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Fieldwork

California Sea Otter Numbers Drop Again

By Ben Young Landis, Tim Tinker, and Brian Hatfield

After a decade of steady recovery, the southern sea otter—a Federally listed threatened species—is in decline for the second year in a row, according to the latest population survey by U.S. Geological Survey (USGS) researchers.

"We have seen a decrease in sea otter numbers throughout most of their range, particularly in those areas where most of their reproduction occurs, while pup counts have dropped to 2003 levels," said **Tim Tinker** of the USGS Western Ecological Research Center and lead scientist for the annual survey. "A number of human and natural factors may be influencing this trend, and we are working to better understand what those are."

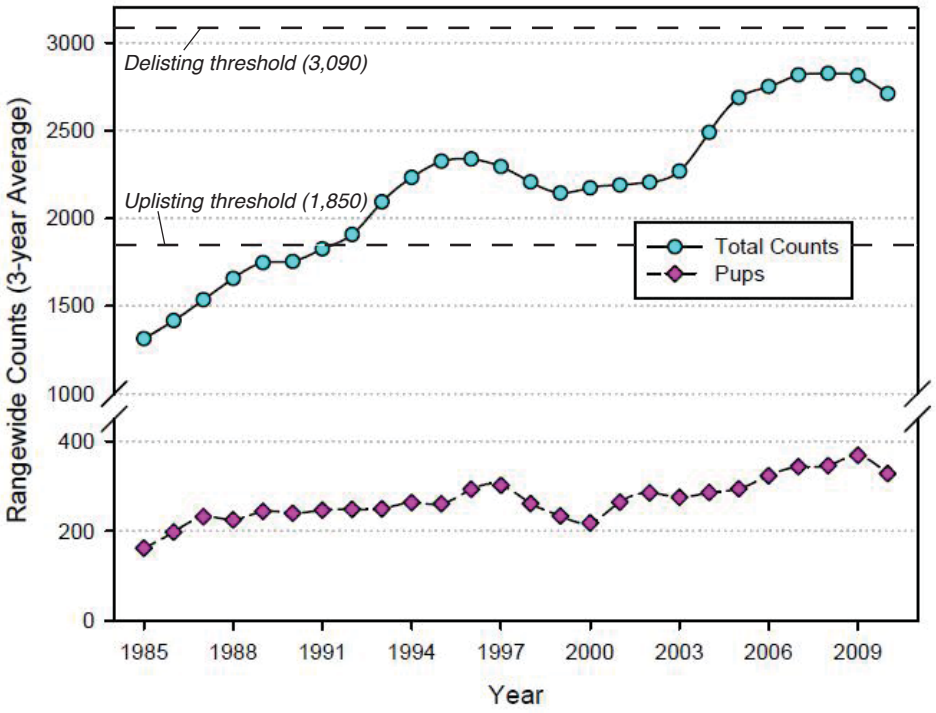
Population estimates are calculated as 3-year averages of annual survey results, which compensate for variations in observation conditions and give scientists a more reliable picture of abundance trends. This year's estimate—averaging counts from 2010, 2009, and 2008—is 2,711 otters. This represents a 3.6-percent drop in the overall population and an 11-percent drop in the number of otter pups in comparison with 2009 estimates.

For southern sea otters to be considered for removal from threatened-species listing, the overall population estimate would have to exceed 3,090 for 3 consecutive years, which is the threshold established under the Southern Sea Otter Recovery Plan by the U.S. Fish and Wildlife Service.

Researchers also saw the sea otters' geographic distribution shrink this year, with fewer animals at the northern and southern ends of their range, which now extends from Pigeon Point to Gaviota State Park in California.

"Movements and clumping of male otters away from the range edges may

(Sea Otter Numbers continued on page 2)



Number of southern sea otters counted during spring surveys, plotted as 3-year running averages. (Example: Values for 2010 are the averages of the 2008, 2009, and 2010 counts.) Southern sea otters are a threatened population on the Endangered Species list; for them to be considered for delisting, the 3-year running averages of total counts (blue-green dots) would have to exceed 3,090 for 3 consecutive years.

*Sea otter off Monterey, California. Photograph by **Joe Tomoleoni**, University of California, Santa Cruz.*

Sound Waves

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Fieldwork, continued

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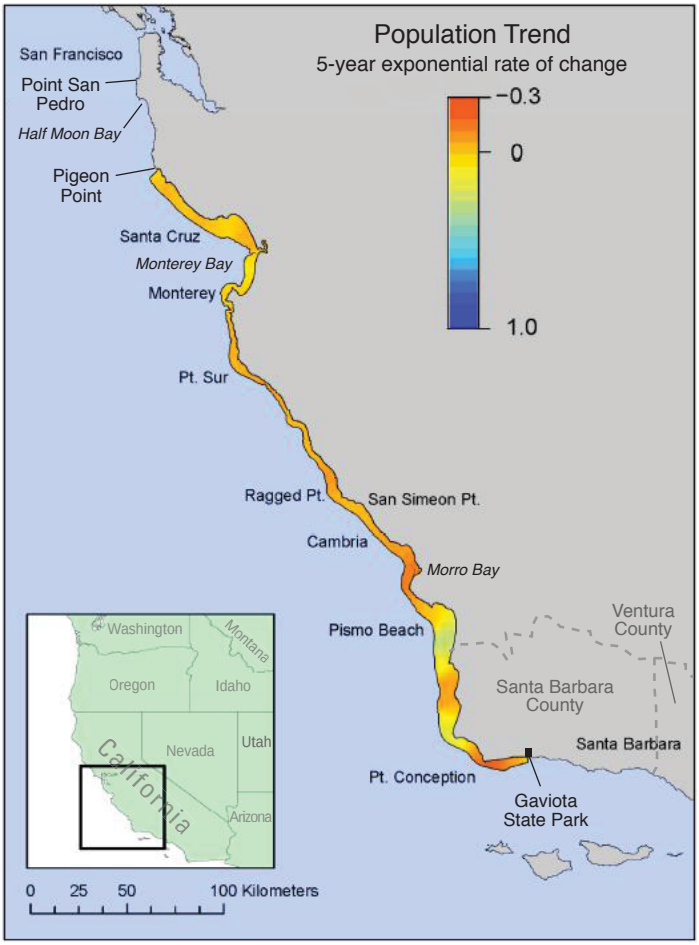

Current distribution of sea otters in California, showing spatial variation in the rate of population change over the past 5 years. Values greater than zero (yellow, green, and blue colors) indicate increasing numbers; values less than zero (orange and red colors) indicate declining numbers.

partly explain this change," said USGS biologist **Brian Hatfield**, who organizes the annual otter survey. "And the low pup count might be linked to heavy storms and reduced kelp cover this past winter, since we also saw a record number of pups and juveniles that got stranded ashore."

As for the overall population decline, all indications point to elevated mortality.

"Our data suggest that breeding-age females are dying in higher-than-usual numbers from multiple causes, including infectious disease, toxin exposure, heart failure, malnutrition, and shark attacks," **Tinker** said.

Sea otters are active predators that rely on nearshore coastal waters. As a result, they are constantly exposed to many stressors, such as chemicals and pathogens from coastal water pollution, ingestion of toxin-contaminated prey, and reduced food abundance. Chronic exposure to multiple

*USGS research wildlife biologist **Tim Tinker**, shown here on the Alaska Peninsula, is the lead scientist on the annual sea otter survey in California. He is also a professor at the University of California, Santa Cruz. Photograph by **Brian Hatfield**, USGS.*

stressors could make otters more susceptible to illness and injury and lead to a greater chance of death.

"Recovery will clearly depend on our understanding the factors contributing to slow population growth in recent years

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and the current downturn," said **Lilian Carswell**, Southern Sea Otter Recovery Coordinator for the U.S. Fish and Wildlife Service. "Research is fundamental to recovery efforts because we need to understand which stressors are most strongly affecting survival rates in order to develop targeted measures to address them."

