

The Crest

Current Issues in
Coastal Ocean and
Estuarine Science

Menhaden Researchers Pay Big Attention to a Small Fish

An interdisciplinary group of VIMS researchers is busy studying Atlantic menhaden, small schooling fish that play a big role in Chesapeake Bay ecology. The group's research will help inform the debate that is currently swirling around this fish, its commercial harvest, and the recreational fisheries that target menhaden predators such as striped bass.

Researchers at VIMS and other institutions are working to determine the abundance of menhaden in the Bay, to quantify the role that menhaden play in filtering water and sustaining predators, and to better understand the process by which young menhaden are "recruited" into the adult population.

Dr. Rob Latour, who leads the project to estimate the Bay's menhaden population, says that research at VIMS will "help provide the data needed to manage Chesapeake Bay menhaden stocks in a sustainable manner."

VIMS Dean and Director John Wells notes that the menhaden projects "are a good example of the key role that VIMS plays in fulfilling its state mandate of providing unbiased scientific advice on sometimes contentious resource issues."

To date, reliable data on the potential effects of commercial fishing on the Bay's menhaden population have been lacking. The Atlantic States Marine Fisheries Commission (ASMFC), the

regulatory body charged with managing East Coast menhaden stocks, noted in an October 2005 addendum that "Sufficient scientific data are not available to satisfactorily address the potential for localized depletion in the Bay..."

The 2005 ASMFC addendum also instituted a harvest cap on the commercial menhaden fishery in Chesapeake Bay at the average landings from 1999-2004. The cap will extend from 2006 to 2010.

The status of the harvest cap is currently unresolved. Virginia's Attorney General ruled in January 2006 that the ASMFC had exceeded its regulatory authority when adopting the cap. Subsequently, during the 2006 legislative

session, the Virginia General Assembly killed or withdrew four bills to implement the cap.

If Virginia takes no other action to implement the cap before the July 1 deadline, the ASMFC Menhaden Management Board will rule on Virginia's possible non-compliance at its August meeting.

Atlantic menhaden (*Brevoortia tyrannus*), which inhabit near-shore waters along the Atlantic seaboard from Nova Scotia to Florida, support one of the most commercially important fisheries on the Atlantic Coast, providing fish meal, fish oil, and bait for other

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Sea Grant Renews Collaborative Effort to Manage Cownose Rays

A multi-agency effort to restore native oysters to a Chesapeake Bay tributary suffered a setback on May 18th when cownose rays ate more than 90 percent of the 775,000 oysters that researchers had planted in the Piankankank River between early April and mid-May.

This and other similar episodes during the last few years have encouraged a collaborative team of marine scientists, resource managers, watermen, and seafood-industry representatives to renew their efforts to develop effective methods for sustainably managing cownose rays in Chesapeake Bay.

The current effort, spearheaded by Bob Fisher, a Commercial Fisheries Specialist in the Virginia Sea Grant College Program at VIMS, builds on previous attempts to manage rays in Chesapeake Bay and other estuaries along the Atlantic seaboard and Gulf Coast. Those efforts stretch back to the early 1970s.

Fisher is more hopeful this time around, believing that a unique junc-

ture of events—a renewed emphasis on restoration with disease-resistant oysters, more venturesome chefs, and new technologies that provide easier penetration of international seafood markets—will provide the impetus, funding, and political will needed to effectively manage cownose rays.

"Timing is everything," says Fisher.

The ray team, which held a two-day workshop in Yorktown in early June to catalyze future efforts, is considering a wide variety of possible management measures to help reduce the rays' predation on oysters and other commercially valuable shellfish.



Well-known Virginia Chef John Maxwell prepared a ray dish that was eagerly consumed by workshop participants, confirming the consistently favorable impressions of ray meat revealed in previous taste tests. He says that rays could be the "next big thing" in culinary circles.

Workshop participants discussed two main approaches: reducing ray numbers by developing a commercial or recreational fishery for the species, and excluding rays from shellfish beds by fences, cages, or chemical repellents.

Fisher and others stressed throughout the workshop that any measures to fish the rays would have to proceed in a sustainable manner. Rays, like their cousins the sharks, grow slowly and have very low reproductive rates. They are thus particularly susceptible to fishing pressure.

"The best available data suggest that cownose rays mature in five to seven years and only produce one pup per year," says VIMS shark expert Dr. Dean Grubbs. "This makes them inherently susceptible to over-fishing, and presents special challenges in managing a sustainable fishery."

People have been interacting with cownose rays since long before Captain John Smith's infamous encounter near the mouth of the Rappahannock River in 1608 (he was stung by a ray while trying to spear it with his sword, nearly died from the injury, then recovered to eat the ray for dinner). Archeologists have

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Food-Web Study Aids Management of Biodiversity

Biodiversity—typically defined as the variety and number of organisms in an ecosystem—is decreasing around the world as human activities fragment and destroy natural habitats.

Many scientists consider the loss of biodiversity—and the consequent loss of the “ecosystem services” that diverse, healthy ecosystems provide—as one of the most pressing environmental issues facing the planet.

A new paper by VIMS graduate student Kristin France and advisor Dr.

Emmett Duffy in the prestigious international journal *Nature* adds a surprising wrinkle to biodiversity research by suggesting that increasing the connectivity among the patches of a fragmented habitat—the goal of many of ecosystem restoration efforts—may in some cases be counterproductive.

Ecosystem services are fundamental processes—like nutrient cycling and the transfer of sunlight into plant matter—that nature provides to humanity. Previous studies have suggested that losses in biodiversity would render these services unstable through time—thus stressing the inhabitants of an ecosystem by continually exposing them to changing conditions.

The studies suggest that the flip side is also true. “The consensus has been that the more diversity you have, the more stable the system is,” says Duffy. “It’s less variable through time.”

Ecologists like Duffy and France describe biodiversity’s stabilizing effect on ecosystem services by borrowing from the world of finance. “The analogy that’s often used is the ‘portfolio effect,’” says Duffy.

“The more diverse your portfolio, the less variable your total stock value is through time,” explains France. “Likewise, the more species you have in an ecosystem, the more stably your ecosystem functions.”

The application of the portfolio effect to ecological theory makes common sense. “It’s essentially saying that it’s

better not to put all your eggs in one basket,” says Duffy.

But the analogy conceals an important caveat that reflects the limitations of basing management decisions on the early experimental studies that inform much of biodiversity theory.

These seminal studies examined changes in biodiversity and ecosystem function through time, using small plots of prairie grasses or a Petri dish full of microbes—organisms that are readily available and don’t move.

France and Duffy’s research added an extra layer of complexity, and realism, by adding mobile animals—small shrimp-like creatures called amphipods—to a collection of five seawater tanks containing seagrass. The researchers then monitored the health and diversity of these experimental systems both when pipes connected the tanks and when the tanks were isolated.

In doing so, they more closely mimicked conditions in the natural world, where the movement of individuals and species among different habitats is the mechanism that creates and maintains diversity.

“What Kristin has done is to turn the issue on its side,” says Duffy. “She looked at how biodiversity influences the predictability of ecosystem services in space. At first glance, you might expect that predictability would be the same in space as it is in time. But it turns out that at least in this system, it’s not.”

“The thinking has been that when you increase diversity you are going to increase predictability in space,” says France. “We found the exact opposite. The more species we had in a system, the more different the patches were from each other, in terms of the variety of species, the variability of the grass biomass, and the total number of grazers in each patch.”

France’s research holds important implications for the management of natural resources, as it suggests that complete connectivity among patches within a fragmented habitat may not always be the optimal goal. It also suggests that maintaining stable ecosystem services will require preservation of a variety of both species and habitats.

“Ordinarily, we think of connecting patches as a good thing,” says France. “Often you need to have habitats connected so that animals across all the patches can immigrate and emigrate to keep populations viable. But we found that when the patches were unconnected, having a greater variety of species across the patches stabilized production across that whole landscape through time.”

“It might be an important thing to think about when designing marine reserves,” she adds. “There may be an optimum level of connectivity for maintaining populations and yet not having the populations fluctuate exactly in synch, so that their ecosystem processes can be somewhat buffered through time.”

Duffy clarifies the importance of limited connectivity by returning to the portfolio analogy.

“The mechanism for the portfolio effect is that the individual elements—whether they be stocks or species—are doing things more or less independently. Individual stocks are fluctuating out of phase with one another. The same thing is likely to happen when you have a collection of unconnected patches, because they are not interacting with one another.”

France and Duffy’s unconnected patches are thus akin to a portfolio that consists of stocks from different industries. “If you have several diverse, unconnected industries in a portfolio, you’re likely to have more stability at any given point in time than you would among the stocks within a single industry,” says Duffy.

But when the patches are connected, “all bets are off,” says France. “The patches become more synchronized,

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VIMS graduate student Kristin France checks the status of her experimental seagrass communities, five-gallon buckets filled with clumps of seagrass and small shrimp-like crustaceans called amphipods. The buckets were either isolated or connected by plastic tubing. The tubing provides “dispersal corridors” for the mobile crustaceans.

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Horodysky Throws Light on Fish Vision

Andrij Horodysky's research can be summed up in a simple saying—what you see is what you get.

Horodysky, a VIMS graduate student working with faculty members Drs. Rich Brill, Rob Latour, and Jack Musick, is using electroretinography—a technique first developed for studying human vision—to explore how fishes see the underwater world of Chesapeake Bay.

Brill, an internationally recognized fish physiologist who heads NOAA's Cooperative Marine Education and Research (CMER) program at VIMS, has recently turned his attention to the sensory world of fish and other marine organisms.

The research is part of an emerging field called "visual ecology" that promises to throw new light on animal behavior and the interactions between predators and prey. Horodysky and his advisors are pioneers in applying this field to Bay fishes.

The researchers are focusing their initial studies on recreationally important Bay species such as striped bass, weakfish, croaker, and drum. This reflects the source of their funding, which comes from the Recreational Fishing Advisory Board of the Virginia Marine Resources Commission. The Board uses money from Virginia's saltwater fishing license to fund projects that improve the Commonwealth's recreational fisheries.

Horodysky also benefits from collaborations with Charter captains like Steve Wray, who provide him with the fish he needs for his experiments.

Horodysky's preliminary results provide basic insight into how Bay fishes see the world. The results show that some species, like striped bass, are adapted to see large, swiftly moving prey in daylight. Others, like weakfish, are adapted to see small, sluggish prey at night.

He is also comparing the types of prey that fishes are adapted to see with the prey items that are actually in their stomachs—with some surprising results that could hold important implications for fisheries management in coastal waters.

