

The

# Crest

Current Issues in Coastal Ocean and Estuarine Science

## Collaborative Project Gets to the Bottom of Oyster Questions

Barring any unforeseen delays in permitting, researchers from VIMS and the University of Maryland will in late August begin a 30-month comparative field trial of native and non-native oysters in Chesapeake Bay.

The study will provide crucial information regarding the future direction of oyster restoration efforts in Bay waters by comparing the perfor-

mance of the native species *Crassostrea virginica* and the Asian oyster *C. ariakensis* during on-bottom trials.

"This work will answer key questions needed for the Environmental Impact Statement [EIS]," says project leader Dr. Mark Luckenbach. The EIS is being prepared by federal and state agencies in response to the proposed introduction of diploid *C. ariakensis* to Chesapeake Bay in Virginia and Maryland. The EIS will evaluate eight alternatives to the states' proposed action (see sidebar).

Luckenbach will conduct the study with fellow VIMS faculty member Dr. Stan Allen, post-doctoral research associate Dr. Peter Kingsley-Smith, and Drs. Kennedy Paynter and Donald Meritt of the University of Maryland Center for Environmental Science. They will deploy the trial oysters in large-mesh bottom cages to exclude large predators and provide biosecurity against human disturbance.

"This is the first study to compare the growth rate, growth form, survival,

and disease resistance of these two species in natural bottom habitats using triploid oysters," notes Luckenbach.

Dr. Stan Allen's lab will produce the study's triploid oysters by genetically manipulating normal diploid oysters to carry an extra set of chromosomes. His lab has produced triploid oysters for all previous *C.*

*ariakensis* trials as well.

The triploid condition renders oysters sterile as a precaution against an unintentional introduction. It also enables oysters to transfer energy that they would otherwise use for reproduction into tissue growth. Some researchers contend that this energy transfer contributed to elevated growth rates seen in previous comparisons of triploid



VIMS doctoral research associate Dr Peter Kingsley-Smith shows one of the predator-exclusion cages that will be used in the oyster trials.

*C. ariakensis* and diploid *C. virginica*. The upcoming study will address this concern by using triploids of both species during the comparative trials.

"Field studies with triploid non-native oysters are not without risks," notes Luckenbach. "A small fraction of the animals are likely to be diploids and a small fraction of triploids can gradu-

*Continued on page 7*

Preparation of the Environmental Impact Statement (EIS) for the proposed introduction of *C. ariakensis* into the tidal waters of Maryland and Virginia is being led by the U.S. Army Corps of Engineers, the Virginia Marine Resources Commission, and the Maryland Department of Natural Resources, in cooperation with EPA, NOAA, and the U.S. Fish and Wildlife Service.

The EIS will evaluate eight alternatives for increasing oyster populations in the Chesapeake and coastal bays:

1. Take no new action
2. Expand the current native restoration program
3. Implement a temporary harvest moratorium on native oysters
4. Establish or expand aquaculture operations using native oysters
5. Establish or expand aquaculture operations using non-native oysters
6. Introduce and propagate an alternative strain of *C. ariakensis* or an oyster species other than *C. ariakensis*
7. Introduce diploid *C. ariakensis* and discontinue restoration programs for *C. virginica*
8. Pursue a mix of alternatives

For more information, visit  
[www.epa.gov/fedrgstr/EPA-IMPACT/2004/January/Day-05/i073.htm](http://www.epa.gov/fedrgstr/EPA-IMPACT/2004/January/Day-05/i073.htm)

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

ADDRESS SERVICE REQUESTED

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

## Rare Crab May Hold Genetic Secrets

VIMS researchers are studying an extremely rare type of crab that was pulled from the Chesapeake Bay in May by watermen David Johnson and Robert Watson of Deltaville.

The crab, called a “bilateral gynandromorph,” is split right down the middle—its right half female and its left half male.

Neither the watermen nor VIMS crab expert Rom Lipcius had ever seen a crab like this one, and all have spent more than 25 years on the water.

