UNIVERSITY OF DELAWARE SEA GRANT
REPORTER

Sea Grant **INSIDE:** UD marine scientists tackle coastal issues.

ON BACK: Learn about our outreach programs, publications, and Web sites. Enter the drawing for our **Great Coastal Gift Package!**

Volume 21, No. 1 — ***2002 Annual Report***

"Biological Fence" May Keep *Phragmites* Out of Marshes

Left: Phragmites australis **(common reed), has invaded over a third of Delaware's 90,000 acres of tidal marsh.** ***Below:*** **UD botanists Jack Gallagher and Denise Seliskar are working on methods to control the plant.**

Among marsh plants, *Phragmites* is a big bully! Its fast-growing underground stems (*rhizomes)* enable it to quickly take over a marsh, crowding out plants better for wildlife.

Botanists Jack Gallagher and Denise Seliskar and graduate student Jiangbo Wang are working to find a way to stop *Phragmites* in its tracks. In their lab at the UD Lewes campus (below), they are evaluating plants they have cultured, as well as plants found in nature, to assess their ability to form a "biological fence" to block *Phragmites.*

"We're looking for plants that have roots and rhizomes so dense they impede *Phragmites'* growth and whose roots release chemical compounds that inhibit *Phragmites,"* says Gallagher. "Evergreen plants that grow taller than *Phragmites* and 'keep it in the dark' are also good because it doesn't like to grow in shade."

So far, he says, black needle rush, wax myrtle, and several other plants show good potential as *Phragmites* blockers. This summer, field testing of the plants will be expanded at a marsh restoration site along Delaware Bay. The project is supported jointly by Sea Grant and Public Service Enterprise Group.

Steven Billups

Navigating Our Course to a "Livable Coast"

Floyd Dean

Dr. Carolyn Thoroughgood

The ocean is a source of endless fascination — a vast resource whose power, mystery, and beauty commands our respect.

Today, the ocean beckons many of us. In fact, according to the National Oceanic and Atmospheric Administration (NOAA), more than half of all Americans now live in coastal counties.

Here in the Diamond State, this trend underscores the importance of Governor Minner's "Livable Delaware" initiative — targeting sprawl and other quality-of-life issues. We need to make wise decisions about growth today to ensure the future welfare of our coastal communities and the natural resources on which we depend.

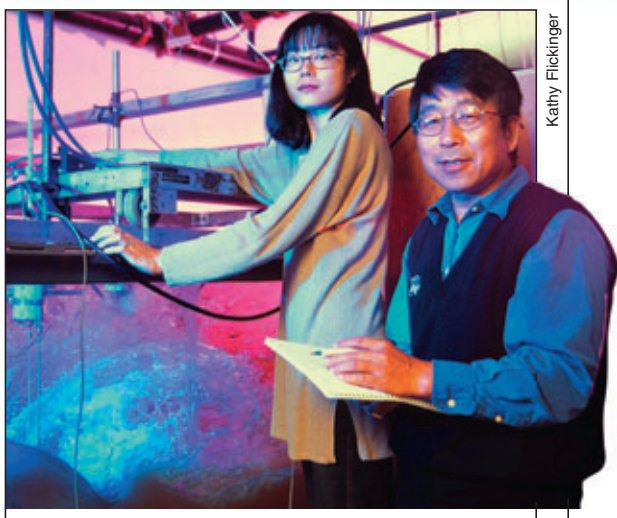
Since the University of Delaware Sea Grant College Program was established in 1976, our goals have been to promote the wise use, conservation, and management of Delaware's marine and coastal resources. We do so through a coordinated program of high-quality research, education, and public service activities.

During the past year, a National Sea Grant Review Team conducted an intensive evaluation of our program and concluded that it is "excellent in all respects." They also recognized five best management practices relating to our industry partnership activities, interactive Web sites, Coast Day open house, and other educational programs.

We remain dedicated to addressing coastal challenges on behalf of Delawareans and the environment. This report highlights several projects we're working on. To learn more, please visit our Web site at *www.ocean.udel.edu* or contact us at (302) 831-8083. We look forward to hearing from you!

