



Ocean Exploration and Research

Ocean Exploration Education Highlights

May 2017

Welcome to the NOAA Ocean Explorer Education Highlights newsletter. This monthly newsletter provides you with quick access to ocean exploration-focused, standards-based tips and tools to bring the excitement and science of ocean exploration into your classroom!

What's the Latest from NOAA Ocean Exploration for Your Classroom?



[Exploring the Deep Ocean with NOAA Ocean Exploration Lessons in Spanish!](#)

The NOAA Office of Ocean Exploration and Research (OER) provides a variety of learning and teaching tools designed to engage broad audiences and enhance America's environmental literacy through the excitement of ocean discovery. Professional development workshops introduce educators to hands-on and standards-based lessons to help bring the excitement and science of ocean exploration into the classroom.

All lessons presented in the *Exploring the Deep Ocean with NOAA* educator professional development workshop are now available in Spanish!

This includes several lessons from the NOAA Ship *Okeanos Explorer* Education Materials Collection, [Volume 1 - Why Do We Explore?](#) and [Volume 2 - How Do We Explore?](#)

Kristin Evans, NOAA workshop facilitator and Education Manager at the University of Texas-Austin, Marine Science Institute, says: "Teachers are always looking for tools and resources that will help them and their students access unique and meaningful learning experiences. As a facilitator of NOAA OER workshops in Texas, I am often asked if these materials are available in Spanish. Since nearly 50 percent of Texas public school students are Hispanic, it isn't surprising to hear teachers request Spanish language documents or materials for their classrooms. They share that these materials would greatly increase student access to and comfort with our valuable lessons and resources."

Spanish translations of the lessons can be found [here](#).

Standards-based Lesson

Creatures of Change (Grades 6-8 or 9-12)

The NOAA Ship *Okeanos Explorer* is currently investigating unknown and poorly known deep water areas in the Central Pacific Basin. This [expedition](#) will help investigate and map vulnerable marine habitats, as well as geologic features such as the young, active volcano named Vailulu'u near American Samoa that is undergoing rapid growth.

In this [lesson](#) students will create physical models that illustrate changes in Vailulu'u seamount topography over time, and use these models and other evidence to make inferences about the relationship between physical and biological components of Vailulu'u seamount ecosystems.

For more educational materials on seamounts and deep sea corals, including lessons, essays and multimedia resources, visit our [Seamounts Theme Page](#) and [Deep-sea Corals Theme Page](#).

Note: All lessons are written to support the [NGSS](#) and the [Ocean Literacy Essential Principles and Fundamental Concepts](#).



2017 American Samoa Expedition
Creatures of Change

Focus
Vailulu'u seamount ecosystems

Grade Level
6-8 or 9-12 (Life Science/Earth Science)

Focus Question
How do physical and chemical processes on Vailulu'u seamount affect empirical observations of living organisms in Vailulu'u ecosystems?

Learning Objective
• Students will create physical models that illustrate changes in Vailulu'u seamount topography over time, and use these models and other evidence to make inferences about the relationship between physical and biological components of Vailulu'u seamount ecosystems.

Materials

- Copies of *Vailulu'u Seamount Bathymetry*, one copy for each model layer (see Learning Procedure, Step 1c)
- Pieces of cardboard, 8.5 in x 11 in, 1/16-inch thick; one piece for each model layer
- Glue, preferably spray type used for mounting photographs
- Sharp scissors or X-Acto knives for cutting cardboard
- (Optional) copies of Levin *et al.* (2016), and/or Bernardino *et al.*, (2012), and/or Hsing (2010), and/or Cordes (2006); see Learning Procedure, Step 5

Audio-Visual Materials

- (Optional) Equipment to show images or video from 2017 American Samoa expedition website <http://oceanexplorer.noaa.gov/okeanos/explorations/ex1702/welcome.html>

Teaching Time
Two or three 45-minute class periods

Seating Arrangement
Groups of two to four students

Maximum Number of Students
30

lesson plan

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Image of the Month

Dumbo Octopus

Scientists observed this rare deep-sea octopod (*Grimpoteuthis* sp.) on the seafloor on March 22, 2017, during the [Discovering the Deep: Exploring Remote Pacific Marine Protected Areas](#) expedition.

This dumbo octopus uses its fins on either side of its head to gracefully propel itself through the water column. Watch this [video](#) to see how the



Scientists encountered this deep-sea octopus.
Image courtesy of the NOAA Office of Ocean Exploration and Research, Discovering the Deep: Exploring Remote Pacific MPAs.

octopus rests on the seafloor and then takes off, gliding through the water as if flying, propelled by the fins near its eyes. Through remotely operated vehicle video observations such as this, we can learn much about the animals in the deep sea and what they are up to.

Join Our May Expeditions LIVE as the NOAA Ship *Okeanos Explorer* Makes New Discoveries!

Mountains in the Deep: Exploring the Central Pacific Basin Expedition

During the [Mountains in the Deep: Exploring the Central Pacific Basin Expedition](#) from April 27 through May 19, 2017, the NOAA Ship *Okeanos Explorer* will investigate unknown and poorly known deep water areas in the Kingman Reef and Palmyra Atoll, and Jarvis Island Units of the Pacific Remote Islands Marine National Monument, around the Cook Islands Marine Park, and the high seas. The remotely operated vehicle, *Deep Discoverer*, will be traversing seamounts and atolls at depths between 250-6,000 m as we work to better understand the deep-sea habitats of the Central Pacific Basin.