More than just a curiosity, the crab’s genetic condition could help researchers better understand sexual development and breeding behavior in

blue crabs, phenomena that are currently poorly understood.

Generations of school kids and crabbers have learned to use a set of body traits to tell male and female blue crabs apart. In a male, or “Jimmy,” the underside “apron” is pointed like the Washington Monument and the claws are sky blue. In a female, or “sook,” the apron is rounded like the nation’s Capitol Dome, and the claw tips are painted red.

Johnson’s crab confounds these rules for assigning gender. It has one “male” claw that is entirely blue, and one “female” claw that is tipped with red. Its apron is rounded on the right and sharply pointed on the left. Its reproductive organs are similarly divided.

It was the blue claw that caught Johnson’s eye when he pulled his crab pot from the waters off Gwynn’s Island on May 21st. Male crabs are uncommon in the mainstem of the Bay at this time of year.

“I was surprised when I saw that its other claw was red like the rest of the sooks in the pot,” says Johnson. “I was even more surprised when I turned it over and saw its apron.” That’s when Johnson decided to contact Lipcius for help.

Lipcius combed the literature and found a report of a gynandromorph crab that was caught near Smith’s Island in 1979. He then called geneticist Al Place of the University of Maryland’s Center of Marine Biotechnology. Place is an expert on the molecular basis of gender determination.

Juvenile organisms grow through a series of divisions in which the number of cells progressively doubles, from 1 to 2, 2 to 4, 4 to 8, and so on. These early “stem” cells later differentiate into all the different body tissues and organs.

In mammals, a single gene (SRY) controls whether an individual is male (XY) or female (XX). Gynandromorphy in mammals occurs due to an error in early cell division, when an X or Y chromosome is left behind in the nucleus of a dividing cell.

For instance, failure to pass along a Y chromosome during cell division in a male mammal (XY) can produce a female “daughter” cell with a single X chromosome (XO). If this error happens early enough in development, the male-female split can propagate through all the remaining development stages of the organism.

Gender determination in other animals is more complicated—and more fluid. In birds and reptiles, hormone levels inside the mother can control gender. In fishes, it can depend on environmental conditions like water temperature. Some fishes can even change gender during their life cycle.

Gender determination in crustaceans like the blue crabs is poorly understood. “There are multiple potential causes,” says Place. “We don’t know how many genes are involved or what the environmental factors might be.”

One thing that scientists do know is that a crab with male and female halves must have been that way almost from conception. “Bilateral symmetry arises very early in development,” says Place. VIMS geneticist Dr. Kimberly Reece adds that the condition “typically arises when the organism has between 8 and 64 cells.”

Researchers had planned to follow the crab through at least one spawning cycle to determine if it were a functional female capable of laying eggs, whether it could fertilize itself, and whether its offspring would be inbred.

Unfortunately, the crab died before the spawning cycle was complete.



Waterman David Johnson of Deltaville pulled the crab from Chesapeake Bay on May 21st.

Lipcius has removed two legs for DNA analysis, which will allow researchers to determine the exact genetic make-up of the cells within its male and female halves. Knowledge gleaned from these studies might someday help researchers trying to breed blue crabs in captivity.

Lipcius froze the remainder of the crab in preparation for mounting. Once mounted, the crab will be on display in the Watermen’s Hall Visitors’ Center at VIMS’ main campus in Gloucester Point.

