

The

Czest

Current Issues in Coastal Ocean and Estuarine Science

NOAA Opens Chesapeake Bay Office in Virginia at VIMS

The National Oceanic and Atmospheric Administration (NOAA) recently selected VIMS as the site for a Chesapeake Bay Office in Virginia. Virginia Coordinator Ms. Paula Jasinski arrived at VIMS in August to open the new workplace.

The NOAA Chesapeake Bay Office (NCBO) was established in 1992 to manage NOAA's activities in Chesapeake Bay and to coordinate with the Chesapeake Bay Program (CBP). The NCBO's main office is co-located with the Chesapeake Bay Program in Annapolis, Maryland.

According to NCBO Director Dr. Lowell Bahner, the idea to establish a lower Bay office first appeared in the NCBO's 2002 Biennial Report. "We'd been getting feedback that we needed a greater presence in Virginia to open up communication pathways and provide a better return on the state's investment," says Bahner.

The idea was supported by Virginia legislators on Capitol Hill, who shared the vision of increased coordination between the NCBO and Virginia programs and agencies. Following congressional authorization

in 2003 and several site-selection visits to Virginia, NCBO staff selected VIMS in spring 2004.

"We realized that a physical presence in Virginia would greatly benefit our office," says Jasinski. "VIMS was an obvious choice—it's a very productive marine research center, presents a good base for us to access current research and product-driven science, and already has several NOAA resources, including CBNERRVA [the Chesapeake Bay National Estuarine Research Reserve], Sea Grant, and CMER [Cooperative Marine Education and Research]."

Jasinski also notes that VIMS is one of NCBO's largest grant recipients. In 2004, VIMS researchers received about one-third of the



Dave Jasinski (Chesapeake Bay Program, L) joins NCBO staff members Paula Jasinski (C) and Walter Priest (R) in front of their new offices in VIMS' Center for Coastal Resources Management.

VIMS Team Discovers Probable Cause of Croaker Deaths

A team of VIMS researchers led by fish pathologist Dr. Wolfgang Vogelbein was kept busy this summer investigating the cause of death for countless Atlantic croaker (*Micropogonias undulatus*) along the coastlines of New Jersey, Delaware, Maryland, Virginia, and Florida. Several million adult croaker died and washed ashore along the U.S. East Coast during July and August.

Although available evidence suggests a bacterial infection of the gills was responsible for the deaths, the exact cause remains unknown, and may perhaps never be known, notes Vogelbein. Research into the cause of the mortality ended in September when the outbreak ceased and newly dead fish were no longer available for study.

"I've never seen anything like this in my 15 years at VIMS," Vogelbein says. "It may have been a one-time occurrence brought on by an unusual combination of storms and wet weather."

Vogelbein notes that infectious diseases in fishes are almost always modulated by environmental factors.

Continued on page 8

NCBO's \$15 million grant funding.

VIMS researchers use NCBO funds for a wide variety of research, monitoring, and restoration projects in Chesapeake Bay. These include efforts

Continued on page 2

Virginia Institute of Marine Science
School of Marine Science
College of William and Mary
P.O. Box 1346
Gloucester Point, Virginia 23062

ADDRESS SERVICE REQUESTED

Non Profit Organization
U.S. Postage Paid
Glou. Point, VA 23062
Permit Number 6

Researchers Test and Refine Storm-Surge Models

Thanks to the recent upsurge in Atlantic Basin hurricane activity, thousands of property owners along the U.S. East and Gulf coasts have become all too familiar with the term "storm surge."

VIMS researchers Harry Wang and Jian Shen have just completed the first phase of a collaborative project whose ultimate goal is to help coastal residents and emergency managers better prepare for future storm-surge flooding. Their help comes in the form of computer models that can predict surge levels more accurately.

Wang, Shen, and other members of VIMS' Estuarine and Coastal Model-

ing Group were joined in the effort by researchers with the International Hurricane Research Center at Florida International University (FIU).

"Our goal," says Wang, "was to compare the performance of new and existing storm-surge models to determine which ones have the greatest potential for further development."

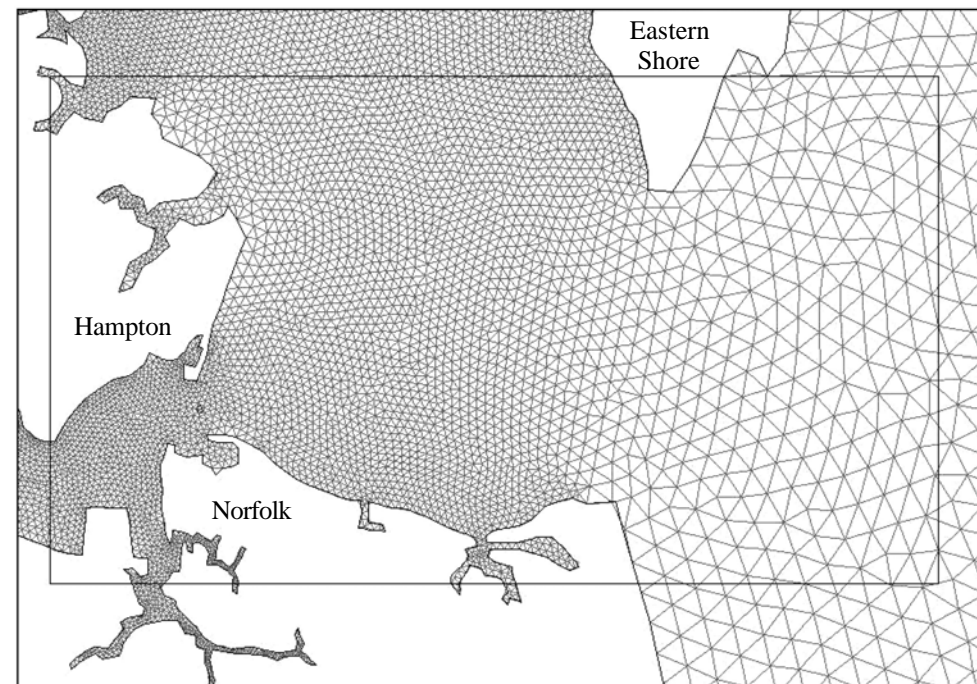
The group tested the National Hurricane Center's current surge model (called SLOSH for Sea, Lake and Overland Surges from Hurricanes) and several newer models to gauge their strengths and weaknesses. The tests measured the resolution, computing efficiency, and accuracy of each model using hurricanes Andrew, Betsy, Camille, Hugo, and Isabel.

The SLOSH model was originally developed by the National Weather Service more than 20 years ago. Emergency managers use SLOSH to determine which areas must be evacuated for storm surge. SLOSH, together with improved track forecasting, communications, and evacuation

routes, has significantly reduced the number of hurricane-related fatalities in the U.S. However, the model's limitations lead to large uncertainty in its flood predictions.

Newer models, including the high-resolution UnTRIM (Unstructured Tidal Residual Inter-Tidal Mudflat)

continued on page 6



The UnTRIM model's high-resolution, unstructured grid can closely approximate the convoluted shoreline of Chesapeake Bay and its tributaries.

The Crest

Vol. 6, No. 2 Fall 2004



Dr. John T. Wells
Dean and Director
Virginia Institute of Marine Science
School of Marine Science

Editorial Board

Dr. Roger Mann
Director of Research and
Advisory Services

Dr. William DuPaul
Associate Director for
Advisory Services

Dr. William Reay
Manager, CBNERRVA

Page Hayhurst
Director for Development

Science Writer

Dr. David Malmquist

Managing Editor

Dr. David Malmquist

Contributors

Dr. Gene Burreson
Susan Maples
Cory Staryk

Art Director

Susan Stein

If you are receiving multiple copies of *The Crest*, or would like to change your address, please call (804) 684-7805 or visit www.vims.edu/newsmedia/crest.html.

NOAA Office at VIMS
continued from page 1

to breed and plant disease-resistant strains of the native oyster *Crassostrea virginica*, and to monitor industry trials of the non-native oyster *C. ariakensis*.

"These efforts are important to overall Bay oyster-restoration activities," notes Jasinski. "Our new presence here will help us develop stronger partnerships and work more strategically with key players in Maryland and Virginia."

NCBO funding also supports ChesMMAP (the Chesapeake Bay Multispecies Monitoring and Assessment Program) and FEMAP (the Fishery Ecosystem Monitoring and Assessment Program), two VIMS programs aimed at providing resource managers with data and tools to assess and manage Chesapeake Bay's fisheries in a sustainable, ecosystem-based manner.

