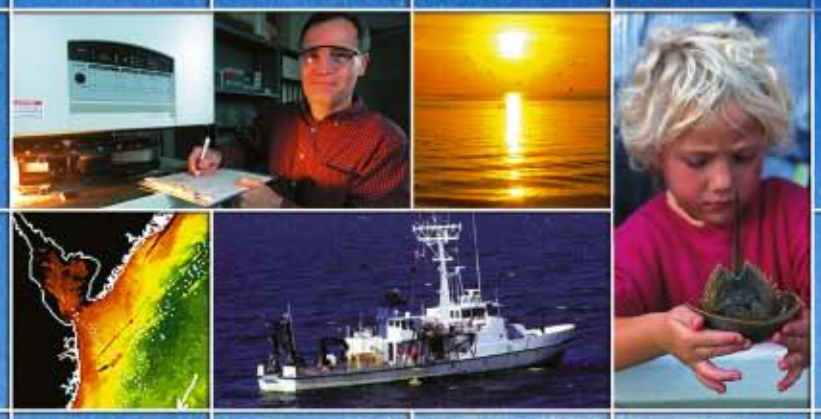
UNIVERSITY OF DELAWARE SEA GRANT
REPORTER

Volume 23, No. 1 — **2004 Annual Report**

Sea Grant **INSIDE:** UD marine scientists and outreach staff tackle coastal issues. Find out what you can do to help. Take our survey and enter the drawing for the **Great Coastal Gift Package!**



An Ocean of Opportunity

Facing Delaware's Coastal Challenges

Floyd Dean

This is a watershed year for the ocean we all depend on. The presidentially appointed U.S. Commission on Ocean Policy recently released its report, concluding that the ocean is in trouble and calling for sweeping changes in how we, as a nation, manage our marine and coastal resources.

Among its recommendations, the commission calls for a new ocean management framework organized by natural ecosystem boundaries versus political borders. It also calls for increased funding for marine research, which has dwindled to only 3.4% of the federal research budget, and for a major commitment to ocean education.

The ocean covers more than 70% of the Earth and serves as our life-support system. The ocean drives our weather and climate. It supplies jobs, food, and recreation. Its diverse inhabitants, from salmon to sea slugs, are advancing research on osteoporosis, cancer, Alzheimer's, and other diseases. Microscopic plants in the ocean even generate most of the oxygen we breathe!

Here in Delaware, the health of the ocean and coast is essential to our quality of life and critical to our future. We are bordered by the Delaware River and Bay, the Inland Bays, and the Atlantic Ocean. We have a top port, world-class beaches, lush marshes, a wide variety of marine life, and communities with a rich maritime heritage. As our marine and coastal resources come under increasing pressure, however, problems occur, from declining fisheries to blooms of toxic algae to life-threatening floods during coastal storms.

The statewide Delaware Sea Grant College Program, based here at the University of Delaware, conducts research aimed at solving coastal problems, educates graduate students in marine science and policy, and delivers information and technologies to the public through our Marine Advisory Service and Marine Public Education Office. This report highlights only a few of our activities during the past year.

Currently, our program is engaged in a strategic planning process to set future marine research and outreach priorities. Please let us know your concerns by filling out the survey inside and mailing it back to us. We value your input and encourage you to become a stakeholder in the future of a bountiful, sustainable ocean — vital to our very existence.

Carolyn A. Thoroughgood

Dr. Carolyn A. Thoroughgood
Director, UD Sea Grant College Program
Dean, UD Graduate College of Marine Studies

SEA FACT: **The ocean covers over 70% of the Earth's surface, yet only 5% of it has been explored.**

Artificial Bait to Help Horseshoe Crabs and Fishermen

The largest concentration of horseshoe crabs in the world lives in Delaware Bay. Each spring, shorebirds migrating north from Central and South America stop here to fuel up on crab eggs. Its blood, which can be removed harmlessly, contains a compound that is used to test drugs, heart valves, and other medical products to ensure that they are bacteria-free.

