

# THE COASTAL CONNECTION

## UNDERSTANDING OUR RELATIONSHIP WITH THE COAST

*It's more than a weekend at the beach!*

It doesn't take a summer weekend visit to Delaware's shorelines to tell us that people are attracted to the coast. Nationally, coastal counties account for less than 25 percent of land area, yet they are home to more than 50 percent of the population.

And new waves of people are on the way. A report from the U.S. Commission on Ocean Policy estimates that from now through 2015, an additional 1.1 million residents will join coastal communities around the United States annually. By 2025, approximately 75 percent of the U.S. population will reside within 60 miles of a coast.

The Delaware coast is already feeling pressure from this increased population. During the last decade, the population of Sussex County grew by 38 percent. The resort communities along Delaware's Atlantic coast grew by an average of 59 percent.

Our oceans and their productive coastal environments are important to us whether we reside near the coast or in the heartland. They benefit our health, support our economy, and provide for our everyday needs. Consider that:

- Our grocery stores are stocked with food caught in and transported over the sea.
- Our docks hold cargo brought to our shores by huge oceangoing ships that originate from ports around the world.
- Today's energy needs are partially met by oil drilled from under the sea or transported by ships to our ports.
- Solutions to our current and future energy needs are found, at least in part, in the ocean's winds, tides, and currents.

- Ocean life provides us with medicine, cosmetics, and health products.
- Millions of Americans enjoy vacations that involve sand and salty air, making coastal recreation and tourism important components of our economy.

Since its creation in 1976, the Delaware Sea Grant College Program has worked to improve our understanding of Delaware's coastal ocean environment. Sea Grant researchers, outreach specialists, and students are discovering innovative ways for society to benefit from the sea—today and in the future. We are also reaching out beyond the laboratories and meeting rooms to help Delawareans understand how they too can help ensure that coastal waters remain clean, healthy, and economically viable for our children and grandchildren.

This report highlights several projects sponsored by Delaware Sea Grant over the past year. It also helps to make that "coastal connection" by explaining how our research and outreach efforts relate to your everyday lives. Whether you live in Wilmington or Seaford, Middletown or Georgetown, Lewes or Newark, the Delaware coast impacts your life everyday. As you read this report, I invite you to consider what you can do to help advance the wise use of Delaware's coastal treasures.



Robert Cohen

*Nancy M. Targett*

**Dr. Nancy M. Targett, Director  
Delaware Sea Grant College Program  
Dean, University of Delaware  
College of Marine and Earth Studies**

# DELAWARE SEA GRANT: Research, Outreach and You

## RESEARCH

Kathryn Coyne studies harmful algal blooms in coastal waters.

Delaware Sea Grant researchers and outreach staff are teaming with environmental professionals and citizens to monitor waterways for warnings of potential water quality problems. One is the presence of harmful algal blooms, or HABs.

HABs are members of a small group of microscopic organisms that grow rapidly under certain conditions. They have been known to kill fish, birds, and marine mammals. Their presence in shellfish and sea air mist can also harm human health.

Sea Grant scientist Kathryn Coyne helped to create several super-sensitive molecular probes that can detect even the smallest quantities of eleven different HAB species. The probes have been used to assist the Delaware Department of Natural Resources and Environmental Control in monitoring the state's Inland Bays. They are also becoming the instrument of choice for other monitoring agencies across the United States.

"Using these probes, we are learning more about the environmental conditions that influence HABs," says Coyne. "This can help scientists and government agencies to deal with the problem more effectively."

## The Coastal Connection

Unpolluted beaches, safe seafood, and healthy ecosystems have something in common: clean water. All Delawareans have a stake in protecting the state's water resources.

Anyone can be a citizen monitor! No special background or experience is required, although participation in the HAB Monitoring Program is more challenging and requires a higher level of training, dedication, and patience. Citizen monitors come from all walks of life—from teenagers to senior citizens. They share a common interest in helping to protect Delaware's rivers, bays, and beaches.

For more information, call 302-645-4250 or visit <http://citizen-monitoring.udel.edu>.

## OUTREACH

From left, monitoring program manager Joe Farrell, Til Purnell, an original citizen monitor, and program coordinator Ed Whereat.

