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Research

The New BOBSled Underwater Camera System Records High-Definition Video of the Seafloor

By Gerald Hatcher, Jonathan Warrick, and Ann Gibbs

A new underwater high-definition (HD) video camera system produced by the U.S. Geological Survey (USGS) made its debut this year, collecting more than 6 hours of HD video footage during field activities in February and March 2013. The Benthic OBservation Sled, or BOBSled, was developed at the Marine Facility of the USGS Pacific Coastal and Marine Science Center in Santa Cruz, California, by ocean engineer **Gerald Hatcher**.

"Benthic" refers to the seafloor, the object of the new system's imaging capabilities. The BOBSled's broadcast-quality HD video of the seafloor allows scientists to observe and identify organisms living there and to ground-truth maps of seafloor materials—such as mud, sand, and boulders.

Seafloor maps are made remotely by interpreting sonar (sound) signals that are

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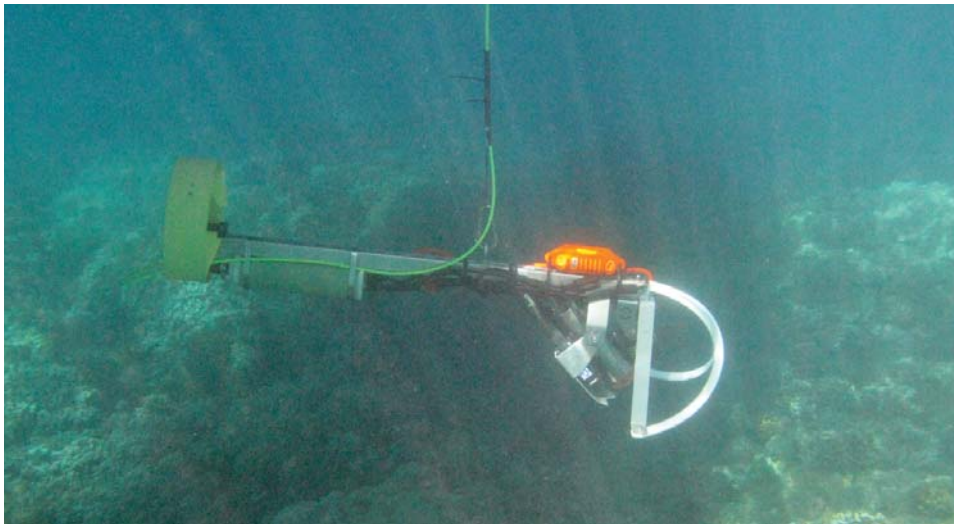
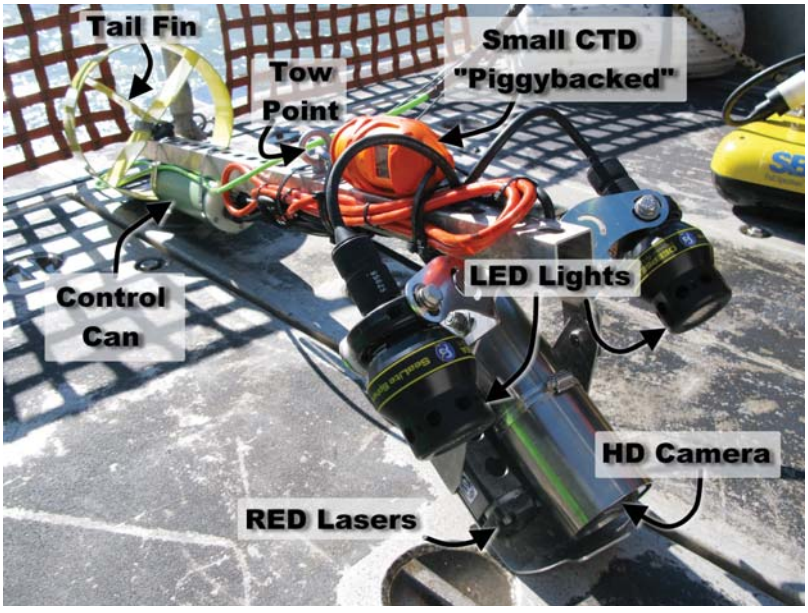


BOBSled suspended by its tow cable. The tow cable has one single-mode fiber-optic line for video transmission, eight conductors for system power and control, a Kevlar layer for strength, and a urethane jacket for abrasion resistance and water exclusion. This photograph shows the system with its removable nylon front bumper installed and an orange, self-contained CTD (for measuring conductivity [related to salinity], temperature, and depth) zip-tied to the framework just forward of the tow point. Excluding the front bumper, the BOBSled is 1.2 meter (4 feet) long.



BOBSled with its major components labeled. The system collects high-definition (HD) video images of seafloor as deep as 100 meters and is easily hand deployed from a small boat. The video imagery is viewed and recorded in real time at the surface. The CTD (orange) is an extra instrument "piggybacked" on the BOBSled to measure conductivity (C, related to salinity), temperature (T), and depth (D). The tow point is the attachment point for the tow cable, which contains components for transmitting power and commands to the BOBSled and video signals to the surface. The "control can" sorts out signals from the tow cable, sending them to and from appropriate instruments. The tail fin helps the assembly track smoothly through the water. Red lasers create two red dots 10 centimeters (nearly 4 inches) apart in the video image to provide scale. LED, light-emitting diode.

Sound Waves

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Publications: When new publications or products are released, please notify the editor with a full reference and a bulleted summary or description.
Images: Please submit all images at publication size (column, 2-column, or page width). Resolution of 200 to 300 dpi (dots per inch) is best. Adobe Illustrator© files or EPS files work well with vector files (such as graphs or diagrams). TIFF and JPEG files work well with raster files (photographs or rasterized vector files).

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Research, continued

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Frame capture from HD video recorded by BOBSled off the Hawaiian island of Maui in the Olowalu area on February 12, 2013. The sea turtle's shell is approximately 1 meter (3 feet) long. See the full-resolution image at ***http://soundwaves.usgs.gov/2013/06/images/BOB_OlowaluTurtle-fullres.jpg****. View a video clip at* ***http://soundwaves.usgs.gov/2013/06/index.html#bobsled-olowalu****.*

bounced off the bottom and—in shallow areas where the water is clear—by incorporating data from aerial and satellite imagery and using lidar (light detection and ranging) to survey the bottom with pulses of laser light. The value of such maps is greatly enhanced by the close-up visual data in seafloor video footage. (Read about other USGS seafloor-imaging activities in "State and Federal Agencies Partner for a Second Year of Seafloor Sampling off Massachusetts" <**http://soundwaves.usgs.gov/2013/06/fieldwork.html**> and "Sea Turtles Benefiting from Protected Areas" <**http://soundwaves.usgs.gov/2013/06/research2.html**>, both in this issue.)

BOBSled has a single camera module housed in a titanium case with a wide-angle acrylic viewport, two 150-watt LED (light-emitting diode) lights, and a pair of lasers aligned to create two red dots 10 centimeters apart in the video image to provide scale. All camera functions, including zoom, white balance, aperture, and video resolution, are adjustable from the surface and in real time during video collection. The towed assembly, or "fish," is connected to the vessel by a 100-meter waterproof cable containing standard conductors for data and power transmission and a single fiber-optic line for the HD video signal. The cable is reinforced with a Kevlar layer for strength and a urethane jacket for water tightness and abrasion resistance. After transmission to the surface, the video is recorded to compact flash-memory cards that are "hot swappable" (they can be replaced without shutting down the computer system), thus creating a robust, solid-state, tapeless workflow. Its moderate size and weight allow the BOBSled to be deployed by hand from a small boat. Its cable length constrains its operation to water depths of 100 meters or less.

By April 2013, scientists from the USGS Pacific Coastal and Marine Science Center had used the new camera system to collect approximately 6 hours (nearly 400 gigabytes) of HD video footage during two field activities. In February 2013, they deployed the system in Hawai'i from a 31-foot sport-fishing boat, the *Alyce C.*, owned and operated by **Joe Reich** out of Moloka'i. Video footage was collected to ground-truth maps of benthic (seafloor) habitat and to evaluate the condition, species diversity, and percentage of coral coverage on reefs near the islands of Lana'i, Kaho'olawe, and Maui. In March 2013, the BOBSled was deployed from the 34-foot USGS research vessel *Parke*

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Frame capture from HD video recorded by BOBSled on the west side of the Elwah River delta in the Strait of Juan de Fuca, Washington, on March 8, 2013. Piece of wood at bottom center is about 3 centimeters (slightly more than 1 inch) long. See the full-resolution image at ***http://soundwaves.usgs.gov/2013/06/images/BOB_ElwahDeltaII-fullres.jpg****. View a video clip at* ***http://soundwaves.usgs.gov/2013/06/index.html#bobsled-elwah****.*

Snavely in the Strait of Juan de Fuca to image the seafloor around the mouth of the Elwah River, Washington. This imaging was part of a multiyear research project to monitor the release of material into the Strait of Juan de Fuca by the removal of two sediment-choked dams upstream (**http://www.usgs.gov/elwha/**).