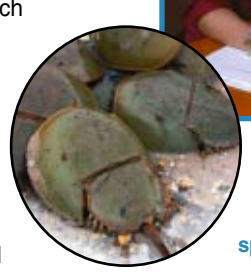
The horseshoe crab also is used for bait in the eel and conch fisheries. Due to concerns about declines in the crab's population, several states have imposed catch restrictions, limiting the crab's use as eel and conch bait. Sea Grant research is aimed at helping commercial fishermen find alternative solutions, to protect one of nature's oldest creatures.

Nancy Targett, a marine biologist at the University of Delaware College of Marine Studies, and Pam Green, a UD molecular biologist based at the Delaware Biotechnology Institute, are working to develop an artificial horseshoe crab bait for the eel and conch fisheries.

"Horseshoe crabs are such a good bait because they produce a specific chemical lure," Targett says. She and her team have evidence that the chemical lure is a protein and are now busy working to purify it in the lab. Once this difficult task has been achieved, the goal will be to develop a sustainable, synthetic version of the protein that can be incorporated into an artificial bait.

This research also has received funding support from the Delaware Department of Natural Resources and Environmental Control, DuPont, and the National Fish and Wildlife Foundation.

Kathy Atkinson



Above: **UD scientists Nancy Targett (right) and Pam Green are working to develop an artificial horseshoe crab bait.** ***Left:*** **Horseshoe crabs come ashore to spawn each spring along Delaware Bay.**

A Tool for Bay Detectives

On July 30, 2003, in Torquay Canal, near Rehoboth Bay, 75,000 juvenile menhaden died in last summer's largest fish kill in Delaware waters.

"We were able to conduct tests on the day it occurred," says George Luther, a marine chemist at the University of Delaware College of Marine Studies. He and his team analyzed the canal's water quality using a microelectrode sensor he developed in Sea Grant research. The novel tool contains a gold wire that is connected to electrical components. It can rapidly detect a host of chemical compounds that are key indicators of environmental health.

"Winds caused the water to overturn, mixing the deadly hydrogen sulfide that's normally confined to the seafloor throughout the water column," Luther says. "Blue crabs were clinging onto pilings trying to escape the water."

Luther and his team — doctoral student Brian Glazer and Don Nuzzio, president of Analytical Instrument Systems, Inc. — also have been testing the sensor's use on a remote chemical analyzer system. Successful tests have been undertaken locally and at hydrothermal vents in the Pacific Ocean. Eventually, Luther hopes to deploy the sensor from lighthouses in the Delaware Bay as part of a national ocean observing system.

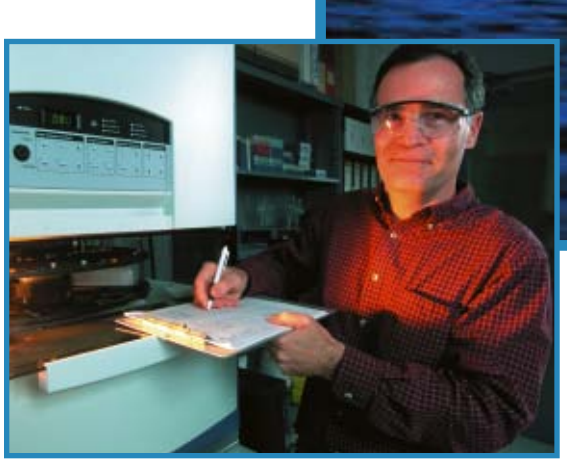
Above: **UD marine chemist George Luther (right) and Ph.D. student Brian Glazer examine the microelectrode sensor's electronics outside of the pressure housing.** ***Right:*** **Close-up of the sensor tip used for sediment work (left); the tip used for bay work is housed in protective plastic.**