Carolyn A. Thoroughgood

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



Kathy Flickinger

Capturing Breaking Waves

It's a busy day at "the beach" in DuPont Hall on the UD Newark campus. Coastal engineer Nobuhisa Kobayashi and graduate student Yuki Tega (above) are conducting experiments in a wave tank to better understand what happens to the seafloor when waves break near shore.

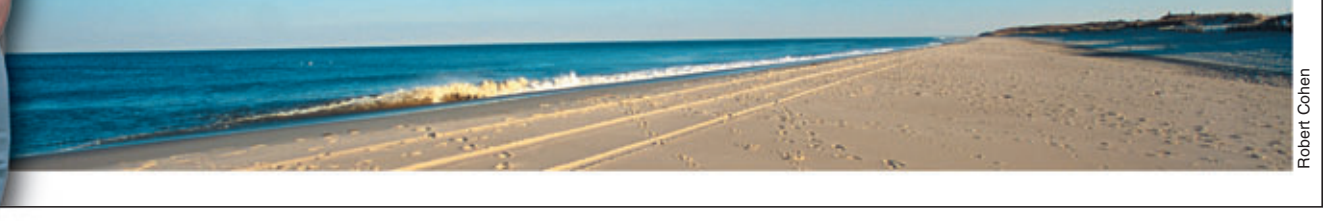
While the waves are only about a foot high — typical of a calm sea — they hit the simulated seafloor when they break, kicking up sediment particles that become suspended in the water.

"We can see what's happening, but quantifying what we see is very difficult," Kobayashi says. "We're working to determine how much sediment is being moved by breaking waves and carried on- or offshore."

The scientists will translate their observations into a mathematical model that can determine how long it will take a beach to recover from storm erosion. Their ultimate goal is to develop a computer program that beach managers can use to predict how long the sand they've put on a beach will last.

Above: **UD coastal engineer Nobuhisa Kobayashi and graduate student Yuki Tega conduct experiments on breaking waves in the lab.** ***Right:*** **When waves break near shore, they hit the sea bottom, moving sand and sediment.**

Sea Grant is a nationwide network of 30 university-based programs that promotes better understanding, conservation, and use of America's coastal resources — "from sea to shining sea." Delaware Sea Grant was established at the University of Delaware in 1976. It is a unique partnership between the University, the National Oceanic and Atmospheric Administration, and the State of Delaware.



Robert Cohen

Steven Billups

Scientists Map Delaware River Seafloor

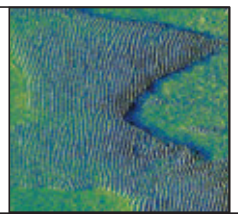
From the deck of UD's research vessel *Cape Henlopen,* scientist Chris Sommerfield (left) is preparing to deploy a "towfish" in the Delaware River. As its name belies, this instrument is towed underwater a few feet above the bottom. It transmits narrow beams of acoustic energy to the seafloor and converts the reflected sound into images. Sommerfield is using the tool to map the seafloor of the Delaware River from Burlington, New Jersey, to New Castle, Delaware.

"We're covering the entire seafloor of that area," Sommerfield says. "We've towed our instruments back and forth, over 300 miles total, to document the bottom completely. It's the most comprehensive survey of this region ever done."

The hundreds of images that have been taken are now being digitally "stitched" together to produce a composite view of the seafloor. Additionally, Sommerfield and his research team have collected several hundred sediment samples to correlate their mapping data with specific sediment types.

Sommerfield's aim is to better understand where over a million tons of sediment that enter the Delaware Estuary annually go, and how the seafloor is being affected by natural and human processes. This baseline information can then aid resource managers and engineers with issues such as contaminant dispersal and shoaling of navigable channels.

The Sea Grant study is being conducted in partnership with the Delaware River Basin Commission, Delaware Department of Natural Resources and Environmental Control, and Environmental Protection Agency.



