USGS

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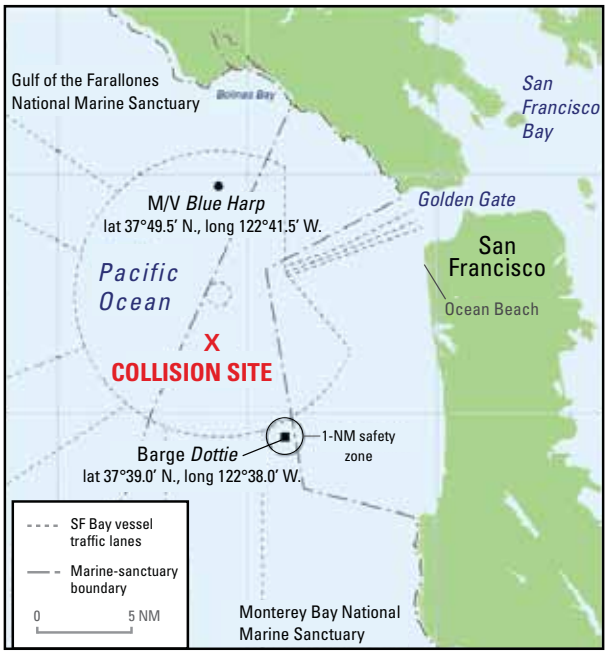
Fieldwork

Oil-Spill Exercise Aims for Safe Seas, Protection of National Marine Sanctuaries

By Helen Gibbons, Catherine Cesnik (DOI), and Greg Baker (NOAA)

What would happen if a cargo ship sailing toward San Francisco collided with a tug towing a tank barge southwest of the Golden Gate? Representatives from Federal, State, and local agencies responded to this hypothetical collision in an oil-spill-preparedness drill on August 9 and 10, 2006. "We learned a lot from the drill," said **Catherine Cesnik**, who coordinated participation by five Department of the Interior (DOI) bureaus, including the U.S. Geological Survey (USGS). "Our main goal was to protect resources under DOI's care, and we accomplished that."

On August 9, a C-130 aircraft flown by the U.S. Air Force tests oil-spill-dispersant application by releasing water over an area of green dye representing oil spilled from the tank barge Dottie *as a result of a hypothetical collision. The U.S. Coast Guard cutter* Aspen, *lower left, hosted elected officials and other VIPs so that they could learn about oil-spill response and see response technologies in action.*



Golden Gate area, showing positions of the merchant vessel Blue Harp *and the tank barge* Dottie *after a hypothetical collision 11 nautical miles southwest of the Golden Gate. Drift cards were released at these sites to simulate oil spilling from the damaged vessels and to test numerical models of ocean currents and oil-spill trajectories. NM, nautical mile. Modified from map at URL* ***http://sanctuaries.noaa.gov/safeseas/images/exercisemap_large.jpg****.*

The drill was part of the Safe Seas 2006 Oil Spill Response Exercise, a 2-week-long, multi-agency effort led by the National Oceanic and Atmospheric Administration (NOAA) in collaboration with the U.S. Coast Guard, the California Office of Spill Prevention and Response, Harley Marine Services, and DOI. The exercise involved nearly 400 people in training, field operations, oceanographic surveys, and incident-command-post activities.

After the imaginary collision, the tank barge *Dottie* and the cargo ship, merchant vessel *Blue Harp*, spilled oil as they moved away from the collision site, threatening three National Marine Sanctuaries (Gulf of the Farallones, Cordell Bank, and Monterey Bay), the Golden Gate National Recreation Area, Point Reyes National Seashore, the California Coastal National Monument, and other economic and ecological resources. Oil released by the vessels was simulated by hundreds of yellow (*Dottie*) and orange (*Blue Harp*) drift cards released to test ocean-current and oil-spill-trajectory models. (Visit URL **http://response.restoration.noaa.gov/dc_study.php? study_id=1** to see where the drift cards were released and where they have been reported washing up on shore.)

Representing the USGS in the drill was scientist **Patrick Barnard**, who has been modeling current and sediment trajectories around the Golden Gate as part of a study of sediment transport and erosion at San Francisco's Ocean Beach (see URL **http://walrus.wr.usgs.gov/coastal_processes/**). He is sharing data with oil-spill-trajectory modelers in NOAA's Hazardous Materials

(Safe Seas continued on page 2)

Sound Waves

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Contents

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Fieldwork, continued

(Safe Seas continued from page 1)

Response Division (HAZMAT). Results from the drift-card release will help **Barnard** and his NOAA HAZMAT colleagues improve their numerical models and the accuracy with which the models can predict where spilled oil will go.

Additionally, green drift cards were scattered on beaches at dawn on August 9 to represent oil and marine debris that had washed ashore as a result of the collision. These cards provided data for Shoreline Cleanup Assessment Teams (SCAT teams), who visited the beaches to map the locations of oil and debris; record the condition, location, and percent coverage of the oil; and suggest appropriate response strategies. SCAT maps and reports were brought back to the command center—set up in an auditorium at the Mission Bay campus of the University of California, San Francisco—to help guide cleanup decisions.

Green drift cards were scattered on beaches at dawn of August 9 to represent oil and marine debris washed ashore after the hypothetical collision. Shoreline Cleanup Assessment Teams (SCAT teams) who visited the beaches later in the day used the cards to map the location and condition of the "oil" and recommend cleanup strategies.

"It was very busy!" said **Cesnik** of the command center, where she worked during the drill with other representatives of her DOI office—the Office of Environmental Policy and Compliance—and coordinated the interests of the participating DOI bureaus: the Minerals Management Service (MMS), the USGS, the Bureau of Land Management (BLM), the National Park Service (NPS), and the Fish and Wildlife Service (FWS).

*One of the drift cards released to simulate spilled oil in a test of numerical models of ocean currents and oil-spill trajectories. Visit URL **http://response.restoration.noaa.gov/dc_study.php?study_id=1** to see where the drift cards were released and where they have been reported washing up on shore.*

Also working in the command center was **Greg Baker**, a NOAA employee in the Natural Resource Damage Assessment and Restoration Program (URL **http://www.darrp.noaa.gov/**). Stewardship for the Nation's natural resources is shared among various Federal and State agencies and tribal governments, referred to as Natural Resource Trustees (see URL **http://www.epa.gov/superfund/programs/nrd/trustees.htm**). When an incident, such as an oil spill, threatens natural resources managed by one or more of these trustee groups, they conduct damage assessments to determine the nature and extent of the event's impacts on natural resources (for example, see URL **http://www.darrp.noaa.gov/about/nrda.html**). The trustees share responsibilities to assess how a spill may have injured natural resources, and then to seek to make the responsible parties restore, replace, rehabilitate, or otherwise compensate the public for these losses. **Baker** pointed out that the trustees have a somewhat different job from

(Safe Seas continued on page 3)

(Safe Seas continued from page 2)

Interagency participants in the Environmental Unit test the ability of the Central California Ocean Observing System (CeNCOOS) to aid responders, while, at the same table, NOAA SCAT team coordinator (facing the camera, far right) collects and distributes data from SCAT teams in the field. More information about CeNCOOS is posted at URL ***http://www.cencoos.org/****.*

that of the oil-spill-response personnel: "Responders, such as the SCAT teams, don't generally have time to stop and do detailed scientific studies. Their interest is in limiting the spill and cleaning it up. We [Natural Resource Trustees] need to assess the extent of the injuries—go lay transects and figure out how many critters are oiled, for example, so that we can recover money from the responsible parties to restore damaged environments. So, during the drill, we mainly organized ourselves and figured out how we could gather the data we need to someday be able to prove how big the impact was and what the responsible parties need to do to make up for it.

