USGS

Sound Waves

Coastal Science and Research News from Across the USGS

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Fieldwork

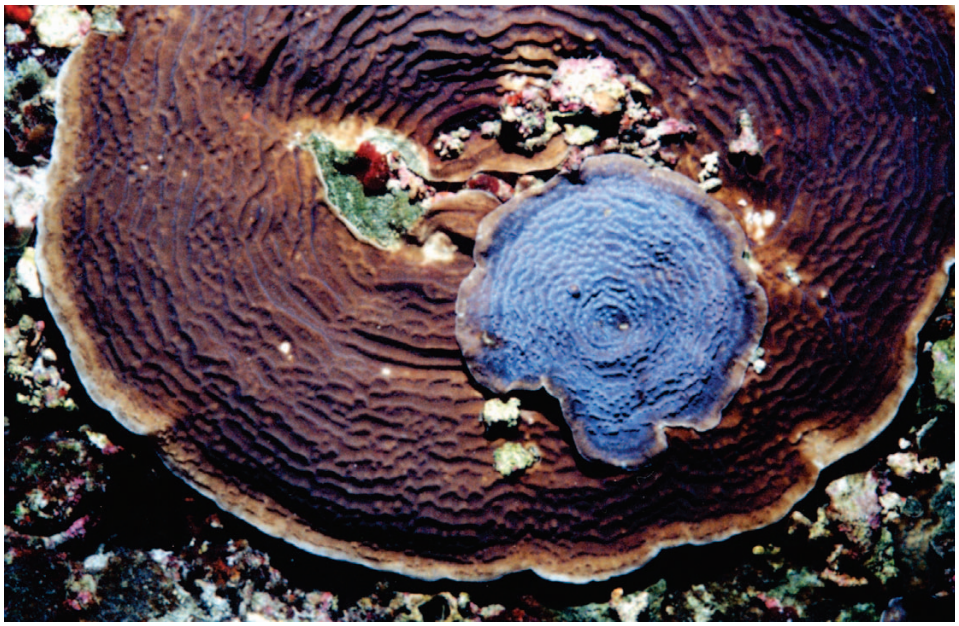
# USGS Scientists Use the SeaBOSS to Explore What Could Be the Deepest Coral Reef in the Continental United States

**By Kate Ciembronowicz, Bob Halley, and Dann Blackwood**

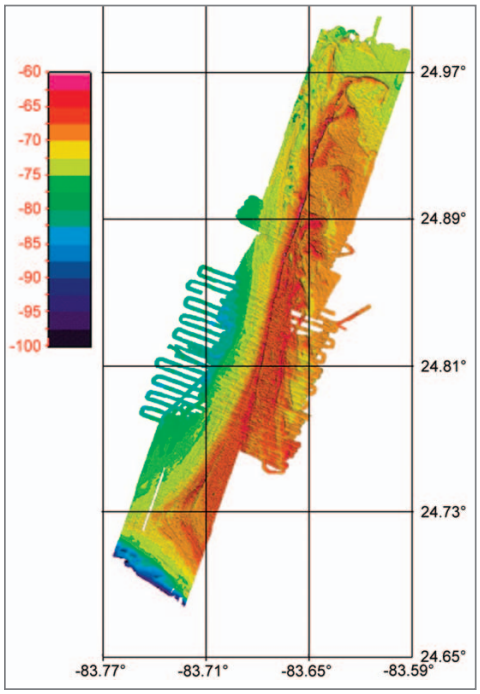
U.S. Geological Survey (USGS) scientists from Woods Hole, MA, and St. Petersburg, FL, departed at the end of April aboard the Florida Institute of Oceanography's research vessel *Suncoaster* to continue a multiyear investigation of what could be the deepest coral reef in the United States, at the southwest edge of the continental shelf off West Florida. Their main goal was to characterize the geologic underpinnings and biological architecture of the Pulley Ridge coral reef. Pulley Ridge is a north-south-trending drowned barrier island, more than 100 km long, approximately 70 km west of Dry Tortugas National Park. The ridge is a subtle feature, about 5 km across, with less than 10 m of relief. The shallowest parts of the ridge are in about 60 m of water. Surprisingly, at that depth, the southern part of the ridge hosts a variety of zooxanthellate scleractinian corals, macroalgae, and tropical fish.

The focus of this cruise was to use the SeaBOSS to collect video transects, still photographs, and coral or algae samples from along the ridge. The SeaBOSS (Sea Bottom Observation and Sampling System) is a modified van Veen grab sampler in a stainless-steel frame with integrated still photography and video systems. The device is lowered straight down from a ship with a winch and conducting cable. It can be deployed quickly and allows many sites to be investigated efficiently. Real-time video allows the selection of still-photograph subjects and the placement of the grab sampler for retrieval of coral samples. In addition to the SeaBOSS data, the scientists collected geophysical map data consisting of boomer seismic and multibeam bathymetry.

*(Deep Coral Reef continued on page 2)*



⇧ *SeaBOSS photograph of plate corals growing on the sea floor at Pulley Ridge, showing* Leptoseris cucullata *(blue) growing on a larger* Agaricia undata *(brown). Field of view is about 30 cm across. Photograph by* ***Bob Halley*** *and* ***Dann Blackwood****.*




⇨ *Southern Pulley Ridge color bathymetry mosaic from high-resolution multibeam sonar, with depths in meters. (Not for navigational purposes.)*

***Sound Waves***

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**Submission Guidelines**

**Deadline:** The deadline for news items and publication lists for the September 2003 issue of *Sound Waves* is Thursday, August 14.
**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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Can't find the answer to your question on the Web? Call **1-888-ASK-USGS**

Want to e-mail your question to the USGS? Send it to this address: **ask@usgs.gov**

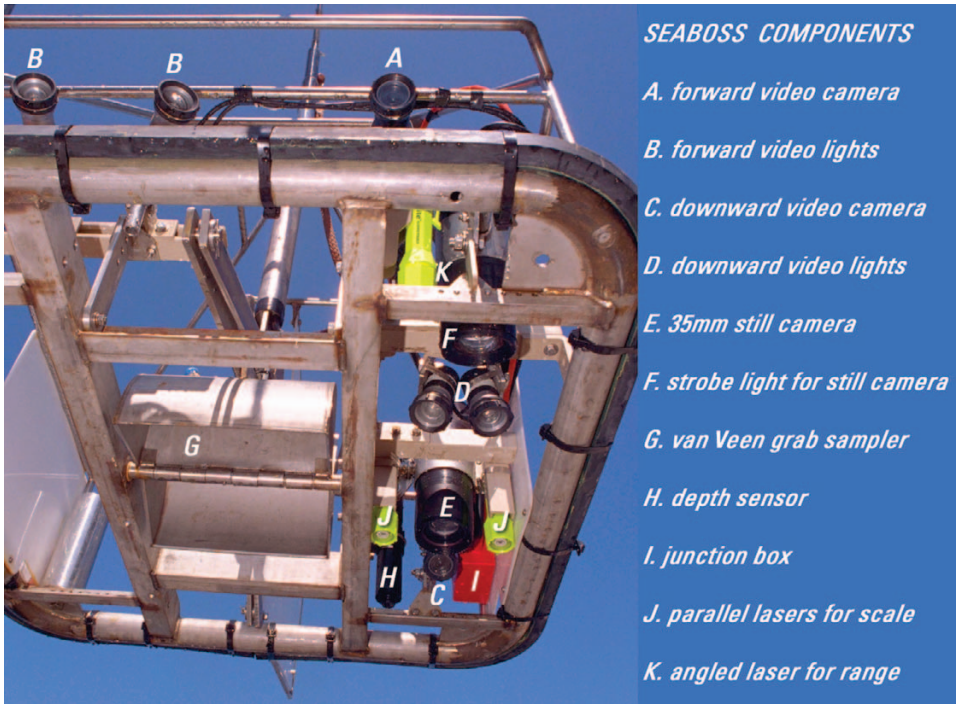
## Fieldwork, continued

*(Deep Coral Reef continued from page 1)*

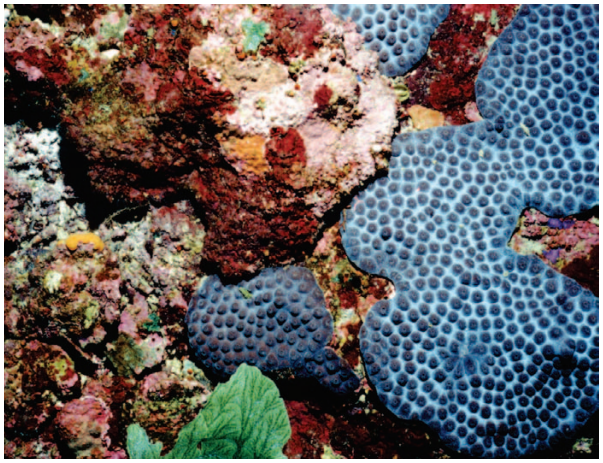
The corals *Agaricia* sp. and *Leptoseris cucullata* are most abundant and are deeply pigmented in shades of tan-brown and blue-purple, respectively. These corals, which form plates as large as 50 cm in diameter, account for as much as 60 percent of the live coral cover at some sites. Less common species include *Montastrea cavernosa, Madracis formosa, Madracis decactis, Porites divaricata,* and *Oculina tellena*. Sponges, calcareous and fleshy algae, soft corals, gorgonians, and sediment occupy surfaces between the stony corals, and coralline-algal nodule-and-cobble zones surround much of the ridge in deeper water (deeper than 80 m). The fish at Pulley Ridge comprise a mixture of shallow- and deep-water species sharing this unusual habitat; more than 60 species have been identified.

