

# Investigating Food Chains in the Open Water Habitats of the Chesapeake Bay

**Grade Level:** 7

**Subject Area:** Life Science

**Virginia Standards of Learning:** LS.6, LS.7, LS.9, and LS.11

**Objectives:**

Students will:

- Understand the complex relationships between predator and prey and producers and consumers
- Understand factors that can increase or decrease population size
- Learn about food chains and food pyramids by investigating diversity in open water habitats of the Chesapeake Bay

**Summary:**

Students will complete a food chain and food pyramid for the open water habitat of the Chesapeake Bay by investigating example species from this habitat.

**Vocabulary:** habitat, open water, food chain, food pyramid, phytoplankton, zooplankton

**Materials:**

For each group/station you will need (designed for 2-5 students per group/station):

- Fish specimens
  - Bluefish
  - Summer flounder
  - Striped bass
  - Atlantic menhaden
  - Bay anchovy
  - American shad
- Pictures of phytoplankton or live or preserved phytoplankton sample
- Pictures of zooplankton or live or preserved zooplankton sample
- 1 or 2 dissecting microscopes for viewing zooplankton and/or phytoplankton samples
- Slides or dishes for holding zooplankton and/or phytoplankton samples
- Pipets for transferring live or preserved zooplankton and/or phytoplankton from container to slide/dish
- *Open Water Habitat* sign (included, hard and electronic form)
- *Food Pyramid* sign (included, hard and electronic form)
- Information cards for each specimen (included, hard and electronic form)

- Power strip to plug microscopes into (three pronged)
- Extension cord (three pronged, if needed)
- *Student Worksheet* (included, hard and electronic form)

## **Procedure:**

### Introduction

1. Tell students they are going to be constructing a food chain and food pyramid for the open water habitats of the Chesapeake Bay. They will learn about food chains and food pyramids in the Bay and also about the different species that live in open water habitats of the Bay.
2. Describe open water habitats – the deeper water in the Bay away from the shore. Usually we are in shallow water habitats when we swim or fish from the dock. However, if you were to take a boat out to the middle of the Bay or River you would be in open water. There are many species of plants and animals that live in these habitats. Many of the larger fishes that we like to fish for and eat, like striped bass, bluefish, and flounder, live in the open water.
3. Give a brief overview of why open water habitats are important – they provide habitat for plants and animals, they are a huge economic and recreational resource for us (fishing, boating, tourism, etc.), photosynthesis by phytoplankton provides us with oxygen, etc.
4. Describe phytoplankton and zooplankton. Ask the students if they know what plankton are (*any organism that drifts/floats in the water; it cannot swim by itself; it goes wherever the tides and currents take it*). Explain that phytoplankton are plants and zooplankton are animals. *Note: Many students might think that plankton are tiny. Most of them are; however, you can talk about jellyfish. Some of them are large but they are still considered plankton. The real definition of plankton is any organism that floats/drifts in the water.*
5. Remind students of safety issues – watch cords for microscopes, do not pick up or open specimen jars, be careful not to knock the jars off the table. Glass jars can break easily, and the preserving liquid inside is unhealthy for humans.

### Activity

1. Students will use the information provided for each organism to fill in the food chain on their *Student Worksheet*. Students can use the information on the information cards or they can look at the size of the organism, its mouth, its teeth, etc. to determine what eats what in the open water. (Note: Students should know that not all of the organisms are full size; therefore, assuming the bigger fish eat the smaller fish might not be appropriate in this case.)

2. Once students have completed the food chain, they should answer questions 2 and 3 on their *Student Worksheet*.
3. Students should fill in the food pyramid on their worksheet. Many students may not understand a food pyramid. This section of the activity can be removed for students who have not had food pyramids in school yet, or you can explain how a food pyramid is different than a food chain. Make sure to talk about available energy and how that affects the population sizes of organisms. Phytoplankton have the most energy available to them so their populations are very large. They are in the biggest box at the bottom of the pyramid. Bluefish have the least energy available to them so their populations are smaller. There is not enough energy available at their level of the food chain to support billions of bluefish. Bluefish would be in the smallest box at the top of the pyramid.