We're talking about economic as well as biological losses—not just birds oiled but perhaps a popular beach closed, so people can't enjoy it." The evidence of these injuries is ephemeral and will gradually be removed by cleanup and natural processes, "so the trustees need to be out there early on," said **Baker**. In addition to assessing damage for long-term restoration, the trustees may be able to identify emergency-restoration actions that will reduce the impacts from spills, thus assisting the responders.

During the Safe Seas drill, the participating trustees (NOAA, several DOI agencies, and the California Department of Fish and Game) experimented with ways of combining their data-gathering work with the fieldwork of the oil-spill responders. "The drill was good because it incorporated a test of our ability to do damage assessment and work with the responders," said **Baker**. The drill also reinforced the importance of organizing and conducting the damage-assessment work in much the same way as the oil-spill-response work, with an incident-command structure that provides everyone with clear responsibilities and lines of communication early on.

The Safe Seas 2006 exercise included many training courses in the months leading up to the drill. "This exercise really focused on training the participants," said **Cesnik**, who considered the classroom and in-drill training a particularly successful aspect of the exercise. In addition to standard safety training, NOAA organized Safe Seas Short Courses in which experienced instructors taught such skills as how to conduct aerial observations of oil on the ocean, how to apply dispersants, how to treat oiled wildlife, and much more. Because of the coursework, the exercise "not only tested knowledgeable responders but also trained new folks as well," said **Cesnik**. The short courses also gave participants a chance to network with their counterparts in other agencies, something that is harder to do in the fast-paced activity of the drill itself.

Commander Arex Avanni *of the U.S. Coast Guard, who played the Planning Section Leader, reports the latest information at a Unified Command meeting at the command post.*

Drill participants in the Environmental Unit (facing the camera from left to right, ***Darren Fong****, NPS,* ***Charlie Hebert****, FWS,* ***Caryn Marn****, FWS, and* ***Irina Kogan****, NOAA Gulf of the Farallones National Marine Sanctuary) identify natural and economic resources at risk and determine recommended protection strategies.*

The field exercise conducted on August 9 and 10 was the culminating event of the drill. "Everyone was pleased with the turnout, the testing of the contingency plans, and the good lessons learned," said **Cesnik**, who joined the exercise design team last March. "Not everything was 100 percent successful, but it wasn't supposed to be. We wanted things that were going to go wrong, to go wrong in a drill environment." **Baker** echoed **Cesnik's** thoughts, saying, "The drill gave us a good opportunity to see what we're ready for and what we're not ready for. The exercise was extremely useful." To learn more about Safe Seas 2006, please visit URL **http://sanctuaries.noaa.gov/safeseas/**.

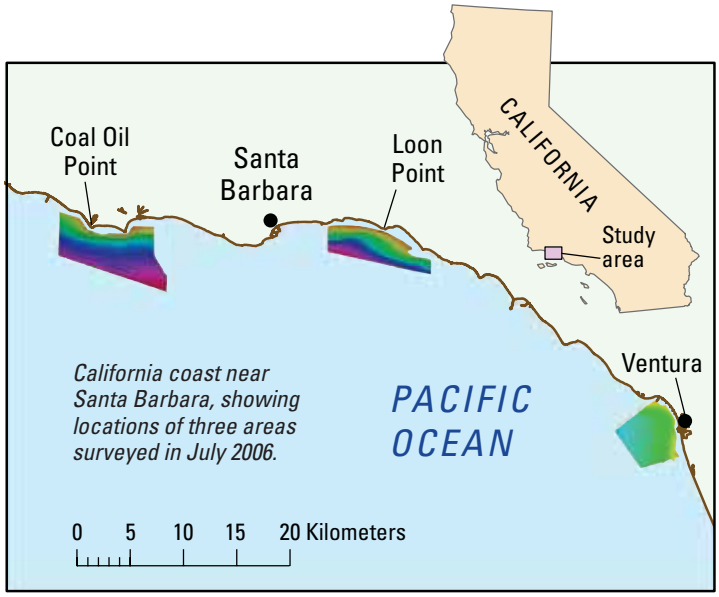
Mapping the Sea Floor Off Santa Barbara, California

By Guy Cochrane

From July 5 to 26, U.S. Geological Survey (USGS) personnel surveyed approximately 85 km^2 of the continental shelf in the Santa Barbara, Calif., area, using interferometric sonar, which collects both bathymetric and acoustic-backscatter data. The survey was funded by Western Coastal and Marine Geology Team projects that are investigating offshore oil seeps, coastal sediment transport, and benthic habitats. Three areas were surveyed: a 40-km^2 area south of Coal Oil Point, where there are active oil and gas seeps, and two areas of interest for sediment transport: one area south of Loon Point and another area off the Ventura Harbor mouth.

Amy Draut *(left) watches bottom video while* ***Neomi Mustain*** *logs video observations with a programmable keypad during the final days of the 2006 survey.*

The recent survey was conducted in two legs. **Pete Dartnell**, **Jamie Conrad**, **Mike Boyle**, and **Larry Kooker** participated in the first week-and-a-half-long leg, and **Guy Cochrane**, **Gerry Hatcher**, **Amy Draut**, and **Neomi Mustain** crewed the second leg. Before the cruise, **Andy Stevenson** came out of retirement and worked with **David Finlayson** and the electronics technicians to install sidescan-sonar and video-sled systems on the research vessel *Zephyr*. **Tom Reiss** operated a shore-based RTK global-positioning-system (GPS) instrument to test the usefulness of such systems for improving the accuracy of the sidescan-sonar position and depth data.



California coast near Santa Barbara, showing locations of three areas surveyed in July 2006.

The final 2 days of the cruise were spent collecting video footage in selected areas to ground-truth each type of pattern observed in the sonar data—smooth, featureless images that might indicate a muddy bottom, for example, or sharp contrasts that might indicate rocky habitat. University of California, Santa Barbara (UCSB) biologist **Donna Schroeder** participated in video surveying of bottom habitat and benthic species.

Similar surveys funded by the Minerals Management Service are described in *Sound Waves* articles published in November 2004 (URL **http://soundwaves.usgs.gov/2004/11/fieldwork3.html**) and October 2005 (URL **http://soundwaves.usgs.gov/2005/10/fieldwork2.html**).

Giant Underwater Sand Waves Seaward of the Golden Gate Bridge

By Patrick Barnard

A field of giant underwater sand waves was mapped at high resolution for the first time just west of the Golden Gate Bridge in a cooperative effort by the U.S. Geological Survey (USGS) and California State University, Monterey Bay (CSUMB). These features are among the largest anywhere in the world, rivaling sand waves at such well-known sites as the Bay of Fundy in Nova Scotia and Cook Inlet in Alaska. Striking images and a description of these features were published in the July 18, 2006, issue of *Eos (Transactions of the American Geophysical Union)*.