Several factors help to account for the existence of this community. First, the underlying drowned barrier island provides both elevated topography and lithified substrate for hardbottom community establishment. Second, the region is dominated by the west edge of the Loop Current,

*(Deep Coral Reef continued on page 3)*




*Bottom view of SeaBOSS (Sea Bottom Observation and Sampling System) components.*



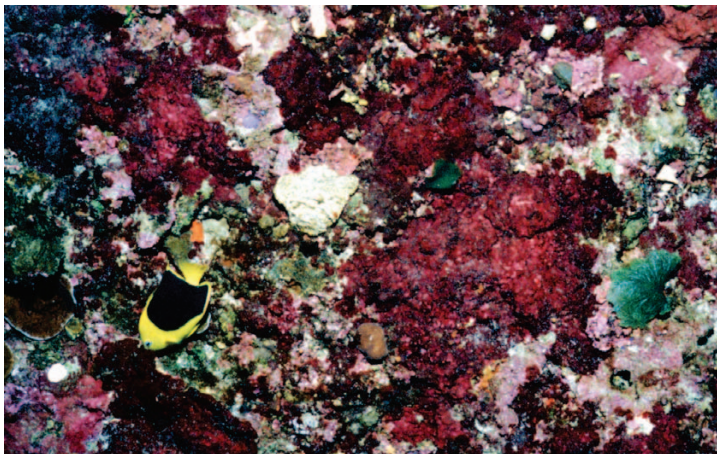
*SeaBOSS photograph of live bottom, including the coral* Montastraea cavernosa *(blue), coralline algae, and the green leafy alga* Anadyomene menzeii. *Field of view is about 50 cm across. Photograph by* ***Bob Halley*** *and* ***Dann Blackwood****.*

*(Deep Coral Reef continued from page 2)*

which brings relatively clear and warm water to the southern region. Third, the ridge's position on the continental shelf places it within the thermocline, a water mass that is known to provide nutrients to shallow reefs in Florida during upwelling.

This largely photosynthetic community appears to be thriving on 1 to 2 percent (5-30 microEinsteins/$m^2$ per second) of the available surface light (photosynthetically available radiation [PAR]) and about 5 percent of the light typically available to shallow-water reefs. This community is clearly one that has adapted to low-light conditions, and so the variety and extent of photosynthetic organisms between 60- and 70-m water depth is impressive.

USGS cruise participants included **Bob Halley** and **Kate Ciembronowicz** from St. Petersburg, FL, and **Dave Twichell** and **Dann Blackwood** from Woods Hole, MA. University of South Florida faculty members **Al Hine**, **Stan Locker**, and **Brian Donahue** and graduate students **Bret Jarrett**, **Beau Suthard**, **Steve Obrochta**, and **Monica Wolfson** also participated. ❁



*SeaBOSS photograph of live bottom at Pulley Ridge, including a rock beauty (fish),* Holacanthus tricolor. *Field of view is about 90 cm across. Photograph by* ***Bob Halley*** *and* ***Dann Blackwood****.*

## Gas Hydrate in the Northern Gulf of Mexico Has Puzzling Characteristics and Could Pose a Hazard to Deep Drilling

**By Debbie Hutchinson and Pat Hart**

Science is often full of surprises, which is what attracts many people to becoming scientists. Studying gas hydrates in the Gulf of Mexico is no exception: the gulf should be full of gas hydrate, given its combination of variables—abundant natural gas, the right water depths, and appropriate temperature regimes. But strangely, the one generally universal indicator of gas hydrate on seismic-reflection records, a bottom-simulating reflection (BSR), is basically absent on the multitudes of seismic-reflection records from the northern gulf. Also unusual is that mounds of gas-hydrate deposits are commonly observed on the sea floor during submersible dives, and gas hydrate, which is less dense than water, should float away. These unexpected characteristics were part of the impetus for the U.S. Geological Survey (USGS) to conduct a recent cruise to collect high-quality seismic-reflection data at selected sites in the gulf.

*Cruise participants in the recent Gulf of Mexico cruise on the research vessel* Gyre. *Photograph courtesy of* ***Lori Hibbeler****.*

Gas hydrate is a frozen form of gas and water that occurs in shallow sediment on most continental slopes and rises of the world, at moderate pressures and temperatures and ample gas saturation. The gas is most commonly methane ($CH_4$) but can also be hydrocarbon gases of greater molecular weight, such as ethane ($C_2H_6$) and propane ($C_3H_8$).

Gas hydrates have the capacity to stiffen near-surface sediment by replacing water-filled pores with hydrate-filled pores. They have been linked to massive slope failures on continental margins (the Storegga Slide off west-central Norway, the largest known submarine slide in the world, is a good example), in which the melting of gas hydrate is suspected of contributing to the destabilization of sediment. As drilling in the Gulf of Mexico has progressed from shallow-water shelf depths (less than 200 m) to deep-water slope depths (more than 1,000 m), wells have come to penetrate the gas-hydrate-stability zone. Because drilling can bring warm fluids up from depth, potentially melting the shallower gas hydrate, many researchers and engineers anticipate that drilling through gas hydrate

*(Gas Hydrate continued on page 4)*

*(Gas Hydrate continued from page 3)*

may pose a hazard to the stability of the well, the platform anchors, the tethers, or even entire platforms.

In an effort to help understand the unusual occurrence of gas hydrate in the northern Gulf of Mexico and to gather data relevant to understanding the possible consequences of drilling, the USGS conducted a 14-day cruise aboard Texas A&M University's research vessel *Gyre* in May 2003. We collected high-resolution multichannel seismic (MCS)-reflection data. These data, in combination with the three-dimensional MCS data provided by industry, will enable us to map gas-hydrate indicators and interpret the geologic framework around two potential deep-water gas-hydrate sites that may be drilled in spring 2004 by the Joint Industry Program (JIP), an industry consortium led by Chevron-Texaco and partly funded by the U.S. Department of Energy (DOE). Chief scientists were **Pat Hart** (Menlo Park, CA) and **Debbie Hutchinson** (Woods Hole, MA).

High-quality data were collected along more than 1,000 km of trackline and were processed onboard during the cruise. Initial interpretation shows a well-developed BSR of restricted extent near the Keathley Canyon site and several potential gas-hydrate vent/mound sites in the Atwater Valley site. Several notable USGS firsts were achieved at sea: all data were demultiplexed and processed through final stack at sea, providing near-real-time feedback on data quality and results. Also, thanks to the efforts of **Pat Hart** (Menlo Park), **Ray Sliter** (Menlo Park), **Seth Ackerman** (Woods Hole), **Brandon Dugan** (Woods Hole), and **Erika Geresi** (University of Mississippi), using two seismic-processing systems and a computer equipped with geographic-information-system (GIS) software, all geometry was defined in true geographic coordinates and merged with the seismic data during the processing sequence.

The *Gyre* cruise, which is part of a much larger program of gas-hydrate research in the northern Gulf of Mexico, was conducted in coordination with the JIP to assess the hazard that gas hydrates pose to deep-water drilling. The two primary study areas for the cruise, lease blocks Keathley Canyon 195 and Atwater Valley 14, were selected from six sites that the JIP originally considered for drilling. The cruise results will be combined with data from additional site-survey work scheduled for August 2003, using near-bottom instrumentation that includes the Deep-Towed Acoustic/Geophysical System (DTAGS), a multichannel seismic instrument from the U.S. Naval Research Lab; heat-flow sensors from Georgia Tech; shallow coring devices from the Naval Research Lab; and instruments for measuring electrical resistivity from the Woods Hole Oceanographic Institution. Selected tracklines from the USGS *Gyre* cruise will be reoccupied by these specialized instruments to further characterize the geology and gas hydrates of the potential drillsites. This work also builds on a strong foundation of gas-hydrate research in the Gulf of Mexico that has been established by numerous academic research groups.

