"Science Education Asea" follows the events of scientists onboard the R/V Melville.

The SEA Times

Current Location
Latitude 48' 35.4" N
Longitude -124' 36" W

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Scientists Track What's Mowing the Marine Lawn

MAIN DECK STERN

Water in aquaria, holding tanks, and plastic cases slosh around Melville's main deck as the ship rolls. On the starboard side, a chain mounted on the side of a hundred-gallon Plexiglas case squeaks like a rusty bicycle.

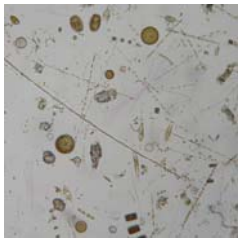
A motor drives the chain, which rotates long tubes. Each tube holds several bottles of seawater. The machine functions day and night, keeping the seawater and microorganisms secure and in constant motion.

These single-celled organisms provide half of the oxygen we breathe!

This plankton Ferris wheel is called an incubator. This one, custom built by scientists at the University of Washington, pipes ocean water through it, to keep the bottled samples on deck the same temperature as they would be in the ocean. Scientists conduct "dilution" experiments to track how well phytoplankton grow, and how much they are being eaten, or grazed.

Phytoplankton, including the diatom *Pseudo-nitzschia* (the target organisms of this research cruise), are the "grass of the sea." They populate the surface of the ocean (about 70% of the Earth's surface) and photosynthesize, providing food for the organisms in the ocean's food web. These single-celled organisms provide half of the oxygen we breathe! Similar to land animals that eat grass, organisms that eat phytoplankton are called "grazers," or zooplankton.

In dilution experiments, scientists fill incubator bottles with different combinations of filtered and unfiltered seawater. After 24 hours, they measure the changes in chlorophyll (a pigment in all photosynthetic organisms). Based on differences between treatments, the scientists calculate the growth and grazing rates of the phytoplankton community. To measure *Pseudo-nitzschia* growth and grazing, scientists preserve the samples and count cells through a microscope – something that is easier to do in the laboratory after the research cruise.



ECOHAB-PNW scientists are asking why diatoms of the species *Pseudo-nitzschia* are so common in the Pacific Northwest. *Pseudo-nitzschia* may have an evolutionary advantage over other phytoplankton species that reduces its death by grazing. In other words, there may be something about *Pseudo-nitzschia* that makes them not as good to eat. And if they grow faster than they are being grazed – watch out - *Pseudo-nitzschia* will accumulate to high numbers in the environment.

Pseudo-nitzschia cells can form long chains (up to 30 long!) that may make them difficult for grazers to get their mouths (or stomachs) around. Domoic acid may have some effect on grazing activity. Or perhaps there's a "trophic cascade" where big zooplankton predators eat the small grazers that would normally feed on *Pseudo-nitzschia*, so there are fewer predators left to feed on these potentially toxic diatoms.

To understand a single organism, scientists must look at many parts of its community. The squeaky chain incubator adds to our understanding of complex plankton systems in the ocean.

A Grazer Guru Speaks

GRAZER GALLEY

Brady Olson talks about the microorganisms he studies with special adoration. "Plankton may be microscopic, but they're so visually appealing. They have such interesting shapes and behaviors," he says.

Brady studies grazers, the zooplankton that feed on phytoplankton. His favorite is *Protoperidinium*, a heterotrophic dinoflagellate. A "*Protoperidinium* cell can eat things five times its body volume," Brady explains. "It wraps an external stomach around the food, drags it around, sucks out the inside, and discards the skeleton."

Having obtained his Masters at Western Washington University, where he studied coccolithophores (a kind of phytoplankton) in the Bering Sea, Brady is currently working towards a PhD at the University of Washington with Dr. Evelyn Lessard.

An ECOHAB-PNW research cruise vet, Brady has been on all five voyages, totaling over 100 days at sea. He explains that being on the ship is the "great sprint for data." The scientists spend much of the rest of the year analyzing the numbers they get from the experiments and samples collected.

When not at sea, Brady spends time with his family - a photo of his son, Fletcher, hangs in his workstation; he also enjoys outdoor activities like backpacking and SCUBA diving and plays mandolin in an alt-country band called "The Vertebrates."

Mr. Olson was a junior high science teacher for several years. He recalls that the best lessons he taught involved ecological concepts such as the food chain and natural cycles – the very topics he has returned to school to study!

ECOHAB PNW is a 5-year multi-disciplinary project that is studying the physiology, toxicology, ecology and oceanography of toxic Pseudo-nitzschia *species off the Pacific Northwest coast. For more information, visit the ECOHAB-PNW website at: http://www.ecohabpnw.org.*

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