Electroretinography involves exposing the eye of an anaesthetized fish to all the colors of the rainbow and more—from ultraviolet to infrared—and then using electrodes to record which wavelengths elicit a response on the fish's retina. Horodysky conducts these tests night and day to account for rhythmic changes in the structure of the fish's eye.

Even though Horodysky keeps his fishes in a dark laboratory, the rod and cone cells in the fishes' eyes still shift position in concert with sunrise and sunset. The color-sensitive cone cells move toward the surface of the retina during daylight hours, and retreat to make room for the contrast-sensitive rod cells at night. This "circadian rhythm" changes with the seasons, which makes for some late nights for Horodysky during summer, when he is not able to start his dim-light experiments until 8 or 9 in the evening.

"The end result of these experiments," says Horodysky, "is the ability to unambiguously ask the retina whether it can see a particular color, and whether it can resolve the color in bright or dim light."

He also tests the fish's "flicker fusion frequency," essentially the shutter speed of its eye. Humans have relatively "fast" vision and can discern the flickering of a light or image at up to 60 cycles per second (that's why TV screens, fluorescent lights, and computer monitors are designed to flicker at a rate faster than this threshold). Values in marine



VIMS graduate student Andrij Horodysky (L) and faculty advisor Dr. Rich Brill (R) are studying the "visual ecology" of popular recreational fishes from Chesapeake Bay. Horodysky's red-light head lamp allows him to work in the dark without affecting his experiments.

W&M Bestows Honorary Doctorate on Van Engel

VIMS Professor Emeritus Willard A. Van Engel received an honorary doctorate of science from W&M Chancellor Sandra Day O'Connor during commencement ceremonies at The College of William and Mary in May.

Van Engel is credited with being one of the individuals responsible for the creation of the Virginia Institute of Marine Science, when in the mid-1940s he and colleagues at the Virginia Fisheries Laboratory developed the scientific community that later became VIMS.

Van Engel conducted research and taught at VIMS until 1985 when he retired at age 70. Upon retirement, he had dedicated 39 years of his life to VIMS and its School of Marine Science.

Van Engel, also known as "Van,"

led the way with cutting-edge research in the Chesapeake Bay and was a pioneer in many marine science research areas, including his seminal work on blue crabs and the blue-crab fishery.

Van Engel is also credited with first recognizing the need for keeping duplicates and reprints of scientific papers and reports in one centralized location—an effort that grew to become the VIMS Library. He has also been a strong supporter of the college and his generosity has allowed for the Van Engel Graduate Fellowship and VIMS Library to continue in perpetuity.

In 2003, VIMS awarded Van Engel with its first ever Lifetime Achievement Award for his outstanding contributions to the state and the college.



Dr. Willard van Engel receives his honorary doctorate from William and Mary Chancellor and former U.S. Supreme Court associate justice Sandra Day O'Connor during commencement ceremonies at the College on May 14th. Photo by Steve Salpukas.

fish range from around 25 in swordfish, which require a "slow shutter speed" to detect prey in the deep, dark waters where they spend their days, to around 55 for mahi-mahi, which often hunt at the surface in the sunlit tropics.

Horodysky's research shows that striped bass are most sensitive during daylight hours to a wide range of colors from blue to red, with a peak at chartreuse. They have a flicker fusion frequency of around 50, relatively fast for a fish, which allows them to track large, quick-moving prey like menhaden.

Compared to striped bass, weakfish have slow vision (around 25 cycles per second) and are more sensitive to contrast than color. This allows them to see best under dim conditions, just right for detecting the small fish and shrimp that prowl the nighttime Bay. They also have the unusual ability to see in ultraviolet.

Seeing in ultraviolet is a dangerous proposition, says Brill, as UV light is very damaging to cells and even DNA. Using UV light allows weakfish to distinguish between dark and light objects in dim conditions, but forces them, like bats and owls, to avoid bright sunlight.

"There's no such thing as a free lunch," says Brill. "You can have a really good UV-sensitive eye, but then you have to work at night."

"Even though these two predators may swim side-by-side, they exist in different visual worlds," adds Horodysky.

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VIMS is again hosting a group of high school students this summer as part of the Virginia Governor's School, a five-week summer residential program provided in cooperation with Christopher Newport University. The program has for 15 years provided high-achieving Virginia high school students with marine research experiences in which each student works with a faculty sponsor on an authentic VIMS research project. From L: Lauren Jarlenski (T.W. Williams High School, Alexandria), Rachel Clark (Deep Creek HS, Chesapeake), Maitreyi Nagarkar (Westfield HS, Chantilly), Devin Nameroff (Oakton HS, Vienna), and Matthew Hinson (Hickory HS, Chesapeake).

Cownose Rays continued from page 1

found ray teeth in Native American sites dating back to the pre-colonial period.

Today, the ray-human conflict hinges on the rays' appetite for shellfish species that people also like to eat, including soft and hard clams, oysters, and bay scallops.

Jim Wesson of the Virginia Marine Resources Commission and other workshop participants suggested that the apparent increase in ray-human conflicts is largely due to the demise and contraction of shellfish resources.

Sea Grant Commercial Fisheries Specialist Mike Oesterling noted that oyster growers lodged their first major complaints of ray predation in the mid-1970s, shortly after Tropical Storm Agnes drastically reduced the number of soft clams (*Mya arenaria*) in the Bay. Soft clams are the rays' preferred prey.

Workshop participant Dr. Pete Peterson, of the UNC Institute of Marine Science, also attributes the conflict to increasing ray numbers, arguing that ray populations are growing due to recent declines in shark stocks. Coastal sharks such as the dusky, bull, and great hammerhead are the main predators of migrating rays.

Grubbs agrees that shark populations have declined—data from the

VIMS Shark program indicate that the dusky shark population declined by about 90% during the 1980s and currently hovers around 20% of pre-exploitation biomass—but he hesitates to link the sharks' decline to any increase in the ray population. In fact, Grubbs contends that there is no hard evidence for a growing number of rays in Chesapeake Bay.

During the workshop, Grubbs presented data—both anecdotal and scientific—suggesting that cownose rays have always occurred in large numbers in Bay waters. Fossil ray teeth are common in sediments around the Bay, Capt. John Smith's crew "took more [rays] in an hour than [they] could eat in a day," and a North Carolina researcher reported the capture of 200,000 cownose rays in the Potomac River in 1964.

More recently, a 1988 aerial survey by VIMS graduate student Robert Blaylock revealed a school of cownose rays near the Bay mouth that covered more than 1,000 acres and held an estimated 5,000,000 animals.

Learning more about the current status of rays in the Bay—their abundance, migratory patterns, and life history—is, along with marketing studies, at the heart of Fisher's current effort.

"Lots of things have changed in the Bay since the last major study of

cownose rays in the 1970s," says Fisher. Changes include the demise of the Bay's soft clams, continued declines in oyster populations, reductions in water quality, and the onset of aquaculture for hard clams, and increasingly, oysters.

Fisher has begun collecting rays from throughout the Virginia portion of the Bay with an eye toward answering the many outstanding questions concerning ray ecology. Study of the first specimens, which he gathered near the Bay mouth in May—just as the rays began their summer migration into Bay waters—shows that ray schools contain about equal numbers of males and females, and that all the rays are hungry.

"They're showing classic migratory behavior," says Fisher. "Their stomachs were absolutely empty when they arrived in the Bay." Many animals do not eat while migrating.

A better understanding of basic ray biology will help regulators manage rays more effectively if current efforts to develop a ray fishery prove successful.

Longstanding obstacles to developing that fishery—the difficulty of handling an animal with a venomous tail barb, the animals' patchy distribution, the bloodiness of their meat, and relatively high production costs—remain. However, Fisher and other workshop participants believe that demand from

VIMS VESSELS BY THE NUMBERS

- **1,200** Number of research trips logged on the boats in VIMS' fleet of trailerable vessels in 2005
- **65** Length (in feet) of VIMS' longest V-hulled vessel, the R/V *Bay Eagle*
- **40** Total number of research vessels in the VIMS fleet, including vessels at the Eastern Shore Lab
- **23** Number of vessels named after sea- or shorebirds, all at Gloucester Point (the *Bay Eagle*, *Egret*, *Fish Hawk*, *Gannet*, *Grebe*, *Heron*, *Loon*, *Mallard*, *Marsh Hen*, *Osprey*, *Pelican*, *Petrel*, *Phalarope*, *Rail*, *Ruff*, *Sandpiper*, *Scoter*, *Seagull*, *Shearwater*, *Skimmer*, *Skuua*, *Teal*, and *Widgeon*)
- **7** Number of vessels named after mollusks, all at the Eastern Shore Lab (*Ensis*, *Macoma*, *Mulina*, *Mya*, *Oyster*, *Scallop*, and *Surf Clam*)
- **86** Certified operators in charge of trailerable vessels. Certification requires successful completion of courses in boating and CPR, flare and fire-extinguisher training, and demonstrated proficiency in vessel operation
- **40** Speed (in mph) of VIMS fastest vessel, the R/V *Scallop*, a 25-ft. Parker with twin 150-horsepower engines
- **41** Draft (in inches) of the R/V *Pelican*. This vessel, a former U.S. Navy landing craft, can literally beach itself, thus providing access to shallow, high-energy coastal waters where other research vessels fear to tread.

**For ray recipes, visit
www.vims.edu/rayrecipes**

existing and emerging markets may help overcome these barriers.

During the workshop, Shirley Estes of the Virginia Marine Products Board reported on the success of her recent efforts to gain the attention of seafood markets in South Korea, which currently import \$18 million in ray meat per year. She also described the emerging Asian market for ray skin, which is increasingly being used to craft high-end products such as wallets and handbags.

A panel of watermen described how cownose rays affect their business. Mike Peirson of Cherrystone Aqua Farms, the largest grower of littleneck clams in Virginia, says that use of mesh nets effectively deters predation by rays. However, he notes that his company devotes about 30% of its labor costs to uncovering clam beds that rays bury with sediment while digging up soft clams that grow in the aisles between the planted beds.

"It's a major source of extra expense," says Peirson.

Fisher closed the workshop on a promising note, describing a series of experiments he plans for later this summer to test chemical repellents for cownose rays. He's collaborating in the experiments with Shark Defense, Inc., a New Jersey company that has successfully developed chemical repellents for blacktip reef sharks and other species.

Research Reveals that Lobsters Avoid Sick Neighbors

Ever tried to avoid a coworker who comes into the office with a runny nose and the sniffles? Turns out that lobsters can do you one better.

A new study by researchers at Old Dominion University and VIMS shows that Caribbean spiny lobsters, normally gregarious creatures that live together in underwater caves, will avoid other lobsters that are infected with a lethal virus called PaV1. They do so weeks before the sick lobsters show any obvious outward signs of disease.