To help untangle this complex puzzle of stressor effects and interactions, **Tinker** is leading a study to compare sea otter health between areas with different types and severity of stressors, to find out which area has healthier otters and why. This study—funded in part by the California Coastal Conservancy and the U.S. Fish and Wildlife Service, with additional support from the University of California, Santa Cruz; the California Department of Fish and Game; and the Monterey Bay Aquarium—is described on a USGS Web page at **http://www.werc.usgs.gov/seaottercount** (scroll down to "Comparing Sea Otter Populations").

"Remember, sea otter health can tell us a lot about the health of the coastal waters that humans also enjoy," **Tinker** said. "So, we're eager to learn more."

The survey was conducted during the month of May, from Point San Pedro in San Mateo County down to the Santa Barbara/Ventura County line. The survey has been conducted annually since 1985 and is a cooperative effort of the USGS Western Ecological Research Center; the California Department of Fish and Game's Marine Wildlife Veterinary Care and Research Center; Monterey Bay Aquarium; the University of California, Santa Cruz; and many experienced and dedicated volunteers. Assistance also comes from staff of the U.S. Fish and Wildlife Service and the Bureau of Ocean Energy Management, Regulation and Enforcement.

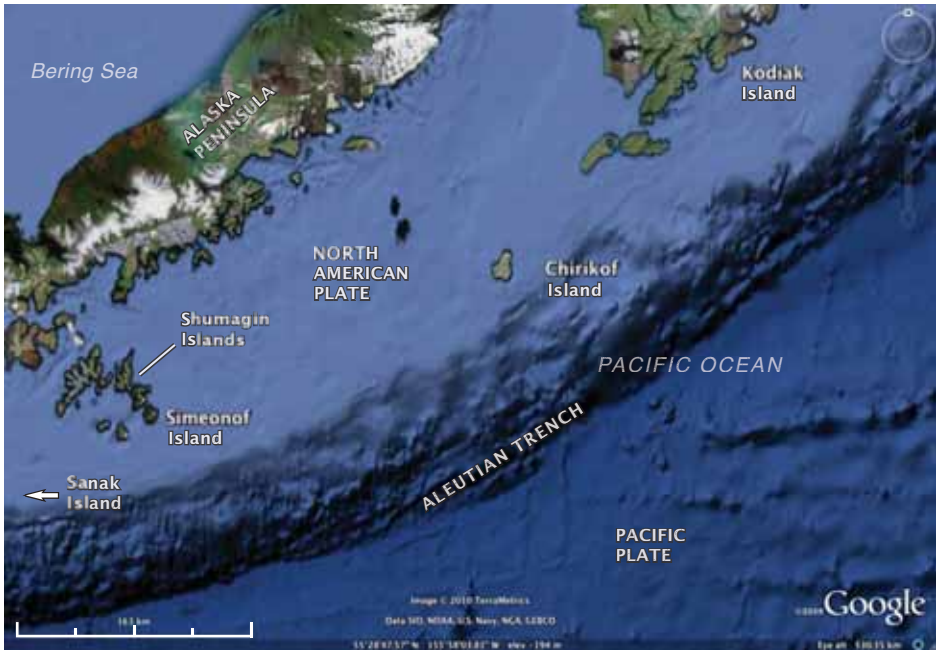
Details about the spring survey, including graphs, maps, and data summaries, are posted online at **http://www.werc.usgs.gov/seaottercount**.

Search for Evidence of Prehistoric Tsunamis and Great Earthquakes on Chirikof Island, Eastern Aleutians

By Rich Briggs, Guy Gelfenbaum, and Alan Nelson

Scientists from the U.S. Geological Survey (USGS) and the University of Pennsylvania (UPenn) visited Chirikof Island, Alaska, in August 2010 to document evidence of prehistoric tsunamis and land-level changes caused by large earthquakes on the Aleutian megathrust, the fault along which the Pacific plate is sliding beneath the North American plate, periodically generating "great" earthquakes of magnitude 8 or higher. Members of the field team were **Alan Nelson**, **Rich Briggs**, and **Guy Gelfenbaum** from the USGS and **Simon Engelhart** and **Tina Dura** from UPenn.

Computer models of how tsunamis move (or "propagate") across the ocean predict that rupture on the Aleutian megathrust between Kodiak Island and the Shumagin Islands will cause seafloor displacements that direct tsunamis toward the west coast of the United States, with the maximum wave energy centered on southern California. With support from the USGS Southern California Multihazards Demonstration Project, fieldwork was undertaken on Chirikof Island to (1) demonstrate the potential for identifying and dating prehistoric tsunamis on Chirikof Island and elsewhere in the eastern Aleutians, (2) investigate evidence for megathrust-related land-level changes on Chirikof Island, and (3) establish a scientific and logistical framework for future studies of prehistoric tsunamis and earthquakes in the Aleutian region.



Chirikof Island lies about 110 km from the Aleutian Trench, where the Aleutian megathrust, the fault along which the Pacific plate is subducting beneath the North American plate, intersects the seafloor. The megathrust dips northwest here, beneath the pictured islands and the Alaska Peninsula. Scale bar at bottom left represents 163 km. Sanak Island is off map, about 200 km west-southwest of the Shumagin Islands.

Chirikof Island lies at the eastern edge of a segment of the Aleutian megathrust that ruptured during great earthquakes in 1788 and 1938. The magnitude 8.2 1938 earthquake did not produce a large tsunami, but fragmentary historical records suggest that the 1788 event generated a large tsunami and was presumably of greater magnitude than the 1938 event. Because it

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lies directly above the megathrust, Chirikof Island likely underwent land-level changes during past great earthquakes. Before this field study, no Quaternary geologic investigations, including studies of historical or prehistoric earthquakes and tsunamis, had been undertaken on the island, although archaeologists did reconnaissance work there in 1963 and 2005.

The field team met in Kodiak, Alaska, on July 28. Bad weather turned back two attempts to fly from Kodiak to the study area. Finally, the weather improved, and three members of the team landed on Chirikof Island on August 4; the other two arrived the next day. Our fieldwork focused on the southwest corner of the 11-by-17-km island, where the terrain includes areas, such as low-lying basins and estuaries, with a high potential for preserving sediment deposited by large tsunamis. Working from a base camp near a small lake on the island's southwest tip, we collected data at seven sites, four of which were studied in detail.

Observations included nearly 40 reconnaissance gouge cores collected along transects both parallel and perpendicular to the shore. A gouge corer with a 5-cm-diameter, semi-enclosed core barrel that was hand-driven into the ground was used to sample vertical sequences of sediment layers and peat (soil made almost entirely of organic matter accumulated in marshy areas) down to several meters below the surface. Depending on the accumulation rates of the peat and sediment layers, these cores could represent hundreds to thousands of years of geologic record to examine for evidence of past tsunamis. The field team also conducted geomorphic mapping and precision elevation surveys, using a Real Time Kinematic (RTK) Global Positioning System (GPS) receiver. The geomorphic mapping helped in the interpretation of past sedimentary environments and how they may have changed during large earthquakes, when land levels may have risen or fallen by several meters. A National Ocean Service (NOS) tidal benchmark tied into the RTK GPS survey provides a common datum for the maps and cores. Finally, four complete Russian cores (13 m total length) were collected and are undergoing detailed radiocarbon and microfossil analyses at USGS laboratories in Golden, Colorado, and UPenn laboratories in Philadelphia. The Russian corer collects 5-cm-diameter cores that—unlike those from the gouge corer—are not compressed or shortened during recovery.

2010 field sites on Chirikof Island. Scale bar at bottom left represents 6.16 km.

Site SW Anchorage Beach on Chirikof Island, looking west. Base camp tents are barely visible on west shore of lake.

Tsunami deposits consist mainly of sand, commonly with some fragments and thin layers of mud. The settings found to be most useful for identifying these sandy deposits were those with thick sequences of peat, in which the lighter colored sand deposits are relatively easy to spot. Possible tsunami deposits were observed and sampled at several sites on Chirikof Island. One site (TR), a broad valley 11 m above sea level, contained freshwater peat more than 5 m thick. At least two conspicuous sand layers, possibly of tsunami origin, are present in the peat, with a layer of tephra (volcanic ash) directly beneath the lower sand layer. At least one of the sand layers is normally graded (the sand grains vary gradually in size from coarser at the bottom to finer at the top), as are many tsunami deposits. To understand the spatial distribution of the sand layers, we described 10 reconnaissance cores and collected two Russian cores for dating, microfossil analysis, and lithologic analysis and description.