*Preparing to deploy the multichannel seismic-reflection streamer in ankle-deep water on the fantail of the research vessel* Gyre. *From left,* ***Billy Green*** *(*Gyre *deck engineer),* ***Graham Standen*** *(Geoforce Consultants Huntec engineer),* ***Larry Kooker*** *(USGS electronics engineer), and* ***Hal Williams*** *(USGS mechanical engineer, partly obscured by the crane).*

## California Sea Otter Numbers Are Up for the 2003 Census

**By Gloria Maender**

Counters tallied a total of 2,505 California sea otters in 2003, 17 percent more than the total of 2,139 sea otters in 2002, according to a survey led by the U.S. Geological Survey (USGS). Excellent to good counting conditions sped the 2003 census to a near-record time, running May 10-15.

"This is the highest total count and the highest count of adult and young adult sea otters, 2,270, since current standardized methods came into practice in 1983," said survey organizer **Brian Hatfield**, a USGS biologist in California. The total number of dependent pups counted was 235. The survey is conducted cooperatively with the California Department of Fish and Game, the Monterey Bay Aquarium, the U.S. Fish and Wildlife Service, and other agencies and organizations. The information gathered from spring surveys is used by Federal and State wildlife agencies in making decisions about the management of this

*Sea otter in Elkhorn Slough. Photograph by* ***Paula Messina****, San Jose State University.*

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*(Sea Otters continued from page 4)*

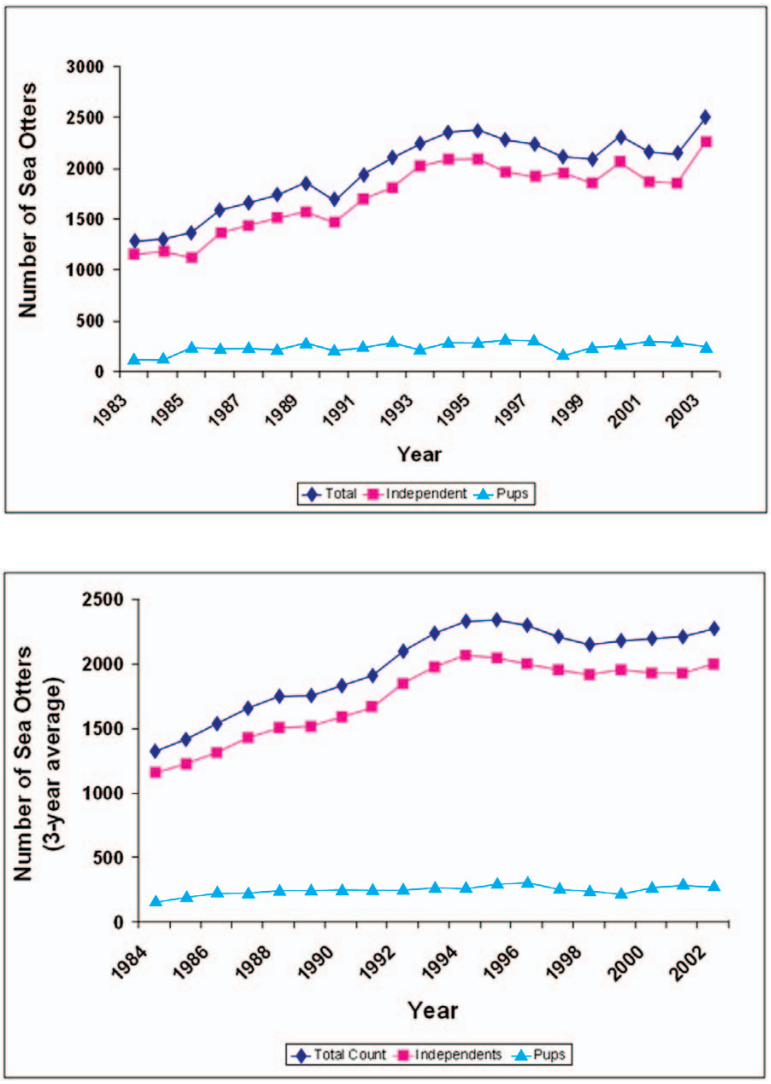
sea mammal.

This year's survey also marks the greatest differential on record in totals for spring counts between any two sequential years. While the increased number of sea otters in the spring 2003 count is a hopeful sign that the California population may be increasing, the number is not necessarily indicative of an overall population increase, said **Jim Estes**, a USGS scientist. Spring counts have varied quite widely since 1999. The U.S. Fish and Wildlife Service's Southern Sea Otter Recovery Plan recommends that trend analyses be based on 3-year running averages to reduce the influence of anomalously high or low counts during any particular year. Factors that can influence the count include viewing conditions, abundance and species composition of surface-canopy kelp, observer experience, and distribution and movements of the animals.

"The 3-year running averages do indicate a gradual but statistically significant population increase of about 0.9 percent per year since 1998; however, this result is strongly driven by the high 2003 count," said **Estes**. "As is always the case, the meaning of this data point will not become clear for several more years."

**Hatfield** said most of the increase in numbers of sea otters counted between 2002 and 2003 occurred in Monterey Bay, where observers counted 169 sea otters in 2002 and 503 in 2003. Elsewhere, the numbers for 2003 were mostly similar to those obtained in 2002. Excellent viewing conditions encountered by the aerial team likely contributed to the increase in the number of sea otters counted in Monterey Bay.

In central California, a short-term change in sea-otter habitat and food availability may also have contributed to higher numbers in Monterey Bay, noted **Estes**. Early storms and large waves during winter 2002-2003 greatly reduced kelp canopies—which sea otters use for resting and foraging—in several exposed outer-coast areas within the sea otter's range in central California. Along some stretches of coast, the number of sea otters counted was reduced from previous years, and some "missing" sea otters may have moved into Monterey Bay. Elevated numbers of Dungeness crabs may also have contributed to the unusually large number of sea otters in Monterey Bay.




*Graph on top shows number of sea otters counted in California spring surveys since 1983; graph on bottom shows 3-year running averages of the same data. (Example: Value for 2001 is the average of the 2000, 2001, and 2002 counts.) Scientists use 3-year running averages—which reduce the influence of anomalously high or low counts during any particular year—to assess whether the California sea-otter population is growing or declining.*

"We're cautiously optimistic about the increase in sea-otter numbers for this year, but elevated sea-otter mortality is still hindering recovery," said **Greg Sanders**, U.S. Fish and Wildlife Service sea-otter coordinator. "In the long run, we have to minimize deaths of these animals."

The greatly elevated number of sea otters in Monterey Bay and, to a lesser extent, in Estero Bay near the town of Morro Bay, about 110 miles south of Monterey Bay, may also help explain the record high number of strandings this year—a preliminary figure of 116 strandings reported from January through May 2003, said **Estes**. The probability of recovering stranded sea otters is greater in the Monterey Bay and Estero Bay areas than in most other areas of central California; together, these two stretches of coast account for 63 percent of all recovered carcasses in California.

For more information about USGS sea-otter research, visit URL **http://www.werc.usgs.gov/otters/.**

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# Florida Integrated Science Centers' Open House in Gainesville—The U.S. Geological Survey Works for All Ages

**By J'aime Posch and Dennis Krohn**

Tiny frogs, a giant blimp, mobile labs, touch tanks, demonstrations, and lots of enthusiastic scientists greeted visitors to a recent Open House at the U.S. Geological Survey (USGS)'s office in Gainesville, FL. Previously known as the Florida Caribbean Science Center, the Gainesville office is now the headquarters of the new Florida Integrated Science Centers (FISC)'s Center for Aquatic Resource Studies.

The center's second annual USGS Open House was a 2-day event, held on May 16 and 17. On May 16, a Friday, nearly 400 4th-graders from Alachua County elementary schools received guided tours, some of them led by volunteers from local high-school service groups. On the next day, a Saturday, the event was open to the public. The Open House gave the Gainesville community a glimpse of current USGS studies, including research on manatees, nonindigenous species, and the effects of African dust on

*(Gainesville Open House continued on page 7)*

⇧ ***Janet Buckland*** *looks on while a young visitor examines an apple-snail shell.*


⇦ ***Dave Wegener*** *(left) and* ***Dennis Krohn*** *ready a USGS blimp for launching. The blimp is used for studying airborne dust from Africa.*

⇧ ***Nikki Kernaghan*** *shows off a frog at the invertebrate touch tank.*

⇨ ***Dennis Krohn*** *has the world in his hands as he discusses "Volcanoes in Florida."*

⇦ ***Jim Reid*** *explains the features of manatee bones to Open House visitors.*

⇦ ***Jon Wiebe*** *shows visitors an American crocodile.*

*(Gainesville Open House continued from page 6)*

the environment. Students had a hands-on scientific opportunity to experience environmental science in Florida, which included handling crayfish, apple snails, tadpoles, and leopard frogs in the large aquarium touch tank.