The research, by ODU scientist and lead author Mark Butler, ODU post-doctoral student Donald Behringer, and VIMS scientist Jeff Shields, appeared in the May 25th issue of the prestigious international journal *Nature*.

"This is the first record of healthy animals avoiding diseased members of their own species in the wild," says Shields.

The researchers suspect that healthy lobsters are using their exquisite sense of smell to detect and avoid diseased neighbors, just like they do to choose mates, feed, and establish dominance hierarchies.



A Caribbean spiny lobster (*Panulirus argus*) near the NOAA underwater habitat *Aquarius*, Key Largo, Florida Keys National Marine Sanctuary. Photo by Dr. Mark Patterson.

Butler, Behringer, and Shields have been studying the PaV1 virus in wild lobsters for several years, in an attempt to better understand the disease, how it spreads, and how it might affect the commercial exploitation of the species. The Caribbean spiny lobster (*Panulirus argus*) is a popular seafood item that is commercially fished throughout its range, with the bulk of landings from the Florida Keys.

Behringer first noticed the PaV1 virus while drawing blood during a separate study of how lobsters molt. He noticed that the blood of many lobsters was milky rather than clear, as in healthy lobsters.

During subsequent field studies, the researchers noticed that infected lobsters only rarely shared shelters with other lobsters, even though healthy lobsters generally prefer to live

together in dens.

To test whether this could be explained by healthy lobsters avoiding diseased neighbors, they set up a laboratory experiment in which healthy and diseased lobsters were given a choice between an empty den and one containing either a healthy or a diseased individual.

What they found was telling—healthy lobsters avoided dens containing diseased lobsters, preferring instead to share dens with other healthy lobsters. Diseased lobsters did not discriminate between dens, regardless of whether the animal inside was sick or well.

Other evidence from the laboratory and field shows that avoidance of diseased neighbors likely helps curb the spread of disease in the wild. When healthy juvenile lobsters are confined in the lab with lobsters infected with the virus, more than 60% of them succumb within 80 days. The rate of infection in wild populations in Florida is only 7%. The avoidance of sick neighbors likely explains the difference.

The ability of healthy lobsters to detect and avoid infected, though not as yet infectious, neighbors provides an important evolutionary advantage, says Shields. Lobsters that have this ability are more likely to survive, breed, and pass on the trait to their offspring.

Art Auction Raises \$60K for VIMS

The 2006 VIMS Art Show and Auction featured the works of world-renowned marine conservationist and artist Dr. Guy Harvey, along with items



The 2006 VIMS Art Show and Auction featured the works of world-renowned marine conservationist and artist Dr. Guy Harvey (R), who has worked closely on several projects with VIMS fisheries scientist Dr. John Graves (L). Harvey earned the first-ever "Lifetime Achievement Award" from the International Game Fish Association in 1998. In 2004, his 13-episode, made-for-television fishing series "Portraits from the Deep," aired on the *Outdoor Life Network*. His new one-hour documentary "Billfish: A Challenge for Survival" is currently airing on PBS. Photo by Bob Carroll.

donated by numerous local artists and businesses. The auction, which was organized by co-chairs Bootsie McCracken, Candy Campbell, and Ginny Lascara, netted more than \$60,000 for VIMS programs, twice as much as the 2005 auction. This year's recipients of auction proceeds include the CBNERRVA Middle School Marine Science Project, graduate-student research support at VIMS' Eastern Shore Laboratory, and a fisheries genetics project to track the invasion route of the non-native marine snail *Rapana venosa*.



Art Show and Auction Committee chairs Candy Campbell (L) and Bootsie McCracken (R) watch the auction unfold.

Marine Science Day "Paper Parade"



Participants in the "Paper Parade of Marine Life" (L to R: a blue crab, jellyfish, and horseshoe crab) stroll through the VIMS campus during the Institute's Marine Science Day open house on Saturday, May 20th. The annual event drew an estimated 1,800 children and adults to Gloucester Point for a fun and educational day that allowed visitors to examine high-tech science equipment, tour a laboratory, collect and observe aquatic animals in the York River, and discover the importance of wetlands in VIMS' Teaching Marsh. Cooking demonstrations, mini-lectures, and "hands-on" activities took place throughout the day, and a Children's Center provided lots of fun, hands-on activities for the younger set. Marine Science Day is supported by donations from Chesapeake Bank, Dominion, Ferguson Enterprises, Gloucester-Mathews Gazette-Journal, John & Julie Dayton, Kanawha Land Company, Ken Houtz Chevrolet-Buick, Southside Bank, The Owens Foundation, Wanchese Fish Company, and the York Chapter of the Chesapeake Bay Foundation.

Miselis Chosen as Foster Scholar

VIMS graduate student Jennifer Miselis has been awarded a prestigious Dr. Nancy Foster Scholarship from the National Oceanic and Atmospheric Administration (NOAA) for her work to better understand the interaction between coastal geology and beach erosion.

Miselis is pursuing a Ph.D. degree at VIMS under the guidance of faculty advisor Dr. Jesse McNinch. Their field studies of the barrier islands of Virginia and North Carolina are helping to explain how the depth, extent, and configuration of near-shore sand bars affect beach erosion and build-up, particularly during and after major storms.

Miselis's most recent findings, soon to appear in the *Journal of Geophysical Research*, indicate that the volume of sediment in the surf zone is a better

predictor of long-term shoreline changes than conventional parameters such as shoreface slope or grain size.

"A volume metric that accounts for both seafloor geology and morphology better represents the geologic character of the shoreface and may help to improve existing predictive models of shoreline change," says Miselis.

"That's a very important finding," says McNinch. "Particularly in light of continued coastal development along the nation's vulnerable barrier-island shorelines."

Miselis is one of only five graduate students from the around the nation chosen for the 2005-2006 Foster award. The other four recipients hail from the University of California San Diego, the University of Rhode Island, Oregon State University, and the University of Georgia.

Miselis's receipt of the Foster Scholarship is particularly impressive, says McNinch, as it follows closely on the heels of another prestigious award—the

National Defense Science and Engineering Graduate Fellowship—which supported the first three years of Miselis's research.

The Dr. Nancy Foster Scholarship recognizes the career contributions of its namesake, who served as NOAA's Assistant Administrator for Oceanic Services and Coastal Zone Manage-



Jen Miselis

ment, and Director of the National Ocean Service. Foster's early understanding of marine ecosystems and their conservation, and the need to consider the interdependent roles of organisms in marine ecosystems, set her apart as a pioneer and visionary.

The Foster Scholarship Program provides support for outstanding scholarship and encourages independent graduate-level research in oceanography, marine biology, or maritime archaeology, particularly by women and members of minority groups. The scholarship carries a 12-month stipend for each student of \$20,000 and an annual cost-of-education allowance of up to \$12,000. Masters students may be supported for up to two years, and doctoral students for up to four years. About four scholarships are awarded each year.

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fisheries. Most of the catch is made by purse seine for the reduction fishery (in which menhaden are "reduced" to fish meal and oil).

Following industry consolidation and closure of most state waters to the reduction fishery in the 1980s and early 1990s, more than half of the total menhaden harvest has shifted to Chesapeake Bay (the remaining harvest, of the closely related Gulf menhaden *Brevoortia patronus*, takes place largely in the Gulf of Mexico).

The concentrated harvest in Chesapeake Bay has raised concern among recreational anglers and conservation groups, who fear that it will disrupt the menhaden's ecological role as a forage fish and filter feeder in Bay waters.

Atlantic menhaden are a favorite food of striped bass, bluefish, sea trout, tunas, sharks, and sea birds. They also consume large quantities of plankton, thus helping to maintain water clarity.

Although the ASMFC's most recent stock assessment indicates that the coast-wide menhaden stock is not over-fished, anecdotal evidence suggests that menhaden abundance in the Bay has declined since the 1980s. A related concern is that low recruitment of juvenile menhaden may decrease the species' ability to serve as a major food source for other fish.

In 2004, the ASMFC's Atlantic Menhaden Technical Committee realized that it could not address these concerns in the absence of reliable data. The

Committee thus identified four research goals: to determine menhaden abundance in the Bay; estimate the removal of menhaden by predators; quantify the exchange of menhaden between Bay and coastal systems; and quantify the recruitment of menhaden larvae to the Bay.

Latour, along with colleagues at VIMS, the Maryland Dept. of Natural Resources, the U.S. Fish and Wildlife Service, and NOAA's Environmental Technology Laboratory, are focusing on the first goal, by testing the feasibility of using LIDAR and sonar as fishery-independent tools for assessing the size of the Chesapeake Bay menhaden stock.

LIDAR (for Light Detection and Ranging) and SONAR (for Sound Navigation and Ranging) are technologies that use the strength of reflected pulses of light or sound to distinguish among materials with differing compositions or surface properties, such as water and fish tissue.



Juvenile menhaden. Photo by Chris Crippen.

The goal of Latour's two-year study is to determine whether use of an airplane-mounted LIDAR unit, a boat-mounted sonar unit, or some combination of these two technologies can detect and quantify menhaden schools, thereby providing a rapid, reliable, and relatively inexpensive means for estimating menhaden populations in the Chesapeake.

Traditional fishery surveys (in which scientists tow a net behind a research vessel for a standardized time period along numerous randomly chosen transects) are prohibitively expensive for this purpose, and are also poorly suited for counting menhaden and other fish that travel in discrete schools and instinctively flee oncoming sampling nets.

"Because both LIDAR and sonar techniques can survey a large area quickly, we expect a significant cost savings as compared to a large-scale survey using traditional fishing gear," writes Latour. "Calibration of both techniques during the first year and comparisons between

both techniques and the fishery during the second year will facilitate full-scale implementation of future menhaden surveys."

VIMS researcher Dr. Mark Brush is leading a related three-year project that will use a state-of-the-art computer model to quantify the role of menhaden as prey items and filter feeders in the Bay.

Brush's team will couple the bay-wide assessment of the menhaden stock with a laboratory study of menhaden diet and feeding behavior. They will use these results to model the "bioenergetics" of menhaden on both the individual and population level, and then couple the bioenergetics model to two different food-web models both separately and in combination.

"Our modeling will help us predict how different populations of menhaden might affect Bay water quality, and how different nutrient-reduction and fishery-management scenarios might impact the menhaden population and its potential to improve water quality," says Brush. "Our results will thus provide the basis for weighing potential management options."

A third menhaden project at VIMS, led by Dr. Mary Fabrizio, is designed to quantify the recruitment of young menhaden into the adult population. The study builds on the long-term records of VIMS' juvenile seine survey, which has monitored juvenile fish abundance for many species, including Atlantic menhaden and striped bass, since 1980.

