# *The Great Plankton Race*

**Grade Level: 5-8**
**Subject Area: Life Science**
**Duration: 50 minutes or less**
**Setting: classroom/lab**
**Skills: Problem solving, teamwork**

**Related State Content Benchmark Objectives**
- **Develop solutions to problems through reasoning, observations, and investigations.**
- **Describe evidence that plants (phytoplankton) make and store food.**
- **Predict the effects of changes in one population in a food web on other populations.**
- **Describe how all organisms in an ecosystem acquire energy directly or indirectly from sunlight.**
- **Explain how energy flows through familiar ecosystems.**

This activity is modified from MARE: Marine Activities, Resources, and Education. 1995. The Regents of the University of California. www.ihs.berkely.edu/MARE/MARE.html

## Objectives
Students will be able to:
- describe why it is important for plankon (especially phytoplankton) to float.
- predict what might happen if phytoplankton could not float.

## Materials
- Large pictures, slides, and/or video of various plankton species.
- Large aquarium (20 gallons or more, if possible).
- Several gallon jars (e.g. clear Mayonnaise jar, small fish bowls, etc.)
- Two – Four stopwatches.
- Recycled Styrofoam packing "peanuts" (the non-biodegradable kind) and/or corks
- Toothpicks, paperclips, metal washers, yarn, fishing sinkers, popsicle sticks, straws (regular and/or coffee stirrers), feathers, etc.
- Plastic baggies
- Lab Worksheet (see page 57).

## Background
The word plankton is from the Greek word for "wanderer" (MARE: Marine Activities, Resources, and Education). They drift or wander the oceans and lakes at the mercy of the currents. They are generally unable to move against the currents. The plankton the photosynthesize are called phytoplankton. The plankton that eat other plankton are called zooplankton, and are made up of tiny animals and single-celled protozoans.

During the Schoolship program, students sample for plankton with a Plankton net, and view their catch under a microscope. Students typically catch zooplankton, as they are larger and do not slip through the net. Most Zooplankton undergo a diurnal migration, where they migrate to deeper waters during the day, then return to the surface at night. It is thought that these zooplankton undertake this energetically costly migration to avoid predation (can not be seen in the dark) and to conserve energy (metabolism is slower in colder water). Therefore, students on the Schoolship lower the Plankton Net close to the bottom and tow it vertically through the water column to catch these migrating zooplankton.

Phytoplankton are not seen much on the Schoolship, as they tend to slip through the net. However, phytoplankton are extremely important as they are the base of the Great Lakes food web. In addition, phytoplankton are photosynthetic, and all the plankton in the world's lakes and ocean produce approximately 40% of the oxygen we breathe. Since phytoplankton are photosynthetic, they must remain in the photic zone of the lake (zone where there is light) in order to convert the sunlight to energy. Phytoplankton come in all shapes and sizes as an adaptation to

float near the surface. Knowing that these organisms must stay near the surface, students will design and build a phytoplankton that will float in the photic zone, and will understand why it is important not to sink to the bottom.

## The Activity

The Lab worksheet should be copied and distributed to students.

1. Ask the students questions:
   - What are plankton?
   - What are some types of plankton?
   - Why are they important?

1. Pass out lab worksheet
2. Have students observe photos, slides of various plankton, then record observations like colors, shapes, spines, and motion.
3. Have students brainstorm possible advantages to observed adaptations.
4. Brainstorm ways that plankton could reduce sinking rates.

   i.e. flattened appendages, small bodies, large surface area relative to volume, reduced density, oil or gas floats, chains, etc.

1. Tell students that they will be creating their own plankton.
2. Have them get into groups around the supplies.
3. Let them know that the objective is to have the slowest one to sink to the bottom.

   - Why does the slowest one win?

1. At the group table, there will be a bag of materials and bowl to practice sinking in. At the end of the time, students will choose the one they like the best to race.
2. Have one person from each group describe their plankton and the adaptations it has to sink slowly.
3. Record the hypothesis of why it will sink the slowest.
4. Have a couple of people be timers. If the aquarium in front of the class is large enough, have the groups race against each other at the same time.
   - Record the depth of the tank and the times of each group
5. Repeat the races if time permits.
6. Have the students figure out the average time and the sinking rates for each group.
7. Declare the slowest one the winner.
   - Record the conclusions and give reasons why they think one plankton was the slowest.

## Items for Discussion

- We conducted this experiment with fresh water, would there be a difference if we used seawater (salt water)? Why or why not?
- Why did we repeat the races several times?
- Why is it important for plankton to sink slowly?
- What would you do differently now if you were going to create another plankton to race? Why?

## Additional Resources

Web information

www.vims.edu/bridge/plankton.html

http://courses.washington.edu/zoo432/plankton/plintroduction/plintroduction.htm

http://encarta.msn.com

For Pictures:

http://life.bio.sunysb.edu/marinebio/plankton.html

www.comet.net/gek/phytoc.htm

http://school.discovery.com/homeworkhelp/worldbook/atozpictures/Ir000195.html

References:

Milne, D. Marine Life and the Sea. New York: Wadsworth Publishing Company, 1995.

"Phytoplankton." The New Encyclopedia Britannica: Micropedia. 1988.

# The Great Plankton Race - Lab Sheet

**Observations:**

**Hypothesis:**

**Data: Time it takes for plankton to sink**

| Group Name | Time1 (sec) | Time 2 (sec) | Time 3 (sec) | Avg. Time (sec) | Distance (cm) |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Average time** = $\frac{\text{Time 1 + Time 2 + Time 3}}{3}$

**Rate** = $\frac{\text{Distance}}{\text{Avg. Time}}$

Calculate the average time and the rates for each of the groups.

**Conclusion:**

Which plankton was the slowest?

Why was that plankton the slowest?

**Discussion Questions:**

We conducted this experiment with fresh water, would there be a difference if we used seawater (salt water)? Why or why not?

Why did we repeat the races several times?