Adapted from NOAA

10 Things You Can Do to Help the Ocean

1. Learn all you can about the ocean.
2. Be a smart shopper and seafood chef. Ask restaurants and grocery stores about the source of their seafood. Find out how to properly prepare your catch.
3. Conserve water. Be careful when taking a bath or shower, washing your car, watering your lawn.
4. Limit your use of household pollutants, including herbicides, pesticides, lawn fertilizers, and nonbiodegradable cleaning products.
5. Reduce waste. Recycle, re-use, and compost whenever possible.
6. Reduce automobile pollution. Use fuel-efficient vehicles or carpool. Recycle motor oil.
7. Protect o… of fishing… or near the wa…
8. Be consid… tat. Don't … mammals, or d…
9. Get Involv… or other o…

Kathy Atkinson



Above: **UD marine biologist Patrick Gaffney runs a DNA analysis of hatchery-produced oysters.** ***Below:*** **The Eastern oyster is native to the Delaware and Chesapeake bays.**

Taking Stock of the Region's Oyster Fishery

A century ago, oyster schooners plied the Delaware and Chesapeake bays, harvesting the "white gold" that supported a thriving industry. Today, the oyster fishery is a dim shadow of its former glory, decimated by years of over-harvesting, degraded habitat, and deadly disease.

During the past decade, a concerted effort has been under way in Chesapeake Bay to restore its oyster population. Patrick Gaffney, a marine biologist at the University of Delaware College of Marine Studies, is working with researchers in Maryland and Virginia to help assess the effectiveness of their stock-enhancement programs.

"Millions of dollars are being spent on restocking the Chesapeake Bay with hatchery-produced oyster seed," he says. "Genetic tags or 'fingerprints' for these oysters would tell us if the oysters that are surviving in the bay have come from hatcheries or from wild stocks."

Gaffney's genetic technique hinges on the distinctive variations that occur in the DNA sequences of hatchery-cultured oysters, a result of the limited genetic lines used to create the stock. To apply the technique, scientists collect oysters from the field and screen them using high-throughput DNA sequencers. This summer, the new method will be applied to a new oyster reef to determine whether hatchery oysters are surviving and contributing offspring to the area.

Getting to the Root of a Marsh Invader

Rising up to 16 feet tall, with long green leaves and silvery plumes, the common reed, *Phragmites australis,* is like a dreaded houseguest in most marshes. Once it gets its foot in the door, it wants the run of the whole household, and it never wants to leave.

Phragmites is widely distributed around the world. It's particularly invasive along the U.S. East Coast, where it has overtaken many marshes, crowding out plants that provide better food and habitat for wildlife.

According to Jack Gallagher, a botanist at the University of Delaware College of Marine Studies, one key to the plant's success is its fast-growing underground stems called rhizomes. Currently, he and colleague Denise Seliskar are analyzing the growth rates of rhizomes from six different populations of the plant collected from Nova Scotia to Florida. They also are examining how *Phragmites* responds at the cellular level to changes in salinity and nutrient stress.

Steven Billups

"We want to then use this understanding to develop better strategies for controlling *Phragmites* in salt marshes and putting the plant to work at sewage treatment facilities," Gallagher says.

In previous research, the scientists demonstrated the plant's beneficial role in drying sludge, leaving less waste to haul away to landfills.

Left: **UD botanists Jack Gallagher and Denise Seliskar examine *Phragmites* in the greenhouse at the College of Marine Studies in Lewes.**

Steven Billups

How Do Dissolved Oxygen Levels Affect Fish?

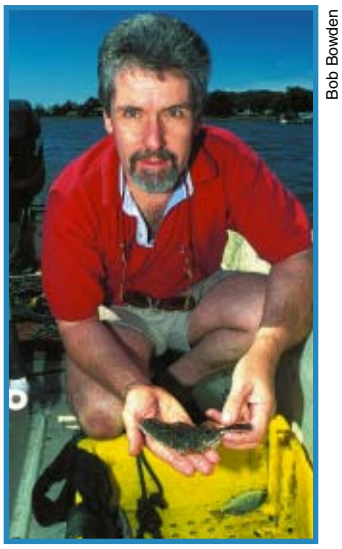
Through extensive laboratory experiments and field studies, Timothy Targett and his students are learning important new information about how the environmental condition of an estuary affects one of its most desirable residents: fish.

