UNIVERSITY OF DELAWARE

Discover the World at Our Shores!

Inside: Take a colorful look at Delaware's coastal environment and Sea Grant research. ***On back:*** Sea Grant reaches out to you. Find out how you can get involved in activities that help the coast. Tell us your concerns about sea and shore.

From Delaware Bay to the Inland Bays, Delaware has been blessed with a bounty of marine resources.

At the University of Delaware, a special program is focusing the talent and energy of marine scientists, students, and outreach specialists on problems facing the coast. It is called the University of Delaware Sea Grant College Program.

UNIVERSITY of DELAWARE
Sea Grant College Program

Bob Bowden

Congress established the National Sea Grant College Program in 1966. The term "Sea Grant" was chosen to emphasize the parallel between this new program focusing on the nation's marine resources, and the Land Grant College Program, which was established over a century earlier to develop the nation's agricultural resources.

Today, a Sea Grant program can be found in every ocean and Great Lakes state in the U.S. and Puerto Rico. The University of Delaware was named the nation's ninth Sea Grant College in 1976, acknowledging our excellence in a broad program of research, education, and public outreach built upon a strong foundation of statewide support.

This year, the University of Delaware Sea Grant College Program is conducting 17 research projects, on subjects ranging from coastal erosion to fisheries decline.

Aiding our scientists are graduate students in marine studies, who develop their analytical skills as they tackle real problems.

Our outreach staff of Marine Advisory Service and Communication specialists then work together to share our research results with those who can use them, from resource managers to schoolteachers, business owners to anglers. This information transfer may take the form of a personal consultation, workshop, publication, or even our popular Coast Day open house.

MISSION

The goal of the University of Delaware Sea Grant College Program is to foster the wise use, management, and conservation of Delaware's marine resources through research, education, and public outreach.

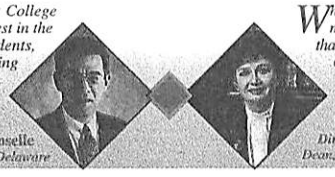
Bob Bowden

As you examine the colorful pages inside, we hope you will be reminded of how important the marine environment is to all of us. *You* play a critical role in how our state's marine resources are used and what we want our coast to look like in the future.

The challenges facing our marine environment are complex and many. But working together, we *can* chart a better course for Delaware's coast.

The University of Delaware Sea Grant College Program is recognized as one of the best in the nation. University marine scientists, students, and public outreach specialists are focusing their considerable talents and energies on the coastal challenges facing our state and region.

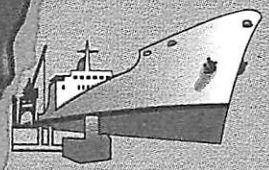
Dr. David P. Roselle
President, University of Delaware



What makes Sea Grant so special is its commitment to addressing real marine problems that affect our state's citizens and our economy. Our outreach specialists then take our research results and get them into the hands of people who can use them.

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

A growing population is pressuring the Delaware coast. According to U.S. Bureau of Census statistics, from 1970 to 1990, New Castle County population increased by 14.5%, Kent County by 35.5%, and Sussex County by 40.9%. State population is now approaching 700,000. More than two-thirds live in the Wilmington area.



The Delaware Estuary supports the second largest port in the nation and the largest oil port on the East Coast—the Philadelphia port complex. It includes the ports of Philadelphia, Camden, Gloucester City, Salem, and Wilmington. The Port of Wilmington handled 4.9 million tons of cargo last year.

The Chesapeake and Delaware Canal is the busiest canal in the U.S. An average of 100 ships and 350 tugboats travel it each month. The 19-mile canal shortens the voyage between Baltimore and Philadelphia by 294 miles.

The Delaware coast is a vital stop for migrating shorebirds. Some species, departing wintering grounds in South America, travel 5,000 miles non-stop before landing here to refuel for the trip to Arctic nesting grounds.

Bob Bowden

WHY IS THE SUMMER FLOUNDER FLOUNDERING? Overfishing is the major reason for this popular fish's decline, but cold weather may also play a role.

Marine biologist Tim Targett has learned that "juvenile" flounder—young fish only ½-inch long—do not grow until water temperature reaches about 52°F and die when water temperature drops to below about 36°F.

Thus, a long, cold winter can be lethal to young fish, and a cool spring can slow growth, keeping young fish small and more vulnerable to predators.