The curly-cue shape is characteristic of this chrysogorgid octocoral, called Iridogorgia.

Image courtesy of the NOAA Office of Ocean Exploration and Research, Discovering the Deep: Exploring Remote Pacific MPAs.

You can watch the ROV *Deep Discoverer's* live video feeds on your computer [here](#). You can also download our free mobile app (for [iOS](#) or [Android](#) devices) that will allow you to bring the excitement of ocean discovery directly to your smart phone or tablet.

Visit our [website](#) to see exciting discoveries we have made thus far this year. An overview of the entire 2017 field season can be found [here](#).

Exploring the Sunken Heritage of Midway Atoll: Honoring the Legacy of the 75th Anniversary of the Battle of Midway Expedition

NOAA OER is funding the NOAA Ship *Hi'lalakai* during the [Exploring the Sunken Heritage of Midway Atoll expedition](#). Few places represent the legacy of World War II like Midway Atoll in Hawaii. Located within Papahānaumokuākea Marine National Monument and World Heritage Site, the sunken history left undiscovered at Midway represents the material remains of one of the most consequential events in the history of the Second World War. From May 2 through May 16, the Exploring the Sunken Heritage of Midway Atoll Expedition will explore sunken aircraft associated with the Battle of Midway, adding an important maritime heritage component to our understanding of the broader history of World War II in the Pacific.





The Remotely Operated Vehicle (ROV) pilot controls *Deep Discoverer's* grasping arm, while the co-pilot positions the main camera. *Image courtesy of William J. Clancey.*

How We Explore - A Look Behind the Curtain

On NOAA Ship *Okeanos Explorer*, the different roles and responsibilities, robotic equipment, software tools, and operating procedures constitute an "exploration system" that all come together during a dive to meet the science objectives of the dive.

In the Control Room, three Remotely Operated Vehicle (ROV) pilots are monitoring and controlling *Deep Discoverer* (D2) and *Seirios* thrusters and cameras, collaborating with the videographer who zooms, focuses, and adjusts brightness and contrast. Seated in the row behind the pilots, the two scientists on board (called "watch leads") are speaking on the telecon with scientists on shore, while responding to chat room "entries" and biology and geology identifications using a web browser tool.

During most of the dive, the scientists are conversing about what they are seeing, where they want to explore further, and what to sample. These interests are communicated by an internal intercom between the on-board scientists and the ROV pilot. The pilot is using D2's thrusters, positioning the ROV as well as its main camera at items of interest. He signals to the video operator when to "come in" or do a "partial" (zoom). This operation is seamless, with the pilots and videographer often knowing from experience what to focus on and for how long.

Read more about how we explore with the NOAA Ship *Okeanos Explorer* [here](#).



Educators discuss how they will implement ocean exploration lessons in their classrooms during a Group Planning session at the professional development workshop in Draper, Utah in March 2017. *Image courtesy of NOAA OER.*

Notes From the Field

On March 4th, 2017, OER held a Professional Development workshop at the Loveland Living Planet Aquarium in Draper, Utah. The workshop was attended by 26 educators from across the state and several Aquarium staff.

Melissa Halvorsen, Special Programs Coordinator at the Aquarium says: "Loveland Living Planet Aquarium was so excited to bring NOAA to Utah. We are a land-locked, desert state, but there is a surprising amount of interest in the ocean here. The teachers appreciated the materials and experience shared by the NOAA facilitator and they loved learning about the discoveries and potential opportunities deep sea exploration affords. Many of the educators were unfamiliar with all the free materials NOAA offers, and I have received feedback from many of them that they are already planning lessons around what they learned. We had a wonderful experience learning about the *Okeanos* and deep sea exploration, and we can't wait for NOAA's next visit to our state."

In a follow-up survey participants expressed how informative and enjoyable the workshop was: "The instruction from both the NOAA presenter and the education staff at the aquarium was excellent. I learned a great deal. This class has helped me become a more informed educator which in turn will help my students become better world citizens" said one teacher. Another teacher noted: "I have already used portions of the lessons and ideas from them in my classroom."

Upcoming Education Professional Development

NOAA OER holds Professional Development workshops for educators at 15 [alliance sites](#) across the country to help bring exploration-focused, standards-based tips and tools and the excitement and science of ocean exploration into classrooms.

If you want to learn about why and how we explore the deep ocean, please attend one of our free educator professional development workshops at an aquarium or science center near you!



Teachers measuring water pH and temperature during the Exploring the Deep Ocean with NOAA Professional Development workshop for educators at the Dauphin Island Sea Lab in Alabama in March 2017.

Image courtesy of Tina Miller-Way.

Upcoming workshops in May and June will be held in [California](#), [North Carolina at Fort Fisher](#), [North Carolina at Pine Knov Shores](#) and [Louisiana](#). The complete Spring/Summer 2017 [professional development schedule](#) for *Exploring the Deep Ocean with NOAA* is posted on our website.

Note: *This workshop is a combination of the previously offered Why Do We Explore? and How Do We Explore? workshops.*

We hope that these Exploration Education Highlights will help you focus more of your classroom teaching and learning on the amazing discoveries taking place right here, right now, on our own Planet Ocean! Onward and downward!

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