Above: **UD scientist Chris Sommerfield prepares to deploy the towfish, which uses sound to see and map the seafloor.** ***Right:*** **Towfish image of a rippled patch of gravel on the sandy seafloor off Delaware Bay. Image scale: 100 x 100 meters.**

Steven Billups

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Science Serving Delaware's Coast

The University of Delaware Sea Grant College Program currently is conducting 19 research projects in the following priority areas: coastal ocean studies, coastal engineering, environmental technology, marine biotechnology, and fisheries. These projects range from developing new sensors that can detect harmful algae, to determining how natural forces — winds and currents — can affect the Delaware Bay's blue crab population.

This report highlights only a portion of our research program. To learn more, please visit our Web site at *www.ocean.udel.edu.*

Our *Coastal Ocean Studies* focus on the Delaware Estuary and the Inland Bays. The Delaware Estuary extends 133 miles from the Delaware River rapids at Trenton, New Jersey, south to the mouth of the Delaware Bay. Among the estuary's benefits, it supports the fourth largest port in the U.S. and the largest concentration of horseshoe crabs in the world.

Delaware's Inland Bays — Rehoboth, Indian River, and Little Assawoman — cover 32 square miles in coastal Sussex County. Besides providing habitat for ospreys to diamondback terrapins, the bays rank as the state's top boating destination.

Steven Billups

New Probe Can Rapidly Detect Brown Tide

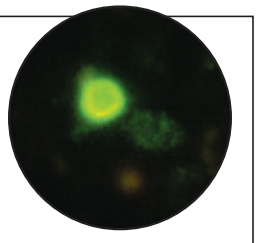
Delaware Sea Grant researchers have developed a molecular probe that can rapidly detect the microscopic plant that causes brown tide. The probe is so sensitive it can detect brown tide at just a few cells per milliliter, advancing the capability to predict waters at risk, well before blooms occur.

"We've already used the probe to assist DNREC in monitoring brown tide in the Inland Bays and expect it will become the method of choice for regulatory agencies throughout the United States," says UD oceanographer David Hutchins, who is leading the project with marine biologist Craig Cary.

Brown tide is not harmful to humans, but it can hurt bay life. When the tiny plant grows rapidly, or "blooms," at the water's surface, it forms a thick, brown soup impenetrable by sunlight. Major brown-tide blooms have damaged the shellfish industries in several states.

A few years ago, New Jersey was the southern extent of brown tide on the East Coast. Then in 1998, Hutchins found it in Delaware's Little Assawoman Bay. Last summer, his students tested for the organism farther south and found it in estuaries "from here to Florida," according to Hutchins.

Currently, Linda Popels, one of Hutchins' students, is working to assess brown tide's ability to survive darkness. If the microscopic plant can live for an extended period with no light, it might be hitching a ride to new waters via the ballast tanks of ships and recreational boats.



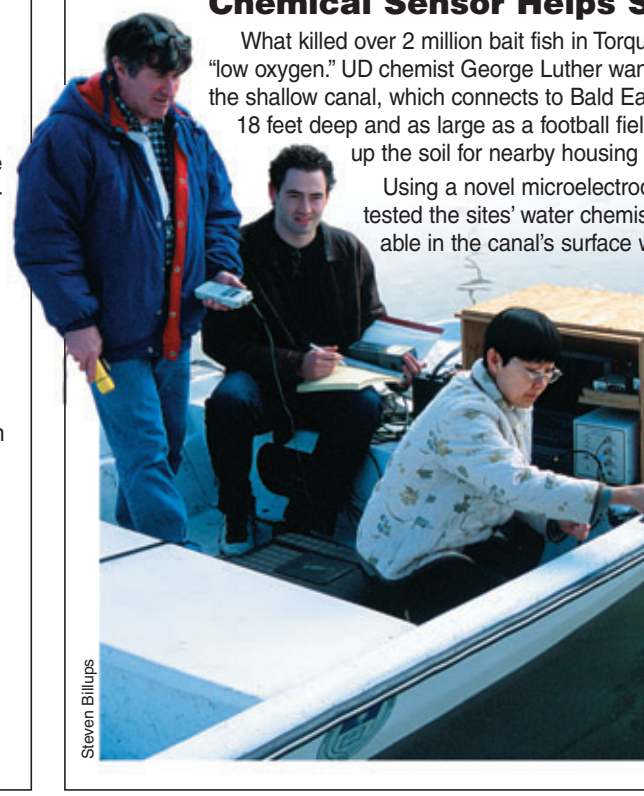
Above: **Magnified view of the brown tide organism *(Aureococcus anophagefferens).*** ***Left:*** **Graduate students Linda Popels (seated) and Fran Pustizzi study brown tide at the UD College of Marine Studies.**

