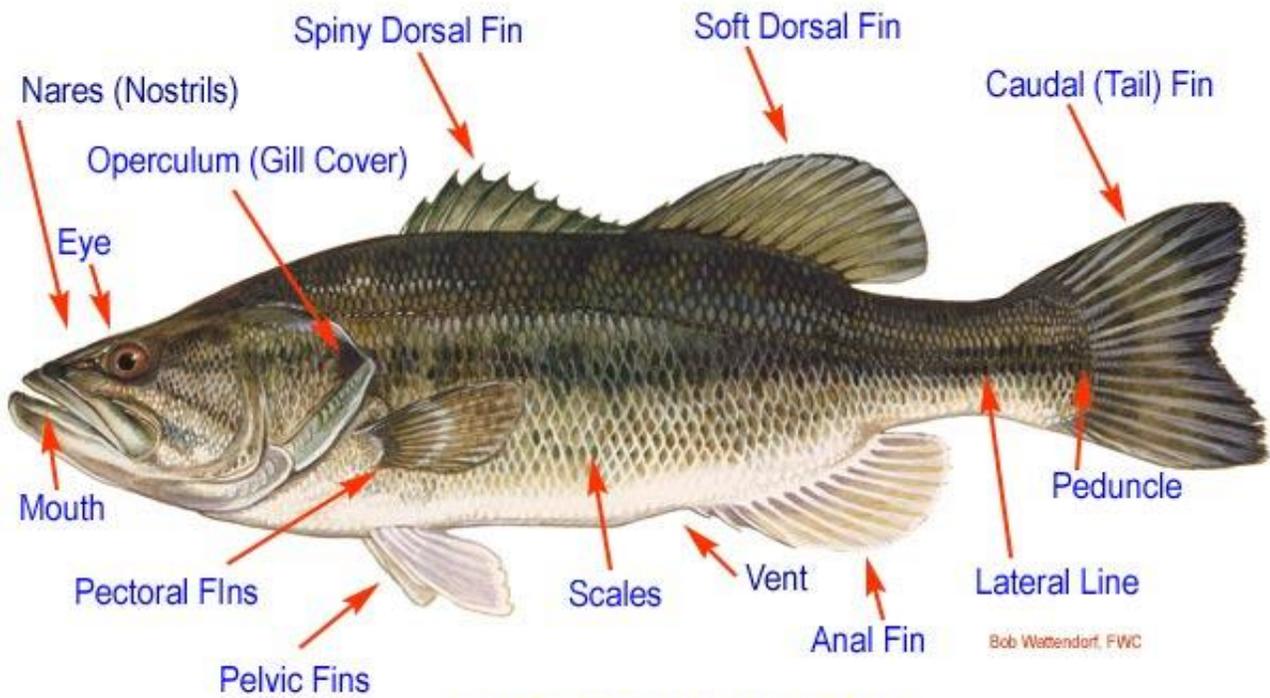
1. Make sure that your extra fish gets put into the freezer for feeding!
2. Erase the white-board for the next instructor.
3. Dump extra fish parts into the river.
4. Put away chairs and any items that are not normally part of Ocean Motion.
5. Check the tanks and report any problems to the Education Director.

VI. Additional Information

1. Generally speaking, all bony fish will tend to have similar internal and external anatomy. Use the following Anatomical Chart when dissecting a WHITING.



Graphic by John Cimbaro, FWC



Bob Wattendorf, FWC

EXTERNAL ANATOMY