## The Crest

Vol. 7, No. 1 Summer 2005



Dr. John T. Wells  
Dean and Director

Virginia Institute of Marine Science  
School of Marine Science

### Editorial Board

Dr. Roger Mann  
Director of Research and  
Advisory Services

Dr. William DuPaul  
Associate Director for  
Advisory Services

Dr. William Reay  
Manager, CBNERRVA

Page Hayhurst  
Director for Development

### Science Writer

Dr. David Malmquist

### Managing Editor

Dr. David Malmquist

### Contributors

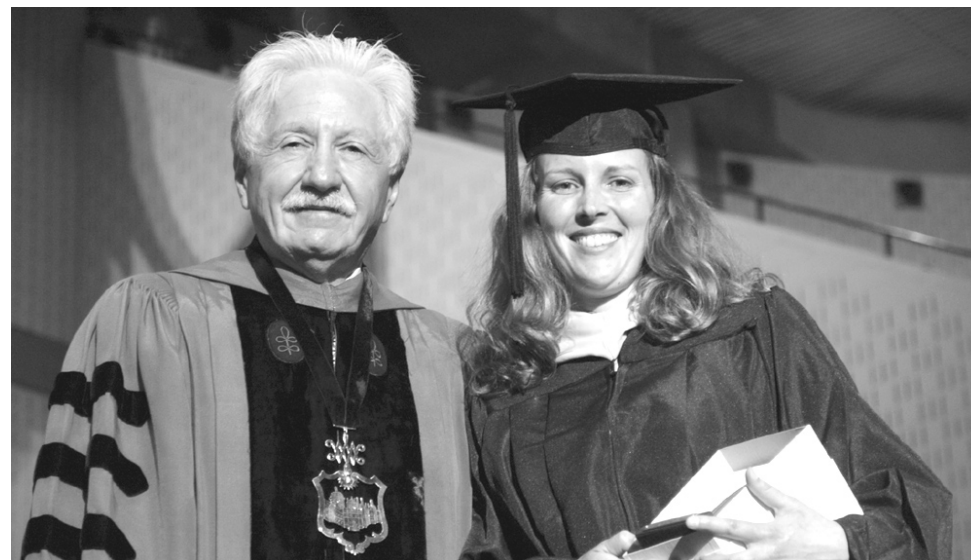
Dr. John Olney  
Susan Maples

### Art Director

Susan Stein

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

## Browder Wins Sullivan Award



VIMS graduate student Grace Browder (R) received a prestigious Algernon Sydney Sullivan Award from William and Mary President Timothy Sullivan (L) during the college’s commencement ceremonies on May 15th. Browder, who graduated with a Master’s degree in physical sciences under advisor Dr. Jesse McNinch, received the Sullivan medallion in recognition of her service to others and the community. For more information on the award, visit [www.vims.edu/topstories](http://www.vims.edu/topstories)



## CBNERR Brings Bay Education to Local Schools

The Chesapeake Bay National Estuarine Research Reserve (CBNERR) at VIMS will this fall begin a new program designed to give every 7th-grade student in Gloucester and Mathews counties a deeper understanding of the Bay and its watershed.

Ms. Sarah McGuire has been hired to head the program. McGuire, who previously managed the COASTeam project at the College of Charleston in South Carolina, will work with 7th-grade teachers and students at Peasley Middle School, Page Middle School, and Ware Academy in Gloucester, and at Thomas Hunter Middle School in Mathews.

CBNERR Education Coordinator Bob Carroll says the goal of the program is to help teachers use Chesapeake Bay as a focal point when addressing the SOLs for their 7th-grade Life Science courses. SOLs, Standards of Learning for Virginia Public Schools, describe the Commonwealth's expectations for student learning and achievement in grades K-12.

"The teachers and school administrators have shown great enthusiasm for the project," says Carroll. "We couldn't do any of this without their support, and we're looking forward to using the local waters as a way to help them make the Life Science SOLs come alive."

"The program combines everything I like to do," adds McGuire. "It will

give me the chance to work with both teachers and students, in the classroom and the field."

Students in the program will monitor water quality and the abundance of aquatic animals in shallow water habitats. "They'll collect juvenile blue crabs in September and juvenile summer flounder in the late winter," says Carroll, "then raise them in aquariums that the schools will receive as part of the project."

The students will also raise oysters to monitor their growth and survival and release them on restored oyster reefs in the region. Summer field trips will also be available for interested students.

The one-year program is designed to give participating teachers the tools and knowledge they need to continue classroom studies of the Bay in future years. CBNERR will continue to provide field trips on an ongoing basis.

