



▲ Governor Pete du Pont (right) and MAS specialist Jim Falk discuss a Sea Grant report at a 1981 conference.

Marine educator Bill Hall teaches a group about the horseshoe crab.

Governor Ruth Ann Minner (far right) congratulates Ryan Wells, winner of the 2005 Coast Day fifth-grade essay contest.

The Delaware Sea Grant Marine Advisory Service (MAS) fosters the wise use, conservation, and development of marine resources by acting as a conduit between university researchers and the public. From their base of operations at the UD College of Marine Studies in Lewes, the staff travels throughout the state to work with business owners, coastal resource managers, teachers, and many other individuals.

The MAS assists these groups in solving problems and addressing new opportunities by providing timely, objective, science-based information and techniques. This technology and information transfer may take the form of applied research projects, workshops and training seminars, personal consultations, publications, Web sites, and other media.

Currently, the MAS is addressing issues related to land use, water quality, marine education, shoreline processes and coastal hazards, aquaculture and fisheries, seafood technology and consumer education, and marine business and transportation. For more information, contact the office at (302) 645-4346.

#### New Initiative to Enhance Coastal Communities



During the past year, James Falk, director of the Delaware Sea Grant Marine Advisory Service, co-chaired a University committee that is now advancing "A University of Delaware Coastal Community Enhancement Initiative."

The effort, aimed at addressing land-use issues in Sussex County, involves the College of Agriculture and Natural Resources and the Cooperative Extension Service; the College of Human Services, Education and Public Policy and the Institute for Public Administration; and the College of Marine Studies and Delaware Sea Grant.

"The Delaware Population Consortium has projected that Sussex County could see a 62% growth rate by 2030 to almost 255,000 people," Falk says. "Unsustainable growth can adversely affect the qualities that are cherished by residents and visitors alike."

Among the UD initiative's recommendations are the development of a model to estimate the impacts of growth on the county to 2030, an infrastructure capacity analysis, and creation of a Web site on community planning issues. For more information, contact Falk at (302) 645-4235.

#### NEMO Planning Guide Now Available

If current trends hold true, including low taxes and a strong consumer demand for coastal properties, Delaware's population is likely to keep growing.

Joseph Farrell, UD Sea Grant marine resource management specialist, coordinates Non-Point Education for Municipal Officials (NEMO), a statewide network of educators, resource managers, and planners that provides communities with educational programs and materials to help them plan where and how to develop while protecting their natural resources.

During the past year, the team published the *NEMO Guide to Natural Resource-Based Planning*, a 67-page manual covering topics ranging from planning for open space, to managing stormwater, to writing ordinances that protect natural resources.

The guide is now in its second printing, with copies also available on CD. It also may be downloaded from the Delaware NEMO Web site at [www.nemo.udel.edu](http://www.nemo.udel.edu) in the near future.

"The guide is designed to help planning commissions and councils guide how growth will occur — and how to minimize undesirable consequences on natural resources and the character of their communities," Farrell says.

Funding for the project has been provided by Delaware Coastal Programs, NOAA Sea Grant, Delaware Sea Grant, and the Delaware Department of Transportation. For more information, contact Farrell at (302) 645-4250.

#### Workshops Aid Region's Charter Boat Industry



"These workshops are a great opportunity for boat operators to come together and discuss mutual challenges," says John Ewart, UD Sea Grant fisheries and aquaculture specialist.

More than 175 boat captains have learned about business management, marketing, safety and legal issues, and fisheries such as white marlin and rockfish in the popular programs.

The next workshop is tentatively set for March 2007. For more information, contact Ewart at (302) 645-4060.

#### Coastal Specialist Assists Beach Monitoring Project

Wendy Carey, UD Sea Grant coastal processes specialist, is assisting with the public education and outreach component of the Surf and Nearshore Dynamics Camera (SANDCam) beach monitoring project at Rehoboth Beach.

With funding from the Department of Natural Resources and Environmental Control, UD coastal engineer Jack Puleo has installed seven cameras on the roof of the Henlopen Hotel. They provide a 180-degree view of the coast, from Herring Point to the north, to the southern end of Rehoboth Beach.

"The camera array will provide imagery that can be used to obtain information on dynamic coastal processes and beach morphology such as sandbar and shoreline locations," Carey says. "Monitoring the coast will enhance our understanding of the driving forces that impact and shape Delaware's shoreline, and will ultimately improve management strategies."