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***Tina Dura** (bending over), **Simon Engelhart** (holding corer), and **Guy Gelfenbaum** collect a gouge core at site TR on Chirikof Island.*

At a second site (RR) at a lower elevation, freshwater peat extends up a narrow valley 4 to 10 m above sea level. In the upper reaches of the valley, a stream and its tributaries have added land-derived sediment to the marsh sediment in the valley floor, and tsunami deposits are difficult to distinguish from the stream deposits. In the valley's lower reaches, thick sand deposits prevent deep coring and complicate interpretations of depositional history. Between these zones, however, are five to nine distinct sand beds, which were probably deposited by tsunamis or storm surges. We described eight reconnaissance cores and collected one Russian core here.

At a third site (FM), beneath what may have been a marsh fringing a former estuary, we found pairs of peat and mud layers capped by a bed of sand with an erosive base. This stratigraphy may record multiple cycles of uplift and subsidence related to earthquakes, followed by tsunamis or breaching of the beach berm (a low ridge of sediment built up on the beach by waves). Several reconnaissance cores were described and one Russian core collected here.

Because they are shaped by waves, beach berms are good indicators of the position of the shoreline. Along Chirikof Island's southwest coast, we mapped cobble berms that are now beyond the reach of the waves and serve as markers of changing shoreline positions, possibly associated with land-level changes during and between earthquakes. The relationships between relict shorelines and archaeological and historical sites should provide important information about late Holocene uplift of the area.

***Simon Engelhart** examines a Russian core from site TR on Chirikof Island; top of core is toward left. Core contains a gray sand bed, possibly deposited by a tsunami, with a white layer of tephra (volcanic ash) at its base, in a 3-m-thick sequence of freshwater peat.*

Mapping, topographic profiles, outcrop descriptions, and interpretation of remote-sensing imagery of the west coast of Chirikof Island indicate a probable eolian (windblown) origin for the landforms and thick sand layers mantling the older surfaces. The absence of peats or other soils hinders identification of tsunami deposits along most of the island's west coast.

We intended to leave Chirikof Island by floatplane on August 15, but bad weather delayed our departure until August 17, when all five scientists finally made it safely back to Kodiak. **Gelfenbaum** returned to the island 2 days later to retrieve gear that had been left behind. Most of our days on Chirikof Island were foggy, rainy, or windy.

As long as field parties plan for weather-related delays, fieldwork in the Aleutians can be quite rewarding: As we anticipated, freshwater marshes and coastal geomorphology on Chirikof Island preserve evidence of possible prehistoric tsunamis and megathrust-related land-level changes. The data we collected in 2010 will provide a baseline for further work in the region and a basis for comparison with emerging records of prehistoric earthquake-induced land-level changes and tsunamis on Kodiak Island, 125 km to the northeast.

Promising areas for future study include islands near the Aleutian Trench, such as Simeonof Island in the outer Shumagin Islands, Sanak Island (about 200 km west-southwest of the Shumagins), and, possibly, sites on the south-facing coast of the Alaska Peninsula. Constructing a history of great megathrust earthquakes and their accompanying tsunamis in this part of the Aleutian Arc will help us better understand the tectonic behavior of this plate boundary—and other, similar boundaries—as well as assess earthquake and tsunami hazards.❁

View along the crest of a relict beach berm composed of cobbles at site SW Anchorage Beach on Chirikof Island. Cobble berm is being overridden by sand from modern storm berm.

Seafloor Mapping in Coastal Massachusetts—How Enhanced Network Infrastructure Facilitates Data Management and Collaboration with Project Partners

By Seth Ackerman, Jane Denny, and Bill Schwab

Another round of seafloor mapping off Massachusetts was completed in May-June 2010 by the U.S. Geological Survey (USGS) Woods Hole Coastal and Marine Science Center in cooperation with the Massachusetts Office of Coastal Zone Management (CZM). The geophysical survey took place in Buzzards Bay and Vineyard Sound, where more than 330 km^2 (127 mi^2) of the seafloor were mapped with swath-bathymetry, sidescan-sonar, and seismic-reflection systems. Approximately 780 gigabytes of raw geophysical data were collected, and more than 650 gigabytes of processed data were generated while at sea. Since its inception in 2003, the USGS-CZM cooperative program has mapped the seafloor geology of approximately 2,000 km^2 (772 mi^2) offshore of Massachusetts during more than a dozen USGS field activities yielding tens of terabytes of data, including data contributed by various partners.

To handle such extremely large datasets, the Woods Hole Coastal and Marine Science Center participates in the Woods Hole collaborative science network—a computing infrastructure partnership between several world-renowned scientific institutions in Woods Hole, Massachusetts. The Woods Hole collaborative science network is joined, by way of fiber-optic interconnectivity, to numerous additional research institutions throughout the Northeast, enabling extremely fast (gigabits per second) network speeds and virtually unlimited bandwidth. This partnership provides us with the computing ability to:

- access the survey data (approximately 1.5 terabytes from the May-June cruise) and transfer it from our offsite Marine Operations Facility to the seafloor-mapping group's data server upon completion of the fieldwork,
- allocate and transfer data to individuals responsible for post-survey processing,
- transfer raw and processed datasets to our Federal, State, academic, and other partners, and
- receive similarly large datasets from our partner agencies.

Also, our advanced networking capability and computing infrastructure are vital when we are in the field, allowing us to communicate with shore-based USGS staff for support and near-real-time data-quality control, as well as to contact software and hardware vendors when technical issues arise. This collaborative network has often eliminated the need to return to port, thereby saving time and money and greatly increasing productivity at sea.

As part of the USGS-CZM cooperative mapping program, we have also worked collaboratively to share relevant data and resources with other research organizations, including the National Oceanic and Atmospheric Administration, the Massachusetts Division of Marine Fisheries, the Woods Hole Oceanographic Institution, the Massachusetts Geographic Information System, the University of New Hampshire, Boston University, the U.S. Envi-