The program is funded through a grant that Carroll submitted to the National Oceanic and Atmospheric Administration's B-WET program (for Bay Watershed Education and Training). The goal of the B-WET program is to give a "meaningful Bay or stream experience" to every student in the Chesapeake Bay watershed at some point during his or her school years.

For more information about CBNERRVA education programs, visit [www.vims.edu/cbnerr/](http://www.vims.edu/cbnerr/).



Page Middle School science teacher Sherry Rollins (L) got a head start on the new CBNERR program with a series of field trips to VIMS this past spring. She and her 7th-grade students investigated shallow-water habitats in the York River in front of VIMS.

## Hardaway Elected to Serve on National Committee

The National Research Council (NRC) has selected VIMS researcher Scott Hardaway to serve on its *Study Committee on Mitigating Shore Erosion Along Sheltered Coasts*.

Dr. Carl Hershner, Director of VIMS' Center for Coastal Resources Management, notes that selection to the panel represents "an impressive recognition and opportunity."

"NRC committee members are selected from the leading U.S. experts in a field," says Hershner. NRC, the principal operating agency of the National Academy of Sciences and the National Academy of Engineering, is a private, non-profit body that provides advice on science policy under a congressional charter. NRC experts serve *pro bono* to address critical national issues and advise the federal government and the public.

Hardaway was chosen for the committee based on his widely recognized expertise in the behavior of shoreline systems in natural and developed settings, particularly their response to the placement of breakwaters and beach-fill.

Hardaway has spent more than 25 years on projects to protect uplands and wetlands from damage due to shoreline erosion and sea-level rise in Chesapeake Bay. He has also helped develop shoreline plans that have been installed at several public beaches including Anderson Park (Newport News), Buckroe (Hampton), Yorktown, and Festival Beach (Mathews).

Scott Hardaway

The NRC shore-erosion study will examine the impacts of shoreline management on sheltered coastal environments such as estuaries, bays, lagoons, and mud flats, and identify conventional and alternative strategies to minimize potential negative impacts to adjacent or nearby coastal resources. The study will provide a framework for collaboration between government, conservancies, and property owners in decisions regarding the most appropriate alternatives for shoreline protection.

The 18-month study began in March 2005. It is funded by Environmental Protection Agency, the Army Corps of Engineers, and the Cooperative Institute for Coastal and Estuarine Environmental Technology.

For study updates, visit [http://dels.nas.edu/osb/sheltered\\_coasts.shtml](http://dels.nas.edu/osb/sheltered_coasts.shtml).

### VIMS By the Numbers.....

- ◆ **157,521** Visits to the VIMS website during June 2005, the most recent month for which statistics are available. A visit is defined as one or more requests for a page by the same user within 30 minutes.
- ◆ **142** Number of countries represented in visits to the VIMS web site during June. Australians were the most numerous visitors, with 12,287 files served. There were also visits from people on all continents (including Antarctica). Countries include the Czech Republic, Thailand, Turkey, Morocco, and Peru.
- ◆ **13,547** Maximum number of visits to the VIMS web site in a single day during June, on Saturday the 18th, shortly after press reports of VIMS' dual-sex crab (see p. 2).
- ◆ **15** Busiest hour (on 24-hour clock) for VIMS web server during June. The server dished up an average of 1,063 web pages between 3 pm and 4 pm each day.
- ◆ **43,093,300** Total number of kilobytes served by the VIMS web server during June, equivalent to about 60 CD-ROMs.

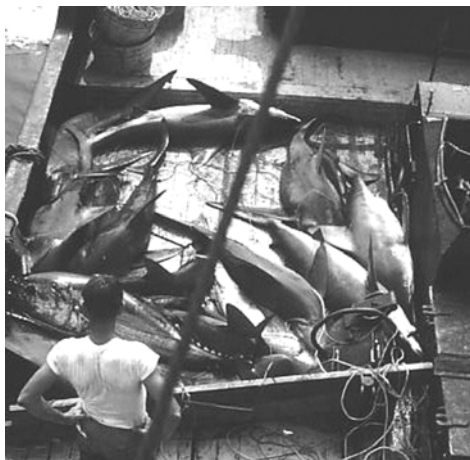
## Shark Trip Brings Research Career Full Circle

On a warm July morning in 1961, undergraduate Jack Musick of Rutgers University stepped aboard a commercial trawler to begin a summertime study of sharks off the New Jersey coast.