For more information, contact Carey at (302) 645-4258.

#### Videos Answer Questions about Seafood

Lights, camera, action! It's time to videotape the "Seafood Advisor," a series of 90-second public service announcements featuring Doris Hicks, UD Sea Grant's seafood technology specialist.

"The series is designed to help answer consumers' most frequently asked questions about seafood," Hicks says.

Hicks recently was videotaped at the Lewes Fish House on the first round of topics — eyeing and buying seafood, and the differences between wild and farm-raised fish. A number of future topics are planned, from deveining shrimp to cleaning squid.

When ready, the video clips will be provided to seafood markets in Delaware and beyond. They also will be linked to Hicks's popular seafood Web pages, as well as the National Fisheries Institute's Web site at [aboutseafood.com](http://aboutseafood.com). For more information, contact Hicks at (302) 645-4297.

#### Teacher Workshops Focus on Biotechnology

Biotechnology is the use of living things to make products, from foods to pharmaceuticals.

"Products that contain yeast such as root beer, bread, cheese, and yogurt are all examples of biotechnology," says Bill Hall, UD Sea Grant marine education specialist. "So is applying pyrethrum for garden pests or using ethanol for gas. Much of the world's economy will depend on biotechnology," he notes.

With funding from the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR) grant to Delaware, Hall is developing inservice programs to introduce Delaware middle-school teachers to biotechnology. A weekend course was held over the winter, and a week-long course is set for July 9–14 at the Virden Center in Lewes.

For more information, contact Hall at (302) 645-4253, or visit the course Web site at [www.ocean.udel.edu/public/biotechcourse.html](http://www.ocean.udel.edu/public/biotechcourse.html).

#### Sea Grant Plays Role in Ocean Observing Network

The Mid-Atlantic Coastal Ocean Observing Regional Association (MACOORA) is overseeing the design and sustained operation of integrated ocean observing systems from Cape Cod to Cape Hatteras.

"Ocean observing systems consist of ocean buoys, stream gauges, radar, autonomous underwater vehicles, satellites, ships, and meteorological instruments that collect real-time data, which is then processed, checked for quality, and made available for a number of applications," says David Chapman, UD Sea Grant ports and transportation specialist and executive director of MACOORA. "For example, coastal radar data is used to measure water surface currents. This data is combined with tide and wind data to predict where an oil spill might come ashore, or to optimize search-and-rescue missions to find crewmen from a sunken fishing boat."

As a Sea Grant extension specialist, Chapman is working to identify users of the new technology and determine how current technology can be modified to meet additional user needs.

For more information, contact Chapman at (302) 645-4268.



## Boosting Public Awareness & Education about the Coast

The Marine Public Education Office, based at the University of Delaware's main campus in Newark, is your connection to an ocean of information! The staff, working for both the UD College of Marine Studies and Delaware Sea Grant, relay timely information about coastal research, issues, and events to thousands of people each year through news releases, curricula and on-line educational programs, the *SeaTalk* radio series, interactive Web sites, videos, and special exhibits.

During the past year, the staff won 15 state and national awards for excellence in communications and public education. In addition to the projects highlighted here, be sure to check out our Web site at [www.ocean.udel.edu](http://www.ocean.udel.edu). For more information, please contact the office at (302) 831-8083 or [MarineCom@udel.edu](mailto:MarineCom@udel.edu).



**Shipwreck Exhibit.** At Coast Day 2005, many of the event's 10,000 visitors explored Sea Grant's special exhibit on shipwrecks, developed in partnership with the Delaware Department of State's Lewes Maritime Archaeology Project. The exhibit highlighted the recent discovery of a colonial shipwreck off Lewes, Delaware, through activities and artifacts, along with the technology used to locate sunken vessels.

**Ocean News.** UD Marine Public Education issues more than 50 press releases a year and helps connect the media with UD marine experts for major stories. In the past year, our scientists appeared in a variety of U.S. media, ranging from local newspapers, radio, TV stations, and Web sites, to the CBS "Early Show" and National Public Radio's "Science Friday." They also were featured in newspapers and TV stations in France, Russia, and China.



**Dogfish Shark Model.** Learn all about the smooth dogfish shark as you put together your very own 3-D paper model! This eight-page, full-color project meets the National Science Education Standards. It includes background on sharks, the model parts to cut out with scissors and tape together, and a crossword puzzle to test your knowledge. Cost: Free to Delaware teachers for classroom use; \$1 for the public. Contact: Marine Public Education, (302) 831-8083.