The survey shows that the abundance of juvenile Atlantic menhaden has declined since the early years of the survey. An index of abundance value for 2006 was 0.79, compared with the survey's greatest index value, 9.01, which occurred in 1982.

For more details on menhaden research at VIMS, visit www.vims.edu/menhaden

Wetlands Workshop Promotes Informed Resource Management

Scientists from VIMS' Center for Coastal Resources Management (CCRM) discussed shoreline and wetland issues with members of local wetland boards and other resource managers during a recent Tidal Wetlands Workshop on the William and Mary campus.

The one-day conference, "Avoid-Minimize-Compensate Through Integrated Shoreline Management," provided up-to-date information on shoreline protection, management, and policy issues—the three core areas of the CCRM Wetlands Advisory Program.

The workshop focused on promoting an integrated, cross-jurisdictional approach to shoreline management along with a discussion of living-shoreline treatments.

"Participants in our outreach programs develop an increased awareness of the ecologic functions of riparian

buffers, marshes, intertidal flats, and the adjacent shallow-water environment," says program director David O'Brien. "They also learn to recognize that the impacts of shoreline protection projects can't always be easily mitigated."

The conference included a computerized audience response system that allowed the 116 participants to cast votes from their seats on relevant wetlands and shoreline-related questions. Evaluation comments show that participants enjoyed the apparatus: "I liked the system because it helped me gauge how much I was retaining and understanding," said one participant. "I enjoyed seeing what the other wetlands boards think," noted another.

The Wetlands Advisory Program at VIMS has been providing wetlands and shoreline information to the public since the late 1960s. "In supporting the Commonwealth's no-net-loss wetland

policy, technical information applied at the local level leads to more informed and ecologically favorable resource management decisions," says O'Brien.

To view workshop presentations and photos, go to ccrm.vims.edu/seminar2006.htm



David O'Brien addresses workshop participants.

Fish Vision continued from page 3

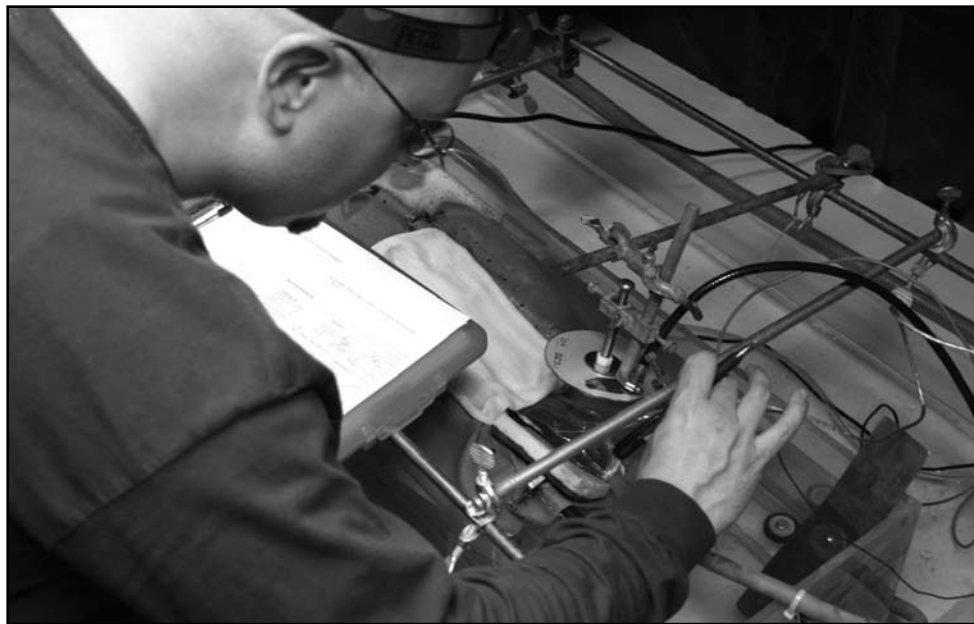
"You've got two animals that are competing for the same food. How do they do it? Stripers use color to see and feed during the day. Weakfish use contrast sensitivity to see at night."

"What these fishes have done is divvy up the visual world," says Brill.

For the most part, study of stomach contents by VIMS researchers confirms what Horodysky's vision research predicts. Work by Dr. Rob Latour shows that the stomachs of weakfish are largely empty during the day, and then quickly begin to fill with small fishes and shrimp as evening falls. Work by graduate student Kathleen McNamee shows that striped bass have full stomachs during daylight hours, but that the stomachs gradually empty through the night.

One intriguing aspect of Horodysky's research is the disparity he's found between the prey items that striped bass are adapted to see—large, fast-moving fish like menhaden—and the items that actually occur in their stomachs—mostly small crustaceans like juvenile blue crabs and mysid shrimp.

Horodysky and his faculty advisors hypothesize that striped bass are living in a visual world very different from the one evolution prepared them for. That's because human activities in the Bay watershed and the demise of the native



VIMS graduate student Andrij Horodysky monitors the progress of a vision experiment using an Atlantic croaker (*Micropogonias undulatus*).

oyster have dramatically reduced the clarity of Bay waters.

The world of Chesapeake Bay stripers was once bright and colorful. Anecdotal evidence from Captain John Smith and others suggests that visibility in the Bay once measured in the tens of feet. Even a century ago, Bay waters were clear enough to allow plant growth at depths of more than nine feet. Now sunlight penetrates to only half that depth.

"Chesapeake Bay used to be very clear," says Brill. "Now we've made it mucky. So we see the visual ecology

of the Bay changing. Our argument is that over evolutionary time these fish have made certain visual choices, then suddenly find themselves in a visual environment they didn't evolve in."

This visual mismatch could have important implications for fisheries managers, who traditionally make management decisions based on the relative abundance of predator and prey—the number of striped bass or menhaden netted per unit area.

"What we're getting at," says Horodysky, "is that it isn't the number of prey per meter that's most important to these

visual predators. It's the number they can see. Is there a visual issue, with the Bay being turbid, being murky? If you can't see very far, how is that affecting your ability to feed? These are larger questions we can begin to chip away at once we get our baseline data. We can't start to answer these questions until we know the limits of the eye."

In the meantime, Brill and Horodysky plan to expand their research to other popular recreational fish like summer flounder and cobia, and also to the forage fish—most notably menhaden—that so many recreational species depend on for food.

For Virginia's anglers, the most important question for Horodysky might be how a better understanding of fish vision can give them better luck on the water. "I can't guarantee that anyone who uses these data is going to catch more fish," responds Horodysky. "But they will be able to make more informed choices."

Horodysky, himself a fly-tier and avid angler, notes that his color research does confirm at least one common saying that Bay anglers use when selecting a lure for striped bass: "If it ain't chartreuse, it ain't no use."

"Nothing in the wild is ever chartreuse," says Horodysky, "but the color is right smack dab in the middle of a striper's visual range. They can see it really well."



Mrs. Candy Campbell (L) and VIMS Dean and Director Dr. John Wells (R). Campbell won the Robert M. Freeman Volunteer of the Year Award.



Ms. Janette Millen received the "Outstanding Classified Employee in Facilities" award.

VIMS held its annual Awards Ceremony on May 25 to bestow service and student awards and to recognize faculty, staff, students, and volunteers for their achievements during 2005.

Mrs. Candy Campbell, Chair of VIMS' Annual Fund Committee, won the Robert M. Freeman Volunteer of the Year Award. Campbell has led the Annual Fund Board for several years. In addition, as a co-chair for this year's Art Show and Auction, she was energetic in acquiring interesting items and attracting sponsors that resulted in the Auction clearing \$60,000 for the educational needs of the Institute. The award honors Robert Mallory Freeman, a former VIMS Council member and supporter who passed away in 2004.

Ms. Janette Millen received the "Outstanding Classified Employee in Facilities" award. Millen's award citation notes that she is "a versatile, extremely dedicated worker who takes great pride in her job in the Housekeeping Department."

Dr. Deborah Steinberg, College of William & Mary Term Distinguished Professor, received the Dean's Prize for the Advancement of Women in Marine Science. Steinberg's award citation notes that she "embodies all of the qualities of a strong role model for women in



Faculty members Dr. Hugh Ducklow (L) and Dr. Deborah Steinberg (R) with Dean and Director Dr. John Wells (C). Ducklow received the Outstanding Research Award. Steinberg received the Dean's Prize for the Advancement of Women in Marine Science.



Ms. Marcia Berman received the "Outstanding Classified Employee in Research/Advisory Service" award.



Ms. Fonda Powell (L) with Dean of Graduate Studies Dr. Iris Anderson (R). Powell received the "Outstanding Classified Employee for Administrative Support" award.

marine science as a mentor, teacher, and researcher. She is an outstanding teacher who displays an infectious passion for her subject, and also maintains a strong research program with projects both within and outside Chesapeake Bay." Steinberg is known internationally for her research in biological oceanography, serves as an associate editor for the journal *Deep Sea Research*, and has chaired the program committee for several major international oceanography meetings.

Dr. Hugh Ducklow, Glucksman Professor of Marine Science at VIMS, received the Outstanding Research Award. Ducklow, an internationally renowned oceanographer and a fellow in the American Association for the Advancement of Science, has had an enormous impact in the areas of microbial ecology and global carbon cycling. Ducklow's award citation notes that he "moves effortlessly from the microscopic scale of bacteria, his specialty, to long-term trends in the global ocean ecosystem, and between mathematical models,

experiments, and large-scale, complex observational data sets." Ducklow has served as Chair of the international Joint Global Ocean Flux Study program, and is currently the principal investigator at the Palmer Station Long-Term Ecological Research program in Antarctica.

Ms. Marcia Berman received the "Outstanding Classified Employee in Research/Advisory Service" award for her service as head of the Institute's Comprehensive Coastal Inventory Program. This program, recognized for excellence both regionally and nationally, uses Geographic Information System (GIS) technology to monitor and analyze shoreline conditions throughout Chesapeake Bay.

Mr. Joe Cope received the "Outstanding Classified Employee for Technical Support" award for his work with the Zooplankton Ecology laboratory at VIMS. Cope's award citation notes that he is "multi-talented—able to dissect and identify tiny zooplankton just as expertly as he can take apart a 2-ton

VIMS Bestows

Graduate student Rob Condon (L) and technician Joe Cope (R) with Dean of Graduate Studies Dr. Iris Anderson. Condon received the Craig L. Smith Memorial Scholarship award. Cope won the "Outstanding Classified Employee for Technical Support" award.



Graduate students Ana Verissimo (L) and Amanda Lawless (R) jointly won the Kelley Watson Fellowship.

2005 Awards

electronic plankton net to troubleshoot a faulty connection.”

