

Picophytoplankton size answer key

This activity will reinforce microscope skills.

National Science Education Standards addressed:

- ✓ Life Science-Content Standard C

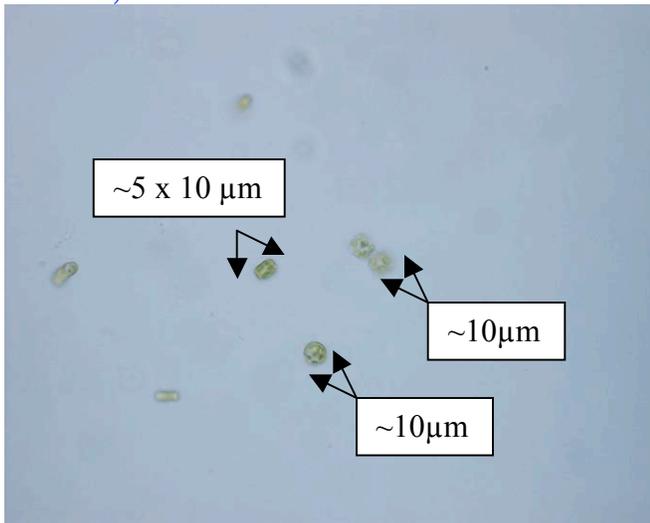
Benchmarks for Science Literacy addressed:

- ✓ The Living Environment-5_A, 5_C
- ✓ Common Themes-11_D

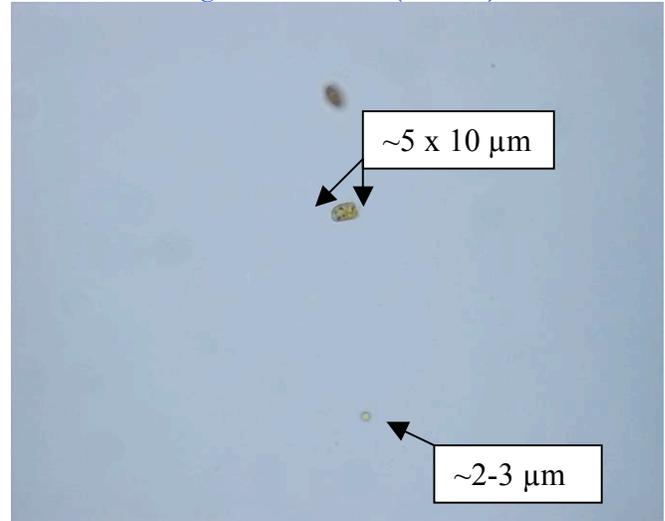
Note: Phytoplankton assemblages can be purchased for very reasonable price from several biological supply companies. To obtain larger sized phytoplankton, purchase a mixed assemblage (marine diatom, dinoflagellate, or green algal mixtures would all work). Picophytoplankton can be bought as individual cultures. Both *Isochrysis* and *Nannochloropsis* are usually $\sim 2\text{-}4\ \mu\text{m}$ in size. Mixed assemblages may also contain picophytoplankton depending on the mixture that is purchased.

Below are several examples of cultures purchased from Carolina Biological Supply Company. These photos were all taken with a 40 x objective. The horizontal dimension of the field-of-view is $330\ \mu\text{m}$. The Diatom mixture contained exclusively large phytoplankton, the dinoflagellate and green algae mixes contained a combination of large phytoplankton and picophytoplankton, and the *Isochrysis galbana* and *Nannochloropsis* sp. cultures contained exclusively picophytoplankton. The exact composition of the mixed cultures and the exact sizes of the individual cells may vary.