Scientists from the four USGS disciplines of geology, hydrology, biology, and geography participated in the event, coming from Gainesville and from many of the USGS' other FISC offices, including those in Altamonte Springs, Miami, Ocala, St. Petersburg, and Tallahassee. **Mike Orr**, a hydrologic technician from Altamonte Springs, brought equipment that demonstrated water-quality sampling and measurement of the flow and amount of water carried by Florida's rivers. **Dennis Krohn**, a geologist from St. Petersburg, showed how a volcano works with a model that was rigged to make sound effects as it erupted. **Jon Wiebe**, a fisheries biologist from Gainesville, explained that USGS researchers working with alligators and crocodiles have placed about 30 'gators on a special diet; female alligators are being monitored to see whether the chemicals in pesticides they ingest by eating contaminated prey are passed on to their eggs.

"The scientists conduct research that people really care about, such as preserving wildlife and endangered species like manatees, American crocodiles, gulf sturgeon, and fresh-water mussels," said **Russ Hall**, center director. "We are doing work that affects everybody's lives."

**Hannah Hamilton**, public-affairs specialist, added, "It is important for the public to see where its tax money is going. The community deserves to see what research is being done and the studies its money is funding. The Open House is a casual way for the public to learn about the large-scale, long-term, and complex things the USGS does."

# Good Time Had by All at USGS Open House in Menlo Park, CA

**By Helen Gibbons**

The sky was clear, and the feeling was festive as thousands of visitors strolled through the USGS campus in Menlo Park, CA, for the center's seventh triennial Open House, held May 30, May 31, and June 1. An event that was almost canceled months ago as organizers struggled with the implications of "Code Orange" turned out to be an exhilarating experience for USGS employees and their eager Open House visitors.

The first day, May 30, was a preview day for school groups and VIPs. It opened with a brief ceremony that included addresses by USGS Director **Chip Groat**, Western Regional Director **Doug Buffington**, and Congresswoman **Zoe Lofgren** (D, San Jose). A member of Congresswoman **Anna Eshoo's** (D, Palo Alto) staff presented an award to longtime USGS volunteer **Tooky Campione** for her many years of leading USGS tours and for forging links between the USGS and Don Edwards San Francisco Bay National Wildlife Refuge, where she also volunteers. Additional guests from local governments and governmental agencies were recognized, and all were invited to tour the Open House exhibits. The VIPs plus an estimated 1,400 exuberant schoolchildren and their teachers gave exhibitors a chance to strut their stuff on Friday and fine-tune their presentations for the much larger crowd—estimates range from 10,000 to 15,000—that came to campus on Saturday and Sunday (May 31 and June 1).

Coastal and marine researchers were big contributors to this year's Open House, with some of the most popular exhibits on campus. "Dress Like a Marine Geologist" kept **Clint Steele**, **Carolyn Degnan**, **Dan Mosier**, and their small army of volunteers—**Judy Steele**, **Nick Degnan**, **Jenny Mosier**, **Eleanore Ramsey**, **Mary Jo De Laere**, **Kat Griffin**, **Chuck Cegelski**, and recently retired **Diana Collins**—busy all three days, as kids of all ages lined up to don life jackets, hard hats, and other marine field attire. The visitors were videotaped against a green screen background, then digitally placed into a field setting of their choice. View their images on the World Wide Web at URL **http://walrus.wr.usgs.gov/infobank/programs/html/main/openhouse2003.html.**

In the hallways adjacent to "Dress Like a Marine Geologist," recent retiree **Gretchen Luepke Bynum** answered questions about rocks, minerals, and fossils on display. **Selita Donaville** and **Bill** and **Maria Adams** directed visitors to exhibits and kept the literature holders full—in some cases

*(Menlo Park Open House continued on page 8)*

*Top: A family poses in front of the green screen at the "Dress Like a Marine Geologist" activity. Volunteer **Nick Degnan** is in the background. Center: **Clint Steele** places the family in a marine field setting, visible on the monitor at lower left. Volunteers **Eleanore Ramsey** (red t-shirt) and **Jenny Mosier** (far right) look on. Bottom: The family at sea.*

*(Menlo Park Open House continued from page7)*

searching the campus or the Web for the last copy of a popular handout and photocopying it to provide a fresh supply.

In the "Big Tent" set up in a parking lot, visitors could see how scientists "Explore the Changing Coast" in a multifaceted exhibit presented by **Laura** and **Nate Landerman**, **Jingping Xu**, **Guy Gelfenbaum**, **Marlene Noble**, **Giles Lesser**, **Kevin Orzech**, **Beth Feingold**, **Lorie Hibbeler**, **Juliet Kinney**, **Jon Warrick**, **Peter Ruggiero**, **Dave Gonzales**, **Simon Barber**, **Charlene Tetlak**, and **Gary Schneider**. Visitors could trigger the acoustic release for the buoy on an instrumented tripod, stir up sand in a tank and see the effects on suspended-sediment measurements, investigate how sediment changes as it moves from the mountains to the sea, and take their photographs on waverunners used for surveying near the shore (a big hit with the kids!).


*Visitor rides a waverunner instrumented for surveying in nearshore waters.*

Across the tent, visitors could winch the "Flying Eyeball" (a.k.a. Underwater Microscope System) down onto a bed of sand at the bottom of a large tank and observe the Flying Eyeball's magnified view of the sand grains on a monitor. This popular exhibit was presented by **Hank Chezar**, **Sarah Chezar**, **Brian Lockwood**, **Fred Payne**, and **Diane Minasian**.

Also in the tent was a poster inviting visitors to come to the ground floor of Building 15 to take a "Real-Time 3-D Fly-Through Over the Seafloor of San Francisco Bay." Presenters **Jim Gardner** and **Pete Dartnell** report that some adults were bashful but kids did not hesitate to grab the computer controls and maneuver their way through the high-resolution


***Diane Minasian** enjoys the calm before the storm as she awaits the first wave of Open House visitors at the "Flying Eyeball" tank.*

multibeam swath-sonar data that provide a detailed view of the floor of San Francisco Bay. One floor up in Building 15 was an exhibit by **Mary McGann**, entitled "Invasion of San Francisco Bay by a Marine Microorganism," that invited visitors to look through a microscope for a closeup view of the invader—a foraminifer called *Trochammina hadai*. On the top floor, visitors were offered "Adventures in Geochemistry" by **Bob** and **Terri Rosenbauer**, **Tom Lorenson**, **Fran Hostettler**, **Keith Kvenvolden**, **Jen Dougherty**, and **Tamer Koksalan**. One activity invited visitors to smell four different jars of oil and learn how the oils' different odors reflect differences in their chemical compositions, differences that can be used to "fingerprint" oils and, in some cases, identify the source of oilspills. In another activity, visitors poured carbonated water into a cup, added a tablespoon of salt, and

***Aren Lorenson** is ready to help visitors explore $CO_2$ solubility at the "Adventures in Geochemistry" exhibit.*

watched the water bubble as dissolved $CO_2$ came out of solution. Enthusiastic help from **Tom's** 8-year-old son, **Aren**, drew a lot of kids and families to this activity, which showed that $CO_2$ is less soluble in saltwater than in freshwater. Understanding $CO_2$ solubility is critical for scientists studying the possible sequestration of excess manmade $CO_2$ in deep saline aquifers (see related article in May 2002 *Sound Waves*).

Building 3 was the site of several coastal and marine exhibits. A dramatic view of the San Francisco Bay region—created by **Ben Sleeter** (Geography Discipline) by combining Landsat imagery and digital-elevation data with offshore bathymetry provided by **Florence Wong**—greeted

*Visitors to the "San Francisco Bay Area Science Room" saw a 12-ft-by-12-ft print of this view of the San Francisco Bay area, created by **Ben Sleeter** (Geography Discipline) by combining Landsat imagery and digital-elevation data with offshore bathymetry provided by **Florence Wong**.*

visitors to the "San Francisco Bay Area Science Room." There they could visit numerous exhibits, including "Fossils of the San Francisco Bay Area," assembled by **Carol Reiss**, **Florence Wong**, and others, and "What's Below the Waters of San Francisco Bay?" presented by **John Chin**, **Kevin Orzech**, and **Don Woodrow**. **John**, **Kevin**, and **Don** educated a steady stream of visitors and offered them a full-color poster of the floor of west-central San Francisco Bay (Open-File Report 01-90, available at URL **http://geopubs.wr.usgs.gov/open-file/of01-90/**)

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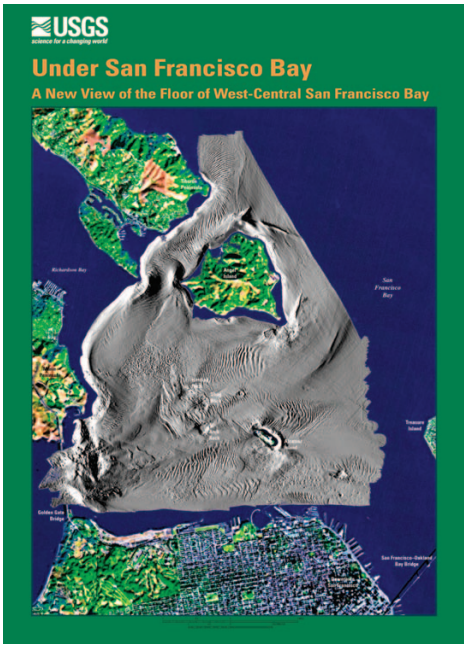


*Poster of the floor of west-central San Francisco Bay (Open-File Report 01-90, available at URL* ***http://geopubs.wr.usgs.gov/open-file/of01-90/****).*

and a pair of 3D glasses for viewing a three-dimensional image on the back of the poster. Across the hall in the "3D Theater," **Eric Geist** helped visitors view a "Virtual Tsunami!" that they picked from a casebook with facts about five historical tsunamis. During a computer simulation of the tsunami wave's development—from its generation by an earthquake through its impact on the shore—visitors could "fly through" the imagery, viewing the moving wave from above, below, or virtually any angle.