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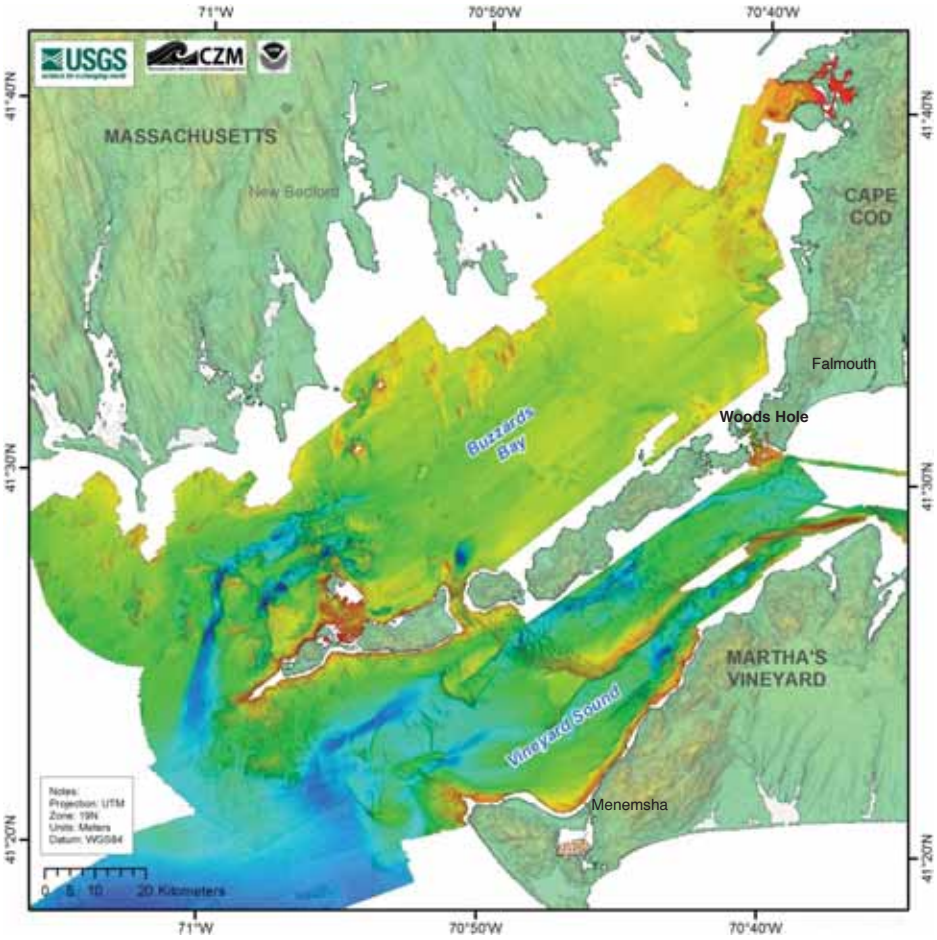
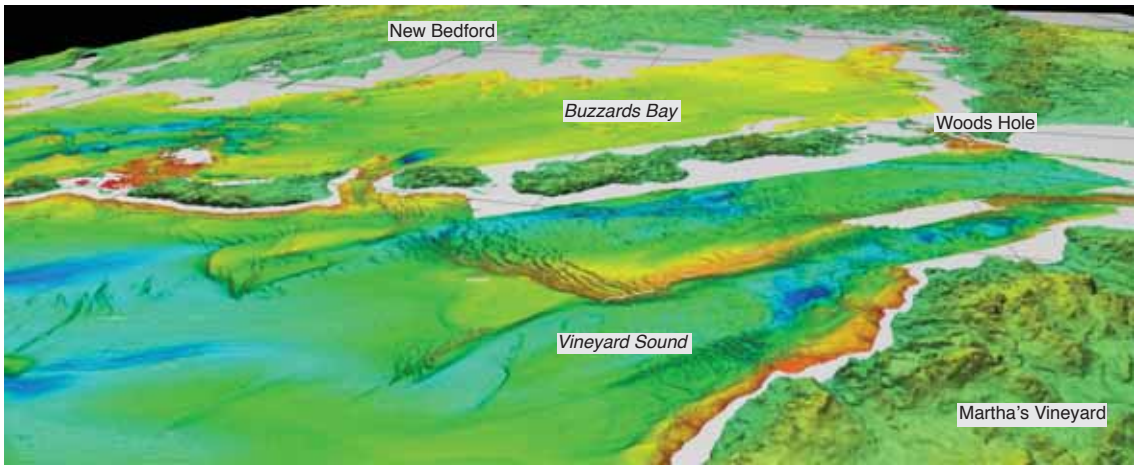


High-resolution bathymetric map of Buzzards Bay and Vineyard Sound, Massachusetts, constructed from data collected as part of the USGS-CZM Coastal Mapping Program (including several hydrographic-survey datasets from the National Oceanic and Atmospheric Administration).

(Mapping Data continued from page 6)

ronmental Protection Agency, the U.S. Army Corp of Engineers, the University of Massachusetts, the Sea Education Association, the Nature Conservancy, and many other nongovernmental organizations, nonprofit organizations, and private industry. There is a noticeable difference in the ease and speed of data exchange between colleagues in the collaborative science network (or a similar ultra-high-speed trusted network) relative to those working on "standard" or otherwise restricted networks.



Oblique view of bathymetric map, looking northward from Menemsha, Massachusetts (on Martha's Vineyard).

Learn more about the USGS-CZM cooperative mapping program at **http://woodshole.er.usgs.gov/project-pages/coastal_mass/**, and about the May-June 2010 mapping (Field Activity 2010-004-FA) at **http://quashnet.er.usgs.gov/cgi-bin/datasource/public_ds_info.pl?fa=2010-004-FA**. Learn more about the seafloor-mapping systems used during the recent fieldwork at **http://woodshole.er.usgs.gov/operations/sfmapping/**.

Unlocking Oceans of Model Data via Web Services

By Rich Signell

Numerical modeling systems are increasingly being used to forecast and understand U.S. coastal and continental-shelf seas, addressing such issues as contaminated sediments, harmful algal blooms, oil spills, and coastal erosion. As computing power grows, so does our ability to represent finer scales and larger domains, thus increasing the amount of model output. For example, the Coupled Ocean-Atmosphere-Wave-Sediment Transport (COAWST) model developed by U.S. Geological Survey (USGS) scientists at the USGS Woods Hole Coastal and Marine Science Center in Woods Hole, Massachusetts, produces 8 gigabytes of model data every day. Hindcast simulations (which test mathematical models by using observational data from past events) at the same center are typically in the 10- to 30-gigabyte range. These models also have large appetites for input: they ingest output files from other models and live data streams from river gauges, weather stations, oceanographic instruments, and satellites. The quantity of the digital data produced and consumed by these models requires special approaches to allow efficient access, especially if the data are to be shared effectively with collaborators and the rest of the international research community.

At the USGS Woods Hole Coastal and Marine Science Center, we have been working with the National Oceanic and Atmospheric Administration (NOAA) Integrated Ocean Observing System (IOOS; **http://www.ioos.gov/**), the National Science Foundation (NSF) Ocean Observatories Initiative (OOI; **http://www.oceanleadership.org/programs-and-partnerships/ocean-observing/**), and the international climate community to adopt a common approach to handling model-data output. Data from modeling teams or instruments are served in their original format by providers or local data-access centers and augmented with metadata (information about the data, such as what systems were used for data collection, what map projections are used for geospatial data, and so on) to allow standardized representation. These datasets are then made available via Web services, allowing the creation of user toolsets and applications that can access the different models used in the community without specialized software for each model.

This standardized-Web-services approach is being used by several USGS Woods Hole Coastal and Marine Science Center projects. For example, **John Warner** and **Brandy Armstrong**, who developed the COAWST modeling system, deliver daily forecasts of wind and current velocities, sea-surface temperatures and heights, suspended-sediment transport, and wave heights for the U.S. east and gulf coasts at 5-km resolution (see **http://woodshole.er.usgs.gov/project-pages/cccp/public/COAWST.htm**). Each new

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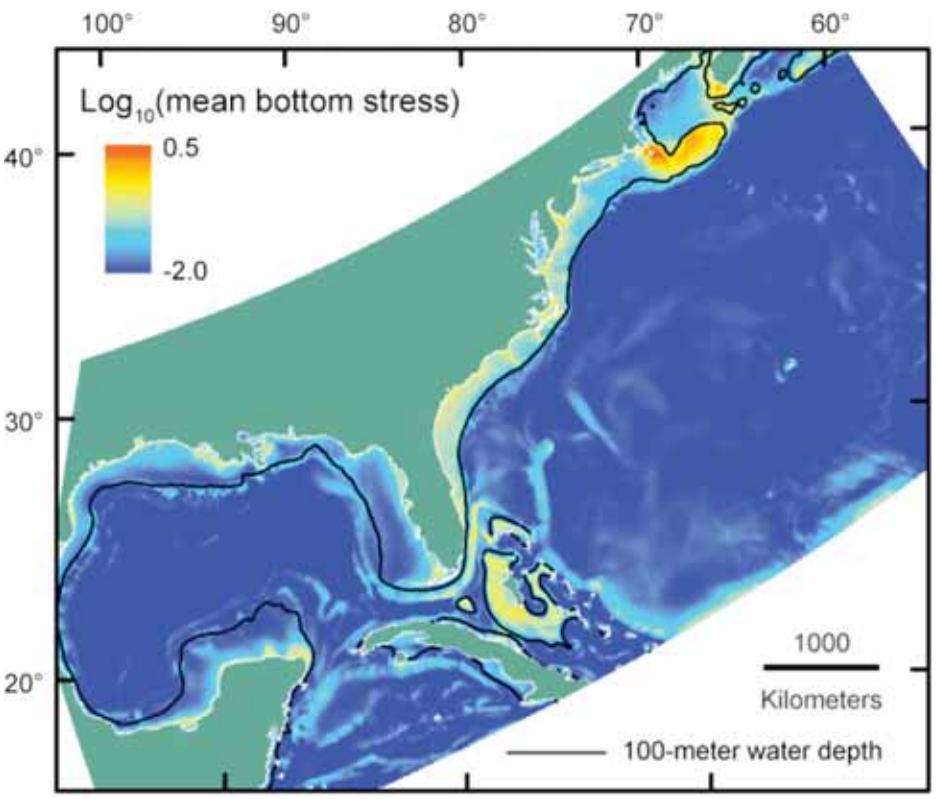
daily forecast consists of an 8-gigabyte file and becomes available to users as part of a growing, cumulative simulation archive (currently 2.6 terabytes). The Web service allows users to extract just the variables they need in specified time, longitude, latitude, and water-depth ranges of interest. **Brad Butman** and **Soupy Dalyander** (see "Patricia 'Soupy' Dalyander Is New Mendenhall Research Fellow in Woods Hole," this issue) are taking advantage of this Web service to calculate bottom stress from COAWST wave-height and current-velocity forecasts over a 1-year period and using the results to examine the distribution of mean bottom stress on the east and gulf coasts. (The higher the bottom stress, the greater the likelihood that bottom sediment, and any associated pollutants, will be transported by the water.) **Neil Ganju** is using the approach for his collaborative circulation and sediment-transport studies near the Martha's Vineyard Coastal Observatory. **Chris Sherwood** and **Rich Signell** are using the approach to share model input and output with academic researchers working on a National Science Foundation (NSF) Rapid Response Research (RAPID) project simulating the three-dimensional dispersal of aging oil—a five-institution study relevant to the Deepwater Horizon oil spill in the Gulf of Mexico. In total, more than 13 terabytes of model data are available and being used by USGS researchers and their U.S. and international collaborators.