Delaware Sea Grant operates an HAB Monitoring Program as part of its larger Citizen Monitoring Program. Program volunteers and staff collect water samples, screen them for key HAB species, and forward them to Sea Grant scientists working on HAB research. The screening process also gives state resource managers timely information on HAB concentrations and distribution.

Volunteers have been collecting water quality data in the Inland Bays watershed since 1991. More recently, volunteer programs have been established for the Broadkill River and for ocean beaches. In addition to HABs, volunteers collect samples for other indicators of water quality such as dissolved oxygen, nutrients, and bacteria.

"Our citizen monitors are key components in the state's water quality monitoring program," says program manager Joe Farrell. "Their participation allows us to collect more data on a more frequent basis and over a broader area." As a result, scientists and resource managers are better able to predict when and where HABs will develop to dangerous levels.

## RESEARCH

New packaging technique for cold-smoked salmon could protect consumers from a dangerous bacterium.

Seafood is usually refrigerated during its distribution and marketing to keep it from spoiling. "However," says University of Delaware food scientist Haiqiang Chen, "refrigeration cannot prevent the growth of the bacterium *Listeria monocytogenes*." Commonly found in soil, water, and on decaying plants, this bacterium can cause severe illness or death in humans. Pregnant women, newborns, the elderly, and those with compromised immune systems are especially susceptible.

In partnership with the National Fisheries Institute, Chen and fellow Sea Grant researchers Dallas Hoover and Doris Hicks are developing new food packaging that will protect seafood consumers from *L. monocytogenes*. They are incorporating nisin, a natural food preservative, into the plastic film used to package cold-smoked salmon. Harmless to humans, nisin could control the growth of *L. monocytogenes*.

Seafood lovers won't be the only ones to benefit from this technique. Hoover says that it also can be used to control *L. monocytogenes* in hot dogs, bologna, and other ready-to-eat meats.

## The Coastal Connection

You can take precautions to ensure that your seafood is safe to eat. Seafood technology specialist Doris Hicks offers these suggestions for purchasing seafood:

- Since seafood is highly perishable, make it one of your last store purchases.
- Fresh whole fish should have bright, clear eyes that are often protruding, bright red or pink gills, firm yet elastic flesh, and shiny skin.
- Your purchase should feel cold to the touch. And it shouldn't smell "fishy." The odor should be that of a fresh sea breeze.

For more information, visit [www.ocean.udel.edu/seagrant/outreach/seafood.html](http://www.ocean.udel.edu/seagrant/outreach/seafood.html).

## OUTREACH

Doris Hicks helps to bring safe seafood to consumers.

Seafood is loaded with nutrients and protein. It's also generally low in calories and rich in "good" fat—polyunsaturates and omega-3 fatty acids. The public is getting the message—between 2001 and 2005, U.S. per capita seafood consumption increased from 14.8 to 16.2 pounds.

Doris Hicks, seafood technology specialist with Delaware Sea Grant, teaches seafood processors, restaurant personnel, and the public how to properly handle, store, and prepare seafood through her workshops, publications, videos, and web site. She also assists Sea Grant researchers in developing new seafood safety techniques.

Hicks works with processors of smoked fish, crabmeat, and crawfish to ensure that seafood products are safe from bacterial contamination. She recently conducted several employee training programs and industry workshops on proper seafood processing. "We are working with the processors to maintain seafood's healthy qualities for the consumer," says Hicks.



Kathy Atkinson



Kathy Atkinson

## WATER QUALITY



Bob Bowler

## SEAFOOD SAFETY



Jon Cox

## The Coastal Connection

Swimmers can avoid a potentially dangerous situation by following these suggestions:

- Learn to swim and never swim alone.
- Check the latest National Weather Service forecast for local conditions and rip current outlooks.
- Talk to lifeguards about rip currents, surf conditions, and other hazards before entering the ocean.
- Learn to recognize signs of a rip current: a channel of choppy, muddy-colored water; a line of foam, seaweed, or debris moving seaward; a difference in water color; or a break in the surf as waves roll toward shore.
- If caught in a rip current, stay calm and don't fight it.
- Swim parallel to shore. When free of the current, swim at an angle away from it. If necessary, float or tread water. Call or wave for help any time you need assistance.