### Wrap Up

Ask students to go over the food chain they came up with. You can write the food chain out on the board. Talk about why phytoplankton are the base, or first, of the food chain (*They are plants that use photosynthesis to make food for all of the other organisms in the habitat.*). You can discuss specific adaptations that filter feeders, such as menhaden, have for eating zooplankton (*gill rakers on their gills to filter small particles out of the water as it passes over their gills*) and that predators, such as bluefish, have for eating other fishes (*sharp teeth, are quick swimmers*). Discuss what happens to all of the other organisms if one link in the food chain is removed – you can extrapolate beyond this food chain to the larger food web in the Bay during this discussion. Make sure you make a point to discuss how a glitch in the food chain can affect humans. It might not be a huge impact, but it would have an effect – we are all connected.

Go over the food pyramid with students and make sure they understand the concept behind it. Have them think about the numbers of organisms in each box. There are billions of phytoplankton because there is a lot of energy available to them, but there are fewer bluefish because there is less energy available to that level of the food chain.

Ask if students have ever seen plankton – phytoplankton or zooplankton – before. They are pretty cool aren't they! Those tiny little plants and animals are floating and swimming around in the water all of the time without us ever even knowing! Imagine, every time you accidentally swallow some Bay water, you are swallowing plants and animals! Despite how small and unknown they are, they are VERY important. They are the base of the food chain for the whole Bay (and ocean). Phytoplankton are also important because they produce oxygen. Nearly 50% of the earth's oxygen is produced by phytoplankton. Think about it – every other breath you take is thanks to phytoplankton. What might be some factors that affect plankton populations (*water temperature, water quality, the size of predator and prey populations, etc.*)?

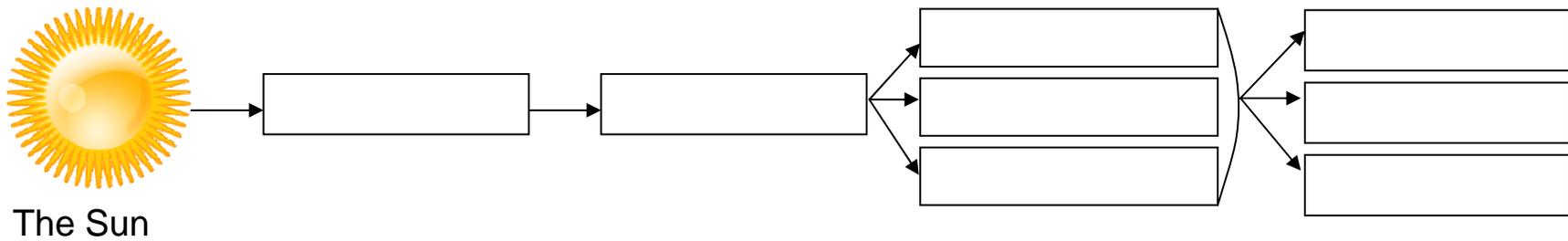
**Example Setup:**



Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Investigating Food Chains in the Open Water Habitats of the Chesapeake Bay**

1. Read the descriptions given for each plant or animal. Use the descriptions to fill in the food chain shown below. Write the name of the organism that belongs in each box.



2. Where do humans fit in this food chain? Write the word “humans” where you think they should go in this food chain. (Humans do not go in the one of the boxes. Fill the food chain in first with organisms from the table and then write “humans” next to the food chain where you think it belongs.)

3. Imagine that all of the filter feeders, like menhaden, Bay anchovies, and American shad, were fished too heavily and went extinct in the Chesapeake Bay.