Chemical Sensor Helps Scie

What killed over 2 million bait fish in Torquay Ca
"low oxygen." UD chemist George Luther wanted to
the shallow canal, which connects to Bald Eagle Cr
18 feet deep and as large as a football field. The
up the soil for nearby housing develo

Using a novel microelectrode ser
tested the sites' water chemistry. Th
able in the canal's surface waters

Steven Billups



an Microbes Detoxify River Pollutant?

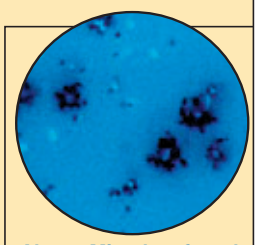
Polyaromatic hydrocarbons (PAHs) are nasty pollutants. iginating in tar, wood preservatives, and oil and other fossil els, they don't break down in water. Found in industrialized tuaries like the Delaware River and Bay, they can cause mors in fish and accumulate to lethal levels in seafloor vellers such as clams and oysters.

UD microbiologist David Kirchman and graduate student wn Ward (left) are working to find out what effect PAHs ve on the microbes of the Delaware River and Bay. While me of these tiny organisms, which form the base of the od chain, are harmed by PAHs, hers can actually detoxify the mplex chemical compounds.

During the past year, the scientists mpled several contaminated sites the river near the Philadelphia val Shipyard and found some own hydrocarbon degraders.

"These microbes may be very use- in bioremediation," says Kirchman. 'e're working to learn more about em and the conditions that enhance ir ability to detoxify PAHs."

The U.S. Naval Research Labora- y is collaborating on the project.



Above: **Microbes found in the Delaware River. *Left:* UD microbiologist David Kirchman and graduate student Dawn Ward use molecular tools to search out microbes that can degrade PAH pollutants.**

Above: **Magnified view of early life stage of the blue crab. It is about the size of a match tip. *Right:* UD marine biologist Charles Epifanio examines crab larvae under the microscope while graduate students Susan Park (right) and Letise Houser work nearby.**

Tracking the Travels of the Blue Crab

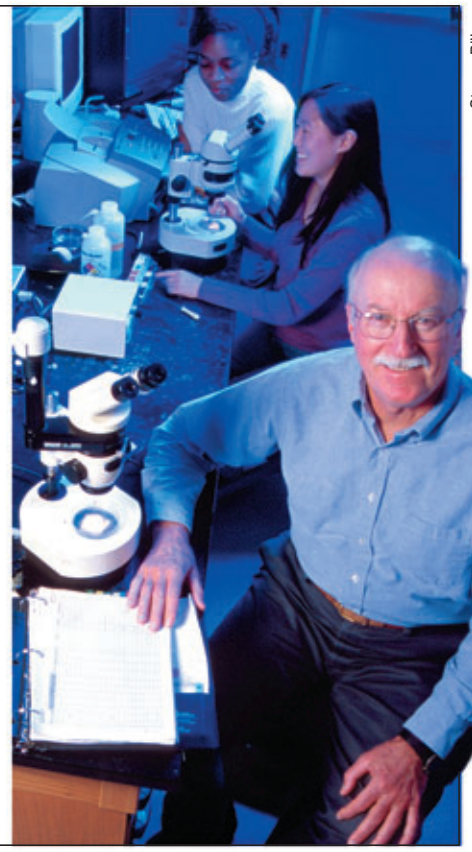
The blue crab is Delaware's number-one commercial fishery, so when its population fluctuates, people want to know why. While fishing pressure is a factor, natural forces — wind and currents — also can impact the crab population, according to UD marine biologist Charles Epifanio.