Both field activities demonstrated the high quality of BOBSled's video output. Sample video clips can be viewed at **http://soundwaves.usgs.gov/2013/06/research.html**. The new system can record video footage at up to 1080i/59.94 full raster (1920x1080 pixels), 4:2:2 color, and a bit rate of 280 megabits per second—parameters that produce broadcast quality (or better) output. Each video frame is stamped with a time code synchronized with Global Positioning System (GPS) time, allowing other time-stamped data, such as navigational data, to be associated with the video on a frame-by-frame basis.

BOBSled's ability to record at a high bit rate enables relatively low compression (the selective removal of data to reduce file size) to be applied to the individual video frames, thus greatly improving the quality of still images captured from the video. For comparison, a contemporary Blue-Ray DVD's HD video stream is transmitted with a bit rate of approximately 30 megabits per second, considerably less than the 280 megabits per second that the BOBSled can record, or even the 100 megabits per second typically employed by BOBSled's users to keep datasets at a manageable size. Because of the human eye's ability to integrate images as they flash by at high speed, the Blue-Ray motion video can appear beautifully sharp, but compression artifacts (distortions of the image caused by compression) become obvious when such video is viewed frame by frame. This is especially true if the video contains a complicated scene with moving objects. The new BOBSled system can record video at a high bit rate if users want to extract high-resolution still images, but it can also record at a much lower bit rate if storage space is of greater concern.

BOBSled is a spin-off from the development, currently underway, of a system for recording HD video of seafloor as deep as 1,000 meters. The deepwater "Big BOBSled" will use two HD camera assemblies identical to the one mounted on BOBSled, and it will have the additional capacity to support a suite of oceanographic sensors and instruments that can be chosen to address specific experimental goals. Big BOBSled is scheduled for its first deployment in fiscal year 2014 (which begins October 1, 2013). Stay tuned!

Sea Turtles Benefiting from Protected Areas—Study Offers First Look at Green Sea Turtle Habitat Use in the Dry Tortugas, Florida

By Kristen Hart, David Zawada, and Rachel Pawlitz

Nesting green sea turtles are benefiting from marine protected areas by using habitats found within their boundaries, according to a U.S. Geological Survey (USGS) study that is the first to track the federally protected turtles in Dry Tortugas National Park, about 110 kilometers (70 miles) west of Key West, Florida.

Green sea turtles (*Chelonia mydas*) are listed as endangered in Florida and threatened throughout the rest of their range, and the habits of green sea turtles after their forays to nest on beaches in the southeastern United States have long remained a mystery. Until now, it was not clear whether the turtles made use of existing protected areas, and few details were available as to whether these areas are suitable for supporting the green sea turtle's survival.

USGS researchers confirmed the turtles' use of the protected areas by tracking nesting turtles with satellite tags and analyzing their movement patterns after they left beaches.

"Our goal was to better understand what types of habitats they used at sea and whether they were in fact putting these designated areas to use. This study not

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only shows managers that these designated protected areas are already being used by turtles, but provides insight into the types of habitats they use most," said the study's lead author, **Kristen Hart**, a research ecologist based at the USGS Southeast Ecological Science Center's field office in Davie, Florida.

Hart's team made the discovery by fitting green sea turtle mothers with satellite tags after they came onto beaches within Dry Tortugas National Park to nest. After tracking their movements and analyzing their time at sea, the team located the areas that turtles used between their nesting events and determined where turtles traveled after the nesting season was over.

They found green sea turtles spending much of their time in protected sites within both Dry Tortugas National Park and the surrounding areas of the Florida Keys National Marine Sanctuary.

"We were thrilled to find that these turtles used some areas already under 'protected' status. The ultimate goal is to help managers understand where these endangered turtles are spending their time, both during the breeding period and then when they are at feeding areas. Given that worldwide declines in seagrasses—one of the most important habitats they rely on for food—has already been documented, this type of data is critical for managers," said Hart.

*Green sea turtle fitted with a USGS satellite tag on Loggerhead Key, Dry Tortugas National Park, Florida. Note: All marine turtle images taken in Florida were obtained with the approval of the U.S. Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWC), FWC Marine Turtle Permit 176 issued to **K.M. Hart**, USGS, under conditions not harmful to this or other turtles. USGS photograph taken May 23, 2011, by **Kaare Iverson**.*

To learn about the turtles' habitat needs during the nesting season, the team collected more than 195,000 georeferenced seafloor images with the Along Track Reef Imaging System (ATRIS; **http://soundwaves.usgs.gov/2010/08/research.html**), an underwater camera system developed by the USGS. Researchers surveyed the areas frequented by turtles within Dry Tortugas National Park by photographing the seafloor in a series of parallel lines totaling 70 kilometers (more than 43 miles). Using a habitat map derived from those images, they found that the turtles most commonly used shallow seagrass beds and degraded coral reefs that have been overgrown by a mixed assemblage of other organisms, such as sea fans, sponges, and fire coral.

"Our synergistic approach of combining satellite telemetry data with an extensive habitat map proved to be an effective way to find out exactly what habitats these nesting turtles were using in the park," said **Dave Zawada**, a research oceanographer at the USGS St. Petersburg Coastal and Marine Science Center in St. Petersburg, Florida, and co-author of the study.

The Dry Tortugas' population made shorter migrations than those typically seen among other green sea turtle populations around the world; this was only the

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*USGS biologists (left to right) **Jeff Beauchamp**, **Thomas Shelby**, and **Kristen Hart** prepare to release a green sea turtle fitted with a satellite tag in the waters of Dry Tortugas National Park, Florida. Note: All marine turtle images taken in Florida were obtained with the approval of the U.S. Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWC) under conditions not harmful to this or other turtles. The activity depicted was conducted pursuant to National Marine Fisheries Service Endangered Species Permit No. 13307-04 (issued to **K.M. Hart**, USGS) and FWC Marine Turtle Permit No. 176 (issued to **K.M. Hart**, USGS). USGS photograph taken July 7, 2012, by **Andrew Crowder**.*

*A green sea turtle (about 80 centimeters [2.5 feet] long) is caught by the georeferenced USGS ATRIS (Along Track Reef Imaging System; **http://ngom.usgs.gov/dsp/tech/deep_atris/**) camera system while swimming over seagrass habitat at a depth of about 8 meters (25 feet) near Hospital Key in Dry Tortugas National Park, Florida. USGS photograph taken June 7, 2009; provided by **Dave Zawada**.*

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second published study showing green sea turtles taking up residence at feeding grounds located quite near their breeding grounds.

"We hope to keep pushing the frontier of what is known about in-water sea turtle habitat use, as this type of scientific information is vital for understanding whether conservation measures are effective," said Hart.

The results of the study were published in the May 2013 issue of the journal *Biological Conservation*. The full citation is: Hart, K.M., Zawada, D.G., Fujisaki, I., and Lidz, B.H., 2013, Habitat use of breeding green turtles *Chelonia mydas* tagged in Dry Tortugas National Park—Making use of local and regional MPAs: Biological Conservation, v. 161, p. 142–154, doi:10.1016/j.biocon.2013.03.019 <**http://dx.doi.org/10.1016/j.biocon.2013.03.019**>.

*Green sea turtle, sporting a USGS satellite tag, swims the waters of Dry Tortugas National Park, Florida. Note: All marine turtle images taken in Florida were obtained with the approval of the U.S. Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWC) under conditions not harmful to this or other turtles. The activity depicted was conducted pursuant to National Marine Fisheries Service Endangered Species Permit No. 13307-04 (issued to **K.M. Hart**, USGS) and FWC Marine Turtle Permit No. 176 (issued to **K.M. Hart**, USGS). USGS photograph taken July 7, 2012, by **Andrew Crowder**.*

About Green Sea Turtles

Although their young feed on jellyfish and other invertebrates, adult green sea turtles feed on seagrasses and algae, making them the only herbivorous (vegetarian) species of sea turtle. In fact, their name comes from their greenish-colored fat, believed to result from their diet.