**Biotech Web Site.** Check out the leading-edge biotechnology research, education, and outreach efforts being advanced by Delaware's institutions of higher education through the National Science Foundation's Experimental Program to Stimulate Competitive Research. It's the wave of the future! Visit [www.epscor.dbi.udel.edu/outreach](http://www.epscor.dbi.udel.edu/outreach) today.



The UD Marine Public Education Office is based at the Newark campus. From left, David Barczak, art director; Tracey Bryant, director; Pamela Donnelly, production manager; Kari Gulbrandsen, writer; and Kimberly Doucette, administrative assistant.

**SeaTalk.** Now in its 31st year, this popular radio series is broadcast on 35 stations with an estimated 10 million listeners. It highlights topics ranging from rip currents to seafood, the latest Sea Grant research, and new publications. Listen in on the Web at [www.ocean.udel.edu/seagrant/seatalk/](http://www.ocean.udel.edu/seagrant/seatalk/).

**Free Resource Guide.** This handy 24-page booklet is your "one-stop shop" for Delaware Sea Grant publications, videos, Web sites, gift items, events, and volunteer opportunities. For a free copy, contact Marine Public Education, (302) 831-8083. It's also available on our Web site.



## "Get Your Feet Wet" in These Events & Activities!

**Ocean Currents Lecture Series — Lewes.** Enjoy free public lectures presented by UD marine scientists. Held the third Thursday of each month, April through Sept., 7:00 p.m., UD Hugh R. Sharp Campus, 700 Pilottown Rd., Lewes. Reservations required. Contact: (302) 645-4279.

**Lunch & Lecture Series — Wilmington.** Learn about the latest UD marine research over lunch at the Hotel du Pont. Held periodically from November through April, 11:30 a.m. – 1 p.m. Cost: \$15. Reservations required. Contact: (302) 831-8083.

**Horseshoe Crab Census.** Help count horseshoe crabs along Delaware Bay beaches each spring. Contact: (302) 645-4346.

**Marine Associates.** Support the UD College of Marine Studies and Delaware Sea Grant. This group brings together "for enlightenment and entertainment" individuals from all walks of life who take an active interest in UD's marine programs. Contact: (302) 831-2841.

**Water-Quality Monitoring.** Help collect and analyze water samples in the Broadkill River or Inland Bays watershed. Training is provided. Contact: (302) 645-4346.

**Coast Day 2006 — Sunday, Oct. 1, Lewes.** Immerse yourself in UD's annual sea celebration, the winner of state and national awards for marine education. 11 a.m. to 5 p.m. Free admission; \$2 parking. Contact: (302) 831-8083. If your company would like to help sponsor Coast Day, please call (302) 645-4346.

**Marine Lab Tours.** Tour UD's marine research complex in Lewes. From June through August, tours are offered every Friday at 10:30 a.m. They also can be arranged for other times through the year. Reservations required. Contact: (302) 645-4346.

**Native Plant Garden Tours.** Learn to identify plants native to the Delaware coast on this self-guided tour. The garden is at the entrance to Cannon Lab on the UD Hugh R. Sharp Campus, 700 Pilottown Rd., Lewes. Contact: (302) 645-4346.

**At Sea E-Newsletter.** Subscribe today to this free e-newsletter highlighting the latest research, educational activities, and public events at Delaware Sea Grant and the UD College of Marine Studies. <http://www.ocean.udel.edu/atsea>

**Web Site.** Explore an ocean of information right at your fingertips on the Web site of the UD College of Marine Studies and Delaware Sea Grant. <http://www.ocean.udel.edu>

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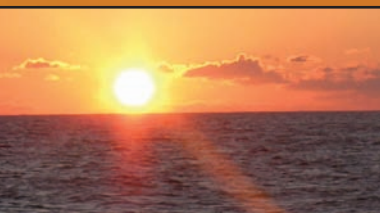


# UNIVERSITY OF DELAWARE SEA GRANT REPORTER

Volume 25 — 2006 Annual Report

# 30 YEARS OF DISCOVERY

Welcome aboard as we sail through the past and look to the future of Delaware's statewide program of marine research, education, and public service.