"Our research indicates that even at non-lethal levels, a shortage of oxygen in the water changes the way fish behave, how they feed, and how rapidly they grow," Targett says.

The UD fisheries scientist and his students have been studying two species that are economically important to Delaware: weakfish and summer flounder. Their focus is on juvenile fish, less than a year old.

"Normally, these fish grow rapidly during their first summer — up to 6 inches for weakfish and 12 inches for summer flounder — which makes them less vulnerable to predation," Targett says. "However, when oxygen levels decline, this growth rate can be cut in half."

Targett's project is part of a regional effort involving Sea Grant researchers at North Carolina State and Lousiana State. His data on weakfish and summer flounder, and North Carolina's data on spot and menhaden, now are being incorporated into a computer model that Louisiana Sea Grant is developing to monitor fish health relative to dissolved oxygen.



Bob Bowden

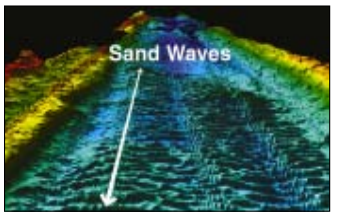
Above: **UD fisheries scientist Timothy Targett examines a young summer flounder collected from Indian River Bay.**

Tracking the Moving Mud

Every year, over a million tons of sediment — about 100,000 dump-truck loads of mud — flow into the Delaware Estuary, which extends 134 miles from Trenton to the ocean.

"We want to know where all this sediment comes from, how it's transported, and where it ends up," says UD geologist Chris Sommerfield.

Ultimately, his goal is to develop a "sediment budget" for the estuary — an account of the various sources and eventual resting places, or "sinks," for the muds. Understanding how the input of sediment balances with the amount that's permanently trapped or taken away by dredging is critical to managing issues ranging from shoreline erosion to toxic contaminants.



Above: **UD marine geologist Chris Sommerfield views a 3-D image of the Delaware River seafloor at a depth of 40 feet near Philadelphia.** ***Left:*** **This close-up of the image shows "sand waves," natural features on the seafloor created by sediment transport.**

Sommerfield and his team, including oceanographer Kuo-Chuin Wong and graduate students Dave Walsh, Tim Cook, and Elyse Scileppi, are using a variety of tools to track sediment transport: current meters to assess water flow, turbidity sensors to monitor sediment concentration, seafloor mapping to reveal the bottom terrain, and sediment cores — long cylinders of sediment extracted from beneath the seafloor — that provide a history of deposition.

Recently, the team discovered that the seafloor itself is a major source of sediment — contributing over a million tons a year on average — due to widespread bottom erosion by tidal currents.

"This sort of erosion is innate in estuaries worldwide, but its scale had never before been determined in the Delaware," Sommerfield says. "Our findings suggest that much of the sediment dredged from the shipping channel each year originates from this erosion."

Steven Billups

Above: **UD marine biologist David Kirchman examines microbes from the Delaware River.**

Scientists Study Pollutant's Effects on Tiniest Life

Marine biologist David Kirchman, who also is associate dean of the UD College of Marine Studies, and postdoctoral researcher Dawn Castle recently completed Sea Grant research to determine how polyaromatic hydrocarbons (PAHs), a class of toxic pollutants, impact the Delaware River and Bay's tiniest life: microbes. Like Atlas with the world on his shoulders, these one-celled organisms form the base of the food chain.

Found naturally in crude oil, creosote, tar, and coal, PAHs do not dissolve easily in water. In bays and estuaries, they can cause tumors in fish and bioaccumulate to deadly levels in oysters and other bottom dwellers.