Green sea turtles are found around the world in three main types of habitat: nesting beaches, open ocean, and shallow water, such as lagoons and shoals where they feed on marine grasses and algae found on the seafloor ("benthic" habitat). Within the United States, green sea turtles are found from North Carolina to Florida, Hawai'i, and the Virgin Islands and Puerto Rico. Their breeding populations in Florida are listed as endangered; all other populations are listed as threatened.

The nesting season for green sea turtles lasts throughout the summer but is most concentrated in June and July. During nesting season, females nest at roughly 2-week intervals, producing an average of five nests or "clutches." Each clutch contains an average of 135 eggs, which will hatch after incubating for about 2 months.

State and Federal Agencies Partner for a Second Year of Seafloor Sampling off Massachusetts—Results Will Refine Maps Used in Research and Resource Management

By Seth Ackerman

In August 2012, U.S. Geological Survey (USGS) researchers rejoined scientists and staff from their partner agencies for a second year of collecting seafloor photographs, bottom video, and sediment samples off Massachusetts. These data are being used to identify bottom types—such as bedrock, gravel, sand, or mud—and organisms living on the seafloor and in the sediment. They expand a similar dataset collected in September 2011 (**http://soundwaves.usgs.gov/2012/02/fieldwork3.html**).

The multiagency sampling survey was part of the ongoing Massachusetts Seafloor Mapping Cooperative project (**http://woodshole.er.usgs.gov/project-pages/coastal_mass/**), an effort initiated in 2003 by the USGS and the Massachusetts Office of Coastal Zone Management (CZM). The National Oceanic and Atmospheric Administration (NOAA) is also an important partner and contributes hydrographic data that are integrated into the maps. The overall goal of this cooperative is to determine the geologic framework of the seafloor inside the 3-mile limit of State waters by using high-resolu-

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***Regina Lyons** (U.S. Environmental Protection Agency, left) and **Emily Huntley** (Massachusetts Office of Coastal Zone Management) deploying the SEABOSS sampler. Photograph by **Dann Blackwood**, USGS.*

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tion seafloor-mapping techniques, sediment sampling, and seafloor photography.

The resulting maps help scientists understand the processes that have shaped the coast and how it has evolved over time, and thereby help them evaluate the vulnerability of coastal environments to storms, sea-level rise, and long-term climate change. Accurate maps that depict the distribution of bottom types on the inner shelf provide scientific guidance for identifying sensitive areas and for appropriately siting offshore development such as sand mining, pipelines, and renewable energy projects.

The seafloor-mapping phase of the project (**http://soundwaves.usgs.gov/2012/02/fieldwork2.html**) has been extended for several more years; new mapping began in May 2013 on the south side of Martha's Vineyard. Last summer's sampling survey was part of the ground-truthing phase, in which researchers sample the seafloor to better understand biological communities and habitat, as well as to refine the mapping-phase products.

Dann Blackwood, **Marinna Martini**, **Katherine Yee**, and **Seth Ackerman**, all from the USGS Woods Hole Coastal and Marine Science Center (WHSC) in Woods Hole, Massachusetts, joined scientists and staff from the CZM, the U.S. Environmental Protection Agency (EPA), the Massachusetts Bays Program, the Massachusetts Division of Marine Fisheries (DMF), and the Massachusetts Department of Environmental Protection (DEP) for the 7-day survey (August 21–27, 2012) in the coastal waters of Massachusetts. Working aboard the ocean survey vessel (OSV) *Bold* (**http://www.epa.gov/bold/**), a 224-foot ocean and coastal monitoring vessel operated by the EPA, they collected samples in Boston Harbor, Massachusetts Bay, and north along the north shore of coastal Massachusetts to the New Hampshire border.

The research team used the SEABed Observation and Sampling System (SEABOSS) to survey approximately 350 sites chosen by the CZM and USGS scientists. Developed at the USGS, the SEABOSS incorporates high-resolution digital still and video cameras with a modified Van Veen sediment grab sampler

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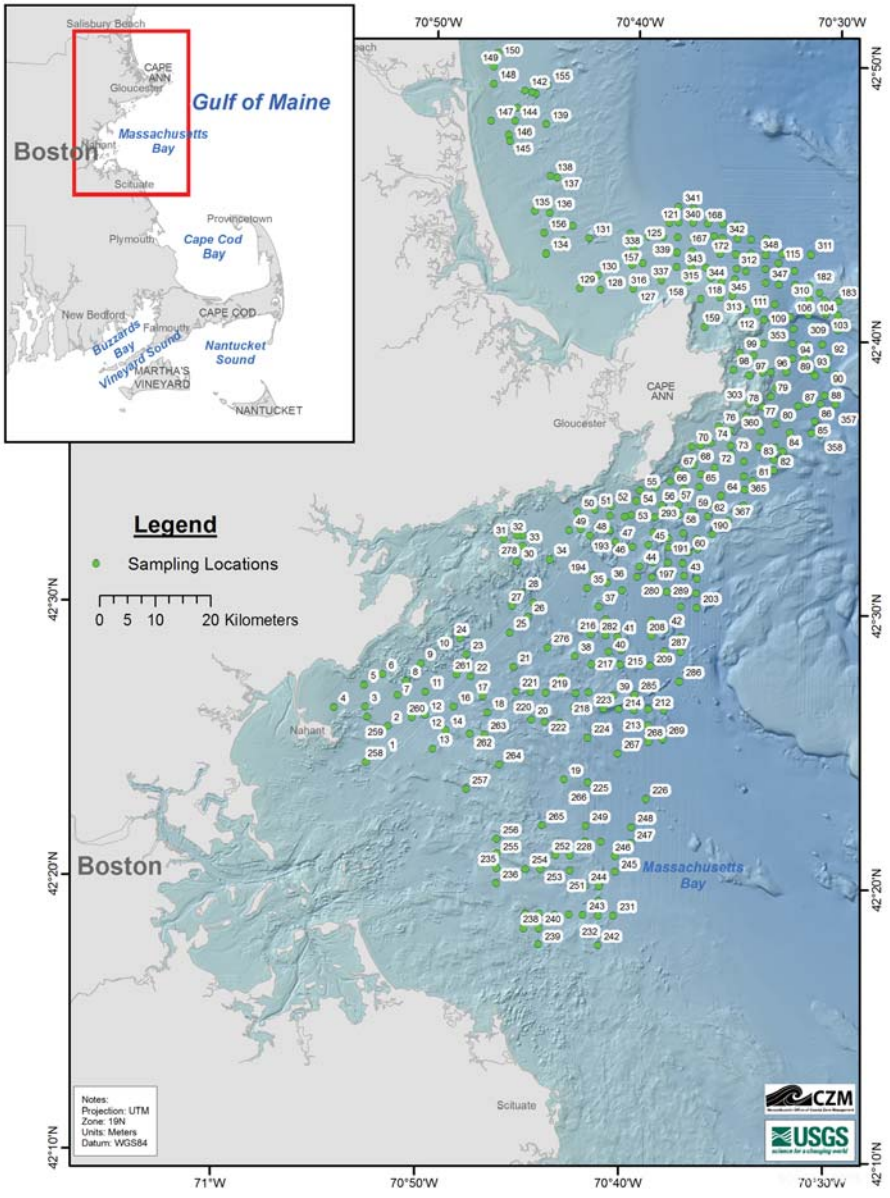
The SEABOSS sampler on the aft deck of the ocean survey vessel (OSV) Bold *as the ship leaves Boston. Photograph by* ***Dann Blackwood****, USGS.*



Study area off Massachusetts, showing locations of approximately 350 sampling sites where seafloor photographs, bottom video, and sediment samples were collected.