The 3D theme continued across campus in Building 5, where visitors wearing red-blue glasses strolled through the "3D Geology Tours Image Gallery" and stopped by a table in the center of the room to play with "Topo Salad Trays: 3D Models of Angel Island and Monterey Canyon," presented by **Helen Gibbons**, **Jon Childs**, **Kristen Lee**, **Brandie McIntyre**, **Chris Gutmacher**, **Carole Woodrow**, **Terry Bruns**, and **Florence Wong**. Visitors love these models—made of clear-plastic stacking trays with a contour line drawn on each tray—which are low-tech (you don't even need the 3D glasses!) and visually striking.

Also in Building 5, **Susie Cochran-Marquez**, **Chad Marquez**, **Ann Gibbs**, **Becky Stamski**, **Josh Logan**, and **Eric Thompson** showed visitors how USGS scientists "Explore Hawai'i's Coral Reefs." People made a beeline for the exhibit's bright-orange drifter, asking "What's the flying saucer?" Its flattened, saucerlike shape exposes very little surface area to the wind, allowing the drifter to be pushed instead by currents flowing against its subsurface sails—plastic fins that can be mounted on the bottom of the drifter to measure surface currents or on a line attached to the drifter to measure currents below the surface. A GPS unit inside the saucer continually records the drifter's location. The exhibit included a slide show explaining how USGS scientists are using current drifters and other technologies to map and monitor coral reefs in Hawai'i.

***Brandie McIntyre*** *(right) watches as a visitor assembles a topo-salad-tray model of Monterey Canyon.*

Pleasant weather made visitors happy to spend some time outdoors and enjoy musical performances by "Duckweed," an old-time band that includes current and former Coastal and Marine Geology team members **Gretchen Luepke Bynum**, **Guy Cochrane**, **Alan Cooper**, **Helen Gibbons**, **Stephanie Ross**, **Lauren Herzog Schwartz**, and **Florence Wong**, and "Shig and Buzz," an instrumental surf and rock band.

Near the musical venue and elsewhere on campus were food and souvenir booths run by the nonprofit, oncampus daycare center, GeoKids, and staffed by volunteers that included Coastal and Marine Geology


*Mystery writer and former USGS employee* ***Sarah Andrews*** *signs copies of her forensic-geology novels.*

team members **Jamie Conrad**, **Pat Hart**, **Laura Torresan**, **Jennifer Mendonça**, **Angela Gallamore**, and **Angela's** fiancé **Jonathan Sasse**. A special attraction at one of the booths on Saturday was forensic-geology mystery novelist **Sarah Andrews**, who spent several hours speaking with visitors and signing books, including her latest, *Killer Dust,* based on research by USGS scientist **Gene Shinn** (St. Petersburg, FL).

The GeoKids booths contributed to the festive atmosphere and provided much-needed refreshment as the weekend warmed up. Nearly an hour after the Open House had officially ended, GeoKids volunteers were still selling ice cream to visitors reluctant to leave the scene of so much fun and to hot, tired, and happy exhibitors.

To see photographs of the recent USGS Open House in Menlo Park, a list of exhibits, and related links, please visit URL **http://openhouse.wr.usgs.gov/**.

# National Park Service Honors Caroline Rogers for Her Coral-Reef Research

**By Dennis Krohn**

**Caroline Rogers**, a marine ecologist at the U.S. Geological Survey (USGS)'s Caribbean Field Station in St. John, U.S. Virgin Islands, has been awarded the 2003 Southeast Region Research Award by the National Park Service (NPS). The 10-year-old program recognizes outstanding contributions to natural-resource research. The award "was created to reward excellence in developing scientific programs or published research which further the cause of science" in the national parks.

The award recognizes **Caroline's** commitment of more than 20 years to the protection of coral reefs and the understanding of coral-reef ecology in the Caribbean and western Atlantic. **Caroline's** noted scientific contributions include helping to gain an understanding of some of the stresses contributing to the decline of coral reefs, including sedimentation, hurricanes, overfishing, and coral diseases. She and her research team have developed monitoring protocols and analytical methods that have been used throughout the western Atlantic and have been adopted worldwide. Of particular note is the NPS commendation that the USGS/NPS program represents a "partnership in the truest sense"; it is commonplace for NPS scientists to participate in field excursions and dives on USGS-sponsored projects and vice versa. **Caroline** received her Ph.D. in ecology/botany from the University of Florida in 1977, worked as a research biologist for the Virgin Islands National Park from 1984 to 1993, and became field-station leader under the USGS Florida Caribbean Science Center (now part of the Florida Integrated Science Centers) in 1995.

***Caroline Rogers**, recently honored by the National Park Service for her work on coral reefs in the Caribbean and western Atlantic.*



# Foreign Professors Visit the USGS' Center for Coastal and Watershed Studies in St. Petersburg, FL

**By Dennis Krohn and Bob Morton**

Two professors visited the U.S. Geological Survey (USGS)'s Center for Coastal and Watershed Studies in St. Petersburg, FL, in spring 2003 to further their education and look for opportunities for continued collaboration with the USGS. **Ivan Correa** and **Scott Nichol** worked under the guidance of **Bob Morton,** looking at different aspects of coastal research that have piqued **Bob's** interest in the past.

**Ivan**, whose formal name is **Ivan D. Correa Arango**, is a professor of coastal and marine geology at EAFIT University in Medellín, Colombia. He formerly worked at INGEOMINAS, the Colombian equivalent of the USGS. **Ivan** first met **Bob** in the mid-1990s, when **Bob** was lecturing in Bogotá. **Ivan** has published reports on both the Pacific and the Caribbean coasts of Colombia, which are quite different in terms of geologic setting and coastal environment. He received his doctorate in Bordeaux, France, and is fluent in Spanish, English, and French. **Ivan** visited the USGS on a 4-month sabbatical to learn about the USGS' coastal and marine research and the types of products we produce. He translated into Spanish a "Geoindicators" paper that **Bob** wrote about tropical coasts and prepared a summary of information about the Colombian coasts for a revised version of *The World's Coastline* (edited by **Eric Bird** and **Maurice Schwartz** in 1985) that is being prepared for electronic publication by Kluwer Academic Press early next year as "The World's Coasts: Online"—a project organized by **Eric Bird** of the University of Melbourne, Australia. **Ivan** also took a field trip to Louisiana, where he worked with **Juan Luis Gonzalez** (University of Illinois, Chicago), who is collecting basal peat cores to help refine sea-level curves.

**Scott Nichol**, who currently resides in New Zealand, visited the USGS for a month during his winter break. **Scott** took advantage of his trip to the Coastal Sediments '03 Conference, held in May in Clearwater, FL, to continue his research on the comparative sedimentology of storm and tsunami deposits. **Scott** is a senior lecturer in the School of Geography and Environmental Science at the University of Auckland. His research interests are coastal geomorphology and evolution, tsunamis in the geologic record, and sea-level change. **Scott** is a native of Australia, where he received his Ph.D. from the University of Sydney. Later, he held a post-doctoral position at Halifax, Nova Scotia, before accepting the teaching position in New Zealand. He has conducted research in Australia, New Zealand, Ireland, the U.S. Gulf Coast, Canada, and Antarctica.

The Center for Coastal and Watershed Studies was fortunate to host two outstanding international researchers, and hopes they will continue their collaboration with the USGS.

## WHOI Summer Fellows at USGS Center in Woods Hole

**By Debbie Hutchinson and Chris Sherwood**

Each summer, the Woods Hole Oceanographic Institution (WHOI) supports from 25 to 30 upper-level undergraduates to participate in its summer research program. These Student and Minority Fellows have a rigorous schedule that includes attending lectures, developing a research project with their advisors, presenting updates and results orally during the summer, and submitting a final written report before the program ends in late August. This year, the U.S. Geological Survey (USGS)'s Woods Hole Field Center is hosting two of these Summer Student Fellows.