In the first phase of the project, the team used DNA fingerprinting techniques to identify microbes in Delaware River water and compare their genetic composition. They also isolated bacteria that can detoxify PAHs — a major scientific accomplishment because marine bacteria are very difficult to culture.

In the project's last phase, the scientists used additional molecular methods to study those bacteria in the Delaware River that couldn't be cultured. Their goal was to quantify these bacteria and determine how PAHs affect them.

"We found that some microbial groups in the Delaware Estuary degrade PAHs, which is surprising because the nutrients associated with PAHs are low, making them less desirable to bacteria than other, more nutritious food sources," Kirchman says. "The positive aspect is that bioremediation of PAHs in the Delaware Estuary is possible. The negative news is that PAHs have adverse effects on other microbes that carry out important functions in the ecosystem."

Probing for Answers to Brown Tide

Brown tide *(Aureococcus anophagefferens)* isn't harmful to humans, but it can hurt bay life. When the microscopic plant grows rapidly, or "blooms," at the water's surface, it forms a thick, coffee-colored soup that sunlight can't penetrate. Major blooms have killed shellfish and dampened tourism in some states.

"The number of harmful algal species in our area appears to be increasing, an alarming trend for those of us concerned with the health of our bays and coastal ocean," says UD marine scientist David Hutchins. His lab was the first to confirm the presence of brown tide in Delaware's Inland Bays in 1998.

In Sea Grant research, he and colleague Craig Cary and their research teams developed a molecular probe that can rapidly detect brown tide at levels as low as 10 cells per milliliter, providing resource managers with a state-of-the-art tool for assessing the risk of future brown-tide blooms.

How is brown tide making its way to new waters? Recently, Hutchins and doctoral student Linda Popels conducted experiments to determine the potential for brown tide to survive conditions similar to those in ship ballast tanks. They found that the tiny plant was able to survive for at least 30 days in the dark when stored at 12°C (54°F).

"Based on our findings, it's highly possible that humans unknowingly are transporting brown tide in the ballast tanks of ships or recreational boats," Hutchins says.

Steven Billups

Above: **UD marine scientist David Hutchins and doctoral student Linda Popels analyze water samples for brown tide using a molecular probe they developed.** ***Left:*** **Close-up of the probe, which can detect brown tide at just a few cells per milliliter.**

Sea Grant

Sea Grant has a team of outreach professionals committed to public service and education on behalf of the ocean and coast.

Based at UD's Lewes campus, the Sea Grant Marine Advisory Service includes six agents who travel the state, assisting Delawareans with issues relating to water quality, coastal hazards, fisheries and aquaculture, marine education, coastal tourism, marine transportation, and seafood technology.

The Marine Public Education Office, located on UD's Newark campus, translates complex scientific information and presents it to the public in award-winning publications, "SeaTalk" radio announcements, on-line expeditions, exhibits, and Web sites.

This page highlights only a few of our outreach activities. For more information, visit Sea Grant on the Web at *www.ocean.udel.edu* or contact the Marine Advisory Service in Lewes at (302) 645-4346 or the Marine Public Education Office in Newark at (302) 831-8083.

Bob Bowden

Lessons about Invasive Species

Marine and aquatic habitats increasingly are being threatened by non-native animals and plants — 298 invasive species are now documented as having invaded U.S. ocean and coastal waters, causing $138 billion in economic losses per year. Marine education specialist Bill Hall is working regionally with educators at the Maryland and Pennsylvania Sea Grant programs to offer teachers in Delaware and throughout the Mid-Atlantic region professional development workshops and classroom curricula on invasive species. For more information, call Hall at (302) 645-4253.

Improving Access at Marinas

There are about 12,000 marinas and 1.1 million boat slips in the United States. At many of these facilities, access for people with disabilities is limited. However, new federal guidelines have been issued for improving the accessibility of fishing piers and platforms and boating faciilties. David Chapman, ports and marine transportation specialist, recently completed a two-page *Marine Advisory Service Note* that provides an overview of the guidelines. For a free copy, call (302) 645-4346.