## RIP CURRENTS



Robert Cohen

## RESEARCH

Coastal engineers Jim Kirby (sitting) and Fengyan Shi work on a computer model that can predict waves and currents along the shore.

Rip currents account for 80% of all surf rescues in the United States, according to the U.S. Lifesaving Association. These fast-moving currents can pull even the strongest swimmer out to sea. Predicting the time and location of a rip current is no easy task. Sea Grant researchers are working to change that.

University of Delaware coastal engineer James Kirby is creating a rip current prediction tool. The tool uses surf data collected by video cameras installed on oceanfront buildings in Bethany Beach. This information will enable scientists to correlate visual observations of rip currents with meteorological and in-the-water measurements. This is part of a regional effort with Maryland Sea Grant scientists who are using a similar camera system at Ocean City, Maryland.

"Finding linkages between certain environmental conditions and rip currents," says Kirby, "will allow us to develop an early warning system that could easily be posted on a web page." Swimmers and lifeguards would certainly welcome such information.



Bob Bowden

## OUTREACH

Wendy Carey briefs National Weather Service and Dewey Beach Patrol staff on the rip current observation program.

Delaware Sea Grant is using scientific research to raise public awareness of rip currents—and help save lives. Coastal processes specialist Wendy Carey has worked with colleagues around the country to improve communications about rip current safety, research, and forecasting. Locally, she has coordinated wave and rip current observation programs with Delaware beach patrols. Information collected by ocean lifeguards is shared with the National Weather Service.

Thousands of Delaware residents and beach visitors have learned about rip current safety through presentations, summer outreach programs, and informative signs posted on beaches, boardwalks, and lifeguard chairs. Delaware Sea Grant has also developed a rip current web site ([www.ocean.udel.edu/ripcurrents](http://www.ocean.udel.edu/ripcurrents)) that complements educational material generated by the National Oceanic and Atmospheric Administration ([www.ripcurrents.noaa.gov](http://www.ripcurrents.noaa.gov)).

"Rip current speeds are variable. They can quickly become dangerous to anyone entering the surf," says Carey. "Swimmers and beachgoers should recognize the dangers of rip currents and know how to deal with them."



Robert Cohen

## OUTREACH

John Ewart works to restore an important part of a coastal ecosystem.

Oysters were once part of a healthy ecosystem in Delaware's Inland Bays. Growing together to create reefs, they provided important habitat for young fish, crabs, and other wildlife. With each adult oyster filtering up to 50 gallons of water per day, they also played a key role in keeping the water clean.

Oysters also had great economic value, supporting vibrant commercial fisheries in Delaware and Maryland. Today, however, the region's oyster populations are down to less than one percent of historic levels—victimized by overharvesting, habitat destruction, and disease.

Partnering with the Center for the Inland Bays (CIB), Delaware Sea Grant aquaculture specialist John Ewart is working to restore oysters to the estuary. Ewart obtains baby oysters from a University of Maryland hatchery and enlists local volunteers to help raise them in floating baskets attached to their backyard docks. After growing to an appropriate size, the oysters are moved to new homes in the Inland Bays.

"Oyster growth has been good to excellent in all three Inland Bays—Rehoboth, Indian River, and Little Assawoman," says Ewart. "Using the results obtained thus far, we are working to further develop useful oyster restoration methods."



Steve Billups

## RESEARCH

Pat Gaffney develops tools to gauge oyster restoration success.

"Species restoration projects can be expensive," says Sea Grant researcher Patrick Gaffney. "Before spending lots of money, managers of oyster restoration programs want to be reasonably confident that their efforts will bring success."

Gaffney and his students are working to improve that likelihood.

Many restoration projects involve "planting" hatchery-raised oysters in selected coastal waters. Such oysters have different DNA than their wild counterparts due to the limited genetic lines used to grow oysters in laboratories. To determine whether hatchery-raised oysters are thriving in the wild, Gaffney and his team collect oysters from the planting sites, extract small amounts of their DNA, and determine their origins. Finding many oysters with hatchery-specific DNA tells the scientists that planted oysters are doing well.