Ms. Fonda Powell received the “Outstanding Classified Employee for Administrative Support” award for her exceptional role in helping to run the Graduate Dean’s office in the School of Marine Science at VIMS. She was also recognized for the help and succor that she provides to students in VIMS’ graduate program, and to the students in the Research Experience for Undergraduate (REU) program.

Graduate student Rob Condon received the Craig L. Smith Memorial Scholarship award, which is given annually to an academically distinguished student in memory of its namesake, former Professor of Environmental Science Dr. Craig Smith. Condon is studying how jellyfish and other gelatinous zooplankton affect organic matter, nutrient cycling, and bacterial communities in Chesapeake Bay.

Graduate students Amanda Lawless and Ana Verissimo jointly won the

Kelley Watson Fellowship, which recognizes academic excellence and leadership during the first year of graduate study. Lawless is studying the effects of shoreline development on bottom-dwelling marine creatures. Verissimo is studying deep-sea sharks.

Graduate student Debra Lambert received the John M. & Marilyn Zeigler Student Achievement Award, which recognizes students who excel in scholarship, leadership, research initiative, outstanding publications, and exceptional thesis or dissertation work. Lambert used state-of-the-art tag-recapture methods to show that survival of blue crabs in Chesapeake Bay is extremely low (about 8% of mature females survive a year) and that the blue crab spawning sanctuary in Chesapeake Bay is an effective tool in reducing fishing mortality on the blue crab spawning stock.

Graduate student Andre Buchheister received the William J. Hargis Jr. Fellowship Award for superior academic performance and a demonstration of

exceptional promise in marine research. Instructors unanimously ranked Buchheister at the top of his first-year class and noted the spirited enthusiasm with which he pursues his studies of the food-web dynamics of top predatory fishes in Chesapeake Bay.

Dr. Joel Hoffmann won the Matthew Fontaine Maury Student Fellowship Award for interdisciplinary achievements in scholarship, research, and management. His research successfully merged fisheries science and biogeochemistry to throw new light on the early life history of American shad. Hoffman’s award is made possible by a gift and pledge of Retired U.S. Navy Captain J. Maury Werth to honor his great-grandfather, a son of Virginia often referred to as the “Father of Oceanography” and the “Pathfinder of the Seas.”

The Best Paper Awards for 2005 went to Master’s student Adriana Veloza for her article in *Marine Biology* examining the ability of microorganisms to convert low-quality algal food sources into essential fatty acids that can be transferred to higher levels of the food chain.

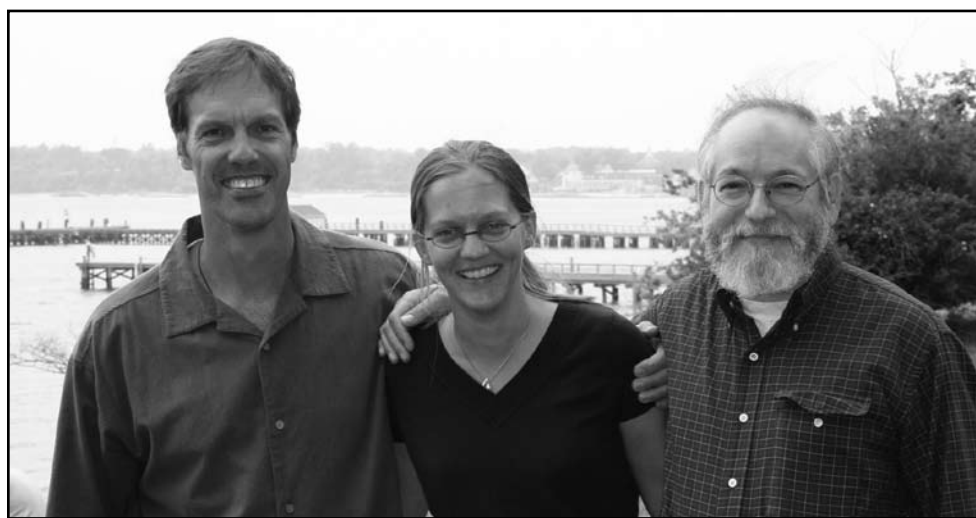
Kristin France won the award for the best paper by a PhD student for her study of how biodiversity and connectivity affect ecosystem stability (see page 2). France’s paper has been accepted by the journal *Nature*.



Dr. Joel Hoffmann won the Matthew Fontaine Maury Student Fellowship Award.



Adriana Veloza won the award for best paper by a Master’s student.



Ms. Debra Lambert (C) with faculty advisors Dr. Rom Lipcius (L) and Dr. John Hoenig (R). Lambert received the John M. & Marilyn Zeigler Student Achievement Award.



Kristin France won the award for best paper by a Ph.D. student.

**Congratulations
to all of the 2005
Award winners!**

Graduate student Andre Buchheister (R) received the William J. Hargis Jr. Fellowship Award. Also pictured are Dean and Director John Wells (L) and Amanda Lawless (C), co-winner of the Kelley Watson Fellowship.



Numerous other VIMS faculty, students, and staff were recognized for special accomplishments during 2005. The following accolades were not reported in previous issues of *The Crest*:

- Graduate student John Pohlman received the Outstanding Student Paper Award at the Fall 2005 Meeting of the American Geophysical Union.
- Graduate student Kurt Gray won the best student poster award during the 85th Annual Meeting of the American Society of Ichthyologists and Herpetologists in Tampa, Florida.
- Dr. John Olney received the award for Excellence in Fisheries Education from the Tidewater Chapter of the American Fisheries Society.
- Dr. Mary Fabrizio received the NOAA Bronze Medal Award for ultrasonic tagging work conducted during her tenure at the National Marine Fisheries Service.

Research Helps Created Wetlands Come to Life

Each time a new development or road fills or drains a Virginia wetland, federal and state laws require that the Commonwealth restore or create a wetland of similar size.

The laws are an outgrowth of the 1977 Clean Water Act, which has led to a policy of “no net loss” of wetlands on a national scale. More than half of the natural wetlands in the contiguous United States have been lost to development since European colonization—along with the vital ecosystem services they provide.

Researchers at VIMS are now collaborating with the Virginia Department of Transportation (VDOT) to study how fast and to what degree newly created wetlands develop into mature, fully functional wetlands like the ones they are meant to replace.

VIMS wetlands expert Dr. Jim Perry, who has been studying mitigation of tidal and non-tidal wetlands since the late 1980s, says his group is helping to “figure out a better way to bring created wetlands to a natural state, so that resource managers can use that information to jumpstart the restoration process.”

Adds Perry, “no-net-loss has little meaning if mitigated wetlands don’t recycle nutrients, trap sediments, store water, or provide habitat for fish and wildlife like their natural counterparts.”

Perry and his graduate students have spent the last few years studying these issues at a created wetland in Charles City

County near the Chickahominy State Wildlife Management Area. VDOT created the site as mitigation for the disturbance of wetlands incurred during the construction of Route 199 around Williamsburg. The new 40-acre wetland is about 7 years old.

The site forms the headwaters for Barrows creek, a small waterway that flows into the Chickahominy River, which in turn flows into the James River and Chesapeake Bay.

A current focus of Perry’s group is to better understand how adding mulch to a created non-tidal wetland might affect the restoration process. VIMS graduate student David Bailey has begun to study this question by comparing the health and vitality of plots within the Chickahominy wetland to which he has added various amounts of compost made from wood and yard waste.

Creating a wetland from scratch can be a difficult process, says Bailey. It typically requires the use of heavy machinery to lower the ground surface so that it intersects the water table or collects rainwater. But doing so also compacts the soil and removes existing vegetation, accumulated organic material, and seeds.

As anyone who has trudged through a muddy swamp knows, the accumulation of organic matter is a characteristic feature of most wetland systems. A thick bed of organic matter is important for wetland health because it helps to even out fluctuations in soil temperature and water content that might otherwise stress wetland plants.

Bailey is tracking the health of his experimental plots using a combination of high-tech field gear and old-fashioned plant identification. His gear includes a transparent, airtight plastic chamber whose base is implanted in the wetland soil. The chamber is connected to a set of computerized data loggers that record levels of carbon dioxide (CO₂), light, photosynthesis, as well as air and soil temperature and other variables within the chamber.

At the same time, he monitors the number and types of plants growing in each plot, noting whether they are annuals or perennials, herbaceous or woody.

The CO₂ measurements will be particularly telling, says Bailey, as they provide a means to gauge whether the created wetland is beginning to function like its natural counterpart in terms of energy flow.

Previous studies suggest that when natural plant communities first colonize a disturbed area, most of the incoming solar energy goes into photosynthesis and plant growth—allowing the system to soak up CO₂ from the atmosphere. As the community matures, succeeding generations of plants die, and

carbon-rich organic materials accumulate. This pushes CO₂ in the opposite direction—from animal decomposers and soils back into the air. In a mature wetland, the system should be in equilibrium—CO₂ in equals CO₂ out.

Bailey’s CO₂ sensors will allow him to gauge where the created wetland lies along this continuum from carbon “sink” to carbon source, a determination that has important implications both for global-warming scenarios and scientists’ basic understanding of “primary succession” in wetlands.

Primary succession, the process by which a living community develops from scratch following a major ecological disturbance, has been studied extensively in other ecosystems, but rarely in wetlands, and even more rarely in created wetlands.

“We don’t have any earthquakes and fewer volcanoes in Tidewater Virginia,” says Perry, in reference to the ecological events that have preceded most previous incidents (and studies) of primary succession. “So our biggest challenge is that we have no models to learn from.”

Created wetlands, because they are built on ground that has typically been scraped bare of plants, soil, and seeds, provide the model that Perry and other wetland ecologists have sought.

“We can learn a lot by using a created wetland as a model of primary succession,” says Perry. “We can look at the new system, and the processes by which it matures from the herbaceous to the woody stage, and then use that scientific information to do better management.”

Based on early studies of primary succession, Perry’s group expected to



VIMS graduate students Azure Bevington (L) and David Bailey (R) monitor experimental plots within a created wetland in Charles City County.

see a sequential shift from annual plants to bushes and then larger trees in the created wetland, with the Chickahominy site someday maturing into a forested wetland dominated by river birch, pin oaks, and other moisture-tolerant trees—a process that can take decades.

But a 2004 study by Perry’s former graduate student Dr. Doug DeBerry turned up a surprise—instead of being dominated by grasses or other annuals, almost half the wetland was clothed in native perennials like the tapertip rush. Perry and DeBerry attribute the discrepancy to wading birds carrying rush seeds from distant wetlands, and have now advised wetland managers to incorporate these native species in their plantings to help stabilize newly constructed wetlands in other areas of Tidewater Virginia.