More than 40 large (greater than 50-m wavelength) sand waves were mapped, with crest-to-crest lengths of as much as 220 m (722 ft) and heights of as much as 10 m (33 ft). The scale of these massive features is unusual because of the modest tidal range in the region (max 2.65 m [8.7 ft] between low and high tide), as opposed to other sites where large sand waves are present (for example, the typical tidal range in the Bay of Fundy is 17 m [56 ft]). But these features persist because tides force an enormous flow through the relatively narrow Golden Gate strait—a total volume of

(Giant Sand Waves continued on page 5)

(Giant Sand Waves continued from page 4)

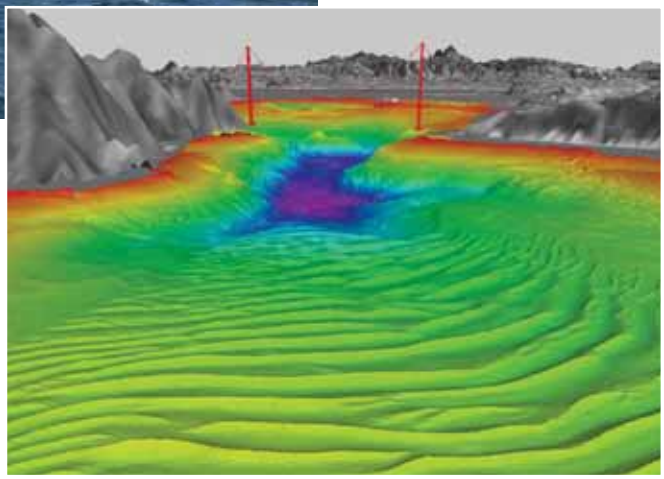
2 billion m^3 (528 billion gallons) every 6 hours—resulting in tidal currents that typically exceed 2.5 m/s (5.6 mph). These strong flows effectively sweep all mobile sediment through the narrowest part of the channel. However, the large sediment-transport capacity of these flows diminishes as they emerge from the Golden Gate, spread out, and slow down, dropping much of their sediment to form one of the largest sand-wave fields in the world.

Most of the sand and gravel that supplies this sand-wave field presumably originates from the Sierra Nevada mountain range and is carried into San Francisco Bay by the San Joaquin and Sacramento Rivers; local erosion of the Marin Headlands (to the north) may also contribute sediment.

Research vessel VenTresca, *used by the CSUMB Seafloor Mapping Laboratory to collect survey data that revealed giant sand waves west of the Golden Gate. Photograph by* ***Patrick Barnard****.*

The bathymetric survey was completed during 44 days in fall 2004 and fall 2005, using a multibeam sonar system. **Patrick Barnard**, **Dan Hanes**, and **Dave Rubin** of the USGS commissioned and analyzed the survey data, which was collected by the Seafloor Mapping Laboratory at CSUMB (URL **http://seafloor.csumb.edu/**), headed by **Rikk Kvitek**. In addition to the USGS, the U.S. Army Corps of Engineers and the National Oceanic and Atmospheric Administration also provided funding for this survey.

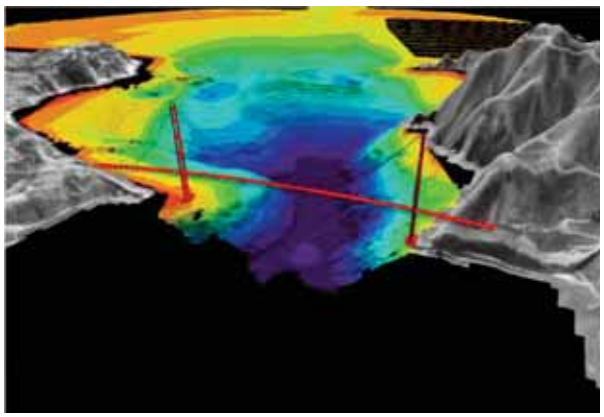
The San Francisco *Chronicle* ran a front-page article about the sand waves on July 20, 2006 (see URL **http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2006/07/20/MNGU1K2AV91.DTL**). Articles appeared in additional media outlets, such as CNETNews.com (URL **http://news.com.com/2300-11395_3-6096457-1.html?tag=ne.gall.pg**) and the San Jose *Mercury News* (URL **http://www.mercurynews.com/mld/mercurynews/living/health/15092078.htm**). The full citation of the scientific report is Barnard, P.L., Hanes, D.M., Rubin, D.M., and Kvitek, Rikk, Giant sand waves at the mouth of San Francisco Bay: Eos (American Geophysical Union Transactions), v. 87, no. 29, p. 285, 289.



The waters west of the Golden Gate (left) hide giant sand waves on the sea floor (below), mapped for the first time at high resolution in 2004 and 2005. Photograph and computer-generated image by ***Patrick Barnard****. Slopes in image appear steeper than they actually are; vertical exaggeration, 3X.*

The sand waves also appear on the recently released USGS Scientific Investigations Map 2917, entitled "Under the Golden Gate Bridge—Views of the Sea Floor Near the Entrance to San Francisco Bay, California" (URL **http://pubs.usgs.gov/sim/2006/2917/**), and they will be featured in a USGS Scientific Investigations Map now in preparation, with the working title "Bedforms at the Mouth of San Francisco Bay."

The existence of these sand waves was first documented by USGS scientists **David Rubin** and **David McCulloch** during a sidescan-sonar survey focused primarily inside the bay in the late 1970s in the following paper: Rubin, D.M., and McCulloch, D.S., 1979, The movement and equilibrium of bedforms in central San Francisco Bay, *in* Conomos, T.J., ed., San Francisco Bay; the urbanized estuary: San Francisco, Calif., American Association for the Advancement of Science, Pacific Division, p. 97-114 [URL **http://www.estuaryarchive.org/archive/conomos_1979/8/**]. ☸



Still image from a virtual "flight" over the new bathymetric data, posted at URL ***http://soundwaves.usgs.gov/2006/09/research.html****. The observer begins above San Francisco Bay, "flies" beneath the Golden Gate Bridge, circles over fields of sand waves outside the Golden Gate, and then flies southward along Ocean Beach (where* ***Barnard****,* ***Hanes****, and other USGS scientists are studying coastal processes that control sand transport and sedimentation; see URL* ***http://soundwaves.usgs.gov/2006/04/****).*

Manatee Traveler in Northeastern Waters Not Chessie

By Hannah Hamilton and Catherine Puckett

A West Indian manatee was sighted in various waters of the northeastern United States during July and August 2006. It traveled up the Hudson River into Harlem, visited Cape Cod, Mass., and, on August 20, was sighted in Bristol Harbor, R.I.

The question on everyone's mind was: Is it **Chessie** on summer vacation? The manatee now known as **Chessie** first gained notoriety in fall 1994, when he was sighted in Chesapeake Bay, Md., far beyond the usual range of manatees in the southeastern United States. Captured and returned by U.S. Coast Guard plane to Florida, **Chessie** was subsequently radio tagged and tracked by the U.S. Geological Survey (USGS)'s Sirenia Project. He gained new fame in summer 1995 by swimming past the mid-Atlantic States, through New York City, all the way to Rhode Island, farther than any manatee had been known to venture. He was sighted in Virginia in 1996 and 2001.