**Kori Newman** is working with **Debbie Hutchinson** on interpreting gas-hydrate seismic-reflection data from the northern Gulf of Mexico. Her project will map the distribution of shallow-amplitude anomalies and their geologic significance on the floor of Mississippi Canyon, in a region where methane hydrate has been sampled. She will be working with recently collected high-resolution multichannel seismic-reflection data and coincident 3.5-kHz bathymetric profiles (see "Gas Hydrate in the Northern Gulf of Mexico Has Puzzling Characteristics and Could Pose a Hazard to Deep Drilling," this issue). **Kori** has just graduated from Smith College with a major in physics and geology. She will be attending graduate school at Lamont-Doherty Earth Observatory in the fall.

**Amit Bohara** is working with **Chris Sherwood** this summer. A physics major at Gustavus Adolphus College in Minnesota, **Amit** will be calibrating acoustic instruments for measuring suspended sediment and helping analyze EuroSTRATAFORM data collected in the Adriatic Sea this past winter (see articles in December 2002/January 2003 and April 2003 *Sound Waves*). **Amit** is looking for some good soccer and Ultimate [Frisbee] matches and someone to help him improve his swimming skills…not a big sport in his hometown of Kathmandu, Nepal!

We welcome **Kori** and **Amit** to our center.


*Summer student interns, fellows, and visiting investigators at the Woods Hole Field Center. Left to right:* ***Mital Shah***, ***Damon Dunson***, ***Amit Bohara***, ***Kori Newman***, *and* ***Pilar Llanes Estrada*** *(visiting postdoctoral student working with* ***Uri ten Brink****).*

## Two Summer Interns Working with the USGS National Knowledge Bank

**By Rebecca Riall and Fausto Marincioni**

**Mital Shah** has joined the U.S. Geological Survey (USGS)'s Woods Hole Field Center for the summer as a Student Conservation Association (SCA) intern. During her sojourn, she will assist with the conceptual model for the National Knowledge Bank. **Mital** has insight into translating knowledge from a technical to a less technical level because of her experience as a teacher—first as a GED (General Educational Development, a high-school equivalency program for adults) instructor on the Tohono O'odham Reservation and more recently as a home-schooling instructor on a ranch outside of Tucson, AZ. Before teaching, **Mital** received her B.A. in religion from Emory University. She has also volunteered on organic farms in Europe and interned as a park guide in Alaska.

**Damon Dunson** is another SCA intern working at the Woods Hole Field Center for the summer. A junior at the University of Maryland, College Park, he is a marine biology major. His knowledge of marine biology and his inquisitiveness will prove useful to the National Knowledge Bank. **Damon** has begun creating a data base of information about the center's photograph collection, as he gathers keywords for each image and works with scientists to identify the more unusual items.

The National Knowledge Bank will manage knowledge related to coastal and marine geology that is held in the publicly accessible data bases and by the public scientists of our Nation. It will include the MRIB Digital Library, at URL **http://mrib.usgs.gov/.**

# Recently Published Articles


Ackleh, A., Carter, J., Derouen, J., and Bounds, D.L., 2003, A spatially explicit model of nutria population dynamics and control [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 85.

Boustany, R.G., Michot, T.C., and Moss, R.F., 2003, Effects of nutrients, light, salinity, and water color on biomass and growth of *Vallisneria americana* in Lower St. Johns River, FL, USA [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 96.

Brock, J.C., Clayton, T.D., Nayegandhi, A., and Wright, C.W., 2003, Airborne lidar sensing of coral reef topographic complexity in Biscayne National Park, Florida: Joint Conference on the Science and Restoration of the Greater Everglades and Florida Bay Ecosystem "From Kissimmee to the Keys," Palm Harbor, Fla., Proceedings, GEER Program and Abstracts, p. 43-45.

Burcham, A.K., Michot, T.C., and Nyman, J.A., 2003, The interactive effects of environmental stress and fungal infection on *Spartina alterniflora* in coastal Louisiana [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 99.

Carter, J., 2003, Review of nutria introductions and eradication efforts around the world [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 102.

Chiasson, R.C., and Proffitt, C.E., 2003, Assessing functional equivalency in created marshes; interactions between *Uca* spp. and *Spartina alterniflora* [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 104.

Dantin, D.D., Boustany, R.G., Lewis, M.A., Moss, R., and Macauley, J.M., 2003, Photosynthetic responses of *Vallisneria americana* following exposure to atrazine at three nutrient regimes [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 108-109.

Day, R.H., and Doyle, T.W., 2003, Effects of nutrients and light on growth of baldcypress (*Taxodium distichum* (L.) L.C. Rich.) and black willow (*Salix nigra* Marsh.) [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 110.

DeLozier, S., and Carter, J., 2003, A harvest model for nutria populations in Louisiana [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 110.

Doyle, T.W., Krauss, K.W., Melder, M., and Sullivan, J., 2003, SELVA-MANGRO; integrated landscape and stand-level model of mangrove forest response to sea-level rise and hydrologic restoration of the Everglades [abs.], *in* Best, R., Torres, A.E., Higer, A.L., Henkel, H.S., Mixson, P.R., Eggleston, J.R., Embry, T.L., and Clement, G., compilers, U.S. Geological Survey Greater Everglades Science Program; 2002 Biennial Report: USGS Open-File Report 03-54, p. 140-141.

Edwards, K.R., and Proffitt, C.E., 2003, Salt marsh creation in the Sabine NWR using dredged material; brief history and structural comparison between created and natural sites [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 113.

Faulkner, S., 2003, Structure and function of urban forested wetlands [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 114-115.

Fessel, K.E., and Middleton, B.A., 2003, Management implications of differential seedling establishment of woody plant species in a bald cypress swamp in southern Illinois [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 116.

Glowacki, G.L., Jr., Hines, R.A., Martinez, T.M., Anteau, A.C., Herbert, B.T., Rooth, J.E., and McKee, K.L., 2003, Effects of $CO_2$ enrichment on reproduction effort and seedling growth potential of black mangrove (*Avicennia germinans*) [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 120.

Grace, S.L., Handley, L. Winch, B.W., and Calix, A., 2003, Lake Woodruff National Wildlife Refuge; a classification scheme designed for specific management needs [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 121.

Halbach, P.E., Tunnicliffe, V., and Hein, J.R., eds., 2003, Energy and mass transfer in marine hydrothermal systems: Berlin, Dahlem University Press, 365 p.

Hammond, E.E., Nolfo, L.E., Carter, J., Merino, S., and Aguilar, R.F., 2003, Surgical implantation of abdominal radio transmitters in wild nutria (*Myocaster coypus*) in southern Louisiana [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 123.

Handley, L.R., Calix, A.G., Jones, W., Hartley, S., Mouton, R.C., Martucci, A., and Linscombe, R.G., 2003, Mapping restoration management of a disappearing barrier island—Raccoon Island, Louisiana [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p.123.

Handley, L.R., Lockwood, C.K., May-Brett, J., and Handley, N.S., 2003, WETMAAP: wetland education through maps and aerial photography [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 123.

Handley, L.R., Martella, K.D., Wells, C.J., O'Neil, C.P., Mouton, R.C., Dugas, J.L., and Winch, B.W., 2003, Mapping Lacassine National Wildlife Refuge with the National Vegetation Classification System and the National Wetlands Inventory [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 124.

Handley, L.R., Mouton, R., Calix, A., and Thibodeaux, J., 2003, Seagrass of the northern Gulf of Mexico; status and trends [abs.]: Wetland Stewardship;


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Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 124.

Handley, L.R., O'Neil, C., Dugas, J.L., Mouton, R., and Calix, A., 2003, Civil war battlefield; mapping present day wetlands for historical comparison [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 124.

Handley, L.R., Wells, C.J., Lichenberg, D., Mouton, R.C., and Hartley, S., 2003, High resolution mapping of marsh dieback syndrome [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 124.

Hapke, C.J., 2003, Quantifying sediment yield from coastal landslides using digital photogrammetry and GIS; Big Sur, California: Coastal Sediments '03, Annual Symposium on Coastal Engineering and Science of Coastal Sediment Processes, 5th, Clearwater Beach, Fla., May 18-23, 2003, Proceedings, 13 p. [CD-ROM].

Hein, J.R., Dowling, J.S., Schuetze, Anthony, and Lee, H.J., 2003, Clay-mineral suites, sources, and inferred dispersal routes; Southern California continental shelf: Marine Environmental Research, v. 56, p. 79-102.