VIMS researchers also rely on NCBO funding to help study and restore Bay grasses, advise shoreline management agencies, develop the next generation of coastal observing systems, and study invasive species.

Jasinski notes that NOAA-funded projects often generate time-sensitive data and deliverables that federal and state managers need for decision-making. "Being on-the-ground in

Virginia will allow us much greater collaboration and oversight on lower Bay projects," says Jasinski. "We'll be able to be much more responsive, both to grant recipients and to managers that need the data and tools."

"Instead of just a funding source, we'd like people to see us as a partner," adds Bahner. "We'd like to establish a cooperative research program so that NOAA and VIMS staff could work more closely together on research projects."

As an example of increased collaboration, Bahner cites a plan to deploy the NCBO vessel R/V *Bay Commitment* in parallel with VIMS' ChesMMAP vessel the R/V *Bay Eagle*. That would help tie the ChesMMAP fisheries data into the bathymetric and habitat data provided by the *Bay Commitment's* high-tech sonar systems.

The Virginia Office currently comprises three staff members. Jasinski will serve as a liaison between VIMS, other Virginia agencies, and NOAA. Habitat Restoration Specialist Walter Priest, who is funded through the NOAA Restoration Center, will act as statewide liaison to NOAA's community-based restoration program and develop expertise in lower Bay restoration activities to complement staff in Annapolis. A Geographic Information System (GIS) Analyst will develop GIS and web-based management tools.

The final staffing level for the office is open. "Our goal is simply to get effective people to help in Virginia," says Bahner. He is currently working to encourage other NOAA offices to take advantage of the Virginia office by relocating or funding additional staff.

Ms. Jasinski's move to VIMS marks a return to her alma mater, where she earned a M.A. degree in 1992 with advisor Dr. Carl Hershner, studying the effect of sea-level rise on tidal wetlands in Gloucester County. "It's good to be back in Virginia and continue to work on Bay restoration," she says.

The move is also one that benefits the Chesapeake Bay Program (CBP). Ms. Jasinski's husband, Dave Jasinski, is an analyst for CBP and the University of Maryland. A recognized expert on Chesapeake Bay water-quality status and trends, Mr. Jasinski is also now located at VIMS. The relocation allows him to also work more closely with several VIMS scientists and engage them on water-quality issues.

NOAA's new Chesapeake Bay Office at VIMS, with a focus on research, complements NOAA's long-term relationship with Nauticus in Norfolk. The Nauticus office, headed by Jim Dixon and Michelle Fox, will continue to serve as NOAA's education and outreach center for the lower Bay.

Dye Helps Predict Potential Dispersal of Non-native Oyster Larvae

Swimmers and boaters may have seen what appeared to be a “red tide” in several areas of Chesapeake Bay this summer and fall. But instead of a potential menace to the waterway, the red patches were part of a study designed to further enhance biosecurity of non-native oyster trials.

“Each of the red patches resulted from the release of about 30 gallons of

rhodamine dye into the water,” says project leader Dr. Roger Mann.

Mann, Dr. Kenneth Moore, and other VIMS researchers tracked the dye patches to help predict where tidal currents would carry larval oysters in the unlikely event that any of the non-native oysters now deployed in seafood industry trials successfully reproduce.

The first release took place in July near Crossroads Aquafarms & Chessie Seafood and Aquafarms on the York River at Yorktown. Additional dye studies took place at three other sites selected to provide a broad range of tidal conditions and salinity: Seafarms Inc., at Milford Haven in Mathews County in September, Shores & Ruark Seafood Inc., on the Rappahannock River near Urbanna in October, and near Kinsale on the Yeocomico River in mid-November.



Karen Hudson and Missy Southworth transfer rhodamine dye onto a VIMS research vessel in preparation for a dye release experiment on the York River. The dye will help show how tidal currents might disperse oyster larvae.

The dye study is one requirement of a July decision by the Army Corps of Engineers to extend the Virginia Seafood Council’s on-going trial of the non-native oyster *Crassostrea ariakensis*. NOAA, EPA, and the US Fish and Wildlife Service also contributed to the decision.

The Virginia Seafood Council (VSC) trials began in September 2003 when commercial growers deployed 100,000 sterile oysters at each of 8 sites in the Virginia waters of Chesapeake Bay. The Virginia Marine Resources Commission granted a state permit for the trial through May 2005. The Army Corps of Engineers granted a federal permit through June 2004. Both dates were based on a planned starting date of August 2003. But a two-month delay in the initial deployment of the oysters led the growers to request an extension of the federal permit until April 2005 so that their animals can grow to market size.

The main concern with the VSC request was that the extension would allow the non-native oysters to remain in the water during their summer

spawning season. The deployed oysters are the offspring of adult oysters that were genetically manipulated to produce progeny with three sets of chromosomes, rather than the pair of chromosomes carried by normal “diploid” oysters. These “triploid” offspring are effectively sterile. However, this process is not foolproof, and the original VSC permit allowed a maximum of 1 diploid oyster per 1,000 non-native oysters deployed.

The federal agreement to extend the VSC permit contained two key provisions to minimize the risk that any of the deployed diploid oysters might successfully spawn and produce larvae that could establish a feral population.

First, the extension permit required that the growers further thin out their oysters, either by distributing them amongst a larger number of containment bags, or selling those of market size. The growers also had to move the structures that contain the bags farther apart. Oysters are “broadcast spawners” that release eggs and sperm freely into the water. Increasing the distance

Continued on page 9

Researchers Release Juvenile Blue Crabs

Hatchery-reared animals may help restore the Chesapeake’s ailing crab fishery

VIMS researchers continue to release hatchery-reared blue crabs into the York River in a collaborative effort to determine whether such efforts could be used to enhance Chesapeake Bay’s historically low blue crab stocks.

The population of female blue crabs in Chesapeake Bay has declined more than 80% during the last ten years.

The VIMS research team, led by Drs. Rom Lipcius and Rochelle Seitz and Mr. Jacques van Montfrans, released 11,540 juvenile crabs into shallow York River coves in June. Maryland scientists released a similar number of juvenile crabs into the Rhode River, which empties into Chesapeake Bay near Annapolis. Together, the 23,000 crabs represent the largest single experimental release of juvenile blue crabs ever attempted to test the feasibility of stock enhancement for the species.

The release program is a collaborative effort between VIMS, the University of Maryland’s Center of Marine Biotechnology (COMB) in Baltimore, and the Smithsonian Environmental Research Center (SERC) in Edgewater, Maryland. It complements

efforts to reduce the harvest of adult crabs through the establishment of blue crab sanctuaries.

The ongoing trials are designed to determine the optimal time and place for releasing juvenile crabs. Because the ultimate success of the trials depends on factors such as crab size, food availability, predation, cannibalism, water temperature, and salinity, the researchers spent the summer months studying crab survival in relation to these parameters. They also studied whether hatchery crabs would survive as well as those collected from the wild.

The VIMS team released another 4,017 hatchery-reared crabs into York River coves in October and November. The fall release was designed to test whether high rates of predation and cannibalism observed during the summer might decrease in autumn as adult crabs and finfish such as Atlantic croaker leave the coves to migrate downstream.

Analysis of the recent experimental data indicates that fall releases are indeed more successful. “During the summer, tethered crabs survived only about a day on average,” says Seitz.

“Many of the crabs we released in November are surviving for as long as 10 days.” In addition, hatchery crabs are surviving at rates equal to those of wild crabs of the same size.

Early results also suggest that crabs of the size used in the release studies (15-20 mm across the carapace) can and do survive in significant numbers when set loose in unvegetated sand and mud flats.

“That’s somewhat unexpected given the traditional view of seagrass beds as the main crab nursery grounds,” says Seitz. Data from ongoing studies suggest that grass beds are important for the youngest crabs, but that the slightly older and larger juvenile crabs used in the release studies may prefer the open flats because of their large populations of burrowing clams—animals the young crabs like to eat.

“Our recent field experiments also suggest that releasing slightly larger juvenile crabs of 20-25 mm carapace width produces higher survivorship,” says Lipcius.



Kristie Erickson inserts a microwire tag into a juvenile blue crab during the summertime translocation experiments.

The hatchery crabs were reared at COMB by Drs. Yoni Zohar and Odi Smora, who have spent the last several years overcoming previous obstacles to raising blue crabs in captivity, including cannibalism. Drs. Anson Hines and Eric Johnson of SERC have directed the Maryland enhancement efforts and provided support for the VIMS component.

Before each release, Lipcius, Seitz, and their staff collect the crabs from SERC, where resident and VIMS scientists have already completed the laborious task of tagging each of the

Continued on page 4

Annual Wetlands Workshop Explores Isabel's Impacts

Wise use of tidal wetlands in Virginia relies on the decisions of a diverse group—including waterfront owners, local wetland boards, and marine contractors.