Bob Bowden

BACTERIA CAN SPEED UP RUST. For boat owner to power plant operator, marine corrosion is a serious force to be reckoned with—it costs the U.S. more than $25 billion a year.

Corrosion scientist Steve Dexter recently confirmed a major catalyst in the rusting process—bacteria. Stainless steel submerged in seawater quickly becomes covered by a film of bacteria. These microorganisms change the chemistry of the seawater at the metal surface, enhancing the chemical reaction that eats away the metal.

He is now working to understand how the bacteria operate so that an economical way can be found to stop the bacteria's growth and thus slow down rust.

Bob Bowden

ARE TRACE METALS HARMING BAY LIFE? Trace metals are natural elements that reach waterways from the weathering of rocks, mining, wastewater treatment, industry, and acid rain.

In small quantities, trace metals such as copper and iron are needed by bay life as essential nutrients. Yet at higher concentrations, these same metals become lethal.

Chemists Tom Church (above right) and George Luther are working to define more precisely how trace metals enter Delaware Bay and what chemical form each metal takes on its journey from bay to ocean. The ultimate goal will be to determine how these metals affect fish, shellfish, and other life in coastal waters.

Unique Circulation

Delaware has 90,000 acres of tidal marsh,

The Cape May-Lewes Ferry carried 1,086,868

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Delaware Bay shoe crab cap feed shorebir a unique com te

Unique Circulation Pattern Discovered in Inland Bays

Bob Bowden

Sewage, agricultural runoff, and other pollutants threaten the water quality of Delaware's Inland Bays—Rehoboth, Indian River, and Little Assawoman. If oceanographer Kuo-Chuin Wong can determine how water circulates through the bays, we should know where and how long such pollutants travel through the system before they are flushed out to sea.

In a series of experiments, Wong launched more than 750 scientific drifters into Rehoboth and Indian River Bays and plotted their paths. He discovered that bay water occurs in two layers that move in opposite directions. The surface layer flows out of the bays, while the bottom layer flows into the bays. In July, he will launch 2,000 more drifters to quantify the strength of this unique circulation pattern, which has never been observed before in such a shallow-water system.

About 95 industries hold pe to withdraw water from/disc into Delaware waters. The s 2,900 farms and 300,000 ho units also impact local wate High loads of nutrients and runoff, wastewater, and ina treated sewage can kill aqu

Sources: Delaware Department of Agriculture, Delaware Department of Natural Resources and Environmental Control, Delaware Development Office, Delaware River and Bay Authority, Delaware River Port Authority, National Marine Fisheries Service, Pilots' Association for the Bay and River Delaware, Port of Wilmington, University of Delaware Bureau of Economic Research, University of Delaware Graduate College of Marine Studies, U.S. Army Corps of Engineers, U.S. Bureau of the Census.

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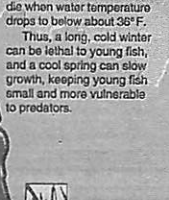

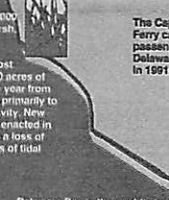

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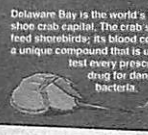
The Cape May-Lewes Ferry carried 1,086,868 passengers across Delaware Bay in 1991.

According to the Delaware Development Office, in 1991 over 2.5 million people came to visit the state's beaches.

Delaware Bay is the world's horseshoe crab capital. The crab's eggs feed shorebirds; its blood contains a unique compound that is used to test every prescription drug for dangerous bacteria.



About 95 industries hold permits to withdraw water from/discharge into Delaware waters. The state's 2,500 farms and 300,000 housing units also impact local waters. High loads of nutrients and sediments in runoff, wastewater, and inadequately treated sewage can kill aquatic life.

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Kevin McLaughlin

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Lane McLaughlin

Henry Hudson sailed the *Half Moon* into the mouth of Delaware Bay for a brief period in 1609, founding it for the Dutch. Fen and Chickens Shoals deterred him from exploring further.

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Sources: Delaware Department of Agriculture, Delaware Department of Natural Resources and Environmental Control, Delaware Development Office, Delaware River and Bay Authority, Delaware River Port Authority, National Marine Fisheries Service, Pilots' Association for the Bay and River Delaware, Port of Wilmington, University of Delaware Bureau of Economic Research, University of Delaware Graduate College of Marine Studies, U.S. Army Corps of Engineers, U.S. Bureau of the Census.