Visit our world at [www.ocean.udel.edu](http://www.ocean.udel.edu)



# A Tradition of Excellence

## Sea Grant Advances Coastal Science & Education in Delaware



Dr. Nancy M. Targett

Happy anniversary! Thirty years ago, on May 18, 1976, the University of Delaware was designated the nation's ninth Sea Grant College. This recognition of excellence signified a strong partnership of the National Oceanic and Atmospheric Administration, the State of Delaware, and the University focused on providing Delawareans with the highest quality research, educational programs, and public service to foster the wise use, conservation, and management of the state's ocean and coastal resources.



◀ The University of Delaware becomes the Nation's Ninth Sea Grant College, 1976. Dr. E. Arthur Trabant (center), then UD president, shakes hands with Paul Felton (left), who chaired the Sea Grant Advisory Council, and William Gaither, who was the Sea Grant director and dean of the College of Marine Studies. The honor signified a national commitment to the University and its broad program of marine research, education, and public service.



**30**  
YEARS OF DISCOVERY

The decline of the state's once-vital oyster fishery was the catalyst for the first Sea Grant research project at the University of Delaware in 1968. Today, our program is conducting 18 research studies and programs in the priority areas of ecosystems, environmental technologies and engineering, marine biotechnology, marine commerce and transportation, and marine literacy, education, and outreach. Our Sea Grant Advisory Council, composed of 51 representatives of marine industry, commerce, resource management, and public education, helps identify key issues facing the coast and provides valuable guidance to our program. We also encourage public feedback at the events and programs we offer, in surveys like the one you will find in this report, and online at our Web site. As always, if you have a concern or comment, we want to hear from you!

While this report highlights a number of projects under way at Delaware Sea Grant across the research, education, and outreach spectrum, we hope you also will enjoy taking a look back at a few of the many accomplishments our program has made in the past 30 years, highlighted in the timeline and in several treasured photos of the past.

We are inspired by the dedication of so many who have helped Delaware Sea Grant achieve its voyage of excellence over the past 30 years, and we look forward to advancing future discoveries — full-speed ahead!

*Nancy M. Targett*

Dr. Nancy M. Targett  
Dean, UD College of Marine Studies  
Director, Delaware Sea Grant College Program

◀ Breaking Ground for the Otis H. Smith Laboratory at UD's Lewes Campus, 1977. This facility was the site of early Sea Grant mariculture research that tested the feasibility of growing oysters to market size in an intensive, controlled laboratory system. Participating in the groundbreaking were, from left, Dr. E. Arthur Trabant, then UD president; Al Stango, who was mayor of Lewes; Dr. Carolyn Thoroughgood, then Sea Grant associate director for planning and operations and Marine Advisory Service director; Thomas B. Evans, Jr., who was the U.S. Representative from Delaware; and Joseph Conaway, then Sussex County Administrator. Thoroughgood later went on to serve as dean of the UD College of Marine Studies and director of Delaware Sea Grant for 20 years and is now UD's vice provost for research.



Robert Cohen

### Aiding Delaware Bay's "Ancient Mariner"

Delaware Bay is home to the largest population of horseshoe crabs in the world. The animal's eggs provide a nutritious source of food for migrating shorebirds. Its blood, which can be removed without harm, is the basis of a pharmaceutical test to ensure that drugs and prosthetics are bacteria free. Horseshoe crabs also are the preferred bait in the eel and whelk fisheries. However, recent declines in the horseshoe crab's population have spurred efforts to protect the animal, from stricter harvesting limits to artificial bait research.

Delaware Sea Grant researchers are continuing to make progress in the development of an artificial bait based on the compound in female horseshoe crabs that attracts fish. In previous studies, the scientists partially purified the attractant, ran preliminary trials with it in the lab, and had some success attracting eels. They worked with several manufacturers to incorporate the compound into artificial bait formulations and worked with local fishermen to conduct small-scale field trials. Due to quality control issues, other bait development options are being explored, and the research is focused on fully isolating the attractant.

University of Delaware molecular biologist Pam Green and research fellow Yu-Sung Wu at the Delaware Biotechnology Institute are partnering with marine biologist Nancy Targett and research associate Kirstin Wakefield at the College of Marine Studies in Lewes to isolate and purify the horseshoe crab's "fish attractant."

"Once we leap this major hurdle, the next step would be to create a synthetic version of the attractant through biotechnology," Green says.

The project is supported by the Delaware Department of Natural Resources and Environmental Control, the National Fish and Wildlife Foundation, and the DuPont Company.