Using this technique, the researchers found that oysters originating from Louisiana did not survive or reproduce very well in one Chesapeake Bay tributary. More recently, they learned that planted oysters genetically selected for improved disease resistance survived and reproduced in good numbers. Such information is valuable to people working to restore oysters to our region.

## OYSTER RESTORATION

## The Coastal Connection

The waterways where oysters live are susceptible to pollution. Industries and factories are no longer the greatest cause of water pollution—we are. Rain washes excess fertilizer from lawns to local waterways, harming aquatic wildlife. If you fertilize your lawn, consider these options:

- Get a soil test to find out the best type and amount of fertilizer for your yard.
- Use only the amount of fertilizer you really need. Too much fertilizer will actually weaken your lawn.
- Keep fertilizer off paved surfaces and don't apply it before a storm. Otherwise, you'll just be sending the fertilizer—and your money—down the drain.

For more information, call 302-831-8083.

## OUTREACH

Bill Hall is in his 18th year of tracking horseshoe crab numbers.

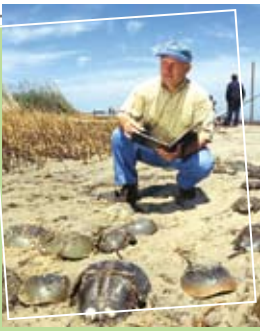
In the darkness of an early morning high tide, an ancient ritual is underway. Hundreds of horseshoe crabs are emerging from Delaware Bay and onto the beach to spawn.

Bill Hall is there to greet them.

In 1990, the Sea Grant marine education specialist helped to organize the first census of breeding horseshoe crabs in Delaware Bay. It became an annual event and today, the census represents the longest continuous data set for tracking the horseshoe crab's spawning numbers.

Throughout May and June, Hall and 200 trained volunteers visit 24 bay beaches in Delaware and New Jersey to count horseshoe crabs. Scientists and state resource managers use this information to help determine the overall status of the horseshoe crab population and set annual harvesting limits.

Hall plans to retire this year after 30 years of dedicated Sea Grant service. That won't put an end to his days of counting horseshoe crabs, however. "Oh, I'll still be on those beaches every spring, waiting for them," he says.



Robert Cohen



Kathy Atkinson

## RESEARCH

Pam Green is part of a team whose goal is to relieve harvesting pressure on horseshoe crabs.

The horseshoe crab is Delaware's state marine animal, and for good reason: Delaware Bay is home to the largest population of horseshoe crabs in the world. The creature's eggs provide a nutritious food source for migrating shorebirds. Its blood is used in medical research. And its scent is irresistible to some aquatic species looking for a meal. This particular feature makes the horseshoe crab the preferred bait in regional eel and whelk fisheries.

It takes ten years for the horseshoe crab to reach sexual maturity, so it is particularly vulnerable to overfishing. Recent declines in the horseshoe crab population have spurred efforts to protect the animal. From their Lewes and Newark laboratories, several Delaware Sea Grant researchers are leading the way, developing an artificial bait that the eel and whelk fisheries can use in place of the horseshoe crab.

Eel and whelk are specifically attracted to chemical cues found in the horseshoe crab. University of Delaware scientists Nancy Targett, Pam Green, and Yu-Sung Wu are collaborating with DuPont researchers to isolate those cues. "Once we leap this major hurdle," says Green, "we can move forward with creating a synthetic bait that mimics the natural chemical attractant." As their work progresses, the horseshoe crab is that much closer to overcoming a major threat to its survival.

## RESOURCE CONSERVATION

### The Coastal Connection

The horseshoe crab plays an important role in the lives of many Delawareans. Its blood is used to detect infectious bacteria in drugs and in prosthetics such as heart valves before they are implanted. Anglers and birdwatchers also know that the crab's eggs are an important food source for birds and fish.

The Delaware Bay Horseshoe Crab Census welcomes volunteers of all ages (volunteers under age 18 must be accompanied by an adult) to conduct surveys every May and June. Volunteers should participate in a 90-minute training workshop to learn proper crab identification and data recording procedures.