Bob Bowden

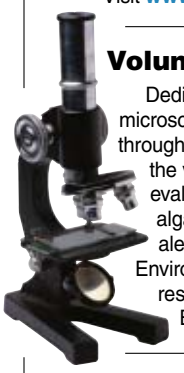
Growing an Oyster Garden

Last summer, with support from a National Wildlife Federation Five-Star Grant, aquaculture specialist John Ewart and staff from the Delaware Center for the Inland Bays recruited citizen volunteers from 14 locations along the Inland Bays to become "oyster gardeners." The volunteers grew baby oysters, or spat, in small floats attached to backyard docks and piers. The spat were then transferred to the Center for the Inland Bays' oyster reef in Indian River Bay last fall. The oyster gardeners produced over 10 bushels of spat for planting on the reef. For more information, call Ewart at (302) 645-4060.

New Web Site Highlights Horseshoe Crab

You can now meet Delaware's state marine animal on Sea Grant's new horseshoe crab Web site! Produced by UD's Marine Public Education Office in partnership with Sea Grant programs throughout the Mid-Atlantic region, the new site features a wealth of information on the horseshoe crab's history and biology, shorebird connection, research, human use, and fisheries management. The site includes a variety of fun facts, a map of spawning hot spots, volunteer opportunities, and resources for more information.

Visit **www.ocean.udel.edu/horseshoecrab** today!



Volunteers Monitor Microscopic Plants

Dedicated volunteers are playing an important role in monitoring microscopic plants — phytoplankton — in Delaware's Inland Bays through a citizen-based, Sea Grant water-quality program. Because the volunteers live near the bays, they can quickly collect and evaluate samples on a regular basis. When large blooms of harmful algae such as *Chattonella* occur, the program provides immediate alerts to the Delaware Department of Natural Resources and Environmental Control. The program is managed by Joe Farrell, resource management specialist, and volunteer coordinator Ed Whereat. For more information, call Farrell at (302) 645-4250.

Sign Up for E-News!

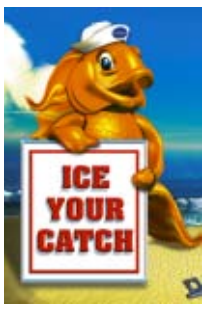
Stay in touch with UD Sea Grant and the College of Marine Studies. The Marine Public Education Office recently launched *At Sea,* a free on-line newsletter to share our latest activities. Subscribe today at www.ocean.udel.edu/atsea.

Beach Signs Boost Ocean Awareness

In a cooperative project with Bethany Beach, Rehoboth Beach, Dewey Beach, and the Delaware Department of Natural Resources and Environmental Control, Delaware Sea Grant has developed colorful, weather-resistant signs to increase public awareness and understanding of a range of coastal topics. More than 130 signs have been produced on rip currents, coastal storms, sand dunes, and bottlenose dolphins. Coordinated by coastal processes specialist Wendy Carey, the sign project is designed to serve as a "boardwalk classroom" for visitors to the Delaware coast. For more information, call Carey at (302) 645-4258.

Ice Your Catch to Prevent Illness

Seafood specialist Doris Hicks is involved in a national initiative aimed at preventing histamine poisoning — one of the most common causes of seafood-borne illness in the United States. Symptoms include flushing of the face and neck, a tingling sensation of the tongue, and vomiting and/or diarrhea. The key to prevention is to cool your catch as quickly as possible to halt bacterial spoilage. The fish species most likely to cause problems include mackerel, mahi mahi, bluefish, tuna, marlin, and several others. For a free brochure, call (302) 645-4346.



