STEM ACTIVITY OF THE WEEK   HUDSON RIVER PK

Build Your Own Plankton

Theme: Plankton; Phytoplankton and Zooplankton; Buoyancy; Food Web; Water Quality
Ages: 8-14 years old
Prep Time: 5 minutes
Activity Time: 30-40 minutes

Activity Summary:
Did you know that the greenish hue of the Hudson River Estuary is an indicator of health rather than toxicity? Microscopic plants and animals, called plankton, give the River this color. Plankton are the foundation of the Hudson River food web; they provide food and oxygen to a variety of organisms.

In this lesson, students will learn about two categories of plankton— phytoplankton and zooplankton— and discover where in the Hudson River these tiny organisms are most abundant, and build their own plankton using common household items.

Goals:
- To understand two classifications of plankton: phytoplankton and zooplankton
- To understand where these plankton are most abundant and why
- To consider what physical properties these plankton must have to survive in their environment

Objectives:
- Students will identify the difference between phytoplankton and zooplankton
- Students will identify the photic and aphotic zones in the water column
- Students will learn the key term "neutral buoyancy"
- Students will build a model plankton that is neutrally buoyant

Lesson Materials:
- Build Your Own Plankton Worksheet
- Build Your Own Plankton Worksheet Answer Key
- Plankton Identification Guide
- Pencil
- Medium bowl filled with water
- Aluminum foil
- Penny
- Timer
- Suggested Plankton Build materials
  - Foil
  - Paper clips
  - Toothpicks
  - Pipe cleaners
  - Bubble wrap
  - Beads
  - Rubber bands
  - Tape
  - String
  - Plastic fragments
  - Coins
  - Pebbles

STEM ACTIVITY OF THE WEEK

Background:

What are plankton?

Plankton are small in size, but big in value and abundance to the Hudson River. These often microscopic plant or animal organisms drift in the Hudson River by way of tides, currents and waves. Plankton are classified by their inability to swim against the forces of the current.

Plankton are broadly categorized into plant plankton or **phytoplankton** and animal plankton or **zooplankton**. Phytoplankton are **producers** and conduct photosynthesis, which converts water, carbon dioxide and sunlight into energy that plankton can use. They can conduct photosynthesis because they have chloroplasts, which also give them their green color. This process allows phytoplankton to provide more than half of our world's oxygen! Zooplankton, on the other hand, are **consumers** and prey on phytoplankton and other zooplankton for energy. Furthermore, some zooplankton remain plankton for their entire life-cycle (**holoplankton**) while other zooplankton evolve into adult animal forms during their life cycle (**meroplankton**). Animals such as the blue crab and flounder begin their lives as tiny plankton and then transform through unique life stages to become an adult crab and flounder. Conversely, copepods, one of the most numerous zooplankton in the Hudson River, stays a planktonic copepod for its entire life. Copepods are also the species that the character Plankton on Spongebob Squarepants is based on!

Why are plankton important?

Both phytoplankton and zooplankton make up the foundation of the Hudson River food web. A **food web** is a network of plants and animals that depend on each other for food.   The connections between organisms within the food web highlight predator/prey relationships. A **predator** is a living organism that eats other living organisms. The **prey** is the living organism that the predator eats. At times organisms can be predators and then at other times prey. Plankton is a very popular prey item. In fact, all animals within the Hudson River system rely on plankton either directly, by eating plankton for energy, or indirectly, by eating other organisms that depend on plankton. Without plankton, the transfer of energy from small producers to small consumers and then to larger consumers would break down and the Hudson River would greatly suffer.

Where in the water do most plankton live?

You can divide an aquatic system into two zones, based on the amount of sunlight that penetrates through the water. The topmost zone is the **Photic Zone**. This is the depth at which sunlight can still penetrate the water and allow photosynthesis to occur. The deeper zone is called the **Aphotic Zone** receives practically no sunlight during the daytime and is nearly dark. No plants can survive in this zone because they cannot access sunlight to perform photosynthesis. Interestingly, phytoplankton and zooplankton both possess a range of physical characteristics that help them stay in the River's **photic zone**. Phytoplankton must stay in this zone to benefit from the sun energy and zooplankton frequent this zone to eat phytoplankton. This is important to know for the main activity in this lesson.

STEM ACTIVITY OF THE WEEK
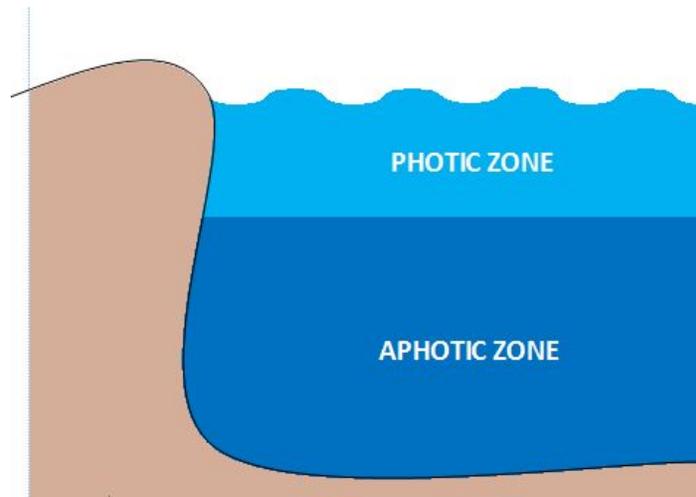
Both phytoplankton and zooplankton have developed numerous adaptations to help them stay in the Photic Zone. These adaptations influence the plankton's ability to float or its **buoyancy**: the force applied by the water in an upward direction. The thing about plankton is that they must be **neutrally buoyant**, this means that they are fully submerged in the water, because in nature plankton that only float on the surface dry up in the sun and die.

Lesson Procedure

Gather all the materials listed at the first page of this lesson plan, and follow the steps in the Build Your Own Plankton worksheet. Answer the guiding questions on the worksheet to learn the concepts presented in the background section above and apply them while constructing your own plankton.

Wrap Up

Remember, these microscopic organisms add a huge value to our ecosystem because they are the foundation of the food web in the Hudson River and the world's oceans. Phytoplankton also give us more than half of earth's oxygen, and provide food for lots of aquatic animals. We hope this activity helped you learn all about the importance of plankton and to continue protecting natural resources like the Hudson River!