In July, VIMS' Center for Coastal Resources Management provided citizens and elected officials with an opportunity to learn about the latest in

tidal-wetlands science by hosting their annual Tidal Wetlands Workshop.

Workshop leader Tom Barnard notes that "the event provides a unique opportunity for attendees to enrich their understanding of wetlands ecology and management through presentations, discussion, and 'hands-on' field exercises."

Fellows Earns Berth at EPA Conference

VIMS graduate students Paul Bradley, Kristin France, and Heidi Geisz have received a prestigious fellowship from the U.S. Environmental Protection Agency and attended the EPA Graduate Fellowship Conference in Washington, D.C. in October.

The trio attended the conference to present their research, learn about federal employment opportunities, and network with federal scientists, congressional representatives, and other fellows.

The conference website noted that the event "provides an opportunity for EPA to engage some of the nation's most promising young adults in meaningful interaction and discussion around some of today's emerging environmental science and policy challenges."

The students won the highly competitive fellowships as part of EPA's *Science to Achieve Results* (STAR) program. The fellowships support masters and doctoral students in environmentally related fields for up to three years. The Agency awards approximately 100 fellowships per year, from more than 1,000 applicants around the nation.

For his dissertation research under advisor Dr. Deborah Bronk, Bradley is

comparing nitrogen-uptake patterns in phytoplankton and bacteria from estuarine, coastal, and oceanic ecosystems. His work could have significant implications for nutrient management strategies in estuarine and coastal waters.

France is studying how changing regional biodiversity affects local diversity and ecosystem function. This information is critical for conserving diversity and managing essential ecosystem services in light of habitat fragmentation, non-native species introductions, and climate change. Her advisor is Dr. Emmett Duffy.

Geisz is investigating persistent organic pollutants in Antarctic seabirds. Her work will help inform policy change regarding pollutants such as BDEs currently produced and used in the U.S., and shed light on the impacts of pollutants such as DDT on fragile Antarctic ecosystem. Her advisors are Drs. Hugh Ducklow and Rebecca Dickhut. Ducklow manages the National Science Foundation's Long-Term Ecological Research program at Palmer Station in Antarctica.

For more information on the STAR fellowship program, visit <http://es.epa.gov/ncer/fellow/>

This year's workshop focused on issues raised by Hurricane Isabel. VIMS emeritus professor Dr. John Boon explained how sea-level rise in Hampton Roads helped boost Isabel's storm tide to within an inch of the level reached during the much stronger "Storm King" hurricane of 1933, and how continued sea-level rise will likely aggravate coastal flooding during future storms.

VIMS coastal geologist Scott Hardaway reported on Isabel's impact

on the local shoreline, as well as on coastal structures such as bulkheads, piers, and marinas.

During a morning field session participants learned to identify species of fresh and salt-water plants that help delineate tidal zones, and observed the effects of tidal range on wetland jurisdictional areas. A seining session allowed participants to get their feet wet while learning about the natural history of Chesapeake Bay's shallow-water inhabitants.



Workshop organizers were (Back row L-R): Tom Barnard, Carl Hershner, and David O'Brien. Front row (L-R) Walter Priest, Dawn Fleming, and Karen Duhring.

Crab Release continued from page 3

juvenile crabs. The tags, which consist of a tiny wire inserted into leg muscle, allow researchers to track the crabs despite repeated molting of the external skeleton. Researchers can easily identify a tagged and recaptured crab by passing it across a metal detector. Each of the crabs was also tagged with a dye visible through the transparent exoskeleton of the swimming legs.

After transporting the crabs to VIMS in iced coolers, the researchers released the animals into a shallow, muddy cove in the Catlett Islands (a pristine salt marsh habitat owned and managed by the Chesapeake Bay National Estuarine Research Reserve at VIMS), and another cove in Indian Field Creek, a pristine habitat under the protection of the Naval Weapons Station.

"Linking our scientific enhancement efforts with the federal protection and relatively pristine nature of many military installations may produce a favorable set of conditions for growth and survival of juvenile blue crabs," notes Lipcius.

The current research builds on experiments during 2003 in which

Lipcius, Seitz, and van Montfrans moved young crabs from York River and Tangier Island grass beds into the same Catlett Island coves. High survival rates among these transplanted crabs showed that the coves contain far fewer crabs than they are capable of supporting.

"Last year's experiments suggest that the ecosystem is below its carrying capacity, and that the blue crab is limited by recruitment, not resources," says Lipcius. In other words, low crab numbers aren't due to a lack of food, but to a shortage of young crabs.

"That's why enhancement using hatchery-reared crabs seems like a viable method for restoring the Chesapeake's blue crab population," says Seitz.

In addition to Lipcius, Seitz, and van Montfrans, the release efforts were aided by VIMS graduate students Russ Burke, Dave Hewitt, Deb Lambert, Chris Long, and Bryce Brylawski; and staff members Mike Seebo, Katie Knick, and Kristie Erickson. REU college interns Francisco Soto Santiago and Nicole Rohr and Governor's school students Ian Keene-Babcock and Jenny Geldermann also assisted with the June release.



VIMS graduate students Paul Bradley, Heidi Geisz, and Kristin France at the EPA Graduate Fellowship Conference in Washington, D.C. in October.

Reay and Priest Share Coastal America Spirit Award

VIMS researchers Walter Priest and William Reay were part of a group that recently received a prestigious national award for their efforts to help restore the Elizabeth River, a highly industrialized tributary of the James River and Chesapeake Bay that includes three "Superfund" sites.

VIMS, the Navy and its contractors, EPA, the Elizabeth River Project, Atlantic Wood Industries, and the Virginia Department of Environmental Quality received the 2004 Coastal America Spirit Award to recognize their restoration work at the Atlantic Wood and Norfolk Naval Shipyard sites and the New Gosport landfill.

The Coastal America Spirit Award is presented to unique, multi-agency partnerships that demonstrate teamwork in restoring and protecting U.S. coastal resources. Coastal America is a partnership among federal, state, and local governments and private alliances to address environmental problems affecting the nation's coast, waterways, and wetlands.

Dr. Carl Hershner, head of VIMS' Center for Coastal Resources Management (CCRM), notes that "Priest and Reay have long and remarkable track records of providing extensive and usually unheralded technical

assistance to many groups in the region." Priest is affiliated with CCRM's Wetlands Unit. Dr. Reay heads the Chesapeake Bay National Estuarine Research Reserve system at VIMS.

The Atlantic Wood site, which was used from 1926 to 1992 to treat wood with creosote, sits on the industrialized waterfront of Portsmouth beside the Norfolk Naval Shipyard. Because the restoration project involved "cross-boundary contamination" between the two facilities, cleanup required unique legal agreements and partnerships among the award recipients.

The nearby New Gosport site contained more than 55,000 tons of abrasive blast material, contaminated soils, and lead-tainted paint chips from Navy ship-blasting operations. Original plans to excavate and dispose of the

material as hazardous waste far exceeded available funding. The restoration team instead decided to stabilize the lead-contaminated material in place. This innovative approach reduced project costs by \$1.4 million and allowed the remaining, non-hazardous materials to be re-used as a cap for a regional landfill.

For both projects, Priest and Reay provided technical advice on the design and construction of wetland and

riparian buffers that help stabilize the cleanup sites and filter pollutants before they enter the River and Bay.



Dr. William Reay (L) and Mr. Walter Priest (R) are recipients of the 2004 Coastal America Spirit Award.

Schaffner Briefs U.S. Congress

VIMS Associate Professor Dr. Linda Schaffner testified before the House Committee on Government Reform in August that restoring the health of Chesapeake Bay will require effective interactions between monitoring programs and computer modeling.

The committee hearing, "A Model of Success? Monitoring, Measuring and Managing the Health of the Chesapeake Bay," was called in response to an August 5th *Washington Post* article on inconsistencies between what modeling and monitoring data say about the true status of efforts to clean up the Bay. The field hearing took place at Fort Monroe in Hampton.

The *Post* article contended that the computer model used by the Chesapeake Bay Program (CBP) to estimate pollution reduction in the Bay significantly overstates the Program's environmental achievements. The CBP is a regional partnership established in 1983 to restore the nation's largest estuary.

The Government Reform Committee, which is chaired by Congressman Tom Davis (R-VA-11th), convened the field hearing to help determine whether or not the Bay Program and its partners are using the best methods to measure and report progress in protecting and improving the health of the Bay.