*Portrait of a manatee (neither **Chessie** nor the manatee sighted in the Northeast in summer 2006). USGS.*

This summer's traveler is a new manatee, not **Chessie**, as determined by USGS manatee researchers and announced on August 23, 2006. The roving manatee's identity is still unknown. Video footage of the manatee was sent to USGS researchers in Florida, who used a manatee-photo-identification catalog—called the Manatee Individual Photo-identification System, or MIPS—to compare scar patterns on the animal with others in the database. Photographs of the mystery manatee do not match those of **Chessie**, nor of any other Florida manatees that have been documented for the MIPS database.

*Photograph of **Chessie** taken in 2001 shows a distinctive white scar used to identify him. USGS.*

In 1994, scientists photographed **Chessie**—and his unique markings and scars—during his rescue from Chesapeake Bay. **Chessie** has a distinctive long gray scar on his back, with several small white spots apparent within the scar.

"Since then, **Chessie** also has acquired tail mutilations, but these are not severe," said **Cathy Beck**, a biologist with the USGS Sirenia Project. "Reports of manatee sightings far from the usual summer range are of great interest, and we appreciate receiving photographs to help us document the individual whenever possible," **Beck** said.

The new far-traveled manatee still had time to reach Florida waters before the onset of cooler weather. USGS manatee scientists believe that **Chessie's** migration from Florida to the Chesapeake Bay may have been common for manatees in previous centuries. The repeated sightings of a "sea monster" in the Chesapeake Bay, nicknamed "**Chessie**," date back throughout the 1900s and may include manatee sightings that were not properly identified. **Chessie** was named after the purported sea monster.

"Cooperation among members of marine-mammal-sighting networks, Government agencies, and the public on tracking **Chessie's** migration has raised the public's awareness of this unique endangered marine mammal," said **Jim Reid**, a biologist with the USGS Sirenia Project. "Manatees are long-lived and typically repeat established movement patterns. It's likely that sightings of **Chessie** or other manatees will occur again in these northern areas."

These huge, harmless, plant-eating marine mammals usually swim slowly and prefer shallow habitats. Manatees are an endangered species, protected by Federal law.

(Manatee Traveler continued on page 7)

(Manatee Traveler continued from page 6)

For future sightings, the public should contact local wildlife authorities, who will get in touch with the USGS manatee research team.

Timeline of summer 2006 sightings of a roaming manatee:

- Initial report, Ocean City, Md.: July 11
- Delaware Bay, Del.: July 14
- Barnegat Inlet, N.J.: July 22-23
- Hudson River, N.Y.: Aug. 1-8
- Quisset Harbor, Mass.: Aug. 17
- Greenwich Bay, R.I.: Aug. 20
- Bristol Harbor, R.I.: Aug 28

For more information on manatees, please visit the following URLs:

- Manatee FAQs: **http://cars.er.usgs.gov/Manatees/Manatee_Sirenia_Project/Manatee_Information_Sheet/manatee_information_sheet.html**
- USGS Manatee Research—Sirenia Project: **http://cars.er.usgs.gov/Manatees/manatees.html**
- **Chessie's** history: **http://cars.er.usgs.gov/Manatees/Manatee_Sirenia_Project/Manatee_Chessie_Surfaces/manatee_chessie_surfaces.html**

USGS Manatee Expert Cathy Beck on Photo-cataloging Manatees:

"To initially document a manatee, the animal must have healed and unique features, and the entire dorsal and lateral aspects of the body and tail must be photographically documented. That first step gets the manatee into the Manatee Individual Photo-identification System (MIPS) database as an individual, but then resightings with photo-documentation of the manatee's features are necessary because manatees often acquire new scars and (or) mutilations that can change an individual's appearance. To match a manatee to a known individual in the MIPS database, we need a good photo of a feature and its exact position on the body or tail. The manatee photographed this summer in Rhode Island has tail mutilations that do not match the tail mutilations on **Chessie** and, unfortunately, do not match the tail mutilations on any manatee currently in the MIPS database."

Manatee with old boat propeller scars that biologists use to identify this individual. USGS.

Cat Parasite May Affect Cultural Traits in Human Populations

By Gloria Maender

Little is known about the causes of cultural change, but behavioral manipulation by a common brain parasite, *Toxoplasma gondii*, may be among the factors that play a role, according to a new study by the U.S. Geological Survey (USGS) published in the August 2, 2006, issue of *Proceedings of the Royal Society, Biology*.

"In populations where this parasite is very common, mass personality modification could result in cultural change," said study author **Kevin Lafferty**, a USGS scientist at the University of California, Santa Barbara, who has conducted extensive studies of parasites in coastal ecosystems. "The geographic variation in the latent prevalence of *Toxoplasma gondii* may explain a substantial proportion of human population differences we see in cultural aspects that relate to ego, money, material possessions, work, and rules."

Although this sounds like science fiction, it is a logical outcome of how natural selection leads to effective strategies for parasites to get from host to host, said **Lafferty**. *Toxoplasma gondii* is a parasite of cats, both domestic and wild. Although modern humans are a dead-end host for the parasite, *Toxoplasma* appears to manipulate human personality by the same adaptations that normally help it complete its life cycle. The typical journey of the parasite involves a cat and its prey, starting as eggs shed in an infected cat's feces, inadvertently eaten by a warm-blooded animal, such as a rat. The infected rat's behavior alters so that it becomes more active, less cautious, and more likely to be eaten by a cat, where the parasite completes its life cycle. Many other warm-blooded vertebrates may be infected by this pathogen, including marine mammals: a study begun in 2001 discovered that *Toxoplasma gondii* had caused 8 percent of stranded-sea-otter deaths in California between 1967 and 1989, the sea otters likely acquiring the parasite from cat feces that had been washed to sea (see article in *Sound Waves*, August 2002, at URL **http://soundwaves.usgs.gov/2002/08/research2.html**). In humans, the parasite commonly causes mild flu-like symptoms, after which it tends to remain in a dormant state in the brain and other tissues.

Evidence for subtle long-term effects on an individual's personality reported

(Cat Parasite continued on page 8)

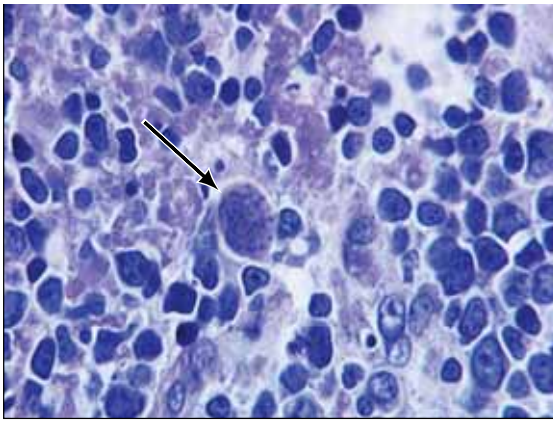
(Cat Parasite continued from page 7)

by researchers in the Czech Republic inspired **Lafferty** to explore whether a shift in the average, or aggregate, personality of a population might occur where *Toxoplasma* has infected a higher proportion of individuals. Infection with *Toxoplasma* varies considerably from one population to another; in some countries it is very rare, while in others nearly all adults are infected. To test his hypothesis, **Lafferty** used published data on cultural dimension and aggregate personality for countries where there were also published data on the prevalence of *Toxoplasma* antibodies in women of childbearing age. Pregnant women are tested for antibodies because of the serious risk posed by toxoplasmosis to fetuses, which lack their own immune systems.