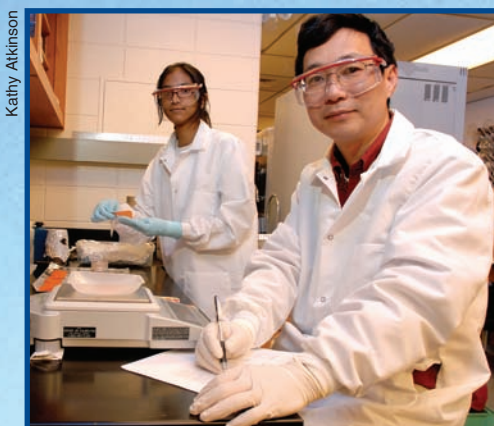


Pam Green, Crawford H. Greenwalt Professor at the University of Delaware, is part of a research team whose goal is to isolate and synthesize the "fish attractant" in horseshoe crabs for use in an artificial bait.



Bob Bowden

◀ Dedicated Marine Scientists Advance Ocean Knowledge. At far left, Charles Epifanio, a marine biologist at the University of Delaware College of Marine Studies, is shown examining oysters in one of Delaware Sea Grant's first research projects in 1974. Near left, he is shown piloting the boat in a recent blue crab study. Today, Epifanio is the senior faculty member at the UD College of Marine Studies, with 36 years of research and teaching under his belt. Known affectionately as "the crab guy," he studies the physical and biological factors that drive year-to-year variations in populations of fish and crustaceans, from blue crabs to weakfish. He also is associate director of Delaware Sea Grant.



In their lab at the University of Delaware, food scientist Haiqiang Chen and Ph.D. student Swaleha Neetoo test the effectiveness of antimicrobial packaging on smoked salmon.

### New Packaging Techniques Boost Safety of Seafood Products

According to the Centers for Disease Control, an estimated 2,500 people become seriously ill and 500 people die each year from eating food contaminated with *Listeria monocytogenes*, a bacterium commonly found in soil, water, and on decaying plants.

In Sea Grant research funded in partnership with the National Fisheries Institute, University of Delaware food scientists Haiqiang Chen and Dallas Hoover and seafood specialist Doris Hicks are working with the seafood industry to develop new food packaging — a kind of antimicrobial film — that will stop *Listeria* in its tracks. The researchers are incorporating nisin, a natural food preservative with bacteriocidal properties, into the plastic wrap used to cover packages of seafood. Nisin is harmless to humans but deadly to bacteria.

As an added benefit, the bacteria-fighting film also can extend the shelf life of fish when used with a technique called "modified atmosphere packaging" in which the air in a package of fish, which can promote spoilage, is replaced with nitrogen or other gases.

This Sea Grant research is aiding the seafood industry at a time when U.S. seafood consumption is at an all-time high, with Americans eating a record 16.6 pounds of fish and shellfish per person annually. What's more, the scientists say their techniques can be used to control *Listeria* in other foods, including hot dogs, bologna, and other ready-to-eat meats.

### Building a New Tool to Predict Rip Currents

Rip currents cause 80% of all surf rescues in the United States, according to the U.S. Life-saving Association. These fast-moving currents can pull even the strongest swimmer out to sea.

James Kirby, Edward C. Davis Professor of Civil and Environmental Engineering at the University of Delaware, is working on a new tool to predict rip currents using surf data collected by a video camera system at Bethany Beach. The project is a collaborative effort with Robert Dalrymple, a coastal engineer at Johns Hopkins University, who has received funding from Maryland Sea Grant to establish a similar beach-monitoring system in Ocean City, Maryland.

Kirby and master's degree student Todd DeMunda are correlating surf conditions recorded by video cameras and observations made by lifeguards with tidal and meteorological data to determine the occurrence of a rip current. Numerical models simulating nearshore hydrodynamics then will be used to reveal the most important parameters involved in the rip current's generation.

"This effort will lead to a simple model that will predict rip currents based on meteorological conditions," Kirby says. "For example, if intersecting waves or wave groups are found to be an important mechanism in generating rip currents at Bethany Beach, then wave data can be used to detect critical conditions. This type of predictive model could easily be put on a Web page and used as an accurate, early warning system for rip currents," he notes.

Footage from the beach monitoring project will be available on the Web site of the UD Center for Applied Coastal Research at [www.coastal.udel.edu](http://www.coastal.udel.edu).



James Kirby (right), a coastal engineer at the University of Delaware, and graduate student Todd DeMunda test their beach video cameras prior to installation.