Forty-four years later, VIMS Professor and international shark expert Dr. Jack Musick will bring the R/V *Bay Eagle* back to the very same waters. His plan is to fish the same stations and gear that he fished in 1961, with the goal of capturing a unique long-term record of changes in shark abundance.

"I've wanted to do this for years," says Musick. He got his wish when the R/V *Bay Eagle* sailed from VIMS on July 18th for the 10-day cruise.

Musick says that a direct comparison of shark numbers across a span this long is unprecedented. His 1961 cruise took place 14 years before *Jaws* sparked the sport fishery that first



This photo from Musick's 1961 trip shows the catch from a four-hour longline set. The set returned a large number of sharks and other fish.

began to take significant numbers of large sharks from Atlantic waters. The upcoming cruise comes 12 years after federal regulations first sought to manage the commercial fishery that had devastated shark stocks during the 1980s.

Musick's plan to use the same gear and stations sets his work apart from other recent studies of shark population trends, most notably an analysis in *Science* by Canadian researcher Ransom Myers. Myers used a technique called "metadata analysis" to conclude that populations of large coastal and oceanic sharks had declined by more than 75% in the past 15 years.

Although Musick agrees with Myers' general conclusion, he questions his methodology. Myers' metadata analysis entails combing through existing scientific and commercial fisheries records to extract relevant data, in this case the number of sharks reported as bycatch.

"Myers compares longline catch rates from the 1950s and 60s with more recent catch rates from observer data in the commercial fishery," says Musick. "During that time the fishing gear and depths have changed completely. It's like comparing apples and oranges."

Today's longline fishery uses monofilament line and, instead of fishing in the top 100 or 200 feet for swordfish, fishes at 400 or 500 feet for big-eye tuna.

"You just can't make those comparisons," says Musick. "There

isn't enough overlap in the gear or target species."

In Musick's case, the gear will overlap completely, making for a statistically robust comparison. His crew will use the exact same type of main line, drop lines, hooks, and bait (menhaden) that he used on the initial longline cruises in 1961.

Musick's *Bay Eagle* crew, headed by graduate student Jason Romine, will set the same 19 stations between Cape May and Sandy Hook Bay. VIMS graduate students Chip Cotton, Andrij Horodysky, Dave Portnoy, and Vince Saba, along with Captain Durand Ward and lab technician Demetria Christo round out the crew.

Musick's longline set-up was initially developed for swordfishing. He and mentor Jack Casey stayed at sea all through the summer of 1961, deploying longline sets from a commercial trawler donated to the Sandy Hook Marine Lab by a local fishing company. "The Lab Director managed to get the help of the Smith Menhaden Company, which had a local plant on Sandy Hook Bay. Mr. Smith contributed fuel, bait, crew, and everything else, for the entire summer of 1961," says Musick.

Musick will use the same longline gear this summer. "We'll set a mile and a half of main line, which is a 3/8-inch braided and tarred nylon with anchors and buoys on each end. That line has 100 dropper lines, or gangions, each around 12-feet long. Each gangion has a couple of feet of steel leader that goes to the hook, because a shark will bite through otherwise."



Jack Musick takes a break during the 1961 longline cruise.

The only changes he's made help ensure that setting the line is safer and more efficient. "We now use quick clips to fasten the gangions to the main line," says Musick. "Back then the clips hadn't been invented. Instead, you used a slipknot, and you had everything coiled in galvanized tubs. If the lines tangled, and that happened often in rough seas, you just tossed the whole tub over the side. Otherwise you could get tangled in the gear and pulled overboard. You'd then go on to the next set and worry about it when you came back. Because the line is fairly stiff, the tangles would often fall out as it soaked."