The results of previous work suggested that *Toxoplasma* could affect specific elements of human culture. *Toxoplasma* is associated with different, often opposite behavioral changes in men and women, but both genders exhibit guilt proneness (a form of neuroticism). **Lafferty's** analysis found that countries with high *Toxoplasma* prevalence had a higher aggregate neuroticism score, and Western nations with high prevalence also scored higher in the "neurotic" cultural dimensions of "masculine" sex roles and uncertainty avoidance.

"There could be a lot more to this story. Different responses to the parasite by men and women could lead to many additional cultural effects that are, as yet, difficult to analyze," said **Lafferty**.

Lafferty suggested that because climate affects the persistence of infectious states of *Toxoplasma* in the environment, it helps drive the geographic variation in the parasite's prevalence by increasing exposure risk. The parasite's eggs can live longer in humid, low-altitude regions, especially at mid latitudes that have infrequent freezing and thawing. Cultural practices of food preparation—such as rare or undercooked meats, or poor hygiene—and cats as pets also can increase exposure to infection. **Lafferty** added, "Toxoplasmosis is one of many factors that may influence personality and culture, which may also include the effects of other infectious diseases, genetics, environment, and history. Efforts to control this infectious pathogen could bring about cultural changes."



Toxoplasma gondii *pseudocyst (16 µm) in subcutaneous tissue of otherwise-normal scalp skin. Image courtesy of* ***M. Lisci, M.D.****, and* ***G. Cera, M.D.****, Ospedale di Mondovì, Italy. (From* Atlas of Medical Parasitology*, URL* ***http://www.cdfound.to.it/HTML/tox1.htm#toxo****).*

"This is not to say that the cultural dimensions associated with *T. gondii* are necessarily undesirable," noted **Lafferty**. "After all, they add to our cultural diversity."

MIT Summer Research Program Students Visit USGS in Woods Hole

By Claudia Flores, Bill Waite, and Glynn Williams

A group of undergraduates from across the country visited the U.S. Geological Survey (USGS) Woods Hole Science Center last June as part of the Massachusetts Institute of Technology (MIT) Summer Research Program (MSRP). MSRP is designed to facilitate the involvement of talented science and engineering students who come from disadvantaged backgrounds, are members of underrepresented minorities, or are first-generation college students. The program draws sophomores and juniors from around the country to MIT's campus, where they spend the summer working in a research laboratory under the guidance of experienced scientists and engineers. As part of their research experience, these students were given the opportunity to visit the six scientific institutions in Woods Hole, Mass., on Saturday, June 24, 2006.

During the day-long tour, the MSRP students visited the USGS Woods Hole Science Center, two National Oceanic and Atmospheric Administration (NOAA) ships, the Woods Hole Science Aquarium (part of NOAA's Northeast Fisheries Science Center), a Woods Hole Oceanographic Institution (WHOI) autonomous underwater vehicle, the Sea Education Association (SEA) campus, and the ecofriendly Gilman Ordway Campus of the Woods Hole Research Center. In the afternoon, the students were provided information about summer programs, research opportunities, and graduate programs available in Woods Hole.

At the USGS, **Glynn Williams** led an informative walk through the Crawford Building and spoke about the USGS' commitment to making its information available to interested researchers and the public, and how to make that possible. **Bill Waite** gave tours of the GHASTLI (Gas Hydrate and Sediment Testing Laboratory Instrument) facility that included a short presentation on gas hydrates peppered with his own research experience. **Claudia Flores** gave a minilecture on the geology of the Caribbean region, focusing on Puerto Rico and reinforcing her information with the USGS center's GeoWall data-visualization system. Tour organizers

(Student Visit continued on page 9)

(Student Visit continued from page 8)

reported that of the four afternoon tours students could choose to attend, the GeoWall tour was the overwhelming first choice.

Despite their long day and hectic schedule, the students were enthusiastic, asking challenging questions not only about USGS science but also about research opportunities and career-path decisions. The chance to put a human face on USGS science and to potentially lure bright, young stars into coastal and marine research made for a valuable outreach opportunity.

The USGS participants were **Claudia Flores**, **Bill Waite**, and **Glynn Williams**. The tour was organized by **Christopher Jones** of the MIT Graduate Students Office and **Regina Campbell-Malone** of the MIT/WHOI Joint Program. Information on the MIT Summer Research Program is posted at URL **http://web.mit.edu/gso/admissions/summer.html**.

Information on the Woods Hole Diversity Advisory Committee is posted at URL **http://www.woodsholediversity.org/**.

***Bill Waite** (USGS) gives visiting students a brief talk on gas hydrates in the GHASTLI lab. Photograph by **Glynn Williams**.*

***Claudia Flores** (USGS) gives a short lecture on the geology of Puerto Rico before introducing the students to the GeoWall data-visualization system. Photograph by **Glynn Williams**.*

USGS Presents Cold Glaciers and Even Cooler Science at the Waquoit Bay Watershed Block Party on Cape Cod

By Brian Buczkowski

The Waquoit Bay National Estuarine Research Reserve (WBNERR) hosted its annual Watershed Block Party on August 8, 2006, at the reserve's headquarters on the south shore of Cape Cod, Mass. Participating in this exhibition of local research and environmental organizations were U.S. Geological Survey (USGS) contractors and employees **Alex Sirotek**, **Brian Buczkowski**, **Nancy Soderberg**, and **Kathy Scanlon**. Additional materials, activities, and live tunicates were provided by **John Bratton**, **Dann Blackwood**, **Page Valentine**, **Jen Bonin**, **Larry Poppe**, and **Kate McMullen** of the USGS and **Mary Carman** of the Woods Hole Oceanographic Institution (WHOI).

At the USGS display table, **Alex** told Block Party visitors about tunicate biology and morphology and the animal's status as an invasive species (see URL **http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum/**). Children and adults were both fascinated and disgusted by these invaders, which look quite alien but, like humans, are members of the chordate phylum, having a notochord (primitive spinal chord) in their larval forms.

***Alex Sirotek** shows visitors live tunicates collected from the WHOI dock in Woods Hole. Photograph by **Brian Buczkowski**.*

Nearby, **Kathy** and **Nancy** stood watch over our "glacier," which was created by **John Bratton**. This glacier contained rocks, sand, and other natural erratics (fragments carried by glaciers and deposited on bedrock of different composition), as well as some semi-precious stones and USGS pens, pencils, and lanyards—not generally found in glaciers the world over. The kids had fun picking away at the ice to retrieve the treasures inside, while **Kathy** explained the miniature glacial features left behind as the sun and the children removed the ice, and **Nancy** told visitors about the role of glaciers in the geologic history of Cape Cod.

