center for microbial oceanography: research and education

C·MORE linking genomes to biomes

Microscopes to Middle Schools

Providing Hawai'i's middle school teachers with the tools and training to teach about plankton

Maui microscope workshop:
Saturday, February 11, 2012: 9:00 a.m. - 3:00 p.m.
At University of Hawaii Maui College, Noii 20A

Hawaii Island microscope workshop:
Saturday, March 3, 2012: 9:00 a.m. - 3:00 p.m.
At Mokupapapa Discovery Center (Hilo)

Instructors:

Jim Foley (C-MORE)
foleyj@hawaii.edu (808) 956-7739
Ann Coopersmith (UHMC-Maui)
Nakoa Goo (NOAA-Hawaii)
Others: TBD

Workshop Goals and Outcomes

During this one-day workshop, Hawaii's middle school teachers will learn about plankton and their important roles in ocean ecosystems, climate regulation and our daily lives. Though a lecture and discussion, participants will learn content knowledge and obtain presentation materials for use in their classroom. They will then participate in two plankton labs: (1) phytoplankton identification from images, and (2) zooplankton identification from samples using a microscope. Participants will leave the workshop with all the necessary tools and training to collect and observe plankton with their classes, including a plankton net, digital microscope, standards-based lesson plans, supporting materials and ideas for inquiry-driven student research.

Background

The oceans are of vital importance to life on Earth: they regulate climate, provide food and oxygen and cycle essential chemical elements and compounds. Marine microbes are the drivers of these ocean processes. For example, phytoplankton (plant-like plankton) form the base of the marine food web and produce over half the oxygen that we breathe. However, phytoplankton and other microbes can be difficult to conceptualize because they cannot be seen without specialized equipment.

So, how do you get students interested in learning about something they can't even see? One way is to start with something they can see! If you go up one step in the food web from phytoplankton, you'll find zooplankton. Zooplankton are a diverse group of organisms that feed upon smaller phytoplankton or other zooplankton, or are parasites. Some zooplankton spend their entire lives drifting in the sea. Others only spend part of their life cycle as plankton and then grow up to become fish, crabs, corals or lobsters. Zooplankton can be easily caught and studied right from shore. After completing this workshop, teachers will be able to collect, observe and study plankton with their students through inquiry driven projects.

Schedule

9:00	Introductions
9:15	Lecture & Discussion: plankton and microbial oceanography
10:00	Break
10:15	Image-based Lab: Phytoplankton identification
11:15	Lunch
12:15	Microscope Lab: Microscope set-up, zooplankton collection training and viewing
2:15	Additional resources (plankton lessons, student project ideas)
2:45	Evaluation
3:00	Pau

Participants & Expectations

Priority will be given to middle school science teachers at DOE schools. Others may participate as space allows, but will not leave the workshop with equipment. After completing the workshop, participants are expected to maintain proper care of the materials provided, share the resources with other instructors at their school, train other teachers in equipment use and participate in follow-up survey of equipment use. Additionally, C-MORE staff will offer supplementary training during webinars as a follow-up to the professional development workshop. Webinars will be timed to coincide with some departmental meetings.

Materials Provided

One participant from each DOE middle school will leave the workshop with the following equipment, valued at over $1775, for use at their school. The equipment is to be stored at their school at a location easily accessible by other science teachers:

- Motic DN-143 Digital Stereo Microscope (with spare bulbs)
- 80 µm mesh plankton net
- 2 tow lines (~15 m and ~3 m lengths)
- 2 Collection jars (one weighted, one plain) with lid
- 53 µm plankton sieve
- 500 ml wash bottle
- 2 Petri dishes
- 3 dissecting needles
- Plankton ID book: *A Guide to Marine Coastal Plankton and Marine Invertebrate Larvae* by DeBoyd Smith and Kevin Johnson

Materials Not Provided but Recommended for the Workshop

The microscope attaches to a computer and projector for classroom viewing. Teachers are encouraged to bring a laptop computer to the workshop so we can assist with software installation and use. However, if this is not possible, teachers can install the software on their classroom computer when they return to school.