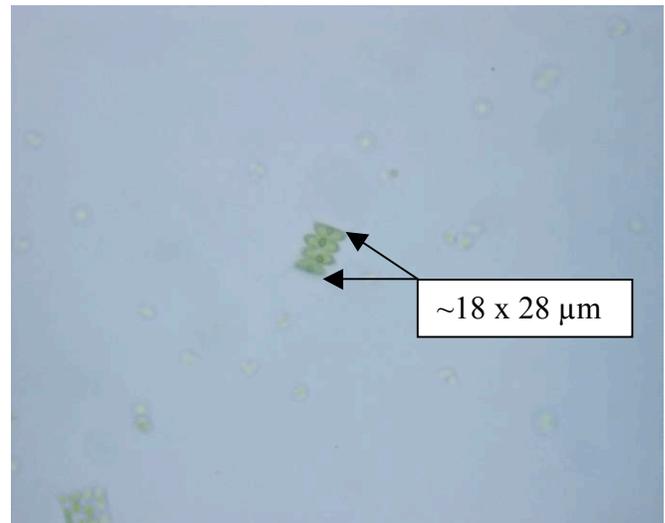
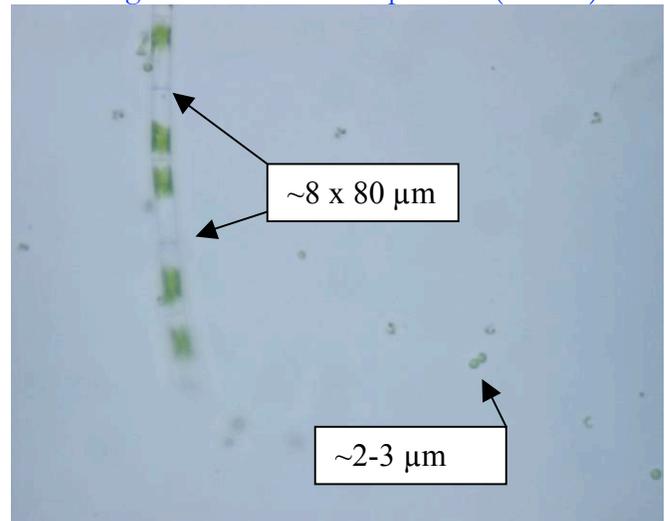
Marine Diatom Mixture (Carolina Biological #151367):

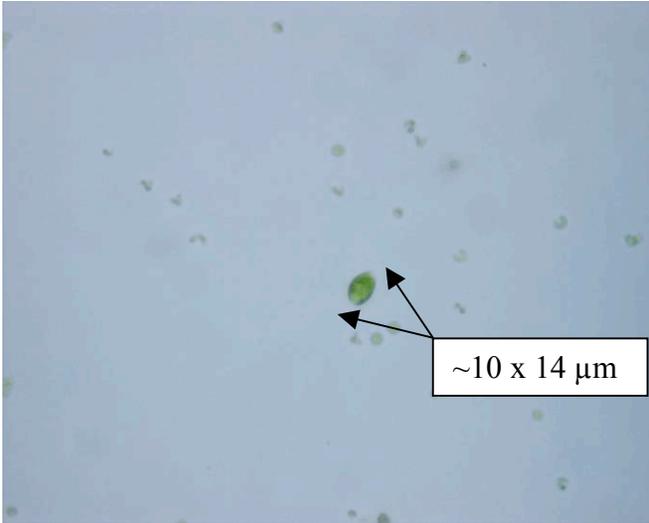


Marine Dinoflagellate Mixture (151372):

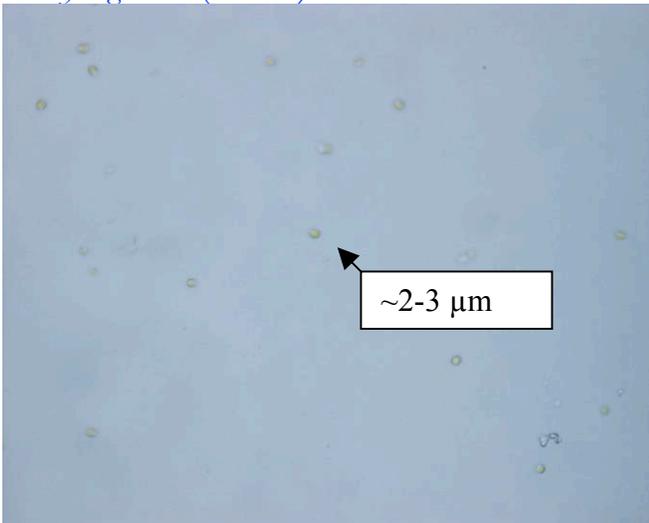


Green Algae Mixture – next 3 pictures (151370):