Back at the table, **Brian** conducted a grain-size-analysis activity in which participants identified the characteristics of a

(Block Party continued on page 10)

(Block Party continued from page 9)

beach profile and speculated on why grain size and sorting were so different within samples taken from the same beach. This exercise was a big hit with children (and their adults), just as it had been the year before (see article in *Sound Waves*, September 2005, at URL **http://soundwaves.usgs.gov/2005/09/outreach.html**).

"Magic" quartz pebbles from Cape Cod beaches were provided again as souvenirs, along with an article about the pebbles' luminescence by USGS Geologist Emeritus **Bob Oldale** (see URL **http://woodshole.er.usgs.gov/staffpages/boldale/pebbles/**).

Kathy Scanlon *explains how glaciers have affected Cape Cod while young visitors excavate a "glacier" (below) and display the treasures they have found (chunk of rosy quartz, left). Photographs by* ***Brian Buczkowski****.*

USGS Intern Receives Fulbright Scholarship

By Ann B. Tihansky

Lauren Yeager, a U.S. Geological Survey (USGS) intern and graduate of Eckerd College in St. Petersburg, Fla., received a Fulbright Scholarship to fund her self-designed research project on coral-reef ecology along the Meso-American reef tract off the east coast of the Yucatán Peninsula, Mexico. She will be working for a year with **Jesus Ernesto Arias Gonzalez**, a professor at the Centro de Investigación y de Estudios Avanzados (Cinvestav) in their Marine Resources Department. Her work will focus on habitat utilization by juvenile reef fish; although the details haven't been determined, she will be working out of Merida conducting fieldwork in a large area along the east coast of the Yucatán, with an emphasis on comparing data from protected and nonprotected coastal areas. She is excited about the prospect of studying in a foreign country, speaking another language, and following her dream of conducting scientific studies in marine science.

When **Lauren** was in elementary school, she decided that she wanted to work in marine science. She attended Eckerd College specifically because she was interested in the college's strong marine-science program. Encouraged by her professors at Eckerd, she sought a summer internship with the USGS after her freshman year. **Lauren** worked as a USGS intern in summer 2003, and she enjoyed the experience so much that she has continued to work for the USGS as her school schedule permits. Throughout this time, she has supported several studies related to mangroves and fish ecology, working on data collected in the Everglades and Tampa Bay, while maintaining a 4.0 grade-point average in school. "I have learned as much from working at the USGS as I have in my undergraduate studies at Eckerd. At the USGS, I was able to participate in fieldwork and get the kind of practical experience you can't get in the classroom."

Lauren has taken full advantage of her opportunities at the USGS. She used some of the data she helped collect to develop her own research project. She gave an oral presentation at the First International Symposium on Mangroves as Fish Habitat, held in Miami, Fla., April 19-21, 2006 (see related *Sound Waves* article at URL **http://soundwaves.usgs.gov/2006/06/meetings.html**). "It was really a great opportunity to go to a symposium and meet all the other scientists. I met several scientists that I knew only by reading their articles, so I was familiar with their work, but at the symposium I had a chance to meet them in person. Attending this meeting was a great opportunity for me."

Lauren Yeager*, USGS intern and recipient of a Fulbright Scholarship.*

Lauren has also prepared a manuscript from this research. "I have been very fortunate to work with C**arole McIvor** and her group; their guidance and support were invaluable. I developed an aspect of work I did with her group into a manuscript that is currently in review with the *Bulletin of Marine Science*. It's really dif-

(Fulbright Scholarship continued on page 11)

(Fulbright Scholarship continued from page 10)

ficult for an undergraduate to publish in a journal, but the USGS support has made a lot of great things possible."

Lauren's internship is supported through a formal cooperative agreement between the USGS and Eckerd College established more than 8 years ago. As part of this agreement, the USGS hosts at least 3 students each summer and several others during the school year. These USGS internships have provided many Eckerd students with the opportunity to contribute to USGS scientific activities and to learn firsthand about the work that scientists do, training many of them for scientific careers. Of the numerous interns who have worked at the USGS offices in Tampa and St. Petersburg, many have continued their scientific studies, earning advanced degrees and pursuing successful scientific careers. **Lauren** plans to return to the United States after her year in Mexico to pursue a Ph.D. in reef-fish habitat use and ecology.

Lauren Yeager *(left) conducting fieldwork in an estuarine tidal wetland with* ***Adam Brame*** *(USGS, St. Petersburg).*

USGS Employees Make Semifinals in Local Outrigger-Canoe Races

By Helen Gibbons and Susie Cochran

In a first for nearly all of them, U.S. Geological Survey (USGS) employees and *ohana* (extended family) competed and made a good showing in outrigger-canoe races on August 20 in Santa Cruz, Calif. Participating on their own time, USGS personnel from the Santa Cruz office put together 3 teams out of 33 entered in the event; 2 of the teams made it to the semifinals. *Haf Mana* team paddler **Bruce Richmond** noted, "The eventual winner, *Pul In Sai*, had to beat our teams twice to make it to the finals."

The Aloha Outrigger Races are held annually at the Santa Cruz Wharf; this year's event was the 14th. The short-course novice outrigger races are orchestrated by a local outrigger club, Pu Pu 'O Hawai'i, to introduce newcomers to the excitement of outrigger-canoe racing and to benefit outrigger clubs in the area, including three

(Outrigger Races continued on page 12)

USGS and ohana *paddlers and family. Left to right:* ***Jorge Lizarzaburu*** *(*ohana*),* ***Amy Draut****,* ***Ann Gibbs****,* ***Amy Foxgrover****,* ***Tim Elfers*** *(former USGS),* ***Kathy Presto*** *(front),* ***Guy Cochrane*** *(back),* ***Eric Grossman****,* ***Bruce Richmond*** *(with daughters* ***Lohana*** *[white T-shirt] and* ***Maurea*** *in front of him),* ***Josh Logan****,* ***Katie Roberts*** *(*ohana*), and* ***Lilian Carswell*** *(U.S. Fish and Wildlife Service [USFWS]).*

(Outrigger Races continued from page 11)

clubs in Santa Cruz and two in Monterey. Participants provide four people for a team, and Pu Pu ‘O Hawai‘i provides a stroker, a steersperson, a canoe, and instructions to start the team racing.

Open to male and female paddlers of all ages, the outrigger races are part of a Polynesian Festival held each year on the wharf by the Santa Cruz Parks and Recreation Department. In addition to the races, this year’s festival included live music, crafts, fresh flower leis, Hawaiian shaved ice, Maori face painting, printmaking, and dance performances.

To learn more about the races, read the article in the August 21 Santa Cruz *Sentinel* posted at URL **http://www.santacruzsentinel.com/archive/2006/August/21/local/stories/01local.htm**.