Registration

Official workshop registration will open soon. Middle school science teachers can pre-registering for the workshop contacting Jim Foley (foleyj@hawaii.edu). Additional workshops will be scheduled for Kauai and Oahu in the coming months. Contact Jim Foley (foleyj@hawaii.edu) if you would like to be notified when the next workshop is scheduled.

Cost & Credits

There is no cost to participate in this workshop. Participants completing the workshop will receive 3 HOUSSE points for this workshop.

HCPS III Standards Addressed

6th GRADE

Benchmark SC.6.1.1 Formulate a testable hypothesis that can be answered through a controlled experiment

Benchmark SC.6.1.2 Use appropriate tools, equipment, and techniques safely to collect, display, and analyze data

We will discuss how to conduct experiments with the plankton net and discuss data collection methods and questions that students could answer using the equipment. Example: Use the net and microscope to answer the question "Are the plankton found at [location] the same during morning, noon and night?

Benchmark SC.6.2.1 Explain how technology has an impact on society and science

Benchmark SC.6.2.2 Explain how the needs of society have influenced the development and use of technologies

We will discuss how microscope technology has developed and examine some microscopic discoveries that have changed the world.

Benchmark SC.6.3.1 Describe how matter and energy are transferred within and among living systems and their physical environment

We will discuss the role of plankton in biogeochemical cycling in the ocean.

7th GRADE

Benchmark SC.7.1.1 Design and safely conduct a scientific investigation to answer a question or test a hypothesis
Benchmark SC.7.1.2 Explain the importance of replicable trials
Benchmark SC.7.1.3 Explain the need to revise conclusions and explanations based on new scientific evidence

We will discuss how to conduct experiments with the plankton net and hypotheses that students could test using the equipment. Example: Does the plankton community at [location] change as a result of a heavy rain?

Benchmark SC.7.3.1 Explain how energy moves through food webs, including the roles of photosynthesis and cellular respiration
Benchmark SC.7.3.2 Explain the interaction and dependence of organisms on one another
Benchmark SC.7.3.3 Explain how biotic and abiotic factors affect the carrying capacity and sustainability of an ecosystem

We will discuss the role of plankton in biogeochemical cycling in the ocean.

Benchmark SC.7.4.1 Describe the cell theory
Benchmark SC.7.4.2 Describe the basic structure and function of various types of cells
Benchmark SC.7.4.3 Describe the levels of organization in organisms
Benchmark SC.7.4.4 Classify organisms according to their degree of relatedness
Benchmark SC.7.5.4 Analyze how organisms' body structures contribute to their ability to survive and reproduce
Benchmark SC.7.5.5 Explain how fossils provide evidence that life and environmental conditions have changed over time

We will discuss how different plankton (including viruses, single cell organisms and multi-celled organisms) are adapted to survive in the marine environment. We will also review the natural history of microbes on Earth.

8th GRADE

Benchmark SC.8.1.1 Determine the link(s) between evidence and the conclusion(s) of an investigation
Benchmark SC.8.1.2 Communicate the significant components of the experimental design and results of a scientific investigation

We will discuss how to conduct experiments with the plankton net using various experimental designs and data collection methods. We will also discuss hypotheses that students could test using the equipment. Example: How does the plankton community at [location] relate to available nutrients?

Benchmark SC.8.2.1 Describe significant relationships among society, science, and technology and how one impacts the other
Benchmark SC.8.2.2 Describe how scale and mathematical models can be used to support and explain scientific data

We will discuss the impact of the microscope on society.
Possible assignment: Use the measurement feature on the microscope to create a scale model of a zooplankter.

Benchmark SC.8.5.1 Describe how changes in the physical environment affect the survival of organisms

We will discuss how changes in the ocean's physical environment cause plankton blooms.