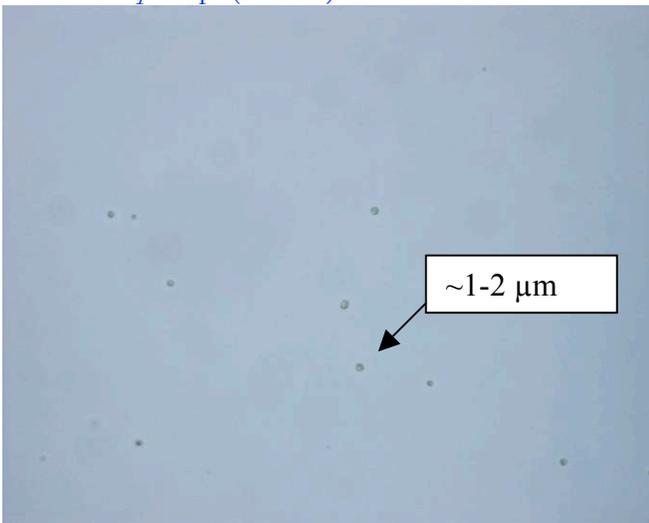




Isochrysis galbana (153180):



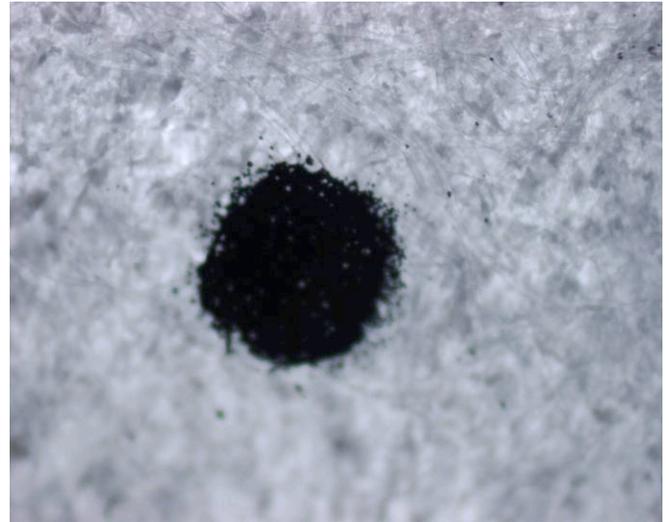
Nannochloropsis sp. (153220):



Questions:

1. How big is a period on this page compared to the large phytoplankton and the picophytoplankton?

Photo taken with a 10 x objective. The field-of-view is 1.33 mm.



This period is approximately 400 μm in diameter. If you laid the largest phytoplankton end to end you could fit 5 across its width. It would take 200 picophytoplankton to stretch across the width of this period. The numbers become even more impressive if you think in terms of area or volume. It would take 40,000 picophytoplankton to have the same area as a period or 8 million picophytoplankton to have the same volume as a sphere equal in size to a period!!

2. What differences did you observe between the phytoplankton and the picophytoplankton?

The students should be able to observe differences between the large phytoplankton cells. For example, in the photos above, the large phytoplankton were many different sizes (5-80 μm), shapes (circles, squares, ellipses, chains), and may have unique features (the dinoflagellates were swimming all around, the chloroplasts could be distinguished in the large green algae, another green algae had spines). However, the picophytoplankton cells will look

much more uniform – given their small size and similar shape and color.

3. What other things might you find in the ocean in these size ranges?

Bacteria are small like the picophytoplankton. Zooplankton – protists and animals that float in the ocean and eat phytoplankton – can be similar in size to large phytoplankton. Some of these zooplankton are actually larval stages of larger animals we see along the coast, such as snails or crabs.

4. What benefits / drawbacks do you think there would be to studying phytoplankton so small?

There are many possible answers to this question. As a researcher studying picophytoplankton, this is my view...There are lots of benefits to studying picophytoplankton. There is still so little known about them that there are many interesting research questions that you can address – which picophytoplankton are found in different locations, how the population changes over time, what role they play in the ecology of the ocean etc... Just about any question you choose to research, you are certain to find something new and interesting that no one has discovered before. The drawback is that they are so small it makes it more difficult to do the research. I can't just observe them under a microscope – I have to be creative to come up with new ways to answer all of my questions.

5. The initial discovery of picophytoplankton was greatly facilitated by technologies used in the medical field. Discuss the possible reasons these technologies were first developed for the medical field.

Just helping students acknowledge the major impact of seeing such small things has helped us tremendously in the medical field to fight off previously unknown (unseen) ailments. Numerous examples are possible, viruses, bacterial infections to name a few.