Simulations that produce these large datasets run remotely on high-performance computing clusters, where resources can be pooled and shared. Most simulations are performed on clusters at the Woods Hole Oceanographic Institution (WHOI). Instead of bringing massive model-output files back to local desktops or to a local server at the USGS Woods Hole office, the model data are left on large fibrechannel disk arrays and made available via the standardized Web services. Processing, analysis, and visualization procedures written in a high-level language like Matlab access the remote model data directly and copy only the relevant portions across the network. In this way, the same procedures used internally within the USGS research group can be used by external collaborators or other scientists without modification, thus allowing others to mine the model data in order to yield insights and understanding beyond the resources of the USGS. It also makes our research more transparent and accountable, in the spirit of "Open Notebook Science" (a term coined by **Jean-Claude Bradley** of Drexel University for the online sharing of "raw experimental data along with the researcher's interpretation in a format that anyone can easily re-analyze, re-interpret and re-purpose"; **http://drexel-coas-elearning.blogspot.com/2006/09/open-notebook-science.html**).



Calculation of mean bottom stress due to forecast waves and currents on the U.S. east and gulf coasts. The higher the bottom stress, the greater the likelihood that bottom sediment (and any associated pollutants) will be swept into and moved by the water. Regions of high stress generally occur where tidal currents are strong or energetic surface waves occur in shallow water.

Rich Signell spent much of 2009 on detail to NOAA helping to implement the standardized-Web-services approach across all 11 regions of the U.S IOOS. This approach is currently being implemented to provide unified access to gridded data across NOAA (**http://geo-ide.noaa.gov/**) and is part of the USGS Council for Data Integration plan for Fiscal Year 2011 (which began October 1, 2010). Implementing the approach across NOAA and the USGS will allow anyone on the Internet to interactively browse, download, and analyze data from hundreds of terabytes of oceanographic (and atmospheric) model output using efficient, standard tools—effectively "unlocking" their scientific content.

Research and experimentation on how best to conduct our science, exchange observational and model data, and disseminate results by using Internet technology is an increasingly important component of USGS research, especially as data-intensive scientific discovery begins to challenge traditional approaches. Scientists and information-technology (IT) professionals will need to work together in order to continue to promote advanced computing capabilities that help researchers share, manipulate, and explore massive datasets while providing appropriate security measures.

Upcoming! Antarctic Science and the Cultural Arts: A New Approach

By Alan Cooper

Two scientists at the U.S. Geological Survey (USGS) center in Menlo Park, California, are leading an effort to help Antarctic researchers more effectively convey key research results and issues to the general public by way of music and the cultural arts. USGS scientist emeritus **Alan Cooper** and volunteer geologist **Julianne Stafford** are part of a 10-member international steering committee organizing a unique set of music and cultural-arts events that will be held in conjunction with the 2012 Scientific Committee on Antarctic Research Open Science Conference in Portland, Oregon (July 13-25, 2012).

The concept is to have Antarctic researchers in all disciplines use their personal musical and cultural-arts talents to convey Antarctic scientific results and issues to the general public in a particularly interesting and understandable way without compromising accuracy and validity. Such efforts have been used effectively on a smaller scale by polar scientists during the International Polar Year. **Cooper** and **Stafford** are co-coordinators of the musical events of the 2012 Portland conference, and other leading Antarctic researchers will coordinate the other cultural-arts events.

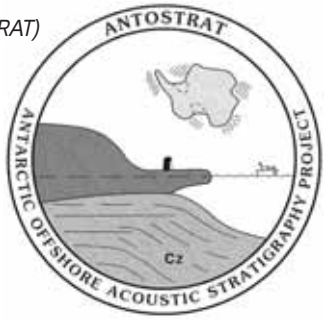
The project was conceived in August of this year. By mid-October, the initial announcement (**http://usscar.tamu.edu/latest-news/92-latest-news/700-a-unique-series-of-music-and-cultural-arts-events-2012-scientific-committee-on-antarctic-research-scar-open-science-conference**) had been distributed to more than 1,900 Antarctic researchers and had received strong interest from scientists in 18 countries.

If you are or have been an Antarctic researcher—as part of the USGS' 60-plus years of research in Antarctica or as part of research conducted by other organizations—please consider the invitation outlined at the Web site to participate in the 2012 Portland conference. If you know colleagues who are or have been Antarctic researchers, please forward this announcement to them. This is a rare opportunity to impart "science with heart" to the public and others. These cultural-arts events are meant not to replace but to enhance our scientific capabilities.❁

***Eric Douglas**, Royal Australian Air Force pilot-officer and member of the British-Australian-New Zealand Antarctic Research Expedition (BANZARE) of 1929-31, plays a gramophone for penguins in Adélie Land (Cape Denison, Commonwealth Bay) on January 5, 1931.*

USGS research vessel Samuel Phillips Lee *in McMurdo Sound (southern Ross Sea) in February 1984 as part of USGS Operation Deep Sweep. Acoustic data were recorded during this cruise to help map the geologic structure of the seafloor and underlying rock layers of the Ross Sea.*

► *Antarctic Offshore Acoustic Stratigraphy (ANTOSTRAT) project logo created in 1991. The ANTOSTRAT project, which ran from 1989 to 2002, laid the groundwork for circum-Antarctic seismic, drilling, and rock-coring programs designed to decipher Antarctica's tectonic, stratigraphic, and climatic histories.*



Slovak Student Interning in Everglades National Park

Kamil Duracka, a student from Slovakia, has begun a 5-month internship with the U.S. Geological Survey (USGS) Southeast Ecological Science Center (SESC) Dynamics of Land Margin Ecosystems project. The principal investigator for this project is research ecologist **Thomas J. Smith III**, stationed in St. Petersburg, Florida. **Duracka's** internship is at the Everglades Field Station (Dan Beard Center) in Everglades National Park. The USGS works cooperatively through the National Park Service's International Volunteers in Parks (IVIP) Program to facilitate international student exchange in National Parks. **Duracka** has a Masters degree in physical geography and is currently enrolled in a Ph.D. program in physical geography at Masaryk University, Czech Republic. **Duracka** is working closely with USGS staff **Gordon Anderson** and **Karen Ballentine**.

Kamil Duracka

To learn more about the Dynamics of Land Margin Ecosystems project, visit **http://sofia.usgs.gov/projects/index.php?project_url=dyn_margin**; to learn more about the National Park Service IVIP Program, visit **http://www.nps.gov/oia/topics/ivip/ivip.htm**.