“That’s a really great thing about this work,” says Perry. “We’re doing basic science that has real meaning and value in an applied setting.”

Bailey’s final results are not yet in, but one thing he has discovered is that adding large amounts of mulch can be detrimental to wetland health—not because of any direct effect, but because by raising the ground surface the mulch makes the soil dry out more quickly and remain dry longer, thus allowing upland plants to invade.

Another Perry graduate student, Azure Bevington, is just starting her wetlands research, in which she aims to study the effects of cattails on wetland restoration. In some created wetlands, these native plants have taken over almost completely. Bevington wants to know why, and whether their dominance might be detrimental to other wetland plants and the process of succession.



David Bailey (L) measures carbon dioxide levels within an experimental chamber as Azure Bevington (R) looks on.

Duffy and Lipcius Receive Leopold Fellowships

Two VIMS faculty members—Drs. Emmett Duffy and Rom Lipcius—are among 18 environmental scientists from the U.S. and Canada who have been awarded 2006 Aldo Leopold Leadership Fellowships.

As Leopold Fellows, Duffy and Lipcius will participate this year in two intensive week-long training sessions designed to promote effective communication of science beyond traditional academic audiences.

“Academic scientists often lack the special communication skills necessary to give decision makers the information they need to address pressing environmental challenges,” says Stanford University Professor Pamela Matson, who chairs the Leopold program’s advisory committee. “The Leopold Leadership Program provides them with critical skills and intensive training to do so more effectively.”

The Leopold program, based at Stanford University’s Woods Institute for the Environment, is named after the influential American conservationist Aldo Leopold, who helped lead the movement for wilderness preservation in the United States and was instrumental in defining modern environmental ethics. Leopold is author of *A Sand County Almanac*, one of the classics of American environmental literature.

Duffy is a marine ecologist whose current research uses experimental seagrass beds to explore how the loss of biodiversity might affect the Chesapeake



Drs. Emmett Duffy and Rom Lipcius.

Bay ecosystem (see page 2). Lipcius is an expert on the ecology and management of the Bay’s blue crab stocks. Both researchers will have ample opportunity to use Leopold training during their frequent interactions with policy makers, watermen, resource managers, and journalists.

Duffy says he looks forward to the training because he thinks it will help him to “fight for the objectivity of science and the role of rational thinking in decision-making.” “The training sessions give participants the language and means of communication to do that,” says Duffy. “It will help to bring us down out of the ‘Ivory tower’ and begin talking more effectively with people in the community.”

Lipcius echoes those sentiments. “As scientists, we typically don’t get training to communicate with general audiences or to negotiate. The Leopold

training will help me become a more effective conservationist by improving my ability to help shape conservation and restoration strategies for blue crabs and oysters in the Bay.”

VIMS is the only institution with two faculty members selected for the 2006 awards. Other recipients hail from Colorado State University, Oregon State University, Stanford, Texas A&M, the University of British Columbia, University of California, University of Hawaii, University of Washington, University of Wisconsin, and the Woods Hole Oceanographic Institution.

“The selection of not one but two of our faculty members for this prestigious fellowship reflects very highly on the quality of our efforts in advisory service, education, and research,” says VIMS Dean and Director John Wells.

Leopold fellows are selected through a competitive application process open to mid-career academic environmental scientists in the U.S., Canada, and Mexico. They are expected to use their training to enhance their professional activities both within and outside the scientific community, and to incorporate components of the training into their undergraduate and graduate courses and other outreach activities.

Following their training, Duffy, Lipcius, and the 16 other 2006 fellows will become part of the Leopold Leadership Network, a developing “community of practice” of 100 academic scientists and past fellows who are skilled communicators of scientific information to policy makers and other non-scientists on a wide range of pressing environmental issues.

The Leopold program was founded in 1998 by Jane Lubchenco, distinguished professor of zoology at Oregon State University, and is funded by the David and Lucile Packard Foundation.

Food-Web Study continued from page 2

presumably because the animals can move where they want to.”

Adding mobile animals to an experimental system is a major undertaking, and helps explain why it has rarely been done in previous experiments.

“As soon as you add another level of interaction, the whole thing gets much more complicated,” says Duffy. “That has been a really big reason why people haven’t tackled it.”

The logistics of working with plants is relatively easy. Seeds are readily available through scientific catalogs. A researcher can order seeds from several different kinds of plants, sow a plot, then return repeatedly to monitor the plants as they grow and interact.

France and Duffy, on the other hand, have to find and collect their animals in the field, then keep track of them as they move within and between their experimental tanks. “What’s always the biggest problem in setting up the experiment,” says Duffy, “is finding enough ‘bugs’ of different kinds.”

The amphipods or “bugs” that France and Duffy use for their experiments are common inhabitants of Chesapeake Bay’s seagrass beds. Related to beach fleas and more distantly to pill bugs, these small creatures play a key role in seagrass ecology by eating the

algae that would otherwise grow on seagrass blades, thereby helping to allow passage of the sunlight that the grasses need for photosynthesis.

Amphipods are ideal creatures for experimental studies of biodiversity, says France. “Our system is really tractable for looking at animal diversity because the critters we use are big enough to see with the eye and tell apart live, and yet at the same time they make babies quickly.”

France says that the take-home message from her research is that there is an important spatial component to biodiversity and its effects on ecosystem processes.

“We need to be conscious about scaling-up the research we’ve done in isolated patches to making predictions across landscapes. There are important things about landscapes, such as patchiness and connections through dispersal and disturbance. Those processes can affect both the magnitude and stability of the ecosystem services that we rely on.”

“Because the spatial component is so important,” she adds, “it’s essential to do these kinds of experiments with animals, because they interact with their habitats in a more complex way. Sometimes that can undermine completely what we have expected from theory.”

WILLIAM & MARY VIRGINIA INSTITUTE OF MARINE SCIENCE

Web Update **VIMS**

Welcome Research Education Advisory Services Administration Resources News & Media

Menhaden
This site describes how VIMS researchers are working to provide the data needed to manage Chesapeake Bay menhaden stocks in a sustainable manner (see p. 1). Visit www.vims.edu/menhaden

CORSACS
This site provides information on the VIMS-component of the NSF-funded CORSACS project. CORSACS, for Controls on Ross Sea Algal Community Structure, is a multi-institution study of how iron, sunlight, and carbon dioxide combine to determine the make-up of algal communities in Antarctica’s Ross Sea. Visit www.vims.edu/bio/corsacs/

Vessel Calendars
VIMS researchers are now able to schedule vessel usage on-line via www.vims.edu/admin/vessels. The site also allows vessel operators to download a safety-procedure checklist; the VIMS Vessels Operation, Training, and Safety Policy; and a Liability Release Form.

Postcards
Want to send someone a special card? Visit www2.vims.edu/greetings to choose an electronic postcard that shows your concern for the environment and your interest in VIMS. Then e-mail the card to the person you designate.

Alum Coaches Blue Crab Winners to National Recognition

The atmosphere is intense. The competition is fierce. Only the smartest and the fastest will prevail.

Each year, teams of top-notch high-school students from around the country compete in lightning-fast buzzer rounds and challenging essays about the world's oceans at the National Ocean Sciences Bowl (NOSB®), a Jeopardy-like championship for the marine sciences.

For four Chesapeake Bay Governor's School students and their coach, Kevin Goff, it was the experience of a lifetime. For Goff, that journey began at VIMS.

Goff first took part in the NOSB experience while a graduate student at VIMS, volunteering to officiate in the Blue Crab Bowl, Virginia's qualifier for the national bowl. Goff earned his Master's in 2002 studying dredge performance in the Atlantic sea scallop fishery.

Co-sponsored each year by VIMS and Old Dominion University, the Blue Crab Bowl is a round-robin, double-elimination contest that tests students' knowledge of oceanography, geology, biology, marine history, and more.

The 2006 Blue Crab Bowl drew nearly 70 students from 14 high schools around the Commonwealth to test their knowledge of marine science. Converging on this year's competition site at ODU, all were hoping to advance to the National Ocean Science Bowl.

"It's a lot of work, but worth every minute of it," says Goff, now a biology and marine science teacher at the Chesapeake Bay Governor's School's Warsaw campus on Virginia's Northern Neck.

Goff's team of two juniors and two seniors began preparations for the February Blue Crab Bowl after the winter holidays. After their successful win, there was little rest—they hit the books even harder, preparing for the nationals coming up in May.

The group met to practice and study two nights a week. Each student took a special focus, such as biology or physics, and received topic-specific assignments to complete. At practice the students shared their assignments and learned to work through team-challenge questions.

The team also went hands-on, with field trips to the National Aquarium in Baltimore and the Virginia Aquarium and Marine Science Center, as well as a three-day spring-break field trip to the Outer Banks to study the region's physical and biological attributes. Goff even worked with the group on what he calls

'speed and aggressiveness training' to gain confidence. "Many of the teams are so good and they are really fast. Speed is one of the keys to success," says Goff.

Another key to success is having an excellent coach.

"Kevin is inspiring," says Dr. Carol Hopper Brill, co-regional coordinator of the Blue Crab Bowl. "He is a master educator and a model of what we would like all educators to be. He is demanding but his excitement about learning really inspires his students to rise to the challenge. One of the things that impresses me most about Kevin is how well rounded he is. He can talk about geology, fisheries, physics, chemistry—you name it. He's kind of a renaissance guy."

Goff's students agree. "He's the best teacher I've ever had," says Abby Hughes, a Rappahannock High School senior and one of Goff's team members. "He is so excited about what he teaches, which makes you so excited about what you are learning. He opened my eyes to what an amazing teacher can do for his students. He has really inspired me to study math and biology and I hope to follow in his footsteps as a teacher at the Governor's School."

Goff credits his time at VIMS for much of his success as a teacher and coach.

"I got a terrific education in marine science at VIMS. I used my time there to explore and learn all aspects of marine science. VIMS offers so many great opportunities, so many great classes and professors. Now I have the opportunity to share my well-rounded oceanographic background with my students."

This year was Goff's second consecutive victory at the Blue Crab Bowl. As Virginia's winners, Goff and his team received an all-expense paid trip to the national competition in May in Monterey, California, facing the top teams from 24 other states.

With Hopper Brill's help, Goff's team gained funding from the VIMS Endowment Association to spend an extra day in Monterey. The group used the time to explore the geology, biodiversity, and coastal ecology of Point Lobos State Park and the world-famous Monterey Bay Aquarium.

"It was just great. I hadn't seen shoreline like that before, getting to see kelp, seals, otters—the whole experience was a terrific learning experience for the kids—and me," says Goff. "I am so grateful to the folks at VIMS who made this happen for us."