After the upcoming cruise, Musick thinks it will take about a week to get a ballpark figure of the change in shark numbers between 1961 and present. A particularly interesting aspect of the comparison will be that between sandbar and dusky sharks, the two most common species along the New Jersey coast. Sandbar populations have responded well to shark management plans. Dusky have not (see sidebar).

Musick's graduate student Dan Ha has already digitized the original 1961 data, which until recently had been held at the National Marine Fisheries Service (NMFS) office in Narragansett, Rhode Island. A researcher at the office had found the original handwritten field notes in a tattered box after Musick's mentor Jack Casey retired from there about 8 years ago.

The timing of the New Jersey cruise is just right, says Musick. "I've got [graduate student] Dan Ha doing some pretty sophisticated analyses of our own long-term shark data right now, so I thought it would be a perfect time to go back up there." Funding agencies agreed. The cruise is funded by NMFS through the National Shark Research Consortium, of which VIMS is a member.

The **VIMS' Shark-Monitoring Program**, which Musick established at the Institute in 1973, uses the same 1961 longline gear that will be used on the New Jersey cruise. The program is now the world's longest fishery-independent study of shark populations. It clearly records the decline that concerns shark researchers and managers around the world.

Fishery-independent surveys are critical for long-term monitoring of marine populations, as they are designed to minimize the bias inherent in commercial fishery records. Bias in those records arises from changes in gear, fishing methods, target species, and fishing effort.

"Our surveys show a decline of almost 50% between 1973 and 1985," says Musick. "After that the commercial fishery kicked in as the demand for shark fins increased in China, Japan, and other places where those items are a delicacy. By the late 1980s, a lot of our large shark species were over-fished to the point where only 15% of the population remained."

A federal management plan for sharks was implemented in 1993. Since its passage, scientists have seen some local shark species, including sandbars and blacktips,

recover to about 50% of 1970s levels. But other species, like the dusky and sandtiger, haven't responded as well.

Reproductive differences help explain the discrepancy. Sandbar sharks take about 15 years to mature and have 10 young every 2 years. Dusky reach sexual maturity around 20 years and average 8 pups every 3 years. "The dusky's intrinsic capacity to increase is lower, so you wouldn't expect as rapid of a response," explains Musick.

"With sandtigers," says Musick, "it's the reproductive potential. Sandtigers are a bit bigger than sandbar sharks, they mature a year earlier, but they only have 2 young every other year instead of 10. We see more sandbar sharks, but sandtigers have just stabilized at very low levels."

Once a research survey shows a shark species to be overfished, federal regulations require a management plan. That plan must include a strategy to restore the species to a pre-fishery condition in 10 years. The plans recognize that some species may take more than a decade to recover because of their lower intrinsic rate of increase.

"A lot of the sharks fit into that category," says Musick. "Mandated recovery periods have thus become more flexible to account for differences in life-history strategies."

## Safety Training



Marine Scientist Supervisor Bob Gammisch tests an inflatable life raft as part of VIMS' on-going vessel-safety training. The training provides an opportunity for vessel operators and passengers to practice safety procedures and become familiar with the safety gear provided in life-raft survival packs.

## Scott Wins Student Prize

Recent Gloucester High graduate Jennifer Scott recently won first place in the Environmental Science category at the Virginia Junior Academy of Science, securing a \$5,000 Henry Mackenzie Scholarship. The award recognizes Scott's presentation of the research she completed this spring at VIMS under the mentorship of Dr. Mike Newman and his lab manager Alanna MacIntyre, through the Chesapeake Bay Governor's School. Scott's experiments challenged conventional methods for measuring toxicity

(see sidebar below photo). "The experience was great," said Scott. "I loved giving the presentation, the whole process of being able to show that a problem exists followed by possible solutions." Scott will attend Old Dominion University this fall.



Governor's School Student Jennifer Scott, lab manager Alanna MacIntyre, and Professor Mike Newman.