Learn more at [www.ocean.udel.edu/horseshoecrab](http://www.ocean.udel.edu/horseshoecrab).

### The Coastal Connection

Sea Grant's coastal community efforts are all about enhancing the quality of life for Delaware residents. Many of the activities are designed to help inform the decisions of community leaders, public officials, and other key decision makers. However, everyone can ensure that their communities are sustainable for future generations. There are many things citizens can do:

- Become familiar with your local land use plan and its ordinances.
- Participate in meetings and workshops held to discuss such issues as land use plans, stormwater management, and transportation planning.
- When possible, walk or bicycle instead of driving. It's healthy and helps to reduce vehicle emissions and congestion.



Jonathan Lilley

## RESEARCH

Willett Kempton is one of several researchers exploring alternative energy.

A growing coastal population has several implications. One is the need for reliable energy. Environmental and other considerations have led some scientists and policymakers to explore alternatives to fossil fuels. One of those options is offshore wind power.

University of Delaware and Stanford University researchers recently learned that the wind resource off the Mid-Atlantic coast could meet the energy needs of nine coastal states from Massachusetts to North Carolina, plus the District of Columbia.

Using that information, University of Delaware researchers Willett Kempton, Jeremy Firestone, and Richard Garvine are exploring the potential for wind power facilities off the Delaware coast. They are working to identify potential facility sites, laws, and policies needed to regulate such facilities, their possible economic and environmental impacts, and public opinions regarding offshore wind power.

Through a 2006 survey, Firestone and Kempton found that Delaware residents are strongly in favor of offshore wind power as a future energy source. This summer, the researchers and their students will interview out-of-state visitors to assess what effect, if any, an offshore wind farm that is visible from the beach might have on tourism.

## OUTREACH

Jim Falk helps communities grow sustainably.



courtesy of Photo Services

As with many coastal areas throughout the United States, population is booming in Delaware's Sussex County. By 2030, its population is expected to swell by 62 percent to almost 255,000 people. "Such growth could put a tremendous strain on natural resources and infrastructure," notes Jim Falk, director of Delaware Sea Grant's Marine Advisory Service (MAS).

MAS has initiated several efforts to address these issues. One is the Nonpoint Education for Municipal Officials (NEMO) program, which introduces local officials to tools that growing communities can use to protect their natural resources. Sea Grant also created a roundtable series in which developers, engineers, planners, and government officials explore ways to grow in an environmentally-friendly manner. Sea Grant also partnered with the Delaware chapter of the American Institute of Architects to sponsor a sustainability workshop in October 2006. More than 70 architects, engineers, and other design professionals attended the program to discuss ways to design environmentally-sustainable buildings.

# Sea Grant Delaware

*Program named  
among best in nation*

**T**he Delaware Sea Grant College Program recently earned high honors from a national review panel, which commended the program for “outstanding work” and “exceptional performance and productivity.”

Delaware Sea Grant is part of a nationwide network, administered through the National Oceanic and Atmospheric Administration (NOAA), of 32 programs that work with coastal communities. Each program conducts scientific research, education, training, and outreach projects designed to foster science-based decisions about the use and conservation of our aquatic resources.

Programs are evaluated every five years. Delaware Sea Grant’s review began in October 2006 with a four-day site visit by a national panel of marine experts and concluded in March 2007 with the receipt of their final report.

## HIGHEST PERFORMANCE RATINGS IN 13 CATEGORIES

The review panel included experts in research, fisheries, outreach, and education appointed by NOAA’s National Sea Grant College Program. The panel gave Delaware Sea Grant its highest possible scores in 13 of 14 categories, including program organization and management, reaching out to constituents, program planning, and producing results.

“The evaluators’ high marks are a reward for

the hard work and dedication of our researchers and outreach staff, as well as the staunch support provided by the State of Delaware, our Sea Grant Advisory Council, and the many citizens, agencies, and industries that work with us,” said Dr. Nancy Targett, director of Delaware Sea Grant and dean of the University of Delaware College of Marine and Earth Studies.