George Parsons, a marine policy professor at the University of Delaware, is updating an economic model that can help state and federal authorities with environmental damage assessments along the coast.

### Helping Ports Curb Invasive Species

Ocean-going ships often carry millions of gallons of water in their ballast tanks. While this water is intended to help stabilize vessels on the high seas, it also can harbor lots of "hitchhikers" — from microscopic plants to entire schools of fish.

"Scientists estimate that approximately 3,000 species are transported in the ballast water of ships or on their hulls each day," says James Corbett, a marine policy expert at the University of Delaware. "Discharging ballast water can introduce these potentially invasive species into ports, causing ecological, socioeconomic, and human health consequences," he notes.

Corbett and colleague Jeremy Firestone are developing a "decision-support model" that will help port operators choose among different alternatives for reducing the potential for invasive species introductions. Data such as the size of the ballast tank in a given vessel, length of voyage, total volume of ballast discharged or exchanged at sea, the concentration of organisms in ballast water, and the temperature and salinity of the water at various ports are being gathered. Information on the effectiveness and costs of various ballast treatment options also is being collected.

"Ultimately, users of the model will be able to change any of the parameters to see which combination makes the most sense monetarily and environmentally," Firestone notes. "The model can be applied to individual vessels or regionally to port traffic, and will enable port operators to rank various control methods by their cost to ship operations or cargo freight rates."

This Delaware Sea Grant project is being conducted in collaboration with the Maryland Center for Environmental Science and the Rochester Institute of Technology.



James Corbett (left) and Jeremy Firestone, marine policy professors at the University of Delaware, are developing a policy tool the marine transportation industry can use to determine their best options for controlling invasive species.



The Asian shore crab is one of many non-native species that has made its home in U.S. waters.

### Scientists Identifying Best Plants for Restoring Marshes

Wetlands are "between a rock and a hard place," so to speak. Rising sea level is eroding their bay side, while coastal development is impacting their landward edge. As marshes disappear, their nutrient-filtering capacities, among other benefits, are lost, resulting in higher concentrations of nitrogen and phosphorus reaching coastal waters. Increased concentrations of nutrients can fuel an overgrowth of algae, which robs bays and estuaries of oxygen, threatening marine life.

Jack Gallagher and Denise Seliskar, botanists at the University of Delaware College of Marine Studies and co-directors of UD's Halophyte Biotechnology Center, believe that if we can find the right marsh plants for the job, they can help tackle a couple of these challenges simultaneously — both stand up to sea-level rise and reduce nutrient inputs into estuaries. These marsh plants would be ideal for restoring existing marshes or creating new wetlands in coastal areas.

"We want to identify those plants that have a superior ability to not only filter and sequester nutrients from upland runoff or the incoming tides, but also to release nutrients at a time when their detrimental impacts to estuarine waters will be minimal, such as during the wintertime," Gallagher says.

Seliskar notes that it also is important to identify those plants that direct most of their photosynthetic activity below ground, to the plant's root system. The accumulation of roots increases the elevation of the marsh surface, and as sea level rises, the marsh is able to "keep up" rather than be swallowed by the sea.

Currently, the two scientists and doctoral student Tracy Elsey are analyzing four species of marsh plants commonly found on the Atlantic and Gulf coasts for their ability to not only filter and sequester nutrients, but also absorb and store carbon in their roots. They include smooth cordgrass (*Spartina alterniflora*), salt-meadow cordgrass (*Spartina patens*), black rush (*Juncus roemerianus*), and groundsel tree (*Baccharis halimifolia*). Field samples of the plants have been collected at Assawoman Wildlife Area in partnership with the Delaware Department of Natural Resources and Environmental Control. The scientists currently are doing comparative studies of the plants, from the leaves to the roots, to determine the best candidates for further genetic studies.



Botanists Jack Gallagher and Denise Seliskar examine the roots and shoots of the marsh plant *Juncus roemerianus*. Its common name is black rush or needle grass.



University of Delaware marine biologist Patrick Gaffney and doctoral student Robin Varney are developing genetic techniques to determine the success of oyster restoration efforts.

### Genetic Tools Help Gauge Success of Oyster Stock Enhancement Efforts

In the heyday of the region's oyster fishery in the 1880s, over 3 million bushels of "white gold" were harvested annually in Delaware Bay, while landings soared to five times that number in Chesapeake Bay. Today, the region's oyster fishery has declined to less than 1% of historic levels — the victim of over-harvesting, habitat destruction, and the deadly oyster diseases MSX and Dermo.