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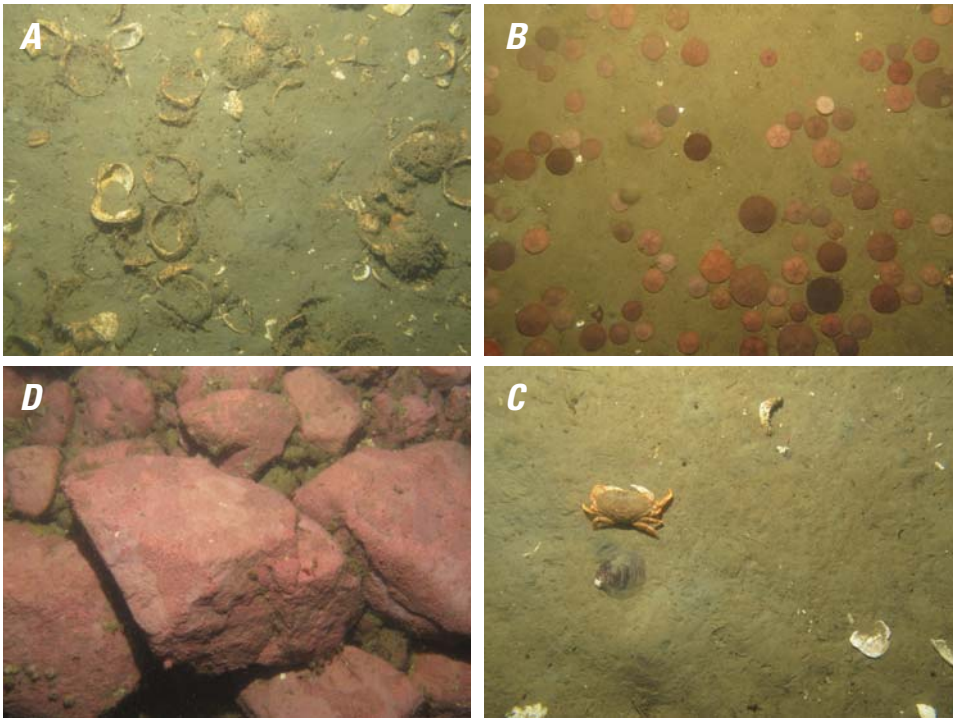
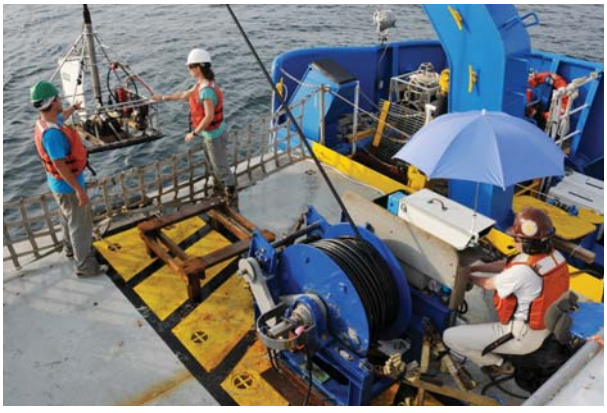


Four (of more than two thousand) seafloor photographs taken by the SEABOSS during the August 2012 survey aboard the OSV Bold. *Area shown in each photograph is approximately 50 to 70 centimeters (20 to 30 inches) across. Some of the organisms visible in these images are: A, clam shells, B, sand dollars (*Echinarachnius parma*), C, Atlantic rock crab (*Cancer irroratus*) and clam shells, and D, organisms attached to angular cobbles: pink crustose ("bubblegum") algae, barnacles, and chitons (*Tonicella *sp. [one small chiton is below center of photograph]). Identification of these organisms (and many more too small to see at publication scale) courtesy of* ***Adrienne Pappal,*** *Massachusetts Office of Coastal Zone Management.*

(see **http://woodshole.er.usgs.gov/operations/sfmapping/seaboss.htm**) to allow scientists to view the seafloor in real time aboard the ship, manually trigger the still camera, and collect sediment grab samples. After a few minutes of drifting over the seabed, the SEABOSS is lowered to the seafloor, and a sediment sample is taken. (Sample grabs are not attempted in rocky areas.) Downward-looking video is recorded to DVD and digital tape during each deployment. Upon retrieval of the SEABOSS on deck, a sediment grab subsample is collected and stored for postcruise analysis at the WHSC sediment lab. On the OSV *Bold* cruise, additional subsamples were collected from the grab sampler at approximately 210 sites to be postprocessed for analysis of benthic fauna (animals living on and in the seafloor sediment) by CZM.



Left to right: ***Mike Bastoni*** *(volunteer) and* ***Lisa Engler*** *(Massachusetts Bays Program) deploying the SEABOSS sampler from the OSV* Bold, *with* ***Marinna Martini*** *(USGS) running the winch. Photograph by* ***Dann Blackwood****, USGS.*

USGS researchers worked on the *Bold* with **Bob Boeri**, **Marc Carullo**, **Emily Huntley**, **Chris Garby**, **Julia Knisel**, **Brendan Sprague** (all from the CZM); **Lisa Engler** (Massachusetts Bays Program); **Tay Evans** and **Steve Voss** (both from the DMF); **Marcel Belaval**, **Regina Lyons**, and **Stephen Perkins** (all from the EPA); **Jim Sprague** and **Alex Strysky** (both from the DEP); and **Mike Bastoni** (volunteer). **Bob Barton** (USGS) was a tremendous help during the precruise mobilization and postcruise demobilization in Boston. We also owe a great debt of gratitude to the ship's crew, who once again kept survey operations running smoothly and made sure we were safe, dry, and well fed during the cruise.

The successful sampling survey was a great opportunity for State and Federal agencies to work cooperatively toward understanding the marine environment of coastal Massachusetts. Results from this research cruise will be used to create and refine maps showing the characteristics of the seafloor, identify coastal and marine resources, and assist agencies in siting and permitting coastal-zone projects. This work will contribute to the goals established in the 2009 Massachusetts Ocean Management Plan (**http://www.mass.gov/eea/ocean-coastal-management/mass-ocean-plan/final-massachusetts-ocean-management-plan.html**) by providing data for efficient and comprehensive coastal and marine spatial planning and ecosystem-based management of the coastal ocean.

Science crew of the August 2012 sampling survey aboard the OSV Bold. *Photograph by* ***Bob Boeri****, Massachusetts Office of Coastal Zone Management.*

Life in the Abyss

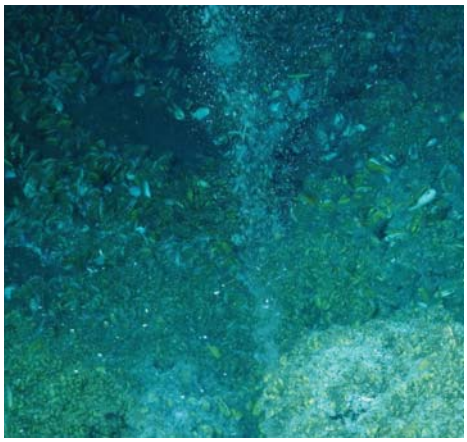
By Rachel Pawlitz

[Reprinted from USGS Science Features: Top Story at **http://www.usgs.gov/blogs/features/usgs_top_story/life-in-the-abyss/**]

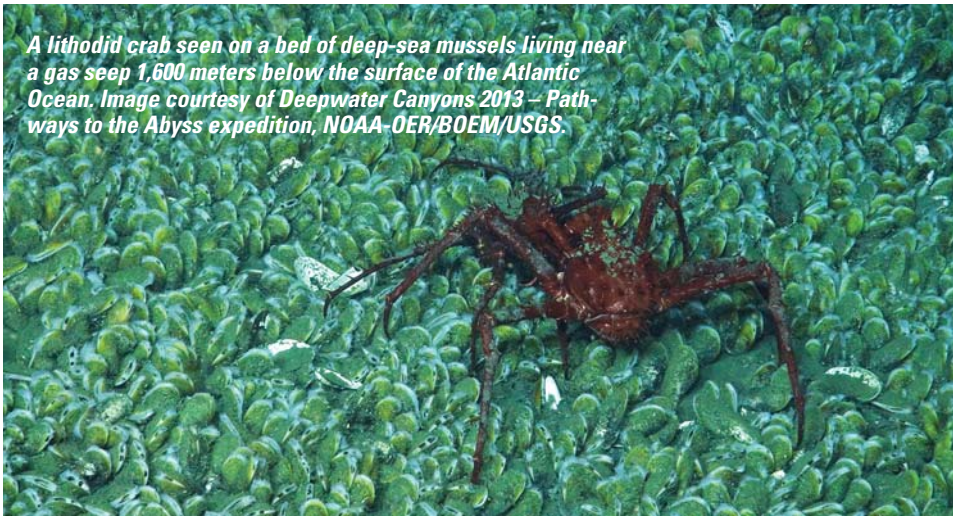
It was the broad extent of mussels covering the seafloor that immediately struck scientists as remarkable. A bright orange crab scuttled over the bed of mussels, and a rockling fish rested in a small crevice between clusters of shells. Nearby, seep-associated shrimps (alvinocarids) swam around the actively venting and bubbling methane at several crevices and cracks in the seafloor.