## ADDRESSING GROWTH ISSUES, SERVING DELAWARE

The report complimented Delaware Sea Grant on connecting with different constituency groups throughout the state and region. The review panel particularly noted “the progress that has been made in recent years to address growth issues along the coast” thanks in part to program efforts to reach out to local and state governments, tourism and business organizations, environmental groups, and other constituents.

The report particularly noted “the significant and beneficial impact that (Delaware Sea Grant) has on the state.” It remarked that the program produces an impressive number of peer reviewed scientific articles, widely considered an indicator of quality research. It also complimented Delaware Sea Grant’s many outreach materials and activities related to coastal resources and issues—some of which have been adopted in other states.

Despite the arduous review process, Targett was pleased with the result. “This high-level, independent review confirms that the Delaware Sea Grant College Program is among the nation’s best,” she said.



Bob Bowler



Robert Cohen

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## OUR ROLE

### THE DELAWARE SEA GRANT ADVISORY COUNCIL (SGAC)

consists of members of the Delaware General Assembly and representatives from state and local government agencies, industry, non-governmental organizations, and the formal and informal education sectors. Members serve staggered 2-year terms that are renewable.

The SGAC provides valuable input on Delaware Sea Grant’s research, outreach, and education projects. It is also a critical partner in the development of Delaware Sea Grant’s strategic and implementation plans. When the SGAC reaches consensus regarding coastal priorities, it represents a strong mandate because of the diversity of stakeholders it represents.

The SGAC also serves as a conduit that facilitates partnerships and alliances for Delaware Sea Grant researchers, outreach specialists, and educators throughout the state and region.

# Making more **COASTAL CONNECTIONS**



Bob Bowden

Want to learn more about ocean and coastal issues, discover how you can keep a clean environment for the future, and have fun in the process? Delaware Sea Grant offers several opportunities to learn more about marine-related topics throughout the year.

In addition to the activities listed here and on previous pages, be sure to check out our web site ([www.ocean.udel.edu](http://www.ocean.udel.edu)), where you can download many of our publications, watch video clips of our work, and more! For a copy of our publications catalog, please contact the UD Marine Public Education Office at [MarineCom@udel.edu](mailto:MarineCom@udel.edu) or 302-831-8083.

### MARINE LAB TOURS

Guided tours of UD's marine research complex in Lewes are available to the public, thanks to dedicated volunteers from the local community. Annually they lead over 1,000 people on walking tours of our labs. To learn more, please call 302-645-4234.

### NATIVE PLANT GARDEN TOURS

Learn about plants native to the Delaware coast on this self-guided tour. The garden is located at the entrance to the Cannon Lab on the UD Hugh R. Sharp Campus, 700 Pilottown Rd., Lewes. Call 302-645-4346 for more information.

### COAST DAY

UD's annual sea celebration, and winner of state and national awards for marine education, is set for Sunday, October 7. Tour the many different types of ships in the harbor, meet sea critters at the touch tanks, and hear modern-day explorers share the mysteries of the deep. Coast Day also features a crab cake cook-off, children's activities, research demonstrations, lectures, and much more. Admission is free, and parking is \$2.00. For more information visit [www.ocean.udel.edu/coastday](http://www.ocean.udel.edu/coastday) or call 302-831-8083.

### CRAB CAKE COOK-OFF

One of the region's most popular cooking contests, the University of Delaware's Crab Cake Cook-Off will be held as part of Coast Day in Lewes. All crab cake recipes are due Friday, August 10th. For more information and a copy of the rules and registration form, call the Sea Grant Marine Advisory Service at 302-645-4346.

### OCEAN CURRENTS LECTURE SERIES

UD marine scientists present free public lectures the third Thursday of each month, April through September, at the Hugh R. Sharp campus in Lewes. Each talk begins at 7:00 p.m. This year, topics range from DNA technology to hurricanes. Seating is limited and reservations are required. Call 302-645-4279 to reserve your seat or to learn about upcoming topics.

### 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 and Earth Studies. Subscribe online at [www.ocean.udel.edu/atsea](http://www.ocean.udel.edu/atsea) or email your request to the UD Marine Public Education Office at [MarineCom@udel.edu](mailto:MarineCom@udel.edu).



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UNIVERSITY OF DELAWARE

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