## ICCAT Adopts Ban on "Shark Finning"

The International Commission for the Conservation of Atlantic Tunas (ICCAT) adopted the first international ban on shark finning during their most recent annual meeting. The U.S. ICCAT Advisory Committee is chaired by VIMS fisheries scientist Dr. John Graves.

Finning occurs when commercial anglers remove a shark's fin (a delicacy in Asian markets) and throw the rest of the carcass overboard.

The U.S. ICCAT delegation introduced the shark proposal early in the meeting. The delegation is led by Dr. Bill Hogarth, Assistant Administrator of the National Marine Fisheries Service, and coordinated by Graves, who has chaired the U.S. ICCAT Advisory Committee for the past nine years.

"The ban on shark finning was a major move by ICCAT," says Graves. "It increased the scope of the convention, moving it from just managing the target species to managing bycatch. ICCAT is the only regional fishery management with competence throughout the Atlantic, so it makes sense that they should be responsible for managing all pelagic resources."

In addition to the U.S., the resolution was co-sponsored by the European Community, Canada, Japan, Mexico, Panama, South Africa, Trinidad &

Tobago, and Venezuela. It requires other shark-fishing nations to adopt procedures already followed by U.S. fishermen and resource managers. The U.S. banned shark finning by anyone under its jurisdiction in 2000.

The ban includes provisions that will allow enforcement. "It is now the responsibility of each member nation to implement the ban with domestic measures," says Graves.

The ICCAT ban is based on a recent stock assessment suggesting that some pelagic sharks, particularly shortfin makos, are in danger of being overfished—both as a targeted species and as bycatch in the longline fishery for swordfish and tuna.

"The stock-assessment results didn't demonstrate an immediate need for management measures," says Graves, "but we felt it was important to establish the Commission's competence for them, so we went forward with the ban on finning."

VIMS' shark expert Dr. Jack Musick hails the ICCAT resolution. "Sharks are particularly susceptible to overfishing because of their slow growth and low reproductive rates," says Musick. "An international ban on finning will certainly help in efforts to restore shark populations to a sustainable level."

Many shark stocks, particularly in the Atlantic, are overfished. Rebuilding these stocks and maintaining healthy shark populations is required under the Magnuson-Stevens Fishery Conservation and Management Act.

The Inter-American Tropical Tuna Commission (IATTC), ICCAT's eastern Pacific counterpart, just adopted a measure identical to the one adopted by ICCAT. "It's nice to see that type of progress," says Graves.

Other notable actions at the New Orleans meeting, the first ICCAT annual meeting held in the U.S., include the extension until 2006 of management measures for bluefin tuna, swordfish, blue marlin, and white marlin that were set to expire this year. The Commission also adopted a four-year agreement for bigeye tuna. These management measures include sharing arrangements and stock allocations designed to provide equitable access to tuna populations for all tuna-fishing nations.

ICCAT is an international treaty organization made up of 39 members from 63 countries. Member nations manage the tuna and tuna-like (swordfish, marlin, sailfish) fisheries in the Atlantic, Mediterranean, and Gulf of Mexico, using scientific evidence to develop recommendations and resolutions aimed at maintaining populations at sustainable levels.

### Time for a Change?

Methods for measuring chemical toxicity haven't changed in decades. In fact, until recently, the standard methods introduced in the late 1920s had not even been questioned. VIMS Professor of Marine Science Dr. Mike Newman says it's time for a change.

Toxicity is currently measured in terms of LC50—the concentration of a chemical in water that kills 50% of test animals in a given period.

The theory currently used to interpret LC50 data says that each exposed animal has an innate tolerance that, if exceeded during a test, results in death. Surprisingly, this theory has not been rigorously tested. An alternative explanation is that the death of a specific animal is simply a matter of chance. If correct, the alternative theory would change how researchers use LC50 data to determine acceptable chemical toxicant concentrations in the environment.