This was the scene first glimpsed by humans on May 8, 2013, at one of only a few gas seeps known to exist on the U.S. Atlantic outer continental shelf north of Cape Hatteras. Roughly a mile below the ocean surface, the seep is located just south of Norfolk Canyon, one of several deepwater canyons found about 70 miles or more east of Virginia and Maryland. Scientists encountered it while on an expedition aboard the National Oceanic and Atmospheric Administration (NOAA) Ship *Ronald H. Brown*, as they explored the floor of the canyon with Woods Hole Oceanographic Institute's remotely operated vehicle (ROV) named *Jason 2*.

The team was working on Deepwater Atlantic Canyons, a project jointly funded by the U.S. Geological Survey (USGS), Bureau of Ocean Energy Management (BOEM), and NOAA. They decided to search out this location after the NOAA Ship *Okeanos Explorer* mapped the seafloor in the vicinity of Norfolk Canyon last November with multibeam sonar. Sonar is used to identify possible hard-bottom habitats, which are often "hotspots" of deep-sea life. At this site, a trail of continuous bubbles rising from the seafloor to the ocean surface provided a tell-tale sign of a gas seep (**http://www.noaanews.noaa.gov/stories2012/20121219_gas_seeps.html**) and raised questions about whether it supported a living community.



Methane gas bubbles rise from the seafloor—this type of activity, originally noticed by NOAA Ship Okeanos Explorer *in 2012 on a multibeam sonar survey, is what led scientists to the area. Image courtesy of Deepwater Canyons 2013 – Pathways to the Abyss expedition, NOAA Office of Exploration (NOAA-OER)/Bureau of Ocean Energy Management (BOEM)/USGS.*



A lithodid crab seen on a bed of deep-sea mussels living near a gas seep 1,600 meters below the surface of the Atlantic Ocean. Image courtesy of Deepwater Canyons 2013 – Pathways to the Abyss expedition, NOAA-OER/BOEM/USGS.

A vast new community

Visually, the community was dominated by *Bathymodiolus* mussels (**https://deepwatercanyons.wordpress.com/2013/05/18/mussel-identification-or-a-bathymodiolin-mussel-by-any-name/**), a type of mussel known from cold seeps and hydrothermal vents that harbor symbiotic bacteria in their gills that convert seeping chemicals to food. These bacteria were so dense they formed "mats"—a dense, dull gray carpet visible amongst the mussels. The clusters of *Bathymodiolus* mussels included different sizes, suggesting there may be both adults and juveniles present. The full spatial extent of the community has not been estimated, but initial observations suggest it is among the largest known cold seep-supported communities in U.S. waters.

At cold seeps, fluids and gases such as methane are emitted from the seafloor. Not all gas seeps support living communities, making the May 8th discovery a novel find. Unlike familiar terrestrial food webs based on the sun's energy, seeps can support food webs based on chemical energy—known as "chemosynthetic" communities. To investigate this one, scientists collected samples of the mussels and smaller animals on the seafloor, as well as the long filaments of bacteria attached to them. In two dives with the ROV, they collected samples from active and inactive areas of the seep region—including water samples, living and dead mussel shells, bacterial mats, and invertebrates. They are still sorting and identifying the samples, and it is not yet clear whether all these species are known to science.

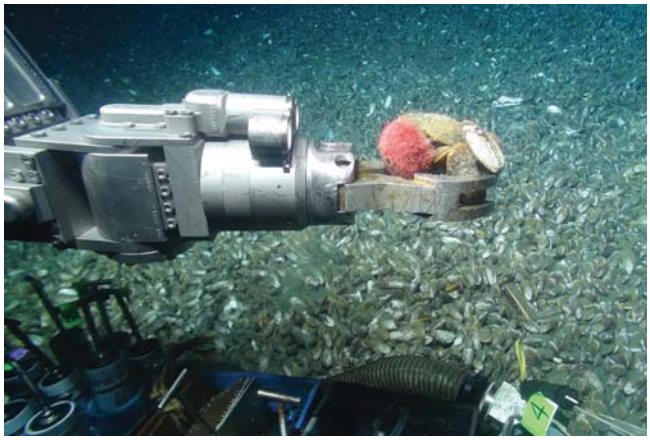
Scientists also took cores of nearby mud, which hosts small, hard-to-see invertebrate animals that are an important part of deep-sea food chains, to conduct tests that help them link different parts of the food web together. Next, researchers trawled nearby for fish and other life forms that live in proximity to the seep site. The data will help them piece together the site's food web and test the extent to which methane, sulfur, and other energy

(Life in the Abyss continued on page 9)

(Life in the Abyss continued from page 8)

sources support life in and around the seep.

Several species known from other cold seeps appear to be absent. Missing from view were the large tubeworm colonies and deep-sea clams (vesicomyids) known to occur at other seeps, including Atlantic seeps found in even deeper water offshore of the Carolinas at Cape Fear and Blake Ridge Diapirs. Microbial life at this seep site may also differ as much as the more visible life forms. Preliminary analysis of samples collected last summer from nearby Baltimore Canyon suggests that the bacterial mats of Atlantic deep-water canyon seeps may be different from those found in the Gulf of Mexico.



Remotely operated vehicle Jason 2 *sampling a sea urchin in a deep-sea mussel community found near a gas seep on the U.S. outer continental shelf. Image courtesy of Deepwater Canyons 2013 – Pathways to the Abyss expedition, NOAA-OER/BOEM/USGS.*

Mile-deep mission

The May 2013 expedition—dubbed "Pathways to the Abyss"—included a multi-organizational science team. The team included researchers from BOEM; NOAA; USGS; University of North Carolina at Wilmington; Florida State University; CSA Ocean Sciences, Inc.; Woods Hole Oceanographic Institution; Texas A&M University; Netherlands Institute of Sea Research; Oregon Institute of Marine Biology; University of Rhode Island; University of Louisiana at Lafayette; and Bangor University.

National Oceanic and Atmospheric Administration (NOAA) Ship Ronald H. Brown. *Image courtesy of* ***Walt Gurley****, Deepwater Canyons 2013 Expedition, NOAA-OER/BOEM/USGS. (From* ***http://deepwatercanyons.wordpress.com/****)*

Most of the team members (see list at **http://oceanexplorer.noaa.gov/explorations/13midatlantic/background/explorers/explorers.html**) have worked on deep-sea ecosystems in the Gulf of Mexico (**http://pubs.usgs.gov/of/2012/1032/**), where their partnership won them an award from the National Ocean Partnership Program (**http://soundwaves.usgs.gov/2012/12/awards.html**). Collaboration is an important way to lower the costs of such challenging scientific discoveries—challenges so difficult they have been compared to space exploration—by allowing scientists to leverage resources and skills. They also share intimately in the process of scientific discovery with complementary scientific expertise. Scientists on board oversee separate, yet closely intertwined, studies that enable them to piece together the complex ecology of these unique deep-sea chemosynthetic ecosystems from the jigsaw puzzle of individual research questions.

The USGS mission on this expedition is to advance understanding of the Nation's deep-sea ecosystems—including the mysterious new community found this month. Four USGS scientists—**Amanda Demopoulos**, **Christina Kellogg**, **Cheryl Morrison**, and **Nancy Prouty**—are heading up projects on this expedition looking at life in sediments, food-web connectivity, microbial ecology (**http://pubs.usgs.gov/fs/2011/3102/**), genetic connectivity, and paleobiology.

By comparing the communities from the recent discovery to other seeps, scientists will be able to place this new community into a broader ecological context. Bacterial mats and sediments can all provide important information about the source of energy in these food webs. Mussel shells can be used to analyze how past environmental conditions and energy sources have changed or fluctuated over time, while their soft tissues can be used to genetically identify species and their bacterial symbionts. One critical question is whether—and how—they are related to those found elsewhere in the Atlantic and Gulf of Mexico. These studies will strengthen our understanding of how life in these communities survives, reproduces, disperses, and interacts with other communities in the deep sea. This provides information on their sustainability and resilience to disturbances that can be used by decision-makers to develop future policies for their management.

Read daily logs from the expedition at these two websites:
http://oceanexplorer.noaa.gov/explorations/13midatlantic/
http://deepwatercanyons.wordpress.com/ ❁

[The expedition team observed a fascinating array of deep-sea creatures and communities, many of them described in the logs cited above. One of those logs is reprinted in this issue, in the article "Coral Gardens: Forests of the Deep, Mission Log, May 11, 2013," **http://soundwaves.usgs.gov/2013/06/fieldwork3.html**.]