Mendenhall Research Fellow to Study Sediment Fluxes in San Francisco Bay

By Jessica Lacy

The U.S. Geological Survey (USGS) Pacific Coastal and Marine Science Center in Santa Cruz, California, recently welcomed **Lissa MacVean**, a new USGS Mendenhall Research Fellow. **MacVean** completed her Ph.D. in civil and environmental engineering at the University of California, Berkeley (UCB), with a focus on environmental fluid mechanics. In her thesis research, she investigated hydrodynamics, sediment cycling, and dispersive fluxes in Coyote Creek, outside some of the salt ponds that were breached for large-scale marsh restoration in South San Francisco Bay. She earned her B.S. and M.S. in civil and environmental engineering from the University of Michigan and worked as a consulting engineer in Guatemala City and Los Angeles before starting her Ph.D. studies. Her postdoctoral project, titled "Sediment Cycling Between Estuarine Habitats," will be a field and numerical-modeling study of sediment fluxes across the subtidal/intertidal interface in San Francisco Bay. Her advisors are USGS research oceanographers **Jessica Lacy** and **Bruce Jaffe**, USGS research hydrologist **Dave Schoellhamer**, and associate professor **Mark Stacey** of the UCB Department of Civil and Environmental Engineering. **MacVean** is one of 22 recent Ph.D. graduates joining the USGS in Fiscal Year 2011 (which began October 1, 2010) as part of the USGS Mendenhall Research Fellowship Program. To learn more about the program, visit **http://geology.usgs.gov/postdoc/**.


Lissa MacVean

Patricia "Soupy" Dalyander Is New Mendenhall Research Fellow in Woods Hole

By Brad Butman

The U.S. Geological Survey (USGS) Woods Hole Coastal and Marine Science Center in Woods Hole, Massachusetts, is very pleased to welcome **Patricia "Soupy" Dalyander** as a USGS Mendenhall Research Fellow. **Dalyander** received a Ph.D. in mechanical engineering from the University of Florida, where she developed optical techniques for the detection of particles in fluid suspension; an M.S. in oceanography from Oregon State University, where she investigated nearshore morphological variability; and a B.S. in physics and mathematics from

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Eckerd College. For 3 years after earning her M.S., and continuing during her Ph.D. studies, **Dalyander** worked with the USGS sediment-transport group in Woods Hole on various regional sediment-transport studies, including a strategy to rank the intensity of storms on the basis of bottom stress. For the past 2 years, she was a research scientist with the U.S. Army Corps of Engineers, where she investigated the influence of menhaden, a type of fish, on eutrophication (the effects of excessive nutrients) in Chesapeake Bay, using an individual-based fish model coupled to a water-quality model. **Dalyander's** Mendenhall project, titled "Developing Seafloor Disturbance Indices Based on Bottom Stress for Habitat Mapping and Marine Spatial Planning," is to develop indices of seafloor disturbance on the continental margin caused by bottom stress, using the Coupled Ocean-Atmosphere-Wave-Sediment Transport (COAWST) model (**http://woodshole.er.usgs.gov/project-pages/cccp/public/COAWST.htm**). (See "Unlocking Oceans of Model Data via Web Services," this issue, for a preliminary map of mean bottom stress calculated by using the COAWST model.) These indices will help define seafloor environments, and have application to the Marine Spatial Planning that has recently been mandated nationwide by the Executive Office of the President. **Dalyander's** principal USGS advisor is oceanographer **Bradford Butman**, and her coadvisors are **John Warner** (principal developer of COAWST), **Chris Sherwood**, **Richard Signell**, and **Page Valentine**. **Dalyander** is one of 22 recent Ph.D. graduates joining the USGS in Fiscal Year 2011 (which began October 1, 2010) as part of the USGS Mendenhall Research Fellowship Program. To learn more about the program, visit **http://geology.usgs.gov/postdoc/**. ❁

Patricia "Soupy" Dalyander. *Her nickname was bestowed by her older brother long ago.*

Recently Published Articles

Bauer, J.E., Moyer, R.P., and Grottoli, A.G., 2010, Carbon isotope geochemistry of two small mountainous river systems and adjacent coastal waters of the Caribbean [abs.]: EOS (American Geophysical Union Transactions), v. 91, no. 26, Ocean Sciences Meeting Suppl., abstract IT41A-0 [go to **http://www.agu.org/meetings/os10/waisos10.html** and search on "bauer"].

Brand, Andreas, Lacy, J.R., Hsu, Kevin, Hoover, Daniel, Gladding, Steve, and Stacey, M.T., 2010, Wind-enhanced resuspension in the shallow waters of South San Francisco Bay—mechanisms and potential implications for cohesive sediment transport: Journal of Geophysical Research, v. 115, C11024, 15 p., doi:10.1029/2010JC006172 [**http://dx.doi.org/10.1029/2010JC006172**].

Brock, J.C., and Palaseanu-Lovejoy, M., 2010, Blue-green airborne lidar for mapping benthic habitat complexity; an emerging tool for coral reef resource managers [abs]: Linking Science to Management, a Conference and Workshop on the Florida Keys Marine Ecosystem, Duck Key, Fla., October 19-22, 2010.

Brock, J.C., Palaseanu-Lovejoy, M., and Nayegandhi, A., 2010, Late Holocene sea-level fluctuation altered coral reef ecosystem structure at the Dry Tortugas [abs.]: International Conference on Global Change and the Environment in Asia and Pacific (GCEAP), 2nd, Inland Waters and Coastal Environment, Hong Kong, October 28-29, 2010 (CD-ROM).

Coble, P.G., Daly, K.L., Cai, W.-J., Fennel, K., Lohrenz, S.E., and Robbins, L.L., 2010, A preliminary carbon budget for the Gulf of Mexico [invited abs.]: EOS (American Geophysical Union Transactions), v. 91, no. 26, Ocean Sciences Meeting Suppl., abstract CO53A-01 [go to **http://www.agu.org/meetings/os10/waisos10.html** and search on "coble"].

Cochrane, G.R., Golden, N.E., Dartnell, P., Schroeder, D.M., and Finlayson, D.P., 2007, revised 2010, Seafloor mapping and benthic habitat GIS for southern California, volume III: U.S. Geological Survey Open-File Report 2007-1271, ver. 2.0 [**http://pubs.usgs.gov/of/2007/1271/**].

Forde, A.S., Dadisman, S.V., Flocks, J.G., Dellapena, T.M., Sanford, J.M., and Wiese, D.S., 2010, Archive of digital chirp sub-bottom profile data collected during USGS cruise 09CCT01 offshore of Sabine Pass and Galveston, Texas, March 2009: U.S. Geological Survey Data Series 526, 5 DVDs [**http://pubs.usgs.gov/ds/526/**].

Hart, K.M., and Hyrenbach, K.D., 2009, Satellite telemetry of marine megavertebrates; the coming of age of an experimental science: Endangered Species Research, v. 10, p. 9-20, doi:10.3354/esr00238 [**http://dx.doi.org/10.3354/esr00238**].

Hart, K.M., Zawada, D.G., Fujisaki, I., and Lidz, B.H., 2010, Inter-nesting habitat for Dry Tortugas loggerhead sea turtles

(Recently Published continued on page 12)

(Recently Published continued from page 11)

[abs.]: GEER 2010, Greater Everglades Ecosystem Restoration; the Greater Everglades—a Living Laboratory of Change; Planning, Policy, and Science Meeting, Naples, Fla., July 12-16, 2010, p. 136 [abstract book posted at **http://conference.ifas.ufl.edu/GEER2010/**].

Hart, K.M., Zawada, D.G., Fujisaki, I., and Lidz, B.H., 2010, Inter-nesting habitat-use patterns of loggerhead sea turtles; enhancing satellite tracking with benthic mapping: Aquatic Biology, v. 77, p. 77-90, doi:10.3354/ab00296 [**http://dx.doi.org/10.3354/ab00296**].

Hein, J.R., Reid, J.A., Conrad, T.A., Dunham, R.E., Clague, D.A., Schulz, M.S., and Davis, A.S., 2010, Seamounts and ferromanganese crusts within and near the U.S. EEZ off California—data for RV *Farnella* cruise F7-87-SC: U.S. Geological Survey Open-File Report 2010-1069, 124 p. [**http://pubs.usgs.gov/of/2010/1069/**].