According to the *Post*, several scientists affiliated with the CBP say that water monitoring measures pollution reduction more reliably than

computer estimates. Environmentalists say the model's exaggeration of Bay health shows that it shouldn't be relied on to measure progress.

Schaffner contends that modeling versus monitoring is not an either-or question.

"Attempts to weigh the relative merits of modeling or monitoring are misguided—they are two sides of the same coin," said Schaffner. "We need both and they should be used in concert to understand and verify where we are in our efforts to restore the Bay."

Schaffner also stressed the need for effective communication between the modeling and monitoring communities, particularly in light of the geographic and administrative complexities inherent in a regional collaboration such as the CBP.

"Good communication and exchange of information between monitoring and modeling efforts is essential," noted Schaffner. "Although this needed level of communication may be relatively easily established and maintained when a program is small, it can be considerably more difficult to attain when a program is large or when different agencies are responsible for modeling versus monitoring programs."

The CBP includes representatives from Maryland, Pennsylvania, and Virginia; the District of Columbia; the Chesapeake Bay Commission (a tri-state legislative body); the Environmental Protection Agency; and participating citizen advisory groups.

Schaffner, who also serves as president of the Estuarine Research Federation, credited the CBP with fostering a spirit of cooperation among the scientists who study the nation's largest estuary.

"[The] program has done a good job of soliciting science input on the issues, asking scientists to review programs, recommendations and strategies, and practicing science-informed management," says Schaffner. "The holistic view that many of us working in the Bay's science community have of the Bay and its ecosystem can be attributed to the structure and synthesis the CBP has promoted."

She also called for an increase in funding for estuarine research and for nutrient reduction in support of efforts to restore the Bay's water quality.

Schaffner was asked to testify by Congressman Ed Shrock (R-VA-2nd), whose district comprises parts of Hampton, Norfolk, and Virginia Beach and the counties of Accomack and Northampton on Virginia's Eastern Shore. Rep. Shrock is another member of the Government Reform Committee.

For Dr. Schaffner's complete testimony, visit www.vims.edu/topstories. A complete list of hearing participants is available at <http://tomdavis.house.gov/cgi-data/news/files/112.shtml>

VIMS Dedicates Hargis Library



VIMS honored Dr. Bill Hargis with a naming ceremony in the newly designated William Jennings Hargis, Jr. Library on August 2nd. The event brought a large crowd of Hargis family members and past and present VIMS employees to campus.

Storm-Surge Models
continued from page 2

model tested by Wang and Shen, equaled or exceeded SLOSH's performance during the modeling tests. Moreover, says Shen, the newer models have much greater potential for further development.

A key to the newer models' potential is their much higher resolution. UnTRIM, for example, can perform its calculations within a framework of grid cells that are as small as 30 meters square. By comparison, the smallest cells in the SLOSH model (which was originally designed for relatively smooth coastlines) are on the order of 1 square kilometer.

The newer models also use grid systems that are much more flexible, allowing a closer fit to the convoluted shoreline of an estuary like Chesapeake Bay.

"UnTRIM's unstructured grid gives us the ability to fit the model grid to the shoreline and to resolve the tributaries," says Shen. "It can accommodate complicated geometry," adds Wang. UnTRIM's greater resolution and flexibility allows it to create a virtual Bay made up of 239,541 cells of varying shape.

In simulations using data from Hurricane Isabel, the UnTRIM model's surge predictions closely matched real-time water-level measurements from various sites in the Bay, including Gloucester Point in the York River and Sewells Point in the James River. "The Isabel simulation captured both the evolution of the surge and its peak distribution," notes Shen. "It clearly demonstrates the effectiveness of the unstructured-grid model for simulating storm surge."

Storm-surge models are also benefiting from advances in coastal mapping. Shen and Wang's collaborators at FIU are leaders in the application of a new airborne mapping technology called LIDAR, for Light Detection And Ranging. Whereas existing coastal maps show topography in intervals of 5 to 10 feet, LIDAR data are routinely accurate to 6 inches.

Incorporating highly detailed LIDAR data within a storm-surge model promises forecasts of unprecedented accuracy. That's particularly important in flat-lying coastal plains, where even small discrepancies between mapped and actual elevations can result in surge-prediction errors that trigger massive over-evacuations,

at an estimated cost of \$1 million per mile.

Data from a new generation of ocean-observing systems, like the one being developed at VIMS (see Spring 2004 issue of the CREST), also promise to improve model accuracy. Modelers can use these data both to improve real-time forecasts and to validate and refine their models.

"We simply can't do high-quality modeling without ocean-observing systems," says Wang. "The accuracy of coastal-flooding predictions is directly related to the accuracy of the model, and that depends greatly on good observational data."

But the modelers' greatest challenge, notes Shen, is to bridge the gap between the large-scale wind forces that drive the hurricane at sea, and the small-scale features that control the surge level in any particular spot.

"Hurricanes come from the ocean, but the critical area for surge modeling is the coast and estuary," says Wang. To perform best, "[the model] needs to simultaneously cover the large area where the storm roams and the details of the local region where people live."

A related challenge is to better incorporate the atmospheric parameters that drive the hurricane and its surge. This is partly an issue of conflicting data standards that reflects the traditional separation between oceanographers and atmospheric scientists.

"We need an 'industry standard' for data so we can communicate more freely," says Wang. Atmospheric data parameters include a hurricane's winds, central pressure, size, forward speed, and track direction.

Funding for the just-completed model inter-comparison study came from the Federal Emergency Management Agency through a grant to FIU. Wang and Shen are now continuing their efforts with funding from the Navy and NOAA, through a grant from SCOOP (the Southeastern University Research Association, Coastal Observation and Operational Prediction Program).

"The inter-comparison study gave us a new direction for our own modeling research," says Shen. "We're excited about the possibilities."

For more information on the model inter-comparison project, visit http://www.ihrf.fiu.edu/lcr/research/windstorm_simulation/index.htm

VIMS Governor's School



VIMS, in cooperation with Christopher Newport University, hosted a group of high school students this past summer as part of the Virginia Governor's School program. The five-week residential program has provided high-achieving Virginia high school students with marine research experiences for 14 years. The program is structured as an apprenticeship in which each student works with a faculty sponsor on an authentic VIMS research project. From L, Molly Turner (West Potomac HS, Alexandria), Residential Assistant Jennifer Scott (Potomac HS, Dumfries, VA), Jenny Geldermann (Chantilly HS, Chantilly), Ian Keene-Babcock (Glenvar HS, Salem), and David Gibbs (H-B Woodlawn Alternative Program, Arlington).

Ms. Turner worked with VIMS graduate student Jill Peloquin to identify and quantify phytoplankton from the Ross Sea, Antarctica. Ms. Geldermann worked with Dr. Rom Lipcius to examine the role of the blue crab as a keystone predator in salt marshes of Chesapeake Bay. Mr. Keene-Babcock helped Dr. Rochelle Seitz to determine relative survival rates of juvenile blue crabs in habitats with varying predator and prey levels. Mr. Gibbs helped graduate student Todd Gedamke determine the rate of growth of barndoor skates via analysis of dissected vertebrae.

VIMS By the Numbers.....

- ◆ 436 Active research awards at VIMS during fiscal year 2004
- ◆ 54,237,007 Dollar amount of those awards
- ◆ 84.2 Percent of VIMS grant awards during fiscal year 2004 that came from federal sources
- ◆ 8.7 Percent of VIMS grant awards during fiscal year 2004 that came from private sources
- ◆ 7.1 Percent of VIMS grant awards during fiscal year 2004 that came from state sources
- ◆ 68 Percent of VIMS grant proposals submitted during fiscal year 2004 that were successfully funded
- ◆ 11.9 to 1 Ratio of federal to state grant funding at VIMS in 2004
- ◆ 11,540 Number of hatchery-reared juvenile blue crabs released into the York River by VIMS researchers in June (see p. 3)
- ◆ 1,000,000 Estimate of dead croaker on the Maryland and Delaware portion of the Eastern Shore during the July 31 weekend (see p. 1)
- ◆ 3,400 Dollars raised to fight cancer by VIMS' Relay for Life team, the Sharks
- ◆ 2 Number of intact 1830s wine bottles excavated during archeological work at the site of VIMS new seawater lab, along with white earthenware, tailor's straight pins, and an English-made clay pipe

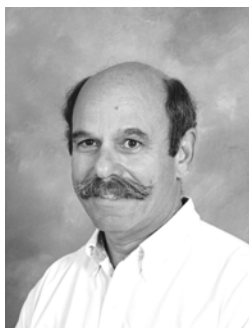
News Briefs

New Marine Research Complex on Track

VIMS' Facilities Management Director Joe Martinez reports that work on the new marine research complex is proceeding according to schedule. The Commonwealth's Code Official recently reviewed the construction documents and specifications; Hicks, Williams, and Reed House have been demolished to make room for the new facilities; and archaeology is proceeding according to requirements of the National Historic Preservation Act. Groundbreaking for the 70,000 square foot research building and the 43,000 square foot seawater lab is scheduled for Spring 2005.