Coral Gardens: Forests of the Deep

Mission Log, May 11, 2013

Cheryl Morrison Research Geneticist
U.S. Geological Survey

Nancy Prouty Research Oceanographer
U.S. Geological Survey

Brendan Roark Assistant Professor
Texas A&M University

From April 30 to May 27, 2013, scientists from the U.S. Geological Survey (USGS) DISCOVRE team (**http://fl.biology.usgs.gov/DISCOVRE/**) worked with colleagues from other organizations in the Deepwater Canyons 2013: Pathways to the Abyss expedition aboard the National Oceanic and Atmospheric Administration (NOAA) Ship *Ronald H. Brown*. Using the Woods Hole Oceanographic Institution's remotely operated vehicle (ROV) *Jason 2*, they investigated the ecology of deepwater canyons off the U.S. mid-Atlantic coast. Little is known about life in the canyons, which are pathways for nutrients, sediments, and pollutants from the continental shelf to the deep sea. A high point of the expedition was the discovery of a new chemosynthetic community at a seafloor gas seep (see "Life in the Abyss," this issue, **http://soundwaves.usgs.gov/2013/06/fieldwork2.html**), but the team observed other intriguing things as well, such as the "coral gardens" described in the May 11 log, reprinted here with additional photographs. This log originally appeared on the NOAA Ocean Explorer website at **http://oceanexplorer.noaa.gov/explorations/13midatlantic/logs/logs.html**.

Two octocoral (sea fan) species we see often in the mid-Atlantic canyons are *Paragorgia arborea* (a.k.a. bubblegum coral) and *Primnoa resedaeformis* (red tree coral). These species are some of the largest and most widely distributed of the deep-sea octocoral species. When they occur in high densities, they are often referred to as "coral gardens."

These gardens rival flower gardens in terms of color and beauty! Colonies of *Primnoa* have a bushy shape, can be up to a meter in height, and are orange in color. *Paragorgia* colonies are often larger (up to 3 meters tall), have a concave fan-shape, and range in color from red to salmon-pink to white.

Although it may not seem like it at first glance, there are many parallels between coral gardens like those we're seeing in the canyons and terrestrial forests. The corals create habitat that is utilized by other organisms; they have slow growth rates that, in some cases, can be measured by counting rings in a cross-section of their skeletons; and they can live for hundreds of years!

Foundation Species

Like trees in the forest, corals are a foundation species, creating three-dimensional habitat that other organisms call home. In other words, these deep-sea corals are ecosystem engineers since they create the structure that an entire ecosystem relies upon, therefore concentrating and enhancing biodiversity.

*Close-up of a crinoid attached to bubblegum coral (*Paragorgia*). The coral's polyps are extended in feeding position. Both animals capture small organisms and organic matter in the water column as it drifts by. Image courtesy of Deepwater Canyons 2013 – Pathways to the Abyss, NOAA Office of Exploration (NOAA-OER)/Bureau of Ocean Energy Management (BOEM)/USGS.*

We see brittle starfish of many types; crustaceans such as shrimps, copepods, amphipods, ostracods and barnacles; anemones; and polychaete worms, just to name a few. Fishes are also attracted to the habitat created by deep-sea corals, and in some cases, fishes rely on the corals for part of their reproductive cycle. For example, catsharks commonly lay egg cases on the branches of *Paragorgia* and other octocorals.

Longevity

Large forest trees are hundreds of years old. We know this because we can count annual growth rings in cross-sections of tree trunks. Deep-sea corals can also be hundreds of years old. In fact, some coral species can be as old as the oldest known trees, the bristlecone pines. For example, a black coral species, *Leiopathes*, has been aged at over 4,000 years, making them the longest-lived marine organism known.

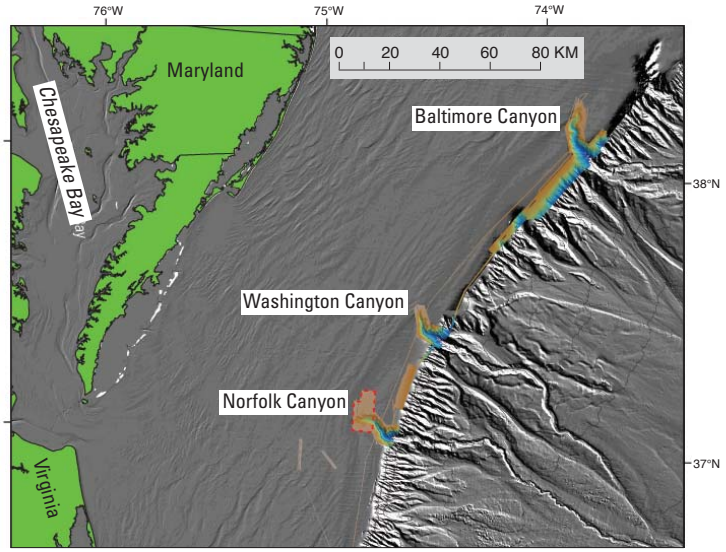
The *Primnoa* coral we've collected during this cruise will be aged by two of our scientists, **Brendan Roark** (Texas A&M) and **Nancy Prouty** (USGS), who are experts in aging techniques.

The skeletons of *Primnoa* have growth rings that appear to be approximately annual, reflecting fluctuations in food supply. Estimated linear growth rates for *Primnoa* range from 1.5 to 2.5 millimeters per year, but growth is likely slower when the corals are young and old. *Paragorgia*, on the other hand, has a less dense skeleton that does not have reliable growth rings. Instead, es-

(Coral Gardens continued on page 11)

(Coral Gardens continued from page 10)

Wet lab photograph of a Primnoa *sample with a shark or skate egg case attached, collected in 2012. Image courtesy of* ***Art Howard****, Deepwater Canyons 2013 – Pathways to the Abyss, NOAA-OER/BOEM/USGS.*



Baltimore and Norfolk Canyons off the U.S. east coast were the focus of exploration by the Deepwater Canyons 2013 expedition. Modified from "High-Resolution Multibeam Mapping of Mid-Atlantic Canyons to Assess Tsunami Hazards," Sound Waves*, September/October 2011 (***http://soundwaves.usgs.gov/2011/10/***).*

timates of ages have been obtained by photographing the same individual twice, the second photo a year later, then comparing the length of branches on the overlaid digital images, as well as detecting the presence of bomb-produced radiocarbon (carbon-14) over the last approximately 50 years.

Potential for Regeneration

Both corals and trees spend their lives in one place. Where they settle down when young is where they will remain for life. Opportunity to move comes very early in life for both of these types of organisms. In most tree species, the creation of new individuals involves the production of flowers by females, followed by pollination, fruit and seed development, then finally dispersal to new locations that may be assisted by animals that eat seeds then move, or wind dispersal.

Although much less is known about the reproductive process in corals, many octocorals spawn gametes [reproductive cells] into the water column, where they meet, fertilize, and become larvae that either drift in currents or swim to some degree. Although these larvae may have the potential to follow currents and travel

(Coral Gardens continued on page 12)

Left: A coral skeleton, likely of the genus Primnoa*, collected by the remotely operated vehicle (ROV)* Jason 2 *and photographed in the wet lab on the National Oceanic and Atmospheric Administration (NOAA) Ship* Ronald H. Brown*. Its branching pattern and growth structure resemble those of trees on land. Right: Close-up of the coral branch at left, showing a cross-section of its growth bands. At very high resolution, one can count these annual growth bands to determine age. This particular species deposits material made of calcium carbonate (light) and material made mostly of protein (dark) to form its skeleton. Images courtesy of* ***Liz Baird****, Deepwater Canyons 2013 – Pathways to the Abyss, NOAA-OER/BOEM/USGS. (From May 16, 2013, log at* ***http://oceanexplorer.noaa.gov/explorations/13midatlantic/logs/may16/may16.html****)*