Hensel, P.F., Proffitt, C.E., Cahoon, D.R., and McKee, K.L., 2003, Response of the white mangrove (*Laguncularia racemosa*) to disturbance regimes; recovery from hurricane-induced sediment burial [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 126.

Herbert, B.T., and McKee, K.L., 2003, Belowground responses of *Avicennia germinans* (L.) L. and *Spartina alterniflora* Loisel to elevated $CO_2$ and increased nutrient availability in a mangrove-salt marsh mesocosm experiment [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 126-127.

Howard, J.L., and Faulkner, S.P., Storm water diversion as a method of wetland restoration [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 128.

Howard, R.J., Rafferty, P.S., Briggs, J.B., and Daigle, T.A., 2003, Plant community succession in brackish marsh habitat restored using dredged sediment [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 128-129.

Jenkins, J.A., and Dale, R.O., 2003, Novel diagnostic biomarkers from aquatic animals [abs.], *in* USGS Conference on Natural Science and Public Health; Prescription for a Better Environment: U.S. Geological Survey Open-File Report 03-097 (unpaginated).

Jenkins, J.A., DeCola, L., Barton, C.C., Buys, J., and Manheim, F.T., 2003, Nonlinear approaches to understanding human and environmental health [abs.], *in* USGS Conference on Natural Science and Public Health; Prescription for a Better Environment: U.S. Geological Survey Open-File Report 03-097 (unpaginated).

Johnston, J.B., Barras, J.A., Hartley, S.B., Steyer, G., Martucci, A., and Sapkota, S., 2003, 100 years of land change for coastal Louisiana; 1956-2050 [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 133.

Koschinsky, A., and Hein, J.R., 2003, Uptake of elements from seawater by ferromanganese crusts; solid phase association and seawater speciation: Marine Geology, v. 198, p. 331-351.

Krauss, K.W., Doyle, T.W., Whelan, K.R.T., and Twilley, R.R., 2003, Woody debris in south Florida mangrove wetlands Everglades [abs.], *in* Best, R., Torres, A.E., Higer, A.L., Henkel, H.S., Mixson, P.R., Eggleston, J.R., Embry, T.L., and Clement, G., compilers, U.S. Geological Survey Greater Everglades Science Program; 2002 Biennial Report: USGS Open-File Report 03-54, p. 162.

Kvenvolden, K.A., 2002, Methane hydrate in the global organic carbon cycle: Terra Nova, v. 14, p. 302-306.

Lichtenberg, D., Martella, K., Mouton, K., Lichtenberg, J., Handley, L., and Wells, C., 2003, A historical comparison of the north unit of Cameron Prairie National Wildlife Refuge, Louisiana, 1956-2001 [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 144.

Lichtenberg, J.S., King, S.L., Grace, J.B., and Walls, S.C., 2003, Habitat associations of chorusing anurans in the Lower Mississippi River Alluvial Valley [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 144.

Marincioni, F., Lightsom, F.S., Riall, R.L., Linck, G.A., and Aldrich, T.C., 2003, The Marine Realms Information Bank; a coastal and marine digital library at USGS: U.S. Geological Survey Open-File Report 03-213 [poster].

McGinnis, T.E., II, McKee, K.L., Mendelssohn, I.A., and Twilley, R.R., 2003, Effects of simulated drought conditions on *Spartina alterniflora* from deltaic plain salt marshes in Louisiana [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 151.

McKee, K.L., and Feller, I.C., 2003, Effects of nutrient enrichment on root production and interactions with flooding in an oligotrophic mangrove ecosystem [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 151.

McKee, K.L., and Rooth, J.E., 2003, Impacts of elevated $CO_2$ and nutrients on biomass production and allocation in a mangrove-salt marsh community [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 151-152.

Merino, S.L., and Carter, J., 2003, Nutria impacts on marsh loss—an enclosure experiment [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 153.

Michot, T.C., Kemmerer, R.S., and Reiser, J.J., 2003, Vegetation and soil changes in a *Spartina alterniflora* saltmarsh experiencing dieback and recovery in coastal Louisiana [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 154.

Middleton, B.A., and McKee, K.L., 2003, Latitudinal variation in primary production

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and carbon stores in baldcypress swamps of the Mississippi River Alluvial Plain; a surrogate for global climate change prediction [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 154.

Minzner, M.M., and Middleton, B.A., 2003, Predicting cattle grazing intensities in Ranomafana National Park, Madagascar [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 155-156.

Moore, L.J., Kaminsky, G.M., and Jol, H.M., 2003, Exploring linkages between coastal progradation rates and the El Niño Southern Oscillation, Southwest Washington, USA: Geophysical Research Letters, v. 30, no. 9, 1448, doi: 10.1029/2002GL016147, 2003, p. 1-1 to 1-4.

Morton, R., Guy, K., Hill, H., and Pascoe, T., 2003, Regional morphological responses to the 1962 Ash Wednesday storm [abs.]: Coastal Sediments '03, Annual Symposium on Coastal Engineering and Science of Coastal Sediment Processes, 5th, Clearwater Beach, Fla., May 18-23, 2003, Book of Abstracts, p. 331-332.

Morton, R.A., Guy, K.K., Hill, H.W., and Pascoe, T., 2003, Regional morphological responses to the March 1962 Ash Wednesday storm: Coastal Sediments '03, Annual Symposium on Coastal Engineering and Science of Coastal Sediment Processes, 5th, Clearwater Beach, Fla., May 18-23, 2003, Proceedings, 11 p. [CD-ROM].

Noel, J.L., Heyel, S.M., Twilley, R.R., Faulkner, S.P., Gambrell, R.P., Klerks, P.L., McKee, K.L. Mendelssohn, I.A., and Swarzenski, C.M., 2003, Marsh dieback syndrome; experimental manipulation of hydrology and soil biogeochemistry [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 162.

Owens, A., and Proffitt, C.E., 2003, Survival, re-growth, and recruitment of *Iva frutescens* in a restored saline wetland following fire and vegetation clipping [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 164.

Palmsten, M., Sallenger, A., and Howd, P., 2003, Longshore currents and shoreline change; Outer Banks of North Carolina [abs.]: Coastal Sediments '03, Annual Symposium on Coastal Engineering and Science of Coastal Sediment Processes, 5th, Clearwater Beach, Fla., May 18-23, 2003, Book of Abstracts, p. 413-414.

Palmsten, M., Sallenger, A., and Howd, P., 2003, Longshore currents and shoreline change; Outer Banks of North Carolina: Coastal Sediments '03, Annual Symposium on Coastal Engineering and Science of Coastal Sediment Processes, 5th, Clearwater Beach, Fla., May 18-23, 2003, Proceedings, 7 p. [CD-ROM].

Perez, B.C., Segura, B.D., Cahoon, D.R., Olney, T., and Swarzenski, C.M., 2003, Elevation change in a coastal Louisiana salt marsh in response to drought conditions; implications for global climate change [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 166.

Proffitt, C.E., Edwards, K., Travis, S., Owens, A., Chiasson, R., and Egerova, J., 2003, Field experiments involving *Spartina alterniflora* in saline wetlands created from dredged sediment; colonization, growth, and interactions with other plant species [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 171.

Rafferty, P.S., and Rizzo, W.M., 2003, Sediment metabolism in the Neches River corridor of Big Thicket National Preserve [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 172.

Smith, T.J., III, Whelan, K.R.T., Anderson, G.H., Walker, C.L., Dismukes, J.S., and Doyle, T.W., 2003, A decade of mangrove forest change following Hurricane Andrew [abs.], *in* Best, R., Torres, A.E., Higer, A.L., Henkel, H.S., Mixson, P.R., Eggleston, J.R., Embry, T.L., and Clement, G., compilers, U.S. Geological Survey Greater Everglades Science Program; 2002 Biennial Report: USGS Open-File Report 03-54, p. 198-200.

Stockdon, H.F., Sallenger, A.H., Jr., and Holman, R.A., 2003, Longshore variability of the coastal response to Hurricanes Bonnie and Floyd [abs.]: Coastal Sediments '03, Annual Symposium on Coastal Engineering and Science of Coastal Sediment Processes, 5th, Clearwater Beach, Fla., May 18-23, 2003, Book of Abstracts, p. 238-239.

Stockdon, H.F., Sallenger, A.H., Jr., Howd, P.A., and Holman, R.A., 2003, Longshore variability of the coastal response to Hurricanes Bonnie and Floyd: Coastal Sediments '03, Annual Symposium on Coastal Engineering and Science of Coastal Sediment Processes, 5th, Clearwater Beach, Fla., May 18-23, 2003, Proceedings, 11 p. [CD-ROM].

ten Brink, U.S., and Smith, S., 2003, High-resolution bathymetric map for the Puerto Rico trench; implications for earthquake and tsunami hazards [abs.]: Seismological Research Letters, v. 74, p. 230.

ten Brink, U.S., Martin, J.L., Gurrola, H., Dillon, W.P., and Huerfano, V., 2003, Block rotation, plate tear, and dynamic topography in the Puerto Rico trench [abs.]: Seismological Research Letters, v. 74, p. 199.