He and oceanographer Richard Garvine have determined that once the tiny, larval crabs hatch in July and August, they get swept out of the bay and onto the continental shelf by the Delaware Coastal Current. Summer winds then push the crabs home, back into their bay nursery grounds.

"If river flow is at a minimum due to drought, wind has a greater effect in shuttling the crabs back into the bay," Epifanio says. "Thus, the supply of larval crabs may be highest in drought years."

The scientists have discovered that the larval crabs often occur in the bay in large, distinct patches. "We think these patches may be formed through the synchronized spawning of large aggregations of female crabs," Epifanio notes.

This summer, the scientists will test their hypothesis using satellites to track the crab patches, coupled with intensive sampling operations at various locations in the bay. This spatial data will help them refine a unique mathematical model of the physical and biological processes involved in blue crab transport.



Steven Billups

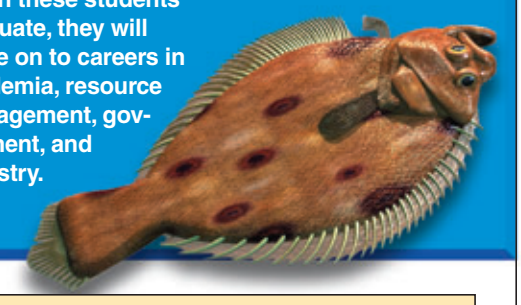
In *Environmental Technology* research, our scientists are developing a specialized probe to detect coastal water-quality problems. They also are exploring new satellite-based techniques for assessing the health of large ecosystems such as the Delaware Bay.

Among our projects in *Marine Biotechnology,* researchers are working at the molecular level to assess the potential of certain marine bacteria in cleaning up toxic pollutants.

The blue crab (above) and the summer flounder (lower right) are among the species targeted in Delaware Sea Grant's *Fisheries* research.

We also are working to help the region's once-thriving oyster population recover from disease and developing an artificial bait to help relieve fishing pressure on the horseshoe crab, which is used to catch eels and whelk. The Delaware Bay horseshoe crab population has been on the decline for the past decade.

***Graduate Education* is a top priority at Delaware Sea Grant. In each of our research projects, graduate students gain valuable, hands-on experience in marine science working under the guidance of their advisers. When these students graduate, they will move on to careers in academia, resource management, government, and industry.**



ntists Solve Fish-Kill Mystery

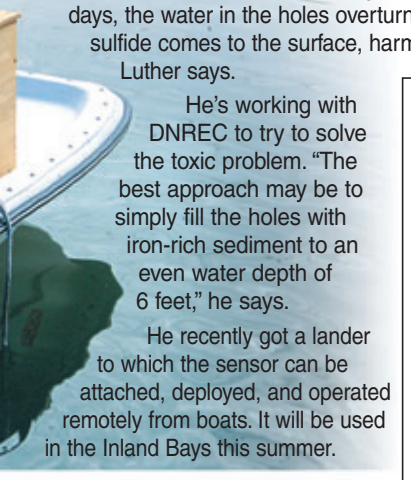
anal in July 2000? Some suspected *Pfiesteria.* Others thought investigate. Last year, he found over a dozen "deep holes" in reek, a tributary to northern Rehoboth Bay. Some holes are ey were dug when mud was removed from the canal to build opments in the 1960s.

nsor he developed in Sea Grant research, Luther and his team ney found that when the weather is calm, oxygen is measur- , but in the deep holes, only toxic hydrogen sulfide exists.

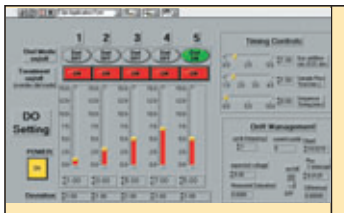
"In summer, if storms or strong winds occur over a few days, the water in the holes overturns and the hydrogen sulfide comes to the surface, harming fish and crabs," Luther says.