Bob Bowden

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Halophytes from Dela-
narshes are now being
in Thailand, China,
Egypt, and California.


Bob Bowden

MUSSEL GLUE HAS STICKY POSSIBILITIES.
The tiny zebra mussel has created havoc in the Great Lakes, where it has clogged industrial intakes and caused other expensive problems.

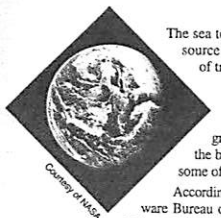
As Delaware prepares for this freshwater mussel's arrival, marine biochemists Herb Waite (above) and Les Rzepecki are examining the mussel's glue-producing foot. If they can decode its chemistry, they may be able to devise a control method to "shoot the mussel in the foot" and prevent it from attaching to pipes and other objects.

Eventually, the scientists hope to develop an imitation of the mussel's glue for use in dentistry and other fields where strong adhesion is needed on wet surfaces.

Discover the World

University of Delaware Sea Grant College Program

at Our Shores


Courtesy of NASA

The sea touches the life of every person on Earth—it's a source of food, a weather maker, a livelihood, a means of transportation, of recreation, and much more.

Delaware's seas and shores are recognized as one of the world's most important stopovers for migrating shorebirds and as the chief spawning grounds for horseshoe crabs. We are also home to the busiest oil-shipping corridor on the East Coast and some of the nation's top beaches.


Lane McLaughlin

According to the University of Delaware Bureau of Economic Research, the Delaware Bay and tidal Delaware River alone generate over 14,000 jobs, $448 million in wages, and $2.3 billion in sales for Delaware.

Yet increasing pressures threaten our coastal areas. Population growth, pollution, overfishing, and other human impacts are contributing to marine resource decline on a global scale. Natural forces—wind, wave, and tide—also make substantial demands on the coast.

A key goal of the University of Delaware Sea Grant College Program is to conduct marine research that addresses these local and global environmental challenges, develops new products from the sea, and provides objective information that will contribute to wise resource use, conservation, and management.

We also strive to build partnerships among scientists, resource managers, industry, and citizens to help foster a better understanding of coastal problems and opportunities.

As you'll see in the articles at left, Sea Grant research focuses on topics important to Delaware—and beyond.

From developing better methods to minimize coastal erosion, to growing nutritional marsh plants that may someday lessen food shortages in arid regions of the world, University of Delaware Sea Grant scientists are working to find answers to some of the complex questions that face us.

Economic Impact of Delaware Coast

Port of Wilmington
$566 Million
(1992 Estimate)

Beaches
$268 Million
(1992 Estimate)

Commercial Crabbing
$2.26 Million
(1992 Estimate)

Photos by Bob Bowden

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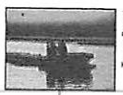
Bob Bowden

USING SATELLITE TECHNOLOGY TO "READ" THE SEA.
Oceanographers Xiao-Hai Yan (above) and Vic Klemas are combining satellite technology and computer modeling to develop an automated method of determining the velocity of sea surface currents. Knowing the speed of these currents will help us more accurately predict the path of an oil spill or other pollutant, conduct more effective search-and-rescue missions at sea, and perform timely environmental analyses of coastal and estuarine waters.


Jonathan Pennock


Bob Bowden


Jonathan Pennock


Tracey Bryant


John C. Kraft

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The Delaware Coastal Zone Act, passed in 1971, prohibits construction of industrial plants in the state's coastal area.

In 1992, Delaware had 187 commercial finfishermen with total landings of 1,411,733 lbs. Top catch: weakfish. Recreational landings: 1,716,402 lbs. Top catch: summer flounder.

Blue crabs are Delaware's most valuable shellfish catch. In 1992, commercial crabbers in the state caught 4,449,000 lbs. of blue crab. Value of the catch: $2,262,000.

Delaware's saltwater shoreline (including that of the Inland Bays) comes to about 260 miles; 24 miles of it border the Atlantic Ocean.

OUTREACH

Education · Aquaculture · Business · Recreation · Seafood

From Coast Day to *SeaTalk*, Sea Grant Shares Marine Information with *You*

The University of Delaware Sea Grant Marine Advisory Service and Marine Communications staff work together to relay the results of Sea Grant research to those who can use them—from business owner to schoolteacher. Last year, the staff reached more than 100,000 people through workshops, seminars, publications, *SeaTalk* radio announcements, and the award-winning Coast Day festival.