Team Haf Mana *in the all-white outrigger pulls ahead of other boats during one of the second-heat races. Left to right: Stroker (from Pu Pu ‘O Hawai‘i),* ***Kathy Presto****,* ***Eric Grossman****,* ***Amy Draut****,* ***Bruce Richmond****, and steersman (from Pu Pu ‘O Hawai‘i).*

Team Pohaku Mana *in the blue-and-white outrigger narrowly pulls ahead of another competitor during one of the first-heat races. Left to right: Stroker (from Pu Pu ‘O Hawai‘i),* ***Lilian Carswell*** *(USFWS),* ***Guy Cochrane****,* ***Ann Gibbs****,* ***Amy Foxgrover****, and steersman (from Pu Pu ‘O Hawai‘i).*

Team Menehune Pupule *in the green-and-white outrigger has to put on the power to stay in the running during one of the second-heat races. Left to right: Stroker (from Pu Pu ‘O Hawai‘i),* ***Tim Elfers*** *(former USGS),* ***Jorge Lizarzaburu*** *(*ohana*),* ***Josh Logan****,* ***Katie Roberts*** *(*ohana*), and steersman (from Pu Pu ‘O Hawai‘i).*

Release of Offshore Sediment Data for the Northern Gulf of Mexico and Caribbean: Basic Tools for Offshore GIS Mapping and Geologic Research

By S. Jeffress Williams, Jane A. Reid, and Brian J. Buczkowski

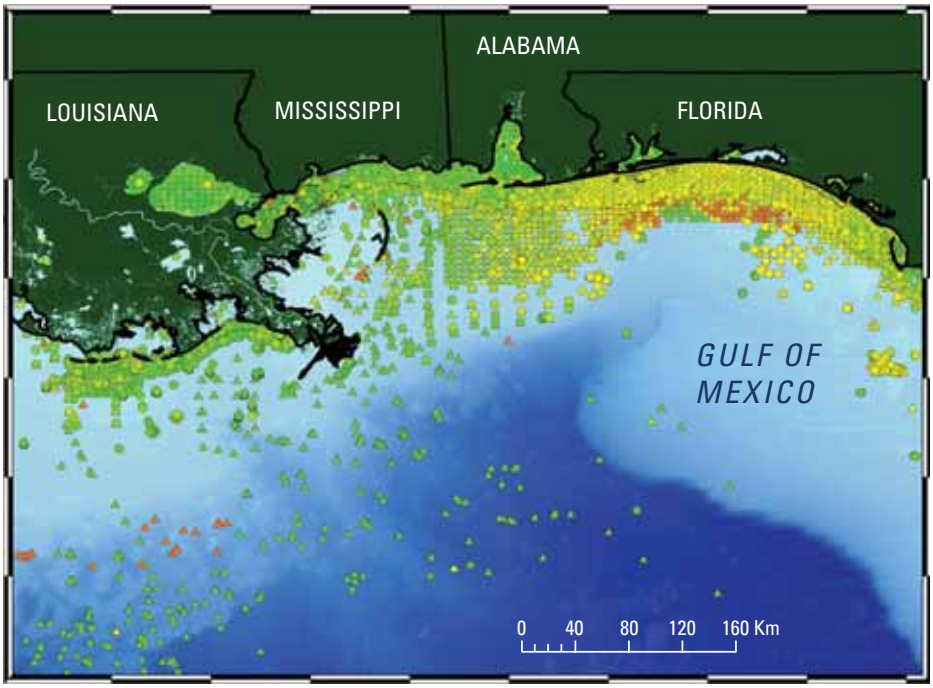
In July 2006, the U.S. Geological Survey (USGS) released "usSEABED: Gulf of Mexico and Caribbean (Puerto Rico and U.S. Virgin Islands) Offshore Surficial Sediment Data Release," USGS Data Series 146 (URL **http://pubs.usgs.gov/ds/2006/146/**). This publication is part of usSEABED, a collection of linked data sets in which sea-floor-sediment data from the USGS and other research groups are collated, processed, and extended to maximize their usability for mapping and analysis.

Detailed and high-quality data and maps of the characteristics of sediment on continental margins and in estuaries and littoral regions are useful to many diverse groups and organizations and are vitally important to expanding our knowledge of sea-floor geology and processes.

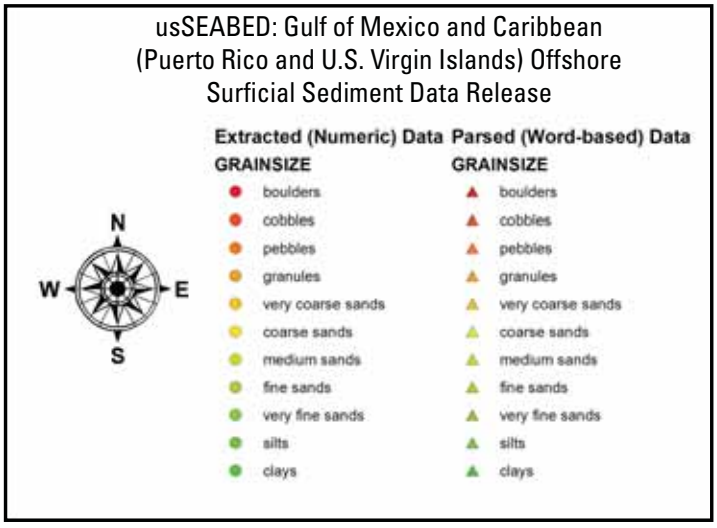
usSEABED (URL **http://walrus.wr.usgs.gov/usseabed/**) is a centralized, fully integrated digital database of existing marine geologic samplings from across the Nation. It is the result of the USGS-led collaboration with other Federal agencies, coastal States, and universities. This innovative database, which combines a broad array of physical data and information about the sea floor, including textural, statistical, geochemical, geophysical, and compositional information, is being used to produce a suite of maps of sea-floor characteristics suitable for use in any geographic information system (GIS). The database design and software (called dbSEABED) originated with **Chris Jenkins** of the University of Sydney, Australia, and the University of Colorado, Boulder. The use of usSEABED and derivative maps is part of ongoing USGS efforts to conduct regional assessments of potential marine sand and gravel resources, to map sea-floor habitats, and to support USGS and others' research interests in sediment transport and other issues. Although the database was created primarily for coastal and marine researchers, GIS products from usSEABED are also being used by planners and managers for numerous purposes.

USGS Data Series 146, the new release of usSEABED data for the Gulf of Mexico and the Caribbean, provides approximately190,000 data points from the sea-floor surface and subbottom in the U.S. Exclusive Economic Zone (extending 200 nautical miles from shore) from the Florida Keys to the United States-Mexican border, as well as around Puerto Rico and the U.S. Virgin Islands. Companion publications are the initial usSEABED data release for the Atlantic margin, published in 2005 as USGS Data Series 118 (URL **http://pubs.usgs.gov/ds/2005/118/**), and the Pacific margin data release, USGS Data Series 182 (URL **http://pubs.usgs.gov/ds/2006/182/**), published in June 2006 (see article in *Sound Waves*, August 2006, at URL **http://soundwaves.usgs.**

(usSEABED Release continued on page 14)



Southern continental margin, showing sediment grain size from Louisiana to Florida, using the extracted (dots) and parsed (triangles) data sets in the Gulf of Mexico and Caribbean data series (DS 146). Grain sizes shown on this map range from cobbles (dark orange) to clays (green).