Hutchinson, D.R., and Barth, G.A., 2010, Continental margins and the U.S. Extended Continental Shelf Project: MARGINS/GeoPRISMS Newsletter, no. 25 [**http://www.nsf-margins.org/Publications/Newsletters/Newsletter.html**].

Kellogg, C.A., Ross, S.W., Demopoulos, A.W.J., Nizinski, M.S., Morrison, C.L., and Brewer, G.D., 2009, USGS Gulf of Mexico deep-sea coral ecosystem studies, 2008-2011: U.S. Geological Survey Fact Sheet 2009-3094, 4 p. [**http://pubs.usgs.gov/fs/2009/3094/**].

Knorr, P.O., Robbins, L.L., and Hallock, P., 2010, Experimental observations of the benthic foraminifer *Amphistegina gibbosa* maintained under elevated pCO_2 [abs.]: EOS (American Geophysical Union Transactions), v. 91, no. 26, Ocean Sciences Meeting Suppl., abstract BO45A-13 [go to **http://www.agu.org/meetings/os10/waisos10.html** and search on "knorr"].

Lee, J.Y., Francisca, F.M., Santamarina, J.C., and Ruppel, C., 2010, Parametric study of the physical properties of hydrate-bearing sand, silt, and clay sediments; part 2, small-strain mechanical properties: Journal of Geophysical Research, v. 115, B11105, 11 p., doi:10.1029/2009JB006670 [**http://dx.doi.org/10.1029/2009JB006670**].

Lee, J.Y., Santamarina, J.C., and Ruppel, C., 2010, Parametric study of the physical properties of hydrate-bearing sand, silt, and clay sediments; part 1, electromagnetic properties: Journal of Geophysical Research, v. 115, B11104, 9 p., doi:10.1029/2009JB006669 [**http://dx.doi.org/10.1029/2009JB006669**].

McIvor, C.C., and Silverman, N.L., 2010, Modifications to the bottomless lift net for sampling nekton in closed-canopy mangrove forests: Wetlands Ecology and Management, v. 18, no. 6, p. 627-635, doi:10.1007/s11273-010-9184-0 [**http://dx.doi.org/10.1007/s11273-010-9184-0**].

Moyer, R.P., Helmle, K.P., Hönisch, B., Chacko, D., and Linsley, B.K., 2010, Historical records of coral geochemistry and growth and their relationship to anthropogenic ocean acidification [abs.]: EOS (American Geophysical Union Transactions), v. 91, no. 26, Ocean Sciences Meeting Suppl., abstract PA31A-04 [go to **http://www.agu.org/meetings/os10/waisos10.html** and search on "moyer"].

Peters, Robert, and Jaffe, B.E., 2010, Identification of tsunami deposits in the geologic record; developing criteria using recent tsunami deposits: U.S. Geological Survey Open-File Report 2010-1239, 39 p. [**http://pubs.usgs.gov/of/2010/1239/**].

Storlazzi, C.D., Presto, M.K., Logan, J.B., and Field, M.E., 2010, Coastal circulation and sediment dynamics in Maunalua Bay, Oahu, Hawaii—measurements of waves, currents, temperature, salinity, and turbidity; November 2008-February 2009: U.S. Geological Survey Open-File Report 2010-1217, 62 p. [**http://pubs.usgs.gov/of/2010/1217/**].

Tedesco, K.A., Spear, J.W., Tappa, E., and Poore, R.Z., 2009, Seasonal flux and assemblage composition of planktic foraminifera from the northern Gulf of Mexico: U.S. Geological Survey Open-File Report 2009-1293 [**http://pubs.usgs.gov/of/2009/1293/**].

Thieler, E.R., and Gutierrez, B., 2010, Sea-level rise hazards and decision support: U.S. Geological Survey Web site, **http://wh.er.usgs.gov/slr/**.

Thieler, E.R., Himmelstoss, E.A., Zichichi, J.L., and Ergul, A., 2010, Digital Shoreline Analysis System (DSAS) version 4.0; an ArcGIS extension for calculating shoreline change: U.S. Geological Survey Open-File Report 2008-1278, version 4.2 [**http://woodshole.er.usgs.gov/project-pages/dsas/version4/**].

Zawada, D.G., and Hart, K.M., 2010, Detailed seafloor habitat mapping to enhance marine-resource management: U.S. Geological Survey Fact Sheet 2010-3090, 2 p. [**http://pubs.usgs.gov/fs/2010/3090/**].

Publications Submitted for Bureau Approval

Andrews, B.D., Ackerman, S.D., Baldwin, W.E., and Barnhardt, W.A., Geophysical and sampling data from the inner continental shelf; northern Cape Cod Bay, Massachusetts: U.S. Geological Survey Open-File Report 2010-1006.

Barnard, P.L., Hoover, Daniel, and Hansen, J.E., Nearshore bathymetric evolution on a high-energy beach during the 2009-10 El Niño winter: Coastal Sediments '11, Miami, Fla., May 2-6, 2011, Proceedings.

Bonisteel-Cormier, J.M., Nayegandhi, A., Brock, J.C., Wright, C.W., Nagle, D.B., Klipp, E.S., Vivekanandan, S., Fredericks, X., and Stevens, S., EAARL coastal topography and imagery—Assateague Island National Seashore, Maryland and Virginia, post-Nor'Ida, 2009: U.S. Geological Survey Data Series (DVD).

Bonisteel-Cormier, J.M., Nayegandhi, A., Wright, C.W., Sallenger, A.H., Brock, J.C., Nagle, D.B., Klipp, E.S., Vivekanandan, S., Fredericks, X., and Segura, M., EAARL coastal topography—Mississippi and Alabama barrier islands,

(Publications Submitted continued on page 13)

(Publications Submitted continued from page 12)

post-Hurricane Gustav, 2008: U.S. Geological Survey Data Series (DVD).

Bonisteel-Cormier, J.M., Nayegandhi, A., Wright, C.W., Sallenger, A.H., Brock, J.C., Nagle, D.B., Vivekanandan, S., and Fredericks, X., EAARL coastal topography—eastern Louisiana barrier islands, post-Hurricane Gustav, 2008; first surface: U.S. Geological Survey Data Series (DVD).

Bonisteel-Cormier, J.M., Vivekanandan, S., Nayegandhi, A., Sallenger, A.H., Wright, C.W., Brock, J.C., Nagle, D.B., Klipp, E.S., EAARL coastal topography—Maryland and Delaware, post Nor'Ida, 2009: U.S. Geological Survey Data Series, online only.

Brothers, L.L., Kelley, J.T., Belknap, D.F., Barnhardt, W.A., Andrews, B.D., and Maynard, M., Pockmark field sedimentary dynamics; a case study from Belfast Bay, Maine: Geo-Marine Letters.

Cronin, Katherine, van Ormondt, Maarten, Storlazzi, Curt, Presto, Kathy, and Tonnon, Pieter, Nearshore disposal of fine-grained sediment in a high-energy environment; Santa Cruz Harbor case study: Coastal Sediments '11, Miami, Fla., May 2-6, 2011, Proceedings.

DeLong, K.L., Flannery, J.A., Maupin, C.R., Poore, R.Z., and Quinn, T.M., A coral Sr/Ca calibration and replication study of two massive corals from the Gulf of Mexico [abs.]: American Association of Geographers Annual Meeting, Seattle, Wash., April 12-16, 2011.

DeWitt, N.T., Flocks, J.G., Pfeiffer, W.R., Forde, A.S., and Wiese, D.S., Archive of sidescan sonar and swath bathymetry data collected during USGS cruise 10CCT01 offshore from Cat Island, Gulf Islands National Seashore, Mississippi, March 2010: U.S. Geological Survey Data Series.

Draut, A.E., Effects of river regulation on aeolian landscapes: Nature Geoscience.