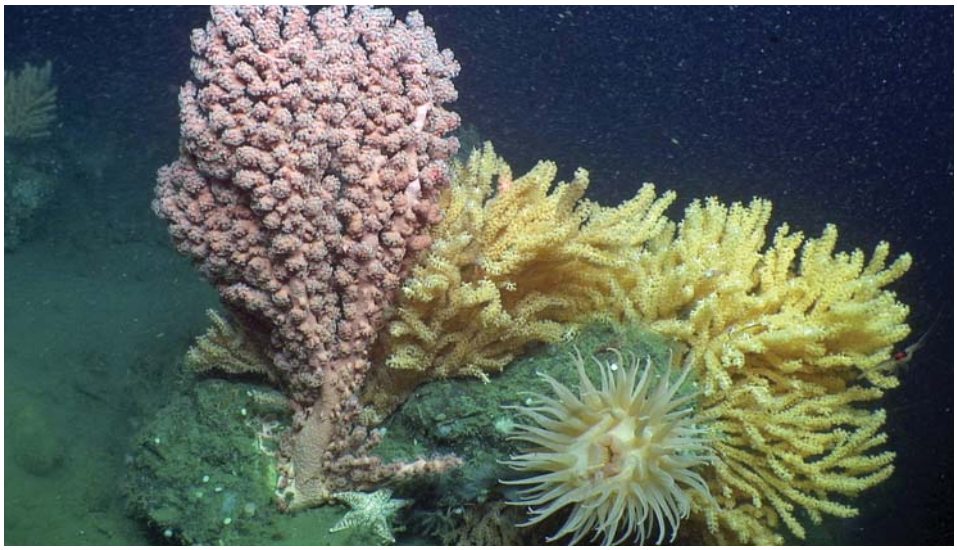
(Coral Gardens continued from page 11)

large distances (hundreds of kilometers), genetic studies of shallow water corals have demonstrated that many larvae don't travel very far from their parents.

We will try to gauge how far larvae of *Paragorgia* and *Primnoa* travel using genetic techniques that quantify how unique populations are. The more connected populations are via exchange of larvae, the more similar their genetic profiles will be. We hypothesize that populations within one canyon will be more similar to each other than populations between Norfolk and Baltimore canyons.

Unfortunately, like forests, these life history traits also make the coral gardens especially vulnerable to destruction. The long life spans and slow growth rates shared by both trees and deep-sea octocorals suggest that regeneration of these habitats could take decades or centuries. In other words, destroyed habitat may not be replenished in our lifetimes.

Given all of the unknowns about the factors that influence reproductive success and failure for deep-sea octocoral species, it is very difficult to predict how this process may play out, and whether techniques used to help regenerate forests, such as artificial propagation, may also work for deep coral ecosystems. Some of the pieces of the puzzle involving the life histories of *Paragorgia* and *Primnoa* may be solved through this research, and may help us understand and protect these complex ecosystems.



*Red bubblegum coral (*Paragorgia*) and several colonies of* Primnoa *occupy a boulder in close proximity to an anemone and sea star, at approximately 440 meters depth in Norfolk Canyon. Image courtesy of Deepwater Canyons 2013 – Pathways to the Abyss, NOAA-OER/BOEM/USGS.*

The principal investigators on the USGS DISCOVRE team are **Amanda Demopoulos**, **Christina Kellogg**, **Cheryl Morrison**, and **Nancy Grumet Prouty**. During the expedition, invaluable help was provided by **Jill Bourque** (Cherokee Nation Technology Solutions, contracted to the USGS), **Katharine Coykendall** (USGS), **Michael Gray** (USGS), **Jennifer McClain-Counts** (USGS), and **Marcus Springmann** (USGS).

For more information about the Deepwater Canyons 2013: Pathways to the Abyss expedition, visit the following websites:

http://oceanexplorer.noaa.gov/explorations/13midatlantic/

http://deepwatercanyons.wordpress.com/

Spring 2013 Monterey Bay Marine GIS User Group Meeting

By Nadine Golden

The third meeting of the Monterey Bay Marine GIS User Group was held on Thursday, April 11, 2013, at the Monterey Institute of International Studies, Monterey, California. A GIS (geographic information system) is a computer-based system for storing, manipulating, analyzing, and managing all types of geographically referenced information. The goals of this user group are to foster collaboration among academic institutions, the private sector, government agencies, and non-governmental organizations (NGOs) in the Monterey Bay marine GIS science community; to facilitate hands-on GIS training; and to increase awareness of marine spatial data sets within the broader GIS science community in the Monterey Bay area.

Approximately 70 members of the coastal and marine community, including GIS users, marine scientists, and policy makers, gathered for a morning of networking and presentations that focused on GIS in scientific research and software tools for more effective use of GIS. An afternoon workshop on SeaSketch (a tool for collaborative ocean planning; **http://mcclintock.msi.ucsb.edu/projects/seasketch**) was also held to support GIS training for user-group members.

The first speaker, **Nadine Golden** of the U.S. Geological Survey (USGS) Pacific Coastal and Marine Science Center, began the day with a demonstration of the Cali-

(Monterey Bay GIS continued on page 13)

(Monterey Bay GIS continued from page 12)

The success of the Monterey Bay Marine GIS User Group meeting was thanks in large part to volunteers from California State University, Monterey Bay (CSUMB) (left to right): ***Jason Adelaars****,* ***Devon Warawa****,* ***Heather Kelley****,* ***Laura Mercado****,* ***Mary McCormick****,* ***Ashley Knight****,* ***Nick Sadrpour****, and* ***Alex Snyder****. Not pictured:* ***Jessica Blakely****,* ***Ben Walker****,* ***Sean Windell****,* ***Corina Marks****, and* ***Mary Young****. Photograph by* ***Lisa Jensen****, Seafloor Mapping Lab, California State University, Monterey Bay.*

fornia Seafloor Mapping Program Video Data Portal currently under development.

Next, **Chris Romsos** of Oregon State University and **Mary Yoklavich** of the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA NMFS) demonstrated an online GIS data catalog developed to support a review of essential fish habitat for Pacific coast groundfish (**http://efh-catalog.coas.oregonstate.edu/overview/**).

Lee Brinton, a member of the Esri Maritime team, gave a presentation on managing and sharing bathymetric data with "ArcGIS for Maritime: Bathymetry" (**http://www.esri.com/software/arcgis/extensions/maritime/bathymetry**). Also from Esri, **Shaun Walbridge**, an ocean engineer and developer of the updated Benthic Terrain Modeler tool (BTM; **http://www.csc.noaa.gov/digitalcoast/tools/btm**), gave a presentation about the past and future of the BTM tool. Walbridge also told the group about progress on an update of the ArcMarine Data Model (**http://blogs.esri.com/esri/arcgis/2013/04/03/setting-a-new-course-for-the-arc-marine-data-model/**).

Dori Dick of Oregon State University presented geneGIS (**http://genegis.org/**), a computational tool for spatial analysis of individual-based genetic and photo-identification data of whales and dolphins.

The final speaker of the morning, **Will McClintock** of the University of California, Santa Barbara, gave a brief overview of SeaSketch, discussed where and how SeaSketch is being used for marine spatial planning around the world, and outlined the goals and tasks for the afternoon SeaSketch workshop.

Lee Brinton*, member of the Esri Maritime team, leads the group through the products, tools, and options of Esri's ArcGIS for Maritime: Bathymetry. Photograph by* ***Lisa Jensen****, Seafloor Mapping Lab, California State University, Monterey Bay.*

After a break for lunch, participants in the SeaSketch workshop gathered again at the meeting site. They saw a demonstration by SeaSketch developers and workshop instructors **Will McClintock** and **Evan Thomas Paul** (University of California, Santa Cruz), created new SeaSketch projects of their own, and learned how to configure SeaSketch for gathering information from large groups of voluntary contributors ("crowdsourcing") as well as from experts. Participants published a map service to ArcGIS Server (that is, they placed geographic data online in a form that allows Internet users to use the data in web, desktop GIS, and other applications), and they configured SeaSketch "Sketch Classes" to gather input from end users on where and how ocean space is managed. McClintock and Thomas Paul closed by teaching participants how to configure web-based discussion forums to foster stakeholder communication and collaboration, and how to secure SeaSketch features (map services, surveys, discussion forums) for access by private groups but not the general public.

The Monterey Bay Marine GIS User Group will meet again in spring 2014; details will be announced on the NOAA Southwest Fisheries Science Center website (**http://swfsc.noaa.gov/MontereyBayGIS/**). For any questions about the Monterey Bay Marine GIS User Group or its meetings, please contact **Lisa Wedding** at **lwedding@ucsc.edu** or **Nadine Golden** at **ngolden@usgs.gov**.