(usSEABED Release continued from page 13)

gov/2006/08/pubs.html). Data currently being compiled for sea-floor areas off Alaska and Hawaii will be published in the near future. Each usSEABED publication will be updated as additional data become available, with notices about these updates and other information posted on the usSEABED Web site at URL **http://walrus.wr.usgs.gov/usseabed/**.

We encourage data contributions to usSEABED from all coastal margins and major lakes of the United States and appreciate comments on these data-release publications.

The data supplied in these reports are made available with geographic coordinates so that the data can be incorporated into any GIS product. Layers include numeric data from field or laboratory measurements (extracted, or EXT), numeric data from word-based descriptions (parsed, or PRS), data mined from the EXT and PRS data files using known or empirical relations (calculated, or CLC), composition and feature data of the sea floor as individual components (CMP), and combined facies (FAC) output files, along with basemap layers compiled in an ArcView project file. The database currently includes sea-floor and sediment data from more than 340,000 stations throughout the contiguous United States. Federal Geographic Data Committee (FGDC) compliant metadata are included for all source data sets and usSEABED data files.

Within regions of dense, high-quality data coverage on the continental margin, such as the New York Bight (off New York and New Jersey), Louisiana, Florida, and many parts of the U.S. Pacific margin, usSEABED is being used to generate GIS maps of sea-floor sediment types, such as gravel, sand, and mud. The database can also be used to investigate various other seabed parameters, such as areas of hard ground, texture classification, color, carbonate content, organic-carbon content, sea-floor roughness, and sediment shear stress.

To contribute data to this nationwide database; to request more information about usSEABED along the Atlantic and Gulf of Mexico coasts, the Great Lakes, and the U.S. Caribbean region; and (or) to request CD-ROM copies of the Atlantic (DS 118) and Gulf/Caribbean (DS 146) publications, please contact **S. Jeffress Williams** in Woods Hole, Mass. (**jwilliams@usgs.gov**). For more information about usSEABED, to contribute data in the Pacific region (California, Oregon, Washington, Alaska, and Hawaii), and (or) to request a copy of the Pacific margin (DS 182) CD-ROM, please contact **Jane Reid** in Santa Cruz, Calif. (**jareid@usgs.gov**).

The full citation of the latest usSEABED publication is:

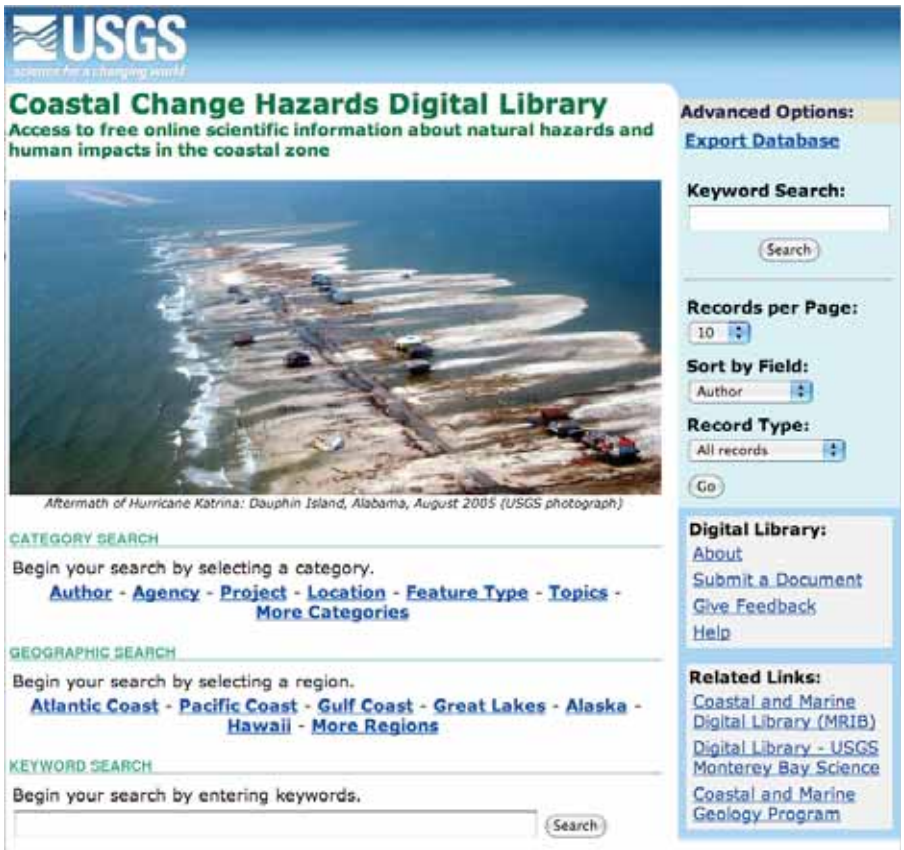
Buczkowski, B.J., Reid, J.A., Jenkins, C.J., Reid, J.M., Williams, S.J., and Flocks, J.G., 2006, usSEABED; Gulf of Mexico and Caribbean (Puerto Rico and U.S. Virgin Islands) offshore surficial sediment data release: U.S. Geological Survey Data Series 146, version 1.0 [URL **http://pubs.usgs.gov/ds/2006/146/**].

New Member in Family of Coastal and Marine Digital Libraries

By Fran Lightsom

The U.S. Geological Survey (USGS) Coastal and Marine Geology Program has released a new version of its family of digital libraries. The Marine Realms Information Bank (MRIB, URL **http://mrib.usgs.gov/**) has provided access to free online scientific information about oceans, coasts, and coastal watersheds since 2001. The MRIB interface encourages library users to discover Web sites and online documents by browsing through its 12-category classification scheme. Moreover, MRIB was one

(Digital Libraries continued on page 15)



*Home page of the Coastal Change Hazards Digital Library (URL **http://mrib.usgs.gov/cch/**), newest member of the USGS family of digital libraries, the Marine Realms Information Bank (MRIB, URL **http://mrib.usgs.gov/**).*

(Digital Libraries continued from page 14)

of the first digital libraries to make full use of maps to allow users to search for information about particular locations. In 2004, the geographic capabilities of MRIB were used to create the Monterey Bay Science Digital Library (URL **http://montereybay.usgs.gov/library/**), a regionally focused search interface providing access to online information about the Monterey Bay National Marine Sanctuary and the coastal watersheds of central California.

The newest member of the MRIB family is the Coastal Change Hazards Digital Library (URL **http://mrib.usgs.gov/cch/**), released in August 2006. This specialized digital library focuses on natural hazards and human impacts in the coastal zone and uses a different topical classification than the parent MRIB interface. The new release provides for "crosswalks" between the MRIB and Coastal Change Hazards topical classifications, so that online resources originally indexed for one interface can be found using the other.

The MRIB digital library system, which is a product of the Coastal and Marine Geology Knowledge Management Project, is being incorporated in the new Coastal and Marine Knowledge Bank. Its principal creators are information specialist **Alan Allwardt** (USGS Pacific Science Center, Santa Cruz, Calif.) and programmer **Guthrie Linck** and oceanographer **Fran Lightsom** (both of the USGS Woods Hole Science Center in Woods Hole, Mass.). For more information about MRIB, read USGS Fact Sheet 064-03 at URL **http://pubs.usgs.gov/fs/fs064-03/**.

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