Tiersch, T.R., and Jenkins, J.A., 2003, Biosecurity and regulatory consideration for transfer of cryopreserved sperm and early life stages of aquatic species, *in* Lee, C.S., and O'Bryen, P.J., eds., Biosecurity in aquaculture production systems; exclusion of pathogens and other undesirables: Baton Rouge, La., World Aquaculture Society, p. 171-198.

Torres, A.E., Higer, A.L., Henkel, H.S., Mixson, P.R., Eggleston, J.R., Embry, T.L., Clement, G., 2003, U.S. Geological Survey Greater Everglades Science Program; 2002 Biennial Report: U.S. Geological Survey Open-File Report 03-54, 290 p.

Travis, S.E., and Proffitt, C.E., 2003, The successional dynamics of fine-scale genetic structure and its effects on inbreeding in smooth cordgrass [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 189.

Troutman, J.P., Boshart, W.M., Steyer, G.D., Hester, M.W., and Willis, J.M., 2003, Long-term monitoring of a marsh site created with dredged sediments in coastal Louisiana, USA [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 189-190.

Visser, J.M., Steyer, G.D., Shaffer, G.P., Hoeppner, S.S., Hester, M.W., Mendelssohn, I.A., Sasser, C., Keddy, P., and Reyes, E., 2003, Development of a conceptual model for coastal wetlands primary production [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the

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Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 191.
Warner, J.C., Schoellhamer, D.H., and Schladow, S.G., 2003, Tidal truncation and barotropic convergence in a channel network tidally driven from opposing entrances: Estuarine, Coastal, and Shelf Science, v. 56, no. 3-4, p. 629-639.
Wells, C.J., Michot, T.C., Kemmerer, S., and Johnson, D., 2003, Monthly aerial survey of marsh die-back syndrome in Louisiana [abs.]: Wetland Stewardship; Changing Landscapes and Interdisciplinary Challenges, Annual Conference of the Society of Wetland Scientists, 24th, New Orleans, La., June 8-13, 2003, p. 194.
Winters, W.J., Waite, W.F., Mason, D.H., Novosel, I., Boldina, O.M., Dallimore, S.R., Collett, T.S., Lorenson, T.D., Paull, C.K., Rogers, R.E., Bryant, W.R., and McGee, T.M., 2003, Physical properties of sediment containing natural and laboratory-formed gas hydrate [abs.]: American Association of Petroleum Geologists Annual Meeting, Salt Lake City, Utah, May 11-14, 2003, Official Program, p. A182.

# Publications Submitted for Director's Approval

Brock, J.C., Wright, C.W., Clayton, T., and Nayegandhi, A., Status of USGS-NASA experimental advanced airborne research lidar (EAARL) surveys of coral reef ecosystems in the Caribbean region [abs.]: Association of Marine Laboratories of the Caribbean Scientific Meeting, 31st, Trinidad, West Indies, July 14-18, 2003.
Butman, B., Gutierrez, B.T., Buchholtz ten Brink, M.R., Schwab, W.C., Blackwood, D.S., and Middleton, T.J., Photographs of the sea floor offshore of New York and New Jersey: U.S. Geological Survey Open-File Report 01-470 [DVD-ROM].
Calderon, K., Dadisman, S.V., Kindinger, J.L., Flocks, J.G., and Wiese, D.S., Archive of boomer seismic reflection data collected during USGS cruise 96CCT01, nearshore south central South Carolina coast, June 26-July 1, 1996: U.S. Geological Survey Open-File Report.
Cochrane, G.R., Butler, J.L., and Davis, G.E., Mapping white abalone habitat using textural analysis of acoustic backscatter data, *in* Symposium on Effects of Fishing Activities on Benthic Habitats; Linking Geology, Biology, Socioeconomics, and Management, Tampa, Fla., November 12-14, 2002: American Fisheries Society Special Publication.
Fernandez, M., Distribution of select wastewater compounds in surface water and bottom sediments in Hillsborough Bay, Florida [abs.]: Tampa BASIS 4—Bay Area Scientific Information Symposium, St. Petersburg, Fla., October 27-30, 2003.
Fernandez, M., Robb, S., Doan, K., Stephens, J., and Grabe, S., Preliminary findings on the distribution of polycyclic aromatic hydrocarbons in the bottom sediment of the Alafia River-Kitchen Bay, Feather Sound, Pinellas Point, and Terra Ceia areas in Tampa Bay, Florida, June 2003 [abs.]: Tampa BASIS 4—Bay Area Scientific Information Symposium, St. Petersburg, Fla., October 27-30, 2003.
Fernandez, M., Smith, K. Grabe, S., and Swarzenski, P., Nearshore distribution of organic carbon, percent silt/clay, and total polycyclic aromatic hydrocarbons in a 0.5 kilometer shoreline corridor in Tampa Bay, Florida, June 2003 [abs.]: Tampa BASIS 4—Bay Area Scientific Information Symposium, St. Petersburg, Fla., October 27-30, 2003.
Garrison, V., Bohnsack, J., Boulon, J., Davis, G., and Tilmant, J., Bambi meets Godzilla (science meets politics)—The making of Virgin Islands Coral Reef National Monument and expansion of Buck Island Reef National Monument, U.S. Virgin Islands [abs.]: Association of Marine Laboratories of the Caribbean Scientific Meeting, 31st, Trinidad, West Indies, July 14-18, 2003.
Garrison, V.H., Rogers, C.S., Beets, J., and Friedlander, A.M., The habitats exploited and the species trapped in a Caribbean island fishery: Environmental Biology of Fishes.
Griffin, D.W., Terrestrial microorganisms at an altitude of 20,000 meters in Earth's atmosphere: Nature.
Grossman, E.E., Eittreim, S.L., Hanes, D.M., Field, M.E., Edwards, B.D., Fallon, S.J., and Anima, R.J., Budgeting postglacial sedimentation history on the Santa Cruz, California, mid-continental shelf: Coastal Sediments '03, Annual Symposium on Coastal Engineering and Science of Coastal Sediment Processes, 5th, Clearwater Beach, Fla., May 18-23, 2003, Proceedings.
Hampton, M.A., Snyder, N.P., Chin, J.L., Allison, D.W., and Rubin, D.M., Bed-sediment grain-size and morphologic data from Suisun, Grizzly, and Honker Bays, CA, 1998-2002: U.S. Geological Survey Open-File Report.
Hanes, D.M., and Chang, Y.S., Sediment suspension and hydrodynamics over mildly sloped large wave ripples: Journal of Geophysical Research.
Holmes, C.W., Buster, N.A., Saruf, J.E., Hudson, J.H., and Kester, C., Changes in trace minor elements and associated micro-architecture of *Montastrea faveolata* during time of "stress" [abs.]: Oceans 2003 Marine Technology and Ocean Science Conference, San Diego, CA, September 22-26, 2003.
Marincioni, F., Lightsom, F.L., Raill, R.L., Linck, G.A., and Aldrich, T.C., The Marine Realm Information Bank; a coastal and marine digital library at USGS website **http://mrib.usgs.gov**: U.S. Geological Survey Fact Sheet.
Morton, R.A., and Peterson, R.L., Coastal classification map series West-Central Florida—Anclote Key to Venice Inlet: U.S. Geological Survey Open-File Report.
Poppe, L.J., Paskevich, V.F., Williams, S.J., Hastings, M.E., Kelley, J.T., Belknap, D.F., Ward, L.G., Fitzgerald, D.M., and Larsen, P.F., Surficial sediment data from the Gulf of Maine, Georges Bank, and vicinity; a GIS compilation: U.S. Geological Survey Open-File Report 03-001 [CD-ROM].
Porcelli, D., and Swarzenski, P.W., The behaviour of U- and Th- series nuclides in groundwater: Reviews in Mineralogy and Geochemistry.
Scanlon, K.M., and Ackerman, S.D., Distribution of deep-water coral habitats off eastern and southern United States; a preliminary GIS database [abs.]: International Symposium on Deep Sea Corals, 2d, Erlangen, Germany, September 9-12, 2003.
Swift, B.A., Thieler, E.R., Colman, S.M., and Nichols, D.R., Archive of boomer subbottom data collected during cruise RAFA01025, Choptank River, Maryland, 6-9 March 2001: U.S. Geological Survey Open-File Report 03-071 [CD-ROM].
Swift, B.A., Thieler, E.R., Colman, S.M., and Nichols, D.R., Archive of CHIRP subbottom data collected during cruise RAFA01025, Choptank River, Maryland, 6-9 March 2001: U.S. Geological Survey Open-File Report 03-072 [CD-ROM].