He's working with DNREC to try to solve the toxic problem. "The best approach may be to simply fill the holes with iron-rich sediment to an even water depth of 6 feet," he says.

He recently got a lander to which the sensor can be attached, deployed, and operated remotely from boats. It will be used in the Inland Bays this summer.



Left: **UD chemist George Luther (standing), and graduate students Robert Trouwborst and Shufen Ma take water chemistry readings in Torquay Canal. *Right:* The gold-tipped sensor they are using can simultaneously measure several chemical compounds that affect aquatic health.**



Right: **Graduate students Kevin Stierhoff (foreground) and Damian Brady monitor the effects of low dissolved oxygen conditions on young flounder. *Above:* Close-up of the computer control panel used for monitoring and controlling dissolved oxygen.**

Regional Team Working to Define Fish Habitat Needs

UD fisheries scientist Tim Targett and his graduate students have built a state-of-the art aquarium system that is a key component in a regional Sea Grant effort to assess the effects of low-oxygen conditions, called *hypoxia,* on fish in coastal nursery grounds.

Targett's collaborators include Jim Rice from North Carolina State University and Ken Rose from Louisiana State University.

"Fisheries management organizations have placed a strong emphasis on the importance of identifying 'essential fish habitat' — those waters critical to fish for spawning, breeding, feeding, and growth to maturity," says Targett. "In our regional project, we're working to develop a simulation model that can predict the impact of changing oxygen conditions on the growth, survival, and distribution of several major species including young weakfish, summer flounder, Atlantic menhaden, and spot."

Using their computer-controlled aquarium system, Targett and his students are monitoring how juvenile fish (less than a year old) respond to the varying oxygen conditions found in healthy versus polluted estuaries over a range of temperatures and salinities. Over the next two years, the data will be used by Targett's collaborators to develop a novel fisheries model.

"When we're done," Targett says, "we should have the framework for quantifying the complex relationships between water quality and fish populations."

Steven Billups

Sea Grant OUTREACH

Where can you learn about fish farming, horseshoe crabs, rip currents, seafood, and much more? Sea Grant is the answer! Our outreach team — the Marine Advisory Service and the Marine Public Education Office — delivers research-based information on coastal topics via seminars, publications, *SeaTalk* radio announcements, special events, and Web sites.

This page highlights just a few of the activities we're involved in. For more information, visit our Web site at *www.ocean.udel.edu* or call the Marine Advisory Service in Lewes at (302) 645-4346 or the Marine Public Education Office in Newark at (302) 831-8083.

UPCOMING EVENTS

Ocean Currents Lecture Series — Free lectures are presented once a month, April through September, at 7 p.m., UD Hugh R. Sharp Campus, 700 Pilottown Road, Lewes. Reservations required. Contact: (302) 645-4279.

Marine Science Tours — Free tours of the UD College of Marine Studies in Lewes are offered every Friday at 10:30 a.m., June through August. Ages 12 and up. Reservations required. Contact: (302) 645-4346.

Coast Day — *Sunday, October 6, Lewes Campus.* This award-winning festival features research demonstrations, ship tours, exhibits, a crab cake cook-off, and more! Contact: (302) 831-8083.

Extreme 2002 — Middle- and high-school teachers, sign up now for an award-winning educational program that will connect your students with UD marine scientists working live at deep-sea hydrothermal vents this fall. Register on-line at *www.ocean.udel.edu/expeditions.* Contact: (302) 831-8083.

Wilmington Lunch & Lecture Series — Enjoy a delicious lunch and engaging food for thought at the Hotel du Pont as UD marine scientists share their latest research. Held periodically, November through April. Cost: $10 per person. Reservations required. Contact: (302) 831-8083.

Bob Bowden

Planning for a "Livable Coast"

Delaware's beaches attract over 5 million visitors a year. The traffic on major roads from Lewes to Rehoboth Beach is intense from May through September.