SeaSketch workshop participants are assisted by instructors ***Will McClintock*** *(University of California, Santa Barbara; standing, right photo) and* ***Evan Thomas Paul*** *(University of California, Santa Cruz; standing, left photo). Photographs by* ***Lisa Jensen****, Seafloor Mapping Lab, California State University, Monterey Bay.*

Department of State Recognizes U.S. Extended Continental Shelf Project Team with Superior Honor Awards

By Ann Tihansky and Deborah Hutchinson

On April 4, 2013, the U.S. Department of State presented Superior Honor Awards to the senior agency representatives and the Integrated Regional Team leads working on the U.S. Extended Continental Shelf Project. The U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), and the Department of State are the principal government agencies for this effort.

The mission of the U.S. Extended Continental Shelf (ECS) Project is to establish the full extent of the continental shelf of the United States beyond 200 nautical miles, consistent with international law. A critical part of this project relies on analysis and mapping of large areas of the seafloor around the U.S. continental margins. The data-collection aspect of the ECS effort is the largest and potentially most significant interagency marine survey ever undertaken by the United States. The Department of State recognized the senior and regional leads for these data-collection efforts with citations signed by **Kerri-Ann Jones**, Assistant Secretary, Bureau of Oceans and International Environmental and Scientific Affairs, Department of State.

Senior agency leads **Deborah Hutchinson** (USGS), **Margot Bohan** (NOAA), **Brian Israel** (Department of State [DOS]), **Barbara Moore** (DOS), and **Brian Van Pay** (DOS) received the citation, "In recognition of your leadership and interagency cooperation that enabled the Integrated Regional Teams of the U.S. Extended Continental Shelf Project to identify the scenarios and options that will facilitate delineation of the Extended Continental Shelf of the United States and international recognition of sovereign rights over more than one million square kilometers of seafloor."

The regional team leads, **Andrew Armstrong** (NOAA, Arctic), **Matthew Arsenault** (USGS, Gulf of Mexico), **Ginger Barth** (USGS, Gulf of Alaska and Bering Sea), **Barry Eakins** (NOAA, Central Pacific), **Jennifer Henderson** (NOAA, Pacific West Coast), **Larry Mayer** (University of New Hampshire, Atlantic), and **Daniel Scheirer** (USGS, Marianas Trust Territories, Guam, and the Commonwealth of the Northern Mariana Islands) received the citation, "In recognition of your meticulous research and interagency cooperation in leading the Integrated Regional Teams of the U.S. Extended Continental Shelf Project. Through your attention to detail and thorough analysis, you and your colleagues have identified the scenarios that will facilitate delineation of the Extended Continental Shelf of the United States and international recognition of sovereign rights over more than one million square kilometers of seafloor."

Deborah Hutchinson *(USGS, standing) leads a discussion at the 2012 Extended Continental Shelf Technical Workshop (**http://soundwaves.usgs.gov/2012/10/meetings.html**). Seated attendees include (clockwise from lower left)* ***Elliot Lim*** *(National Oceanic and Atmospheric Administration [NOAA] National Geophysical Data Center),* ***Andy Armstrong*** *(NOAA and University of New Hampshire),* ***Jennifer Henderson*** *(NOAA National Geophysical Data Center),* ***Craig McLean*** *(NOAA),* ***Larry Mayer*** *(University of New Hampshire, hidden),* ***Matt Arsenault*** *(USGS),* ***Barry Eakins*** *(NOAA National Geophysical Data Center, hidden),* ***Jim Gardner*** *(University of New Hampshire),* ***Chris Fox*** *(NOAA National Geophysical Data Center),* ***John McDonough*** *(NOAA),* ***Dave Balton*** *(Department of State),* ***Ginger Barth*** *(USGS), and* ***Jon Childs*** *(USGS). Not pictured:* ***Margot Bohan*** *(NOAA),* ***Jason Chaytor*** *(USGS),* ***Terry Holman*** *(Department of the Interior),* ***Brian Israel*** *(Department of State [DOS]),* ***Barbara Moore*** *(DOS),* ***Dan Scheirer*** *(USGS), and* ***Brian Van Pay*** *(DOS). Photograph by* ***Brian Van Pay****.*

Where a nation can demonstrate that it has extended continental shelf—seafloor beyond 200 nautical miles from shore that meets criteria set forth in Article 76 of the United Nations Convention on the Law of the Sea (**http://www.un.org/Depts/los/**)—it can exercise certain sovereign rights over seabed and sub-seabed resources there. Preliminary studies have indicated that the U.S. extended continental shelf likely totals at least 1 million square kilometers—an area about twice the size of California or nearly half the area of the Louisiana Purchase.

Data collection and analysis are critical to the ECS Project as it comes to a more definitive conclusion about the extent of U.S. extended continental shelf (**http://continentalshelf.gov/**). The project began in 2003 with the first of 28 research expeditions to collect multibeam bathymetric data along the deep-water portions of the U.S. margins, including its island territories. Beginning in 2007, the United States has participated in or led seven research cruises to collect seismic and geophysical data, with five of those cruises in partnership with Canada in the Arctic utilizing two icebreakers (**http://soundwaves.usgs.**

(Superior Honor Awards continued on page 15)

(Superior Honor Awards continued from page 14)

gov/2012/02/). (For a full list of cruises and access to data, visit **http://www.ngdc.noaa.gov/mgg/ecs/cruises.html**.) The project has supported 11 workshops that bring together regional experts in geology, bathymetry, and data management. In spring 2012, the ECS Project held a Technical Workshop at the U.S. Geological Survey Woods Hole Coastal and Marine Science Center in Massachusetts, followed by a Scenarios Workshop in Washington, D.C., to describe the options and uncertainties associated with delineating the extended continental shelf (**http://soundwaves.usgs.gov/2012/10/meetings.html**). The two Department of State Superior Honor Awards recognize the large effort that brought the project to this phase of understanding.

Although several more data-collection cruises are still required, the project now moves to its next significant phase, which is to begin synthesizing the vast amount of information already gathered into a form that can be used by the Department of State to be consistent with customary international law in delineating the outer limits of the extended continental shelf. Earlier in 2013, a pilot project focused on the western Gulf of Mexico began to apply the variables in Article 76 and develop the required documentation. For the rest of the regions where the United States expects to delineate an extended continental shelf, the analysis and documentation stage is expected to continue through the end of this decade.

USGS a Big Winner in National Association of Government Communicators 2013 Blue Pencil & Gold Screen Awards Competition

By Helen Gibbons

The U.S. Geological Survey (USGS) won 10 awards, more than any other agency, in the National Association of Government Communicators (NAGC) 2013 Blue Pencil & Gold Screen Awards Competition.

*A female Burmese python (*Python molurus*) on her nest with eggs. Photogaph by **Jemeema Carrigan**, University of Florida. Courtesy of **Skip Snow**, National Park Service. Used with permission.*

The NAGC Blue Pencil & Gold Screen Awards Competition recognizes superior government communication products and those who produce them. Winning entries come from all levels of government. Blue Pencil Award categories are for writing, editing, photography, and published products, such as magazines, books, newsletters, and other materials. Gold Screen Award categories recognize audiovisual and multimedia products, including broadcast and Internet-based products.

Of the 10 awards received by the USGS, two were related to coastal or ocean topics. First place in the News Release category for Blue Pencil Awards went to public affairs specialist **Catherine Puckett** and research wildlife biologist **Robert Reed** for the January 30, 2012, news release "Severe Declines in Everglades Mammals Linked to Pythons" (**http://www.usgs.gov/newsroom/article.asp?ID=3087#.UX69JSuG0QA**). Second place in the Education Programs category for Gold Screen Awards went to video producer **Stephen M. Wessells**, research ecologist **Chad Jay**, wildlife biologist **Tony Fischbach**, supervisory biologist **Karen Oakley**, and public affairs specialist **Paul Laustsen** for the video "Tracking Pacific Walrus: Expedition to the Shrinking Chukchi Sea Ice" (**http://gallery.usgs.gov/videos/600#.UZaXY-CfOZY**).

The award winners were honored in Arlington, Virginia, on April 17, 2013, at a reception and banquet held in conjunction with the 2013 NAGC Communications School.

For more information about the Blue Pencil & Gold Screen Awards—including a complete list of the 2013 awardees—visit **http://www.nagc.com/awards/bluegold.asp**.

Congratulations to all the winners!

*Adult female Pacific walruses (*Odobenus rosmarus divergens*) on ice floe with young. Screenshot from award-winning USGS video "Tracking Pacific Walrus: Expedition to the Shrinking Chukchi Sea Ice" (**http://gallery.usgs.gov/videos/600#.UZaXY-CfOZY**).*

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