Kator Named EAAH chair

Associate Professor of Marine Science Dr. Howard Kator has been named chair of VIMS' Department of Environmental and Aquatic Animal Health, replacing outgoing chair Dr. Stephen Kaattari. Kator's research interests involve various aspects of environmental microbiology, with a focus on the ecology of the bacteria and viruses that are used as indicators of sewage or fecal contamination. He also studies the ecology of microorganisms that cause diseases in fish, such as mycobacteriosis in striped bass.



Dr. Howard Kator

Latour Appointed Assistant Professor

The Board of Visitors of the College of William and Mary has approved the appointment of Dr. Rob Latour as an Assistant Professor in VIMS' Department of Fisheries Science.



Dr. Rob Latour

Latour received a B.A. in mathematics from Western New England College in 1994, a M.B.A. in biomathematics in 1996, and a Ph.D. in biomathematics in 2000, both from North Carolina State University. He came to VIMS as a postdoctoral research associate in 2000 and continued as a

research assistant professor beginning in July 2001. Latour's research interests include modeling of population dynamics and stock assessment of exploited marine resources. He is currently focusing on multi-species interactions and ecosystem-based approaches to fisheries management. In addition to continuing his research program, Latour will teach courses in population dynamics and modeling of biological systems, and participate in VIMS' advisory mission through service on various state and regional fishery management committees.

Coughlin Appointed Library Director

The Board of Visitors of the College of William and Mary has approved the appointment of Ms. Carol Coughlin as Director of the Hargis Library at VIMS.



Carol Coughlin

Coughlin comes to VIMS from the Swem Library at William & Mary, where she served as the Reference and Instruction Librarian. She has a library science background in instruction, teaching, and research using a variety of electronic and web-based tools. Prior to her position at William and Mary, Coughlin was a Life Sciences Librarian at Virginia Commonwealth University, where she managed and developed collections for the Department of Biology and the Center for Environmental Studies.

Coughlin holds a Master of Library Science degree from the University of Toronto and a Bachelor of Science in Biology from Concordia University, Montreal.

Network Upgrades Continue

The drive to replace VIMS' outdated network of copper lines with fiber-optic cables moved one step closer to completion in September when contractors converted the lines on the north end of campus. "All the north end buildings are now connected by fiber optic cable for their data network connections," says ITNS Director Newt Munson. "This will greatly reduce ITNS staff time and equipment replacement costs following the next lightning storm."

The new fiber optic network provides at least 100-megabit data connection rates among Brown, Hall, Wilson, and Sowers houses; the DCOP building; and the new CBNEER facilities.

Copper-to-fiber conversion is next scheduled for Facilities/ Customer Service, Raleigh House, Maury Hall, the Sediment and Marine Culture labs, and the Old Telephone building.

Boon Takes to the Airwaves

VIMS emeritus professor Dr. John Boon appeared on public radio's *With Good Reason* in August, when he discussed infamous U.S. hurricanes, including the deadly 1906 Galveston storm, 1968's Hurricane Camille, and last year's Hurricane Isabel. Boon's analysis of long-term sea-level records helps explain Isabel's unexpected ferocity and suggests that future storms will pose even greater flood risks in Chesapeake Bay.

With Good Reason, the only statewide public radio program in Virginia, features in-depth interviews with leading scholars from Virginia's public universities. To listen to Boon's interview on-line, visit <http://www.withgoodreasonradio.org/archives/aug04wgr.html>

Vecchione Returns to Mid-Atlantic Ridge

VIMS adjunct faculty Dr. Mike Vecchione and graduate student Charles (Chip) Cotton joined 60 other scientists aboard the research vessel *GO Sars* this summer to further explore deep-sea life along the mid-Atlantic ridge.

The researchers used remotely operated vehicles, sonar, and other technologies to collect a wealth of new information, and to observe, photograph, and sample numerous deep-sea organisms, including several thought to be new species.

The Norwegian-led expedition was the latest cruise of the 7-year Mid-Atlantic Ridge ECO-system Project. MAR-ECO is in turn part of the 10-year, \$1 billion Census of Marine Life (see *The Crest*, Summer 2003).

MAR-ECO is designed to enhance understanding of the occurrence, distribution, and ecology of animals and animal communities along the Mid-Atlantic Ridge between Iceland and the Azores at depths down to 4 km (2.5 miles).

The project, which started in 2001 and lasts until 2008, is an international research program with scientists from 16 nations.

For more information on MAR-ECO and the Census of Marine Life, visit <http://www.coml.org/descrip/mareco.htm>

Modelers Reunite

The VIMS 3-D modeling team is once again consolidated under a single roof due to careful planning and hard work from facilities and administrative staff at VIMS. The modelers had been scattered across the VIMS campus ever since their previous home in Newport Hall was deemed uninhabitable following Hurricane Isabel. The group will occupy the newly restored third floor of Davis Hall until the completion of the Marine Research facility in 2006.



Chip Cotton poses with a 4.5 m Greenland shark captured during this summer's cruise aboard the *RV GO Sars*.

VIMS Student Develops Educational Board Game

VIMS graduate student John Carriger spent most of his time at a conference this summer playing games. Rather than voicing concern, his advisor Dr. Mike Newman joined right in.

Carriger was working with teachers to test an educational board game that he and Newman developed to help students better understand the worldwide problem of marine invasive species (see *The Crest*, Spring 2004). The pair unveiled the game during a July workshop of the mid-Atlantic Center for Ocean Science Educational Excellence (MACOSEE).

MACOSEE is one of seven COSEE centers established around the U.S. in 2002 to coordinate ocean-science education on a national scale. MACOSEE partners include VIMS, the Chesapeake Bay Foundation, the Rutgers Institute for Marine and Coastal Sciences, Hampton University, the Center for Environmental Science at the University of Maryland, the Jacques Cousteau National Estuarine Research Reserve, the New York Aquarium, and the Mid-Atlantic Bight National Undersea Research Program.

Carriger says that his game has two purposes. "It's designed to educate students about invasive species and their detrimental effects, and to make them recognize the overlap and precarious balance between economic development and environmental protection."

To start the game, individuals or groups take on the role of harbor manager at one of five imaginary ports, from tranquil Port Pleasant to the

highly polluted Port of Potty. With an initial bankroll of \$100, each player tries to maintain financial success while accumulating the fewest invasive species.

The game is divided into rounds in which each player rolls a die in an attempt to bring a ship and its associated revenue into their port. Some of these ships carry invasive species in their ballast tanks. If an invader is present, the player checks a reference card to determine if the port provides it with suitable habitat. If so, the player records the species along with the number of rounds it will require to become established. If two invasive species become established in a port, it loses business and the player begins to lose money. After each round players can hire inspectors to keep out invasive species. They can also pay to raise their port's economic level to attract more vessels.

"The winners are the players that end up with the fewest invasive species, the best economic performance, and the most money," says Carriger. At the end of the game, the group compares each port's success and reviews the strategy behind each player's actions.

The MACOSEE conference gave Carriger and Newman an opportunity to test the invasive species game with classroom science teachers from several mid-Atlantic states. Carriger worried the game might be too involved for pre-high-school students, but the middle-school teachers he worked with thought it would be perfect for their curriculum. Several of the teachers



VIMS graduate student John Carriger (R) tests his invasive species board game with a group of middle school science teachers during a conference of the Mid-Atlantic Center for Ocean Science Educational Excellence (MACOSEE).

developed lesson plans around the game so that they can use it in their classroom during the school year.

"The teachers absolutely loved it," says Newman. "There wasn't a single person who wasn't pleased. In written comments, one teacher noted 'the game rocks!'"

Carriger plans to refine the game based on the teacher's suggestions and to freely distribute the revised version to additional teachers during future meetings of groups such as the National Science Teachers' Association.

The overall goal of MACOSEE is to integrate marine research and education programs to encourage lifelong learning by teachers, students, coastal managers, families, and under-

represented groups in marine science.

Newman leads VIMS' participation in MACOSEE. His goal is to extend the group's activities into Virginia and the Eastern Shore and to oversee the distance learning, teleconferencing, and video-on-demand aspects of the program. He is also coordinating efforts with Hampton University to recruit minority student into the program.