As winners of the 2006 Blue Crab Bowl, the Chesapeake Bay Governor's School team represented the Virginia Region at the finals of the National Ocean Sciences Bowl held on California's Monterey Coast May 13-15.

From L: Susan Haynes, NOSB Director; Dr. Richard Spinrad, National Ocean Service; Vice Admiral Conrad Lautenbacher, Jr. (US Navy, Retired), NOAA Administrator; Jonathan Lee (junior, Essex High School); Tiffany Lee (senior, Essex High); Luke Bessler (junior, Lancaster High); Abby Hughes (senior, Rappahannock High School); Coach Kevin Goff (Chesapeake Bay Governor's School, Warsaw Campus), and Rear Admiral Dick West (US Navy, Retired), President of the Consortium for Oceanographic Research and Education (CORE).

While Goff's team didn't win this year's national competition, they did walk away with the coveted James D. Watkins Sportsmanship Award. This special recognition from the NOSB® officials acknowledges the students who best exemplify professionalism and collegiality, demonstrating respect for one another, their opponents, and the competition judges.

"I'm very proud of how my team performed," says Goff. "Even though the competition was intense, there is still a wonderful bonding that goes on between the kids from different teams. My students worked very hard to get there. They earned it and it is a great gift that will be with them forever."

by Leslie McCollough



Alexander Smith of Dominion (L) presents a \$50,000 check to VIMS Dean and Director John Wells (R). The gift will be used to equip a classroom in VIMS' new research building, Andrews Hall, which is scheduled to open in the spring of 2007. VIMS Development Director Anne Marshall (C) looks on.

News Briefs

For more details on these news briefs, visit the VIMS "Top Stories" web page at www.vims.edu/topstories

Dickhut Gets To The Point

Dr. Rebecca Dickhut, Chair of Physical Sciences at VIMS, was interviewed on the nationally syndicated public radio program *To The Point* on April 21 concerning chemical contamination of the world's oceans. Dickhut was joined on the program by Vice Admiral, U.S. Coast Guard (Ret.) Roger Rufe, President and CEO of The Ocean Conservancy, who spoke on issues related to fisheries management; and by Drs. Ralph Keeling from the Scripps Institute of Oceanography and Rodney Fujita of Environmental Defense, who discussed issues related to ocean warming. *To The Point* is co-produced by KCRW and Public Radio International and airs on selected public radio stations around the U.S. Listen to the archived broadcast of "The Critical State of Our Oceans" via www.kcrw.com.

Tarantino Earns NSF Graduate Fellowship

Will Tarantino, a first-year graduate student with faculty advisor Dr. Emmett Duffy, has received a prestigious Graduate Research Fellowship Award from the National Science Foundation. The award will support Tarantino as he

uses theoretical modeling, observations of natural systems, and experiments to explore how the loss of species from a natural food web will affect interactions among remaining species and the stability of the ecosystem. The awards are made to outstanding graduate students from around the nation who demonstrate the potential to contribute significantly to research, teaching, and innovations in science and engineering. The award is based on a nationally competitive fellowship application that is evaluated according to the NSF Merit Review Criteria of Intellectual Merit and Broader Impacts. The \$30,000 per year fellowship provides funding for a maximum of three years that can be used over a five-year period.

VIMS Quartet Chosen as Knauss Fellows

VIMS students Paul Bradley, Kristin France, Leonard Pace, and Matthew Strickler were recently awarded prestigious John A. Knauss Marine Policy Fellowships through the National Sea Grant Federal Fellows Program. This one-year fellowship matches outstanding graduate students from around the nation with hosts in legislative or executive offices in Washington, DC and provides an opportunity for a better understanding of the decision-making process affecting national policy toward marine resources. The fellows will learn about their specific assignments during Knauss placement

week in early December. The selection of the VIMS quartet continues a long tradition of involvement in the program by VIMS students. Of the 50 students from institutes of higher education in Virginia who have served as Knauss fellows since the program began in 1979, 34 (68%) have hailed from VIMS.

Faculty Member Provides Radio Musick

Henry Raines of American AM radio in Tampa Bay interviewed VIMS fisheries scientist Dr. Jack Musick on March 28th concerning reasons to preserve the Endangered Species Act. The half-hour interview is available via webcast at www.americanam.com. American AM is billed as providing a unique mix of news, talk, interviews, comedy, and music.

Veloza Broadcast from Pole to Equator

VIMS technician Adriana Veloza was interviewed for a story describing Hispanic scientists in Antarctica during her recent stint at the McMurdo Research Station. The story, which described Veloza's life and science at the largest U.S. research facility on the continent, aired on CNN Español and appeared in Colombia's largest newspaper *El Tiempo*. Veloza earned her Master's degree in the School of Marine Science at VIMS in November 2005 with Drs.

Kam Tang and Fu-Lin Chu, studying how microorganisms convert low-quality algal food sources into essential fatty acids that can be transferred to higher levels of the food chain.

Saba Wins Sea Turtle Award

VIMS graduate student Vincent Saba was awarded the second-place prize during the 26th Annual Symposium on Sea Turtle Biology and Conservation for his presentation on the link between El Niño and the nesting behavior of leatherback sea turtles. The symposium, hosted by the International Sea Turtle Society, drew more than 300 sea turtle experts from around the world to the Island of Crete in early April. Crete is home to the sea turtle conservation project ARCHELON and hosts a significant nesting population of loggerhead sea turtles. VIMS graduate student Kate Mansfield won the same award at the previous International Sea Turtle meeting.

VIMS Lands on State Map

The Virginia Dept. of Transportation (VDOT) has added VIMS to the latest edition of Virginia's Official State Transportation Map. The 2006-2008 map, which commemorates the 400th anniversary of Jamestown, is available in the state's welcome centers, regional tourism offices, and VDOT offices. Additional copies can be requested by contacting www.VirginiaDOT.org.

VIMS Alumna Receives Prestigious National Award

VIMS alumna Dr. Leigh McCallister has won the prestigious Lindeman Award from the American Society of Limnology and Oceanography (ASLO) for research she conducted while a graduate student in the School of Marine Science at VIMS.

ASLO presents the Lindeman award annually to recognize the outstanding paper in aquatic sciences by an early-career researcher. With 3,800 members from 58 countries around the world, ASLO is the nation's leading professional organization for researchers and educators in the field of aquatic science.

McCallister's award-winning paper, published in the journal *Limnology and Oceanography*, described her use

of carbon and nitrogen isotopes to estimate the sources and ages of organic matter in the York and Hudson rivers. Her findings suggest that bacteria profoundly alter the mean composition and age of the organic matter that rivers and estuaries carry to the coastal ocean. Her work leads to a better understanding of the fate of organic matter as it is transported through estuaries to the sea, a key conduit in the global carbon cycle.

In their award citation, the Lindeman

Award committee writes that McCallister's paper "provides a new answer to an old problem and raises a new question about something we thought we knew. These are prime criteria for key, landmark papers and your paper clearly belongs to this category."

While at VIMS, McCallister was co-advised by faculty members Drs. Hugh Ducklow and Jim Bauer.

Ducklow, who nominated his former student for the award,

notes that "Leigh's paper demonstrates many attributes of great science: elegance and determination, a new attack on an important and interesting problem, painstaking work, creative analysis, and graceful writing."

McCallister, now with the Institute of Marine and Coastal Sciences at Rutgers University, received a small cash prize as well as the opportunity to present the results of her research at the 2006 ASLO annual meeting in Victoria, British Columbia.

For more on McCallister's research, see "Assessing sources and ages of organic matter supporting river and estuarine bacterial production: A multiple isotope (^{14}C , ^{13}C , and ^{15}N) approach" *L&O* 49: 1687-1702.



Dr. Leigh McCallister

New Faculty Brushes Aside Disciplinary Boundaries

Modeler and systems ecologist Dr. Mark Brush, the newest member of the VIMS faculty, embodies the Institute's emphasis on interdisciplinary research, teaching, and advisory service.

Brush will occupy the vacancy in the Dept. of Biological Sciences created by the retirement of Dr. Dick Wetzel, who stepped down last spring after 30 years at the Institute.

Brush, who earned a B.S. from Cornell University in 1995 and a Ph.D. from the University of Rhode Island in 2002, arrived at VIMS in 2002 as a post-doctoral researcher, working on the Fisheries Ecosystem Modeling and Assessment Project (FEMAP) with Wetzel and Dr. Rob Latour. He then served as an Assistant Research Scientist within Biological Sciences.

Combining the high-tech world of computer modeling with the muddy realities of estuarine and coastal ecology—two often-disparate fields—is at the core of Brush's interest and expertise, and one of the main reasons he was hired at VIMS.

Dr. Emmett Duffy, Biological Sciences Chair and head of the search committee that hired Brush, says "Mark's combination of experience in modeling and empirical ecology, and the rapidity with which he established research collaborations, were strong selling points. His interdisciplinary background makes him a great addition both to our department and to VIMS as a whole."

Brush says that what he's tried to do since coming to VIMS is to "cut across departmental and disciplinary boundaries, to develop strong working relationships with modelers like Harry Wang and Jian Shen in Physical Sciences,

Liz Canuel and other biogeochemists, and with Rob [Latour] in Fisheries Science."

He is also collaborating with Dr. Ken Moore to analyze the high-frequency time-series data collected by National Estuarine Research Reserve (NERR) sites across the mid-Atlantic; with Drs. Larry Haas, Howard Kator, Iris Anderson, and Shen to use the 3D Acrobat monitoring system to visualize oxygen levels in the York River; and Drs. Wang, Shen, and Anderson to study ecosystem functioning in the Lynnhaven River.

Another interest is in working with large databases like those maintained by NERRS and by the Chesapeake Bay Monitoring Program, in which more than 30 scientists from 10 institutions have been collecting data on 19 physical, chemical, and biological characteristics at more than 165 stations in the Bay since 1984.

"I've done a lot of work synthesizing that database and trying to analyze it," says Brush. "We're trying to turn it into useful information. Empirical analyses of existing data can help us to better understand how the Chesapeake Bay ecosystem is functioning."

Brush's quest to understand the function of whole ecosystems—Chesapeake Bay, or the York and Lynnhaven Rivers—is what defines him as a "systems ecologist."

"System-level ecology treats an estuary as a complete unit," says Brush. "It involves looking at key processes within the system and determining how they fit in the context of the entire place. How, for instance, does nutrient enrichment affect the entire York River ecosystem?

What does it do to major processes like the rate of photosynthesis or respiration, or to dissolved-oxygen levels?"

Another aspect of Brush's interest in ecosystem ecology is his study of "top-down" and "bottom-up" control of food webs. These are hot topics in both ecology and modeling, but rarely investigated by an individual researcher.