In March in Lewes, Delaware Sea Grant and the Greater Lewes Foundation, working with several sponsors, hosted programs on land-use planning to reduce traffic congestion problems while protecting the coastal area's heritage and natural resources. More than 120 planners and elected officials participated in a technical seminar, while 75 people turned out for a public forum.

The educational programs are helping to advance Governor Minner's "Livable Delaware" initiative, which is targeting sprawl and other quality-of-life issues throughout the state. For more information on Sea Grant's efforts to promote a "Livable Coast," contact the Marine Advisory Service at (302) 645-4346.

Demo House Shows How to Protect Your Home from Storms

If you want to know what you can do to better protect your home from storm damage, take a tour of Delaware's new coastal demo house.

The portable 6-by-16-foot unit, built on a trailer, demonstrates the construction techniques and materials that coastal residents and builders should use to safeguard their homes from storms. It was built through a partnership involving Delaware Sea Grant, the City of Lewes, Town of Bethany Beach, Federal Emergency Management Agency's Project Impact, and a host of local businesses.

The demo house may be coming soon to an event near you! For more information, call the Marine Advisory Service at (302) 645-4346.

Interested in fish farming? The Delaware Aquaculture Resource Center at UD's Lewes campus can help. Visit the Web site at *www.darc.cms.edu* or call (302) 645-4060.

Our paper horseshoe crab model is educational and fun! To order, send $1 per copy with your name and address to Univ. of Delaware, Marine Public Education Office, Newark, DE 19716-3530.

Catch of the Day

If you're hooked on seafood, you'll enjoy Sea Grant's popular cookbooks — *Seafood Delaware Style* ($4) and the *Coast Day Crab Cake Cook-off Cookbook* ($3). To order, send your name/address and check payable to "University of Delaware" to Univ. of Delaware Marine Public Education Office, Newark, DE 19716-3530.

Web Site Makes a Splash!

Be sure to visit our Web site at *www.ocean.udel.edu* and click on "Neat Stuff!" Here are a few of the treasures you'll find:

- *"SeaTalk,"* our award-winning radio series
- *Sea Flicks* video clips of marine research
- *Interactive Coastal Habitat* where you can meet a diamondback terrapin, blue crab, osprey, sand tiger shark, loggerhead turtle, horseshoe crab, and more!

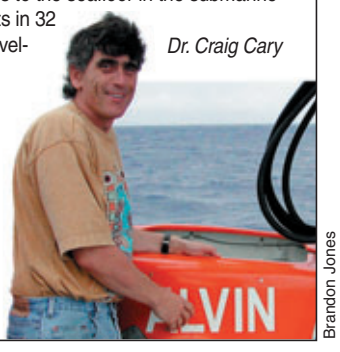
Students "Dive in" to Deep Sea with UD Scientists

Last October, UD marine biologist Craig Cary (below) led "Extreme 2001: A Deep-Sea Odyssey," a 17-day expedition to hydrothermal vents in the Pacific Ocean. The mission: to learn more about the Pompeii worm (left), one of Earth's most heat-tolerant animals, able to withstand water as hot as 176°F.

While Cary and his team dived 2 miles to the seafloor in the submarine *Alvin,* more than 13,000 middle- and high-school students in 32 states followed along via a formal classroom program developed by the Marine Public Education Office with support from the National Science Foundation, WHYY-TV, and Sea Grant. The program included curricula, a documentary video, and an interactive Web site at *www.ocean. udel.edu/extreme2001,* where the scientists reported their findings each day. Forty classrooms also participated in a conference call with Cary and his team as they worked live in *Alvin* on the seafloor.

Extreme 2002 will set sail in October. Teachers, register your class now at ***www.ocean.udel.edu/expeditions!***

Dr. Craig Cary



Brandon Jones

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Visit our world at www.ocean.udel.edu

Take This Survey and You Could Win a Prize!

Delaware Sea Grant offers an ocean of information, but what is the best way to share it with you? Fill out and mail us this brief survey, and you will be entered into a drawing for our **Great Coastal Gift Package,** to be awarded ***July 31, 2002.*** Mail your completed survey to *University of Delaware, Marine Public Education Office, Newark, DE 19716-3530.*

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