Funded for the COSEE program is provided by the National Science Foundation (NSF), the Office of Naval Research (ONR), and the National Oceanic and Atmospheric Administration (NOAA).

For more information, visit www.macosee.net

—Cory Staryk

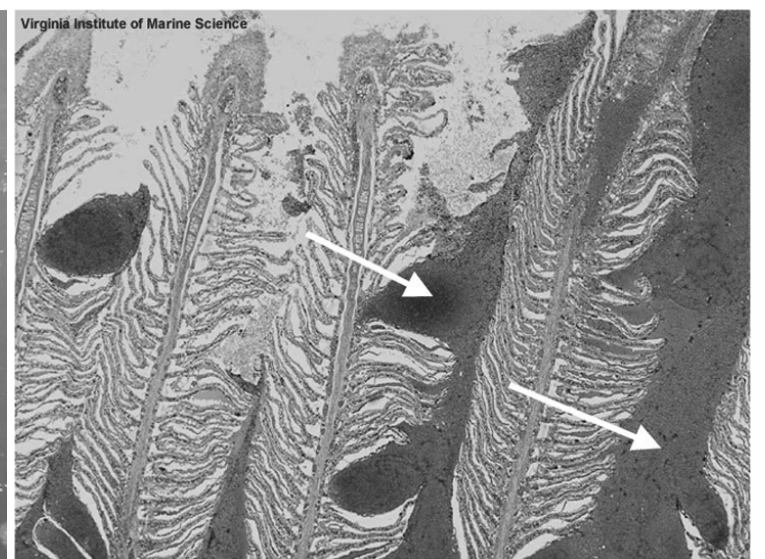
Croaker continued from page 1

"Microbial organisms capable of causing disease in fishes are always present in the environment. Only when fish become stressed by a changing environment will they generally break out with disease.

According to Vogelbein, dying croaker submitted for evaluation to the Aquatic Animal Disease Diagnostic Laboratory at VIMS appeared healthy externally except for extensive bleeding from the gills. Microscopic evaluation of the gills showed degeneration of the respiratory tissues associated with a bacterial infection.



Large numbers of dying and dead croaker periodically appeared in offshore surface waters during July and August. All fish were large croaker estimated at 4-years old and older. The fish were bleeding extensively from the gills but otherwise appeared healthy.



A magnified thin-section of affected gill tissue showing widespread damage to the gill filaments and lamellae and severe bleeding (white arrows).

VIMS Hosts Release of Fisheries Ecosystem Plan

VIMS hosted the Virginia presentation of the newly developed Chesapeake Bay Fisheries Ecosystem Plan (FEP) on October 5th. The plan culminates a process that began in 2000, when NOAA's Chesapeake Bay Office established a Technical Advisory Panel to develop an ecosystem-based fisheries management plan that recognizes the importance of key habitats and species interactions.

"Fisheries management plans traditionally focused on a single species," says VIMS researcher Dr. Rom Lipcius, who heads the Advisory Panel's food web section. "The FEP recognizes that Chesapeake Bay's fisheries will be sustainable only if we also preserve and restore water quality and habitat and account for relationships between predator and prey."

The new FEP is an umbrella document that sets forth guidelines that must be followed by all future fishery management plans in Chesapeake Bay. Five such plans are currently in the works. They are designed to help managers simultaneously provide maximum sustainable yields for blue crabs, oysters, striped bass, shad and related species, and menhaden.

"The FEP will make all future fishery management plans in Chesapeake Bay ecosystem-based," says

Lipcius. Ecosystem-based plans reflect a growing recognition among scientists that a complex web of interacting factors affects the dynamics of every fisheries species.

That means, for instance, that the blue crab management plan will take into account that adult crabs eat young oysters, and that juvenile crabs won't survive unless they have sea grass beds in which to escape predation by striped bass.

"In the past we managed fisheries species one by one, apart from what was going on in the rest of the ecosystem," says Lipcius. "But we've now come to recognize that everything is hooked to everything else, and that all species are affected by a range of ecological and socioeconomic issues. Ecosystem-based plans incorporate that recognition."

Also serving on the technical panel were VIMS fisheries scientists Dr. Herb Austin (Climate Index), Chris Bonzek (Long-term Monitoring Data), and Dr. Rob Latour (Modeling/Food Web), and VIMS economist Dr. Jim Kirkley (Resource Economics).

—For more information on the Chesapeake Bay Fisheries Ecosystem Plan, visit <http://noaa.chesapeakebay.net/fepworkshop/netfep.htm>

Natural Illustrators Visit VIMS



Kitty Dough (L), Georgia Minnich (R), and eight other members of the Guild of Natural Science Illustrators visited VIMS in July to sketch the wide variety of plants growing in the Teaching Marsh. The illustrators were offered the field trip as part of the Guild's 2004 Conference in Williamsburg hosted by the College of William and Mary. Karen Durhing, VIMS Center for Coastal Resources Management, guided the guests through the tidal wetland.

School of Marine Science Admits Class of 2004

The School of Marine Science at VIMS welcomed 35 incoming graduate students to campus during a 2-day orientation session in late August. The new students represent the second largest class in SMS history. About 60% of the new students will work toward a master's degree, while the

remaining students will seek the Ph.D. Seventy percent of the incoming students are from outside Virginia, with two from foreign countries. Students earned undergraduate degrees at colleges and universities in 12 U.S. states.



Red dye
continued from page 3

between spawning oysters decreases the already low risk that water currents will bring an egg and sperm cell together for fertilization.

The second provision required the completion of the dye study, to better understand where tidal currents are likely to carry any larvae that might result from successful reproduction between two diploid non-native oysters. If tidal currents scatter the larvae so that they settle over a broad area, they will be too far apart to reproduce as adults.

VIMS Assistant Professor Jian Shen is feeding the field data from the dye releases into a high-resolution computer model of lower Chesapeake Bay. Model output helped the researchers track and sample each dye patches in the week following its release (after which it became too dilute to measure). In turn, their field data helps the model predict the movement of the patch, and can be used to calibrate the model so that it can more accurately predict larval dispersal at other sites and under different conditions.

Researchers have used rhodamine dye in hundreds of studies since the

1960s to trace water movement through lakes, rivers, and estuaries. They use it because it dissolves readily in water, is harmless in low concentrations, and is strongly fluorescent and thus easy to detect. Mann and Moore traced the dye patch using a boat-mounted "Dataflow" sensor that can measure dye concentrations continuously while the vessel travels at speeds up to 20 knots.

"Our overall objective is to demonstrate and quantify dispersal of a larval surrogate—fluorescent dye—at four of the trial sites to provide quantitative input to the risk analysis," says Mann. "Release of fluorescent dye provides a tractable method to simulate passive dispersal of larval forms on a site-specific basis in real time. Site-specific data are required to provide critical values for risk assessment in the ongoing permit process."

Funding for the study comes from EPA and NOAA through the Chesapeake Bay Program, and from the Virginia Marine Resources Commission.

To see a video of the dye release, visit www.vims.edu/newsmedia/iv_bank/index.html

VIMS Mourns Passing of Andrews

VIMS Emeritus Professor Dr. Jay D. Andrews passed away October 28 at the age of 88. Andrews, affectionately known as “Andy” by his many friends and colleagues, is widely respected for his fundamental research on the ecology of oyster pathogens in Chesapeake Bay. Equally important were his oyster spatfall studies and the disease-management strategies he developed for industry.

Andy was born in 1916 in Kansas and grew up on a wheat and cattle farm south of Dodge City during the depression and drought of the 1930s. He earned an undergraduate degree in agriculture from Kansas State College in 1938, and an MS from the University

of Wisconsin in 1940. After four years in the infantry during World War II, he returned to Madison to finish his Ph.D., which he earned in 1947.

In 1946 Andy and fellow student Willard Van Engel attended a fisheries meeting in St. Louis where they met the Director of the Virginia Fisheries Laboratory (the precursor of VIMS), who offered them jobs that they both accepted.

Andy soon began studying oyster spatfall patterns in Bay tributaries. After years of monitoring, he recognized that small Bay tributaries have significant annual setting patterns despite relatively low oyster populations, due to high larval retention. Andy

tried to persuade managers in Virginia to use the small estuaries to produce seed oysters for larger tributaries, but this advice was ignored until long after he retired. When the reef-restoration strategy was initiated in Virginia in 1996, the first reconstructed reefs were placed in these small tributaries because of the larval-retention patterns Andy had documented.