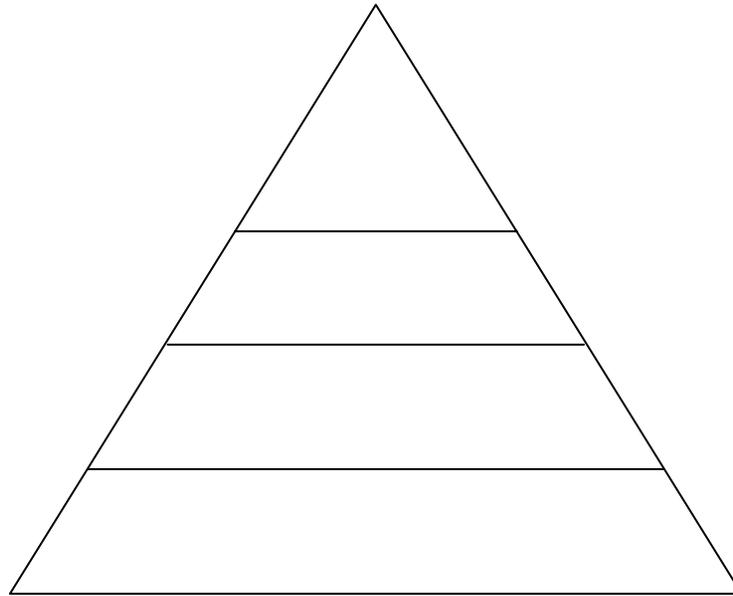
What would happen to zooplankton? \_\_\_\_\_

What would happen to summer flounder? \_\_\_\_\_

What would happen to humans? \_\_\_\_\_

4. Put the following organisms into the food pyramid that is shown below:

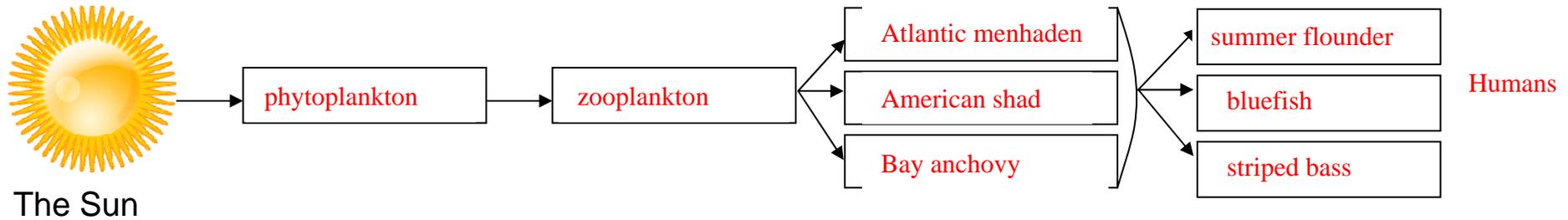
- Menhaden
- Zooplankton
- Bluefish
- Phytoplankton.



Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**KEY - Investigating Food Chains in the Open Water Habitats of the Chesapeake Bay**

1. Read the descriptions given for each plant or animal. Use the descriptions to fill in the food chain shown below. Write the name of the organism that belongs in each box.



2. Where do humans fit in this food chain? Write the word “humans” where you think they should go in this food chain.

3. Imagine that all of the filter feeders, like menhaden, bay anchovies, and herring, were fished too heavily and went extinct in the Chesapeake Bay.

What would happen to zooplankton? **Their population size would get much larger because several of their predators would be gone.**

What would happen to summer flounder? **Their population size might get smaller because some of their food source would be gone. There would still be fishes for them to eat, just not as many.**

What would happen to humans? **Humans would lose a source of food. We would not starve, but many people like to eat flounder. Also, many people's job relies on flounder (fishermen). These people might lose their job.**

5. Put the following organisms into the food pyramid that is shown below:

- Atlantic menhaden
- zooplankton
- bluefish
- phytoplankton.

