

## ♦ Biological Sampling Device Using a SeaPerch ♦

**Grade Level:** 9th-12th

**Length of Lesson:** From 2 days up to 1 week (one day to construct and test, one day to collect samples, and from 1 hour up to 1 week to analyze samples and write lab reports)

### **Goals:**

- Construct a plankton net to be towed by the SeaPerch
- Develop research skills by collecting and analyzing an aquatic sample
- Identify and interpret biological samples
- Develop teamwork during data collection
- Write lab reports

### **National Science Standards:**

- LS1.C: Organization of Matter and Energy Flow in Organisms
- LS2.A: Interdependent Relationships in Ecosystems
- LS2.B: Cycles of Matter and Energy Transfer in Ecosystems
- LS2.C: Ecosystem Dynamics, Functioning, and Resilience
- LS4.D: Biodiversity and Humans
- PS3.D: Energy in Chemical Processes
- ESS3.D: Global Climate Change
- ETS1.C: Optimizing the Design Solution

### **Materials:**

- SeaPerch ROV
- Plankton Net:
  - 8" plastic embroidery hoop
  - Gatorade bottle (or similar)
  - Zip ties
  - Panty hose
- Harness
  - Braided Dacron line - 60lb test strength
  - PVC pipe T connectors
  - 2 ft. PVC pipe
- Microscope
- Blank microscope slides and cover slips
- Small containers to hold samples
- Disposable pipette or other small dropper

### Background

Plankton is the collective term used to describe the smallest animals and plants in the sea. It is a vast and diverse group with approximately 10,000 species. They are all called by the same name, plankton, because they all have similar lifestyles:

- Most exist in the top 30 meters of the sea, an area scientists call the ‘photic zone’.
- Most are incapable of free swimming and drift on the ocean currents.

The word plankton comes from a Greek word, *planktos*, which means ‘to wander’. They are found at all depths and are comprised of both plant (phytoplankton) and animal (zooplankton) forms. Plankton are important as indicators of the health of our oceans, as they are the primary producers of the ocean. They are also a key factor in helping alleviate climate change. Plant plankton (phytoplankton) is responsible for almost 50% of the total photosynthesis of plants on Earth, sucking the greenhouse gas carbon dioxide (CO<sub>2</sub>) from the atmosphere.

In the marine environment, climate and weather patterns affect the rate of photosynthesis, and therefore the primary production in that area of the sea. There are distinct differences between the seasonal cycles in temperate Atlantic waters and tropical seas. This distinction is based on thermoclines (abrupt temperature differences between areas of water).

By collecting samples of plankton along with the temperature of your sample site, you can assess the health of the aquatic environment, which impacts the local fish and shellfish population. Marine biologists and ecologists are constantly monitoring plankton levels in critical areas of the ocean to determine global climate change, as well as its impact on our ocean resources, such as commercial fishing.

### Lesson: LAUNCH

1. Warm up and/or dry demo the SeaPerch
2. Discuss the aquatic food chain. For more information about aquatic food chains, both in fresh- and saltwater, use the following resources:
  - a. <http://www.tutorvista.com/science/aquatic-food-chains>
  - b. <http://dendro.cnre.vt.edu/forsite/studentpages/jenniferaquaticfoodwebsb.htm>
  - c. [http://www.teachoceanscience.net/teaching\\_resources/education\\_modules/aquatic\\_food\\_webs/learn/](http://www.teachoceanscience.net/teaching_resources/education_modules/aquatic_food_webs/learn/)
3. Create food chains for the body of water you are going to test. What organisms are likely to live there? Which ones fall into the different levels of the food chain?
4. Create a plankton net using the materials noted above. Allow students to discuss different designs for the net and compare ideas with each other.

5. Attach the plankton net to the SeaPerch and modify if necessary so that the net does not get caught in the propellers.
6. Test the modified ROV in a large container of water or pool. What is the most effective way to trap plankton?

### **Lesson: INVESTIGATE**

1. Take your SeaPerch ROV(s) to a local water source, such as a lake, river, or pond. Use the modified ROV with the plankton net attached to collect samples of plankton.
2. Gently scrape the plankton off of your net and into small containers. Add a little water from your local source to keep the samples alive.
3. Bring your samples back to the classroom or lab.

### **Lesson: PRACTICE**

1. Mount your samples onto microscope slides using the following instructions:
  - a. Using a disposable pipette or other small dropper utensil, place a small drop of plankton-filled water onto a blank slide. The droplet should be small enough that when flattened, it will not flow over the edges of the slide.
  - b. Gently place a cover slip on top of the water droplet. If bubbles are present, gently tap the cover slip with a finger to move the bubbles out.
2. View your samples under a microscope. Remember to start on the lowest power and increase as necessary.
3. Identify the different types of plankton you have found using one or more of these sites:
  - a. <https://sealevel.jpl.nasa.gov/files/archive/activities/ts3ssac3.pdf>
  - b. <http://www2.sunysuffolk.edu/blackn/UCLAp planktonIDguide.pdf>
  - c. <http://oceandatacenter.ucsc.edu/PhytoGallery/phytolist.html>
  - d. <http://cfb.unh.edu/cfbkey/html/groups.html>
4. Discuss how the plankton you have found in your local water source fit into the local food chain.
5. (Optional) Write a lab report detailing the organisms you have collected and their place in the food chain.