Andy produced fundamental papers on Dermo disease during the 1950s and his 1988 review on the pathogen is still widely read and cited. When *Haplosporidium nelsoni* (MSX disease) appeared in Chesapeake Bay in 1959, Andy immediately began studying this organism and produced many seminal papers on its ecology. In 1960 he initiated a monitoring program for *H. nelsoni* at VIMS using imported oysters. This program continues today and provides a 42-year database on *H. nelsoni* prevalence and intensity that has proved invaluable for examining climate effects on pathogen abundance.

Andy was also a long-time educator. During his career at VIMS he taught Ichthyology, Field Biology,



This 1954 photo shows Dr. Andrews (C) with Virginia Fisheries Laboratory Director Dr. J.L. McHugh (L) and Victor Loosanoff, Virginia's first trained marine scientist (R).

Obituaries

Carroll C. Ballard Jr.

VIMS Council member Carroll Chadwick “Chad” Ballard Jr. passed away Oct. 27. A native of Norfolk, Mr. Ballard became a pioneer in scientific aquaculture as chief executive officer of Cherrystone Aqua-Farms on the Eastern Shore. His companies soon developed into leading national growers and distributors of shellfish and Mr. Ballard became an instrumental force in the development of the Virginia seafood industry. Governor Baliles appointed him to the Virginia Aquaculture Advisory Board and at the request of Governor Wilder he served on the Virginia Marine Products Board. In 1997 Governor Allen named him as an associate commissioner of the Virginia Marine Resources Commission. Governor Gilmore reappointed him to the post in 2001. His leadership and business acumen was also evident at the Virginia Seafood Council, where he served as president and as vice president for Legislative Affairs. He became well-known to members of the Virginia Congressional delegation and the Virginia General Assembly as a tireless spokesman for the seafood industry, admired for his knowledge of issues and his skills in resolving difficult problems affecting business, consumers, and the environment. Mr. Ballard was honored as Conservationist of the Year by the Chesapeake Bay Foundation in 1995.

Harold Delbert Slone

Retired VIMS staff member Harold Delbert Slone died Oct. 18 following a long illness. Mr. Slone

retired from VIMS in 1994 after 15 years of service.

Mr. Slone served as the laboratory manager for VIMS' water chemistry labs during the late 1970s and 1980s. It was during this time that major studies were undertaken of Hurricane Agnes's impacts, Kepone contamination of the James River, and potential impacts of oil and gas exploration off the Virginia coast. Mr. Slone helped to develop analytical techniques and to train many of the graduate students studying in the labs during that time. He was well known for both his attention to procedural detail and his dry sense of humor.

In his memory, should friends desire, contributions may be made to the VIMS Foundation, P.O. Box 1346, Gloucester Point, VA 23062.

Mike Spangler

Retired VIMS employee Mike Spangler passed away October 27. Mr. Spangler was shop foreman and lead fabricator in the Vessel Service Center from 1994-2004. He fought courageously against a form of cancer that drained his stamina, and suffered dramatic physical setbacks following periods of chemotherapy. Nevertheless, each day his diminished strength allowed he reported to work to complete projects that he knew would benefit the VIMS community. Mr. Spangler accomplished each of these goals and retired last April at 65.

Vessel Operations Director George Pongonis notes that “By his example, Mike taught those of us who worked beside him invaluable lessons in courage, hope and humility. He has been our hero.”

Taxonomy and Systematics, Marine Ecology, and Biological Oceanography.

He was a long-time member of the National Shellfisheries Association and served as President and Editor of the Journal. He was elected Honorary Life Member in 1983. In 1998 he received the David Wallace Award in recognition of his career-long efforts to use science for the betterment of shellfish management and a sustainable industry.

—Gene Burreson

Panel Explores U.S. Ocean Report



A group of marine experts from Virginia explored the Commonwealth's response to the recent U.S. Ocean Commission report during a September 22nd panel discussion at VIMS. The President is mandated to use the Commission's report as a guide for submitting a new national ocean policy to Congress. The program was introduced by Virginia Secretary of Natural Resources W. Tayloe Murphy, Jr. and moderated by VIMS Dean and Director Dr. John Wells. Panel members (L-R) were Ms. Laura McKay (Program Manager, Virginia Coastal Program), Dr. William Reay (Program Director, Chesapeake Bay National Estuarine Research Reserve), Dr. John Graves (Chair of VIMS' Fisheries Science Dept.), Dr. Cynthia Jones (Old Dominion University), Mr. Jack Travelstead (Chief, Fisheries Management Division, Virginia Marine Resources Commission), Ms. Ann Regn (Director of Environmental Education, Virginia Dept of Environmental Quality), and Ms. Vicki Clark (Virginia Sea Grant).

Researchers Study Ocean's "Internal Weather"

Satellites give a bird's eye view of Earth's weather to millions every day. Marked by swirling clouds, the weather systems that regularly sweep across the globe have become a familiar image of the daily news.

VIMS researchers are now involved in a multi-institution project to explore a less familiar kind of weather—the internal weather of the sea. Their goal is to better understand how ocean weather affects the tiny floating animals or "zooplankton" that support the marine food web.

The VIMS project, headed by Associate Professor Dr. Deborah Steinberg, is part of the larger "EDDIES" program led by Woods Hole Oceanographic Institution (WHOI) researcher Dr. Dennis McGillicuddy. Scientists from the Bermuda Biological Station, the University of Miami, Rutgers University, and the University of California are also participating.

Steinberg's post-doctoral researcher Sarah Goldthwait, graduate student Grace Henderson, and research technician Joe Cope sailed on the first two cruises of the 3-year project this summer, aboard the research vessel *Oceanus*. The 175-foot ship made a round trip from Woods Hole to Bermuda.

"The ocean has weather, just like the atmosphere," says Steinberg. "Our focus in this project is on the mesoscale eddies that spin through the North Atlantic." These ocean cyclones,

which can span hundreds of miles, are similar to the swirls of low and high pressure that determine much of everyday weather.

"Cold-core eddies" spin counterclockwise like low-pressure cells in the atmosphere and feature a core that is cooler than surrounding waters. "Warm-core eddies" spin clockwise and are relatively warm.

What makes eddies especially interesting to biological oceanographers is their nutrient content. The surface waters of the North Atlantic's Sargasso Sea typically lack the dissolved nitrogen and phosphorus needed to support abundant phytoplankton growth. Yet growth rates for these tiny marine plants can spike during almost any month. "We think that cold-core eddies may explain some of these peaks," says Steinberg. The researchers suspect that eddies draw nutrient-rich waters from depth up to the Sargasso's nutrient-poor surface. The sudden influx of nutrients into sunlit surface waters could fuel phytoplankton blooms that in turn send ripples all the way up the food chain and outward to affect the ocean's fundamental geochemical cycles.

But because eddies are transient, mobile features, they have proven difficult to study using fixed moorings or occasional ship visits. The EDDIES project is designed to overcome these sampling limitations by carefully tracking and studying a few selected eddies.

During this summer's cruises, the *Oceanus* crew explored five different eddies before focusing on a single, well-defined cold-core eddy just south of Bermuda. WHOI scientists had been tracking the eddies in satellite images long before the first cruise departed. Eddies can persist for months and travel thousands of miles. The researchers conducted two cruises separated by three weeks to assess changes over time in these dynamic ocean features.

Steinberg's team is exploring how the eddies' physical and biological features might affect the small animals that feed on phytoplankton. "Our overall goal is to better understand the role that eddies play in structuring zooplankton communities in space and time," she says.

One key question for the team is whether eddies concentrate zooplankton physically, by swirling them inward like debris in a tornado, or if the animals actively migrate upward into the eddy to feast on phytoplankton. Preliminary data show that zooplankton biomass is indeed higher within the eddy than in the surrounding seawater, notably along the eddy periphery.

Another question is how changes in zooplankton abundance and behavior within an eddy might affect the transport of carbon to the deep sea. During photosynthesis, phytoplankton take up carbon from atmospheric carbon dioxide that has dissolved in seawater. If this carbon subsequently sinks to the deep sea, it will contribute nothing to global warming and can remain there for thousands of years.

"Food webs in the Sargasso Sea and other open-ocean gyres are typically dominated by small phytoplankton and bacteria," says Goldthwait. These small cells are hard for larger zooplankton to find and eat, and they sink slowly if at all. Thus the carbon they contain is normally recycled back into the surface ocean and atmosphere before it ever reaches the depths.

But nourishment of open-ocean food webs by a passing eddy might help pump this carbon to the abyss. If the added nutrients promote the growth of larger phytoplankton species and these are eaten by zooplankton that produce heavy fecal pellets, the carbon incorporated in their tissues can sink to the depths relatively quickly. In fact, on the summer's first cruise, the abundance of fecal pellets found in traps that collect



VIMS graduate student Grace Henderson (L) and post-doctoral associate Sarah Goldthwait (R) on the deck of the *R/V Oceanus*.

sinking material was much higher inside than outside the eddy.