Kent Price, associate professor of marine biology-biochemistry, directs the Marine Advisory Service (MAS), which is comprised of specialists in five areas.

Marine Recreation and Tourism. Tourism is Delaware's #3 industry. The state's sandy beaches are a major draw.

Jim Falk's aim is to improve beach safety and decrease conflicts between coastal user groups. He's also helping resource managers develop long-term strategies for beach preservation. This summer, he will aid planners at the U.S. Army Corps of Engineers and Delaware Department of Natural Resources and Environmental Control by interviewing beach goers to determine their attitudes about beach nourishment and their willingness to pay for such efforts.

Marine Business and Resource Management. Delaware's marine-related businesses generate over $2 billion in sales annually and provide more than 14,000 jobs. Joe Farrell's goal is to help coastal business owners improve their operations and devise marketing programs.

Farrell also is active in marine resource management issues. He initiated a volunteer water quality monitoring program for the Inland Bays two years ago. Today, 50 volunteers are gathering data that will help resource managers design better strategies to improve the Inland Bays.

Marine Education. As undergraduates, few teachers receive formal training in marine or aquatic sciences despite the fact that 71% of the world is water.

Bill Hall helps teachers learn more about our water resources so that these educators can incorporate water education in their classrooms. In addition to holding teacher workshops throughout the year in conjunction with the Department of Public Instruction, Hall serves as an event supervisor for Delaware Science Olympics and helps coordinate the area's annual horseshoe crab census.

Kent Price *(right)*
Marine Advisory Service Director
Jim Falk *(center)*
Marine Recreation & Tourism

Joe Farrell
Marine Business & Resource Management

Bill Hall
Marine Education

Doris Hicks
Seafood Education

John Ewart
Aquaculture

Seafood Education and Technology. With today's emphasis on healthy foods, seafood consumption is up. Yet many consumers are concerned about seafood safety. Doris Hicks teaches food service workers, restaurant personnel, and the public how to properly handle, store, and prepare seafood through workshops, publications, videos, and a bimonthly seafood column called "Catch of the Day!"

Hicks is also working on an applied research project with food scientists Dallas Hoover and Dietrich Knorr to investigate the use of high pressure to pasteurize crab meat and other seafood.

Aquaculture. If you're interested in fish farming, talk to John Ewart! From his office in the Delaware Aquaculture Resource Center at the Lewes campus, Ewart fields dozens of phone calls each month from Delawareans interested in this growing industry. Currently, he is providing technical information and assistance to fish and shellfish growers, working with state officials to simplify permits, and developing a publication series devoted to aquaculture.

Marine Communications. Professional communicators also play a critical role in outreach and education, identifying the best ways to reach audiences with marine information. Communications coordinators Tracey Bryant and Pam Donnelly, with outreach specialist Beth Chajes, art director David Barczak, and staff assistant Kimberly Doucette, develop publications such as the award-winning *Sea Grant Reporter* newsletter, *SeaTalk* radio series, and videos on topics ranging from blue crabs to marine careers.

Photos by Bob Bowden

Tracey Bryant
Writer and Editor

David Barczak
Art Director

Pamela Donnelly
Production Manager

Marine Communications
University of Delaware
Newark, DE 19716-3530
(302) 831-8083

Come to Coast Day!
Sunday, October 3

Get Involved

Be an informed voter! Your most important voice on the environment is your vote.

Volunteer for next year's horseshoe crab census! Call Sea Grant at 645-4253 to sign up.

Monitor the water quality of the Inland Bays! Call Sea Grant at 645-4250 for more info.

Learn, learn, learn at Coast Day on Sunday, Oct. 3, from 11–5, at UD's Lewes campus!

Boat and fish responsibly. Many coastal resources are stretched to the limit.

Plant beach grass, clean up litter. Call the DNREC at (302) 739-4506 for more details.

Publications Catalog Order Form & Survey

The University of Delaware Sea Grant College Program has a wealth of information about the marine environment. For a free catalog of publications and videos, please clip or photocopy this coupon, put it in an envelope, and mail it to *University of Delaware, Marine Communications Office, Newark, DE 19716-3530.* Thank you!

What is your greatest concern about the marine environment? We want to know! Your response will aid us in planning future projects.

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☐ Check for FREE publications catalog.

Name: _____

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