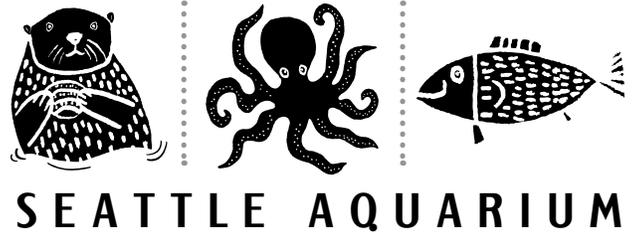


# PLANKTON LAB



## GRADES:

9–12

## DURATION:

30–60 minutes

## MATERIALS:

- Plankton sample
- Dissecting microscopes
- Petri dishes
- Droppers
- Plankton ID cards
- Student lab worksheets

## STANDARDS:

WA state:

- Life Sciences: LS1A & LS3E

Ocean Literacy Principles:

2. The ocean and life in the ocean shape the features of Earth.
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably interconnected.

## OVERVIEW:

*The surface of the ocean is home to diverse populations of plankton. In this hands-on activity, students will observe and identify plankton under microscopes while looking for specific characteristics that make plankton so unique.*

## GOALS AND OBJECTIVES:

Students will:

- Observe a plankton sample under microscopes at school.
- Practice microscope skills.
- Examine plankton on their own and record observations.
- Identify different phytoplankton and zooplankton using identification cards.

## VOCABULARY:

**Plankton:** Passively floating, drifting or somewhat motile organisms occurring in a body of water.

**Phytoplankton:** Generic term for photosynthesizing plankton (aka plant plankton).

**Zooplankton:** Plankton belonging to the Kingdom Animalia (aka animal plankton).

**Holoplankton:** Plankton that spend their entire life cycle as free-swimming organisms.

**Meroplankton:** Eggs and larvae of organisms that are nektonic (active swimmers) or benthic (live on the bottom) in their adult stage; temporary plankton.

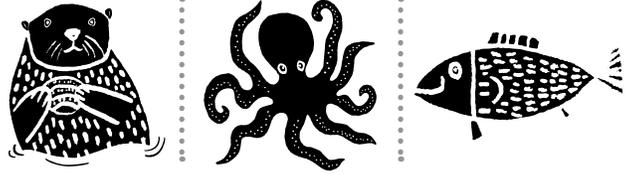
## BACKGROUND:

Plankton is comprised of thousands of types of organisms including invertebrates, fish, bacteria, viruses, algae and protozoans that are, because of their size or swimming abilities, at the mercy of ocean movement. The word plankton originated from the Greek planktos which means to wander or drift. They can't determine where they go; they drift with the currents. The ocean is full of small planktonic algae (seaweeds) and animals which require a microscope to view properly. Surprisingly, even large animals in the ocean that ride the currents are considered plankton. Jellies (jellyfish) are examples of these. Some animals, like octopuses, spend only part of their life cycle as tiny planktonic drifters, depending on other planktonic organisms for nutrition. Plankton is not just one thing; instead, it's a lifestyle.

## Plant plankton

Phytoplankton (plant plankton) consists mainly of single-celled algae known as diatoms. Diatoms provide food for many animals and are the foundation of important food chains. The other main class of phytoplankton are dinoflagellates which use a whip-like tail, or flagella, to move through the water. A famous type of dinoflagellate is Noctiluca scintillans, which causes bioluminescence (green light) in the water that you can see at night. Like plants, phytoplankton produce their own food (sugars) through photosynthesis. Phytoplankton have special adaptations to keep them floating near the surface so they can get the sunlight they need to photosynthesize. Many organisms eat phytoplankton, and it is one of the bases of the food web. It also gives Puget Sound its green color!





## Photosynthesis

In photosynthesis plants, algae (which includes phytoplankton), cyanobacteria and a few other organisms capture the energy from sunlight, store it chemically and use this stored energy to combine  $\text{CO}_2$  and  $\text{H}_2\text{O}$  to produce carbohydrates (read sugars). The carbohydrates are used as the producers' food supply. A waste product from this process is  $\text{O}_2$ .



At least half of the oxygen in the Earth's atmosphere is generated in the oceans. Additional nutrients are needed to build the organisms' structures and these come directly from the water.