Goldthwait, Henderson, and Cope studied zooplankton communities using a high-tech instrument called a MOCNESS plankton net (for Multiple Opening and Closing Net Environmental Sampling System). Unlike traditional plankton nets, which are continually open and thus mix organisms from all depths sampled, the MOCNESS has a set of nets that can be programmed to individually open and close at a particular depth, allowing study of zooplankton from discrete water levels. They deployed the net 21 times within the Bermuda eddies.

The researchers are now comparing zooplankton captured from inside the cold-core eddy with those collected in surrounding waters. This will help determine whether the animals moved into the eddy to feed or were swept in by its rotation.

The researchers are using a suite of laboratory tools to determine the zooplankton's diet and health. Analysis of stomach contents shows the kinds and amount of phytoplankton consumed. Analysis of fatty tissues sheds light on diet, as well as overall health. They are also examining the ratio of RNA to DNA within the animals' cells. Elevated RNA levels indicate rapid growth and metabolism, which in turn suggests access to abundant food.

"Eddies perturb the chemical and biological environment on a global scale and dramatically impact biogeochemical cycling in the ocean," says Steinberg. "Ultimately, our experiment could provide critical information about how the ocean has responded to environmental changes in the past, and how it might do so in the future."

Both Steinberg's project and McGillicuddy's EDDIES project were funded by the National Science Foundation. They will run through 2006.

WILLIAM & MARY
VIRGINIA INSTITUTE OF MARINE SCIENCE

Web Update

Welcome
Research
Education
Advisory Services
Administration
Resources
News & Media

After Hours Seminar
This site enhances VIMS' monthly series of public lectures by providing background materials and web links for past and upcoming talks. The site also provides an opportunity to suggest a seminar topic, reserve a space, and evaluate speaker performance. Visit www.vims.edu/afterhours

MACOSEE
VIMS now hosts the website of the Mid-Atlantic Centers for Ocean Sciences Education Excellence (MACOSEE; see article on p. 8). Visit <http://www.macossee.net/>

DOMINO
Visit www.vims.edu/domino to learn about the 5-year DOMINO project (for Dissolved Organic Matter IN the Ocean). This \$1.7 million, multi-

institution grant from the National Science Foundation is led by VIMS researchers Deborah Bronk, Walker Smith, and Deborah Steinberg.

Publications and Print Shop
This site describes publication services and prices, answers frequently asked questions about creating posters and other materials, provides access to commonly requested logos and images, provides an order form for requesting VIMS promotional brochures, and introduces staff. Visit www.vims.edu/pubs/

Volunteer Forms
Those interested in volunteering at VIMS can now submit an application form on-line. Visit <http://tethys.vims.edu/general/volunteer.cfm>

Calendar of Events

—January 2005—

- 15 TOGA Meeting
 27 Council Meeting
 Foundation Board Meeting
 After Hours Lecture - Striped Bass / Mycobacteriosis
 28 Seminar Series - Building Ocean Observatories
 (Dr. Oscar Schofield, Rutgers University)

—February 2005—

- 11-12 Blue Crab Bowl, VIMS Campus
 24 After Hours Lecture - Ancient Life of the Chesapeake Bay

—March 2005—

- 18 Seminar Series - Ecological Genomics
 (Dr. Alison Murray, Desert Research Institute)
 25 Seminar Series - Dissolved Organic Matter
 (Dr. Sybil Seitzinger, Rutgers University)
 31 After Hours Lecture - Backyard Landscaping for the Bay

—April 2005—

- 8 Seminar Series - Flood Sedimentation
 (Dr. Rob Wheatcroft, Oregon State University)
 15-16 Alumni Reunion
 28 After Hours Lecture - TBA
 29 Art Show / Auction

—May 2005—

- 20-21 Raft-Up for VIMS
 21 Marine Science Day
 26 After Hours Lecture - TBA

For an up-to-date listing of public events and seminars at VIMS, visit the on-line calendar system at www.vims.edu/calendars/

For more information call 804/684-7846 or 804/684-7001.

Visit our website at www.vims.edu



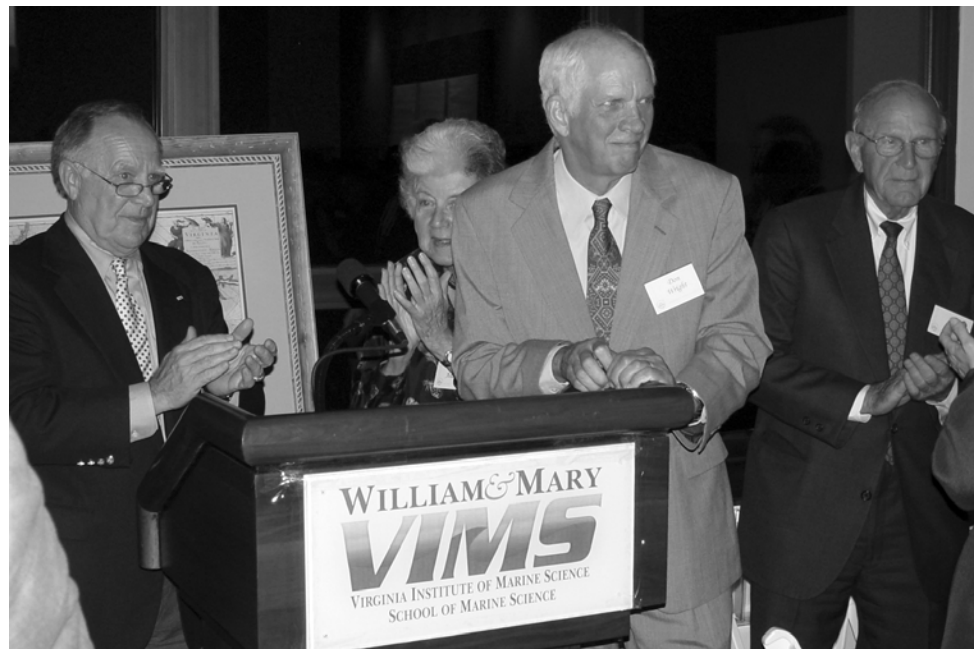
Pete Clay (L), chair of VIMS' Annual Fund Board, joins Jan and Cal Boyd (C) and Del. Harvey Morgan (R) to watch champion shucker Deborah Pratt prepare oysters for guests at the Kauffman Aquaculture Center on October 6th. The oyster tasting, a barbecue buffet, and a tour of the newly dedicated building were part of Associates Day, VIMS' annual event to honor and recognize donors.

Council Welcomes New Members

The VIMS Council welcomed four new members during its quarterly meeting in September. Dr. David C. Bosworth is Medical Director of Riverside Hospital and previously served as a Lieutenant Commander in the U.S. Navy Medical Corps. Ms. Michela English was President of Discovery Consumer Products until March of 2004 and previously had been President and COO of Discovery.com and Discovery Enterprises Worldwide. She has also served as Senior Vice President for the National Geographic Society. Mr.

Donald H. Patterson, Jr., is the retired Executive Vice President, Landmark Communications and President, Landmark Broadcasting. He serves as President of the Virginia Aquarium and Marine Science Center Foundation, and as a member of the Virginia Beach Wetlands Board, Chesapeake Bay Foundation, and Virginia Maritime Heritage Foundation. Mr. Thomas Young retired from Lockheed Martin in 1995. He previously served as Director of NASA's Goddard Space Flight Center and President and COO of Martin Marietta. Mr. Young began his

Maury Society Honors Wright, Awardees



VIMS Council Chair Carroll Owens (L) and other audience members recognize outgoing Dean and Director L. Donelson Wright for his nine years of service to VIMS. Wright and winners of the 2003 service and student awards were acknowledged during the annual Maury Society Dinner on September 22nd. Diners also recognized the establishment of three fellowship endowments: The Edward Holland Fellowship, Juliette B. and Carroll W. Owens, Sr. Fellowship, and the Kathleen and Robert Roper Fellowship. These endowments will help address one of VIMS' top Campaign priorities—raising \$4 million for graduate student fellowships. A fourth endowment in honor of Page Hayden Young will help VIMS meet its most pressing needs.

career with NASA in 1961 at the Langley Research Center and was a member of the Lunar Orbiter Project Team and Mission Director for Project Viking. He became Director of the

Planetary Program at NASA Headquarters in 1976 and was later appointed Deputy Director of the Ames Research Center.