2004 Sea Grant Advisory Council

Mr. William J. Miller, Jr.
Chairman

Mr. Russell Archut
Mr. Gene Bailey
Hon. Joseph W. Booth
Hon. George H. Bunting, Jr.
Hon. V. George Carey
Hon. John C. Carney, Jr.
Hon. G. Wallace Caulk, Jr.
Ms. Carol R. Collier
Hon. Dori Connor
Ms. Sarah Cooksey
Hon. Charles L. Copeland
Ms. Marsha A. Corcoran
Mr. Richard S. Cordrey
Hon. Joseph G. DiPinto
Mr. John Dragone
Hon. Bruce C. Ennis
Mr. Gerard Esposito
Ms. Lorraine Fleming
Mr. Daniel Furlong
Mr. William Grosskopf
Mr. Geoff Halfpenny
Ms. Jeanie Harper
Mr. A. Richard Heffron
Hon. Gerald W. Hocker
Mr. John A. Hughes
Mr. James T. Johnson, Jr.
Ms. Kathy Klein
Ms. Phyllis Laffey
Dr. Daniel J. Leathers
Dr. Ann Masse
Hon. David B. McBride
Mr. Roy Miller
Mr. William J. Miller, Jr.
Mr. Gary B. Patterson
Ms. Grace Pierce-Beck
Dr. Joseph Pika
Ms. Shirley Price
Mr. Michael S. Purzycki
Dr. Hazell Reed
Dr. Bruce A. Richards
Mr. Dennis Rochford
Mr. James J. Roszkowski
Dr. T. W. Fraser Russell
Mr. Edward Santoro
Mr. John Schneider
Hon. Peter C. Schwartzkopf
Dr. Janice A. Seitz
Dr. Edward M. Simek
Hon. F. Gary Simpson
Hon. Liane Sorenson
Ms. Maria A. Taylor
Mr. Douglas Van Rees
Ms. Katherine Ward
Mr. Stuart Widom
Ms. Valerie A. Woodruff

COMING EVENTS

Ocean Currents Lecture Series. UD marine scientists present public lectures each month, April through September, at 7 p.m., UD Hugh R. Sharp Campus, 700 Pilottown Rd., Lewes. Reservations required. Contact: (302) 645-4279.

Free Marine Science Tours. Guides lead hour-long walking tours of the UD College of Marine Studies in Lewes throughout the year. From June through August, tours are offered every Friday, starting at 10:30 a.m. Reservations required. Contact: (302) 645-4346.

Extreme 2004. Teachers, your students can "dive in" to the deep sea and explore hydrothermal vents with UD marine scientists in this virtual field trip sponsored by the National Science Foundation. From Nov. 30 – Dec. 20. Register now at *www.ocean.udel.edu/expeditions.* Contact: (302) 831-8083.

Coast Day — *Sunday, Oct. 3, Lewes Campus.* 11 a.m. to 5 p.m. Free admission; $2 parking. Have a bounty of fun learning about the ocean and coast at this award-winning event. Sea seminars, exhibits, ship tours, children's activities, 15th annual crab cake cook-off, and more! Contact: (302) 831-8083.

Wilmington Lunch & Lecture Series. Held periodically from November to April, this series highlights the latest UD marine research over lunch at the four-star Hotel du Pont. 11:30 a.m. – 1 p.m. Cost: $15. Reservations required. Contact: (302) 831-8083.

Dive in today! ***www.ocean.udel.edu***

University of Delaware
Sea Grant College Program
University of Delaware
Newark, DE 19716-3530

The University of Delaware is committed to assuring equal opportunity to all persons and does not discriminate on the basis of race, color, gender, religion, ancestry, national origin, sexual orientation, veteran status, age, or disability in its educational programs, activities, admissions, or employment practices as required by Title IX of the Education Amendments of 1972, Title VI of the Civil Rights Act of 1964, the Rehabilitation Act of 1973, the Americans with Disabilities Act, other applicable statutes, and University policy. Inquiries concerning these statutes and information regarding campus accessibility should be referred to the Affirmative Action Officer, 305 Hullihen Hall, (302) 831-2835 (voice), (302) 831-4563 (TDD). 6/04:141K

Printed on recycled paper.