## Animal plankton

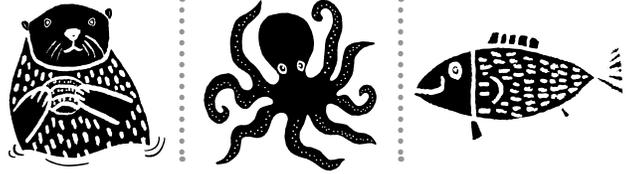
Most of the animals that you see in the tide pools in Puget Sound started out as zooplankton (animal plankton), including sea stars, sea anemones, clams, barnacles, worms, chitons, crabs, shrimp and octopuses. All of these animals spend only part of their lives drifting through the ocean and are called meroplankton. Other zooplankton, such as copepods, arrow worms and comb jellies, spend their entire lives drifting along with the ocean currents, never settling down to the bottom or swimming entirely on their own power. These are called holoplankton.

## Other planktonic organisms

Lots of bacteria are also drifting throughout the ocean. In fact, there are about as many bacteria in the ocean at any one time as there are stars in the universe...times 100,000,000! Many are photosynthetic (cyanobacteria), and also produce nitrogen. Without them, we would have no oxygen to breathe, organic matter would not be degraded, and the cycling of life's essential nutrients would cease. (Look closely and you will find 500 species in your mouth.) One study on another prolific type of ocean plankton, the viruses, showed that in a single quart of seawater there were as many as two billion viruses! Marine viruses infect and kill phytoplankton. Viruses likely have a large controlling influence on plankton diversity and population numbers.

## Sizes

Plankton comes in a variety of sizes. Megaplankton, such as loose pieces of kelp or large jellies, is large enough to catch without a net. Nanoplankton and picoplankton, which include bacteria, are too small to be caught in even the finest mesh plankton net; to see them you have to look at a water sample. Other sizes of plankton can be caught in plankton nets. Using a fine mesh net versus a coarse mesh net will determine which size plankton you will catch. These "net plankton" are divided into macroplankton, mesoplankton and microplankton.

**ACTIVITY:**

Students should pair up and collect a petri dish, dropper, dissecting microscope, plankton ID cards and worksheet. Place two or three drops of the plankton sample on the dish, making dime-sized drops rather than one large puddle. This will limit how far zooplankton can swim and will make it easier to find them when they go out of view. Observe the plankton in the sample and record what you see on your worksheet:

1. Find as many different types of phytoplankton and zooplankton as you can by scanning your plankton sample.
  - a. How do you know which are phytoplankton and which are zooplankton?
2. Once you have looked around a bit, find one example of phytoplankton and draw it below. Use the ID cards to figure out what type of phytoplankton it is.
  - a. What are some characteristics of your phytoplankton?
  - b. What color is it and why?
  - c. What are some adaptations that allow it to remain near the surface?
3. Now choose one example of zooplankton and draw it below. Use the ID cards to figure out what type of zooplankton it is.
  - a. Is your zooplankton moving? If so, how is it propelling itself?
  - b. Does it appear to still be alive, dead or a molt?
  - c. What are some characteristics of this animal?
  - d. Is it holoplankton or meroplankton?
  - e. If it is meroplankton, what will it grow up to be? How will its looks change as it grows (for example barnacles become sessile creatures)?

**How to acquire a plankton sample from the Seattle Aquarium**

To obtain a plankton sample for use in your classroom, please email [registration@seattleaquarium.org](mailto:registration@seattleaquarium.org) at least one week in advance of your required use date.

*Please note: plankton samples must be picked up in person and cannot be shipped.*

**Instructions on keeping your plankton sample alive:**

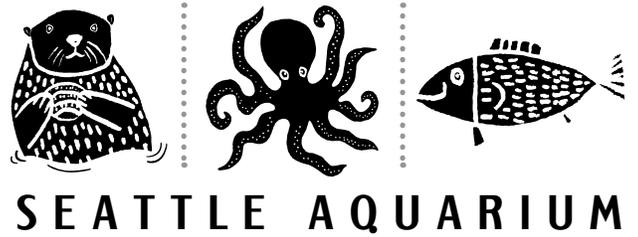
1. Keep cold until you reach school.
2. Place it in a refrigerator with the lid OFF (otherwise it will run out of oxygen).
3. It should last this way for two or three days.

**EVALUATION:**

Upon completion of this activity students should:

- Be able to identify whether an organism is phytoplankton or zooplankton.
- Feel comfortable generating a scientific drawing and recording observations.

# PLANKTON OBSERVATION WORKSHEET



## PHYTOPLANKTON

Draw an example of phytoplankton.

A large, empty rectangular box with a thin black border, intended for a student to draw an example of phytoplankton.

Phytoplankton characteristics:

What color is the phytoplankton? Why?

What adaptations allow it to remain near the surface?





## ZOOPLANKTON

**Draw an example of zooplankton.**

A large, empty rectangular box with a thin black border, intended for drawing an example of zooplankton.

**Zooplankton characteristics:**

**Is the animal moving? How is it propelling itself?**

**Meroplankton or holoplankton? If it is meroplankton what will it grow up to be?**