Draut, A.E., Redsteer, M.H., and Amoroso, Lee, Climate variation, landscape cover, and aeolian sand mobility on the Navajo Nation, southwestern U.S. [abs.]: American Geophysical Union (AGU) Chapman Conference on Source to Sink Systems Around the World and Through Time, Oxnard, California, January 24-27, 2011.

Fredericks, X., Nayegandhi, A., Bonisteel-Cormier, J.M., Wright, C.W., Sallenger, A.H., Brock, J.C., Klipp, E.S., and Nagle, D.B., EAARL coastal topography—eastern Florida, post-Hurricane Jeanne, 2004; first surface: U.S. Geological Survey Data Series, online only.

Gibbons, Helen, U.S. Extended Continental Shelf Project—establishing the full extent of the continental shelf of the United States: U.S. Extended Continental Shelf Project (**http://continentalshelf.gov/**), poster.

Gittens, J., St. Petersburg Coastal and Marine Science Center home page: U.S. Geological Survey Web site.

Hanes, D.M., Waves and hydrodynamics responsible for the intermittent closure of the entrance of a small, sheltered tidal wetland at San Francisco, CA: Continental Shelf Research.

Hapke, C.J., Himmelstoss, E.A., Kratzmann, M.G., List, J., and Thieler, E., National assessment of shoreline change; historical shoreline change along the New England and Mid-Atlantic coasts: U.S. Geological Survey Open-File Report 2010-1118.

Henkel, H., Conceptual components for the coastal Everglades Depth Estimation Network (EDEN): U.S. Geological Survey National Surface Water Conference and Hydroacoustics Workshop, Tampa, Fla., March 28-April 1, 2011.

Henkel, H., and McCloskey, B., Everglades Depth Estimation Network (EDEN) data management cycle; from data input to confidence index maps: U.S. Geological Survey National Surface Water Conference and Hydroacoustics Workshop, Tampa, Fla., March 28-April 1, 2011.

Himmelstoss, E.A., Kratzmann, M.G., Hapke, C.J., Thieler, E.R., and List, J., National assessment of shoreline change; a GIS compilation of vector shorelines and associated shoreline change data for the New England and mid-Atlantic coasts: U.S. Geological Survey Open-File Report 2010-1119.

Kneafsey, T.J., Lu, H., Winters, W.J., Boswell, R.M., Hunter, R.B., and Collett, T.S., Analysis of core samples from the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope; insights into core disturbance and handling: Journal of Marine and Petroleum Geology.

Lentz, E.E., and Hapke, C.J., The development of a probabilistic approach to forecast coastal change: Coastal Sediments '11, Miami, Fla., May 2-6, 2011, Proceedings.

List, J.H., Warner, J.C., Thieler, E., Haas, K., Voulgaris, G., McNinch, E., and Brodie, K., A nearshore processes field experiment at Cape Hatteras, North Carolina, U.S.A.: Coastal Sediments '11, Miami, Fla., May 2-6, 2011, Proceedings.

Lorenson, T.D., and Collett, T.S., A petroleum system model for gas hydrate deposits in northern Alaska [abs.]: International Conference on Gas Hydrates, 7th, Edinburgh, Scotland, July 17-21, 2011.

Moore, L., List, J.H., Williams, J., and Patsch, K., Barriers on the brink? The complex intertwined roles of geologic framework, sediment availability and sea-level rise in island evolution: Coastal Sediments '11, Miami, Fla., May 2-6, 2011, Proceedings.

Nayegandhi, A., Vivekanandan, S., Brock, J.C., Wright, C.W., Bonisteel-Cormier, J.M., Nagle, D.B., Klipp, E.S., and Stevens, S., EAARL coastal topography—Sandy Hook Unit, Gateway National Recreation Area, New Jersey, post-Nor'Ida, 2009: U.S. Geological Survey Data Series (DVD).

Noble, Marlene, Rosenberger, K.J., and Robinson, George, Temporal and spatial patterns in wind stress and wind stress curl over the central Southern California Bight: Continental Shelf Research.

Plant, N.G., and Holland, K.T., Prediction and assimilation of surf-zone processes using a Bayesian network, part 2—inverse models: Coastal Engineering.

Pohlman, J.W., The biogeochemistry of anchialine caves: Hydrobiologia.

Prouty, N.G., Roark, E.B., Buster, N.A., and Ross, S.W., Growth rate and age distribution of black corals in the Gulf of Mexico: Marine Ecology Progress Series.

Robbins, L.L., Meylan, S.C., Yates, K.K., and Cai, W.-J., Evaluation of estuarine delineation techniques for carbon flux estimates: Estuaries and Coasts.

(Publications Submitted continued on page 14)

(Publications Submitted continued from page 13)

Robbins, L.L., Yates, K.K., Byrne, R., Liu, X., Dufore, C., Patsavas, M., and Hansen, M., A high-resolution view of carbon system parameters in the Canada Basin, Arctic Ocean [abs.]: Alaska Marine Science Symposium, Anchorage, Alaska, January 17-21, 2011.

Rosenbauer, R.J., Campbell, P.L., Lam, Angela, Lorenson, T.D., Hostettler, F.D., Thomas, Burt, and Wong, Florence, Reconnaissance of Macondo-1 well oil in sediment and tarballs from the northern Gulf of Mexico shoreline (Texas to Florida): U.S. Geological Survey Open-File Report.

Rubin, D.M., and Draut, A.E., Differences in human/landscape/climate interactions in Grand Canyon between 1-2 millennia ago and the present [abs.]: Chapman Conference on Climates, Past Landscapes, and Civilizations, Santa Fe, N. Mex., March 21-25, 2011.

Sherwood, C.R., Directional bottom roughness associated with waves, currents, and ripples: Coastal Sediments '11, Miami, Fla., May 2-6, 2011, Proceedings.

Smith, C.G., Swarzenski, P.W., Dimova, N., and Zhang, J., Natural radium and radon tracers to quantify water exchange and movement in reservoirs, *in* Baskaran, M., ed., Handbook of environmental isotope geochemistry: New York, Springer-Verlag.

Smith, K.E.L., and Flocks, J.G., Environmental investigations using diatom microfossils: U.S. Geological Survey Fact Sheet.

Smith, K.E.L., Flocks, J.G., Steyer, G.D., and Piazza, S.C., Distribution of diatoms in the coastal wetlands of southwest Louisiana and their potential use as sea-level indicators [abs.]: American Association of Geographers Annual Meeting, Seattle, Wash., April 12-16, 2011.

Spear, J.W., Poore, R.Z., and Quinn, T.M., Evidence for winter warming and reduced seasonality in the northern Gulf of Mexico during the past 135 years: Marine Micropaleontology.

Storlazzi, C.D., Field, M.E., Elias, Edwin, and Presto, M.K., The influence of sea level rise on fringing reef sediment dynamics—field observations and numerical modeling: Coastal Sediments '11, Miami, Fla., May 2-6, 2011, Proceedings.

Takesue, R.K., and Swarzenski, P.W., Over 100 years of background-level metals, Nisqually River delta, south Puget Sound, Washington: U.S. Geological Survey Open-File Report.

Telis, P., McCloskey, B., and Henkel, H., Rainfall and potential transpiration data for Everglades Depth Estimation Network (EDEN) gages [abs.]: U.S. Geological Survey National Surface Water Conference and Hydroacoustics Workshop, Tampa, Fla., March 28-April 1, 2011.

Twichell, D., Pendleton, E., Baldwin, W., Flocks, J., Miner, M., and Kulp, M., Geologic controls on sediment distribution and transport pathways around the Chandeleur Islands, Louisiana, USA: Coastal Sediments '11, Miami, Fla., May 2-6, 2011, Proceedings.

Vivekanandan, S., Klipp, E.A., Nayegandhi, A., Bonisteel-Cormier, J.M., Brock, J.C., Wright, C.W., Nagle, D.B., Fredericks, X., and Stevens, S., EAARL coastal topography and imagery—Fire Island National Seashore, New York, 2009: U.S. Geological Survey Data Series (DVD).

Xu, J.P., Elias, Edwin, and Kinsman, Nicole, Does littoral sand bypass the head of Mugu Submarine Canyon? A modeling study: Coastal Sediments '11, Miami, Fla., May 2-6, 2011, Proceedings.