"Top-down effects are those that propagate from the top of the food chain," says Brush. "They include things like changes in the population of a predator or fishing pressure. That's what most fisheries models deal with."

"Bottom-up processes impact the ecosystem from the bottom of the food chain—including nutrient-driven eutrophication or climate change. These first and primarily influence phytoplankton growth and biomass, and then propagate up the food web. That's what most nutrient-load and water-quality models involve."

"One of the exciting things today in modeling" says Brush, "is that we're starting to combine these processes by creating models from nutrients through fish. You can build a model and manipulate climate or nutrient loading while at the same time manipulating harvest of menhaden or striped bass, and study the net effects of such changes and identify the dominant processes."

"There are issues and concerns about doing that," he cautions, "but you can start to play with these bottom-up and top-down effects in ways that you usually can't do through experimentation."

Of Brush's many current projects, his study of menhaden's role as forage and filter feeders in Chesapeake Bay (see p. 1) best illustrates the power of integrating models and fieldwork with studies of both top predators and plankton.

The menhaden project, a three-year effort funded by the Chesapeake Bay Program, seeks to quantify the filtering capacity of menhaden. Like oysters and clams, these small fish feed primarily on plankton, thus potentially improving water clarity and quality. The Bay Program has funded similar studies of other filter feeders in the Bay, and will use the results to compare this "top-down" control on water quality with what they might see from nutrient management.

The modeling aspect of Brush's menhaden project builds on his post-doctoral collaboration with Latour, in which they modeled interactions between the menhaden and its predators.



Dr. Mark Brush

"Now," says Brush, "we're using the menhaden model to look at how menhaden impact lower trophic levels." Menhaden may help clear Bay waters by consuming large quantities of phytoplankton, "but at the same time they are excreting nitrogen and perhaps stimulating further algal blooms. We can use the menhaden model to compare the amount of nitrogen they export and recycle to the anthropogenic load, and to put these fish in the context of the Baywide nitrogen budget."

"It's like a cost-benefit analysis," adds Brush. "Do you manage your menhaden fishery to maximize yields, or to maximize water clarity if it turns out they have an effect? They're also a major prey source, so there are all kinds of different, competing reasons for how you might manage them."

Brush contends that ecosystem models provide the best tool for addressing these types of complex management issues.

"One of the key tools for getting at [ecosystem management] is through ecosystem modeling," says Brush, "simulating a variety of different species and how they interact."

Doing so, however, requires continued refinement of the models.

The early estuarine models of the 1960s and 70s were built to answer basic questions—how estuaries operate, how they recycle nutrients. Today, some of the same models are being used to inform major management decisions, concerning, for instance, possible nutrient-reduction strategies.

"That's a very different goal for a model," notes Brush, "with different expectations of accuracy and precision."

Continued on the next page



Dr. Dick Wetzel (4th from L) retired from VIMS in March after 30 years at the Institute. Wetzel was a pioneer in applying ecosystem modeling to Chesapeake Bay. Joining him at the retirement ceremony were (from L): Biological Sciences Chair Emmett Duffy, Dean and Director John Wells, SMS Dean Iris Anderson, and long-time collaborators Betty Berry-Neikirk and Ken Moore.

Lucy Wins Conservation Award

Mr. Jon Lucy, a Marine Recreation Specialist in the Sea Grant Marine Advisory Program at VIMS, has received the Bob Hutchinson Conservation award from the Portsmouth Anglers Club for his continuing efforts to promote more effective management of Virginia's recreational fisheries.

Lucy was recognized for his long-standing leadership with the state's game-fish tagging program, which he coordinates in concert with Mr. Claude Bain, Director of the Virginia Saltwater Fishing Tournament.

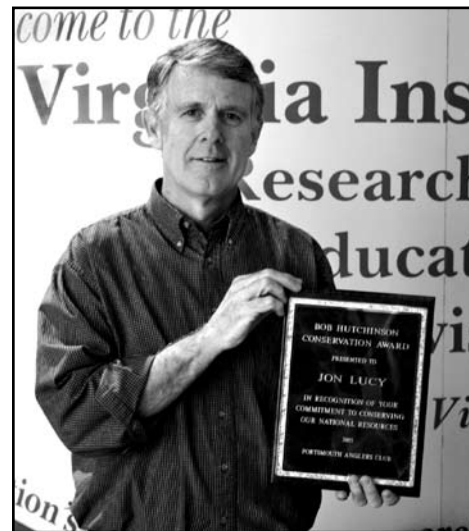
Lucy's work expands understanding of catch-and-release fishing as a management tool in marine sport fisheries, and includes studies of release-mortality issues in fish discarded by anglers. Working with both conventional and telemetry tagging projects, he also studies small- and large-scale movement patterns of important recreational species.

The Virginia Game Fish Tagging Program, initiated in 1995, coordinates the tagging efforts of a dedicated group of trained recreational anglers who help gather new and updated information on seasonal movements and habitat preferences of marine fish targeted by Virginia's anglers. The program's database now includes more than 87,000 records of tag-released fish and approximately 8,400 recapture records. The program is primarily funded with revenues from Virginia's saltwater recreational fishing license.

In response to the award, Lucy says "To give credit where credit is due, significant funding for much of my work has come from saltwater license revenues. So I think it's only fair to say that the award, while presented to me, really also recognizes the growing conservation ethic of our saltwater angling community."

This is the fifth year the club has presented the award, which is named after Bob Hutchinson. Still looked to as a leader by Virginia's saltwater angling community, Hutchinson retired in 2001 after 37 years as outdoor editor of *The Virginian-Pilot*.

The Portsmouth Anglers' Club was founded in 1965 and now has more than 300 members. The club has been the principal anglers' club in Portsmouth for several decades.



Jon Lucy displays his award.

Dr. Mark Brush

continued from previous page

"What we try to do," he says, "is come up with different ways of formulating, simplifying, and aggregating major processes, to decrease the parameterization and error propagation. We're trying to take out some of the uncertainty in these models and to make them more useful for making a prediction for management applications." That philosophy guides Brush's current project with several colleagues at his alma mater to better predict low-oxygen levels in Narragansett Bay, Rhode Island.

Today's models have a litany of key uses, both for management and basic science. "Modeling developed as a way of synthesizing disparate data sets that had been collected by a variety of investigators on a variety of different processes," says Brush. "Models allow you to understand how all those processes and different trophic groups interact as

a complete ecosystem. Usually when we do fieldwork or lab experiments we focus on a particular organism or a particular process that we're studying, but models give you a way to piece all of those things together, to see how the whole system works together as an integrated unit."

Perhaps most important for VIMS' advisory role is that models allow for what-if scenarios.

"That's really the key," says Brush. With a model, "you can do a series of virtual experiments that you could never do on a natural system. No one would ever allow you to dump 100 times the ambient load of nitrogen into the York River to see how it responds. But you can do that in a model in about 30 seconds, push the run button, and see what happens. It's the virtual what-if. What-if scenarios have great potential for guiding sound management practices."

Calendar of Events

July 2006

Entire month: Dr. Maynard Nichols Marine Paintings
Exhibit in the Hargis Library
Friday Public Tours

- 5 MAST Visit
- 5-12 Oceanography Field Workshop for Teachers, Wachapreague
- 7 W&M STAR Program
- 18-19 Estuarine Aquarium Keeping in the Classroom
- 20 Bay Exploration Field Trip
- 25-26 Water Quality Workshop for Virginia Teachers
- 27 Bay Exploration Field Trip

August 2006

Entire month: Dr. Maynard Nichols Marine Paintings
Exhibit in the Hargis Library
Friday Public Tours

- 2 Summer Intern Reception
- 9-10 York River Habitat Workshop
- 25, 28 Student Orientation
- 30 Classes Begin
- 31 NOAA/VIMS Marine Debris Congressional Briefing

September 2006

- 29 Council Meeting
- 29 Maury Society Dinner
- 30 VIMS' Raft-Up at Seaford Yacht Club

October 2006

- 4 "A Healthy Bay for Healthy Kids" with Virginia's First Lady
- 11-11/1 Global Warming in Chesapeake Bay Mini-School, Science Museum of Virginia, Richmond (Wed. evenings)
- 13 Tools for Shoreline Management Workshop
- 17 Chef's Seafood Symposium

Future Events

After Hours Lectures - to resume upon completion of renovations to McHugh Auditorium ; the last Thursday of the month

For an up-to-date listing of public events and seminars at VIMS, visit www.vims.edu/events/

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

Visit our website at www.vims.edu



Students from colleges and universities around the U.S. arrived at VIMS in early June to begin their summer internships as part of the Research Experience for Undergraduate program. The REU program is funded by the National Science Foundation and managed at VIMS by Drs. Linda Schaffner and Rochelle Seitz. Front row: Barbara Salgado (Univ. of Puerto Rico in Arecibo). 2nd row (from L): Talia Fletcher (Norfolk State Univ. (NSU)), Paul Littreal (a Mellon Intern from William and Mary), Cara Babineaux (Hampton Univ.), Andria Salas (Grand Valley State Univ.), Katherine Kokotky (Boston Univ.), and Adrienne Wiggins (NSU). 3rd row (from L): Carolina Funkey (Univ. of Mary Washington), Emilee Mroz (St. Lawrence Univ.), Miranda Westphal (Florida Gulf Coast Univ.), David James (NSU), Philip Matich (Univ. of S. Carolina), Sara Tappan (Clemson), and Dan Naly (William and Mary).



VIMS graduate students David Gillett, Treda Smith, and Leonard Pace visited Capitol Hill this spring with Professor Linda Schaffner for a quick immersion into the "Washington Policy" experience. The students discussed marine-resource issues with staffers in the offices of Virginia Senator John Warner and Representative Jo Ann Davis.

Campus Construction Update



Andrews Hall: This 71,000-square-foot research facility is currently on schedule with completion slated for February 2007. The structural steel is in place and 90% of the concrete floors have been poured. Crews have begun framing exterior and interior walls, and will soon begin to install the roof, exterior brick walls, and windows. Interior mechanical, plumbing, and electrical work is underway and installation of the rooftop HVAC units is scheduled for the last week of June.



Seawater Research Lab: This 46,000-square-foot building, which will house numerous flow-through tanks for culturing fish, shellfish, and sea turtles, is currently on schedule with completion slated for February 2007. Crews are currently grading the site and installing sidewalks, and will begin installing the roof in July. The interior and exterior (brick) walls are complete and window installation is in progress. Interior mechanical, plumbing, and electrical work is underway. A separate Water Treatment Building (not shown) is nearly complete.

The Crest - Summer 2006

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