In the quest to rebuild the Mid-Atlantic oyster fishery, a lot of time and energy has been invested in breeding and "outplanting" disease-resistant stocks derived from our native oyster, *Crassostrea virginica*. But are these efforts working?

In Sea Grant research at the University of Delaware, marine scientist Patrick Gaffney and doctoral students Coren Milbury and Robin Varney are developing genetic techniques to rapidly identify hatchery-cultured oysters versus wild stocks. The project is a regional effort to help scientists in Maryland and Virginia assess the effectiveness of their stock-enhancement programs.

Hatchery oysters have a different DNA "fingerprint" than wild stocks due to the limited genetic lines used to grow oysters in the lab. To find out how well hatchery stocks planted out in the Chesapeake Bay are faring and if they are contributing offspring, the scientists collect oysters from specific locations in the bay, extract a small amount of DNA from them, and then analyze them using DNA sequencers that can process up to 96 samples at a time.

In addition to evaluating the success of marine stock enhancement programs, Gaffney says the protocols developed in the project also can be adapted to screen sediments or ballast water for a particular organism.

"This would be very useful in cases where the target species is difficult to identify or extremely rare, such as in the early stages of a biological invasion," he notes.

1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
The University of Delaware is named the 9th "Sea Grant College" in U.S.	UD's first Coast Day open house is held at Lewes campus. Over 2,000 attend in spite of pouring rain.	Unilever, Campbell Soup, and others invest in studies to test feasibility of growing market-size oysters in lab.	Delaware Sea Grant is funded to launch an international research program in Costa Rica.	UD's wave-driven DELBUOY, which can convert seawater to fresh water, is tested off Puerto Rico.	"Fishermen's Hotline" enters its 10th year, having fielded over 1 million calls from the public.	Delaware River & Bay Authority contributes \$1 million to bi-state study of Delaware Bay.	Decisions for Delaware report focuses public attention on the state's Inland Bays.	A weather-reporting program for boaters is initiated with the National Weather Service.	Coastal engineers construct a spiral wave basin to model the effects of various shore protection methods.	Business Week reports licensing of UD patents to turn chitin, a biopolymer in crab shells, into surgical sutures.	Biotech researchers regenerate whole plants from tissue portions of two salt-tolerant marsh plants.	The full-color book <i>Delaware Estuary: Rediscovering a Forgotten Resource</i> is published to critical acclaim.	Fisheries biologists determine that juvenile summer flounder will not grow at temperatures below 50°F.	Outreach staff initiate annual census of spawning horseshoe crabs on Delaware Bay beaches.	The Inland Bays Citizen Monitoring Program is established. Volunteers collect and analyze bay water samples.	Delaware salt-marsh plants are now grown as food/animal forage in Thailand, China, Israel, and Egypt.	A microelectrode sensor is designed to rapidly detect chemical compounds in seawater and sediments.	Coast Day — UD's annual celebration of the sea — is inducted into the Delaware Tourism Hall of Fame.	Botanists put the invasive marsh plant <i>Phragmites</i> to use as a "sludge buster" at sewage treatment facilities.	Food scientists demonstrate effectiveness of high-pressure methods to pasteurize crab meat and oysters.	In blue crab study, scientists use satellites to track travels of baby crabs (larvae) in Delaware Bay.	Annual lecture series are kicked off in Wilmington and at UD Lewes campus in honor of the Year of the Ocean.	"Ocean observing" begins in Delaware Bay using a light-house as a platform for deploying tide/weather sensors.	Schoolchildren and the public "dive in" to UD's pioneering "Extreme" expeditions to deep-sea hydrothermal vents.	Working with the Governor's Office, Delaware Sea Grant establishes award for Marine Science Teacher of the Year.	Fisheries biologists build state-of-the-art aquarium system to study effects of low oxygen (hypoxia) on fish.	In Delaware Estuary research, scientists isolate bacteria that can degrade toxic polycyclic aromatic hydrocarbons (PAHs).	Sea Grant editorial echoes U.S. Ocean Commission's call for changes in how the nation manages marine resources.	Outreach staff help launch NOAA's Break the Grip of the Rip campaign to alert public about rip currents.	UD commissions the 146-foot ship <i>Hugh R. Sharp</i> — the nation's most advanced coastal research vessel.