Newman has designed several experiments to investigate the alternative hypothesis, including a mentorship project for Chesapeake Bay Governor School student Jennifer Scott. Ms. Scott's assays with mosquitofish showed overwhelmingly that acute toxicity is much more random than previously assumed, evidence that the traditional interpretation of LC50 data was unreliable in the common situation where subsequent exposures are likely to occur.

## Fisheries Hires Fabrizio

The Department of Fisheries Science has hired Dr. Mary Fabrizio as an Associate Professor in the field of finfish population dynamics. She will occupy the vacancy created by the retirement of Dr. Herb Austin, who steps down this summer after 28 years at the Institute.

Fabrizio is currently the Chief of the Behavioral Ecology Branch at the Northeast Fisheries Science Center, a division of the National Marine Fisheries Service. She is scheduled to begin work at VIMS this fall.

Fisheries Chair John Graves describes Fabrizio as a "valuable addition to the Department." We had several excellent applicants and were lucky to attract Mary," says Graves. "She brings additional quantitative strengths to the department, complementing those of Drs. Hoenig and Latour."

Fabrizio's interest in the population dynamics of finfish is motivated by her desire to better manage and conserve species of commercial and recreational interest. In addition to her academic duties, her two main responsibilities at VIMS will be to supervise the Institute's juvenile fish surveys and develop a research program to explore issues in fisheries management.

Those tasks are by no means mutually exclusive, says Fabrizio. In fact, she sees them as complementary.

One of Fabrizio's key research goals is to incorporate the behavior of individual fishes into the population-level models used to manage fish

stocks. Running the fish surveys will give her ample opportunity to study the behavior of most of the common fish species in Chesapeake Bay.

Current fisheries models typically use average rates of birth, growth, mortality, and fishing pressure to predict changes in a fish stock. Recently, scientists have developed more nuanced models that incorporate variations around the mean in factors such as body size. These models can more accurately predict population trends by incorporating variables such as the higher rate of winter mortality among smaller fish.

Fabrizio would like to further enhance the models by providing input on the behavior of individual fish, particularly in light of their response to habitat changes. She helped pioneer this approach during a recent study of habitat use and dispersal by marine fishes off New Jersey. Her team used state-of-the-art ultrasonic tags and a network of moored receivers to closely track large numbers of individual black sea bass and summer flounder. This helped them clarify the factors affecting the fishes' dispersal from a habitat that had been disturbed by the placement of dredge spoils.

Habitat issues have become important in fisheries management and are formally recognized in the essential fish habitat (EFH) requirements of the Magnuson-Stevens Fishery Conservation and Management Act, the nation's primary federal law governing fisheries management issues.

"Fishery management plans are required to describe and identify essential fish habitats, minimize adverse effects on those habitats, and encourage their conservation and enhancement," says Fabrizio. "A better understanding of individual fish behaviors will help accomplish these goals."

She plans to implement similar studies in Chesapeake Bay and Virginia's coastal waters. "Examining individual responses could help explain fish movement or dispersal in relation to changes in the environment or habitat," says Fabrizio. "These types of studies can lead to a better understanding of larger scale patterns in distribution and habitat use."

Fabrizio also plans to investigate how habitat changes through time might bias long-term survey results by altering the catchability of a target species. For instance, an apparent increase in a fish stock might reflect the loss of bay grasses and a consequent rise in trawl-net efficiency, rather than a true increase in the number of



New VIMS faculty member Dr. Mary Fabrizio.

fish. Likewise, a more turbid habitat might alter a fish's escape behavior in response to survey gear.

Fabrizio has published more than 30 peer-reviewed publications and 26 technical reports during her career. She served as President of the American Fisheries Society's Marine Fisheries Section from 2002-2004, and is scheduled to assume the Society's presidency in 2007.

## VIMS Helps Restore Wicomico Oysters



A disease-tolerant oyster strain developed at VIMS underpins the latest and largest effort to restore native oysters to Chesapeake Bay. This past spring, the U.S. Army Corps of Engineers and other partners began to seed 3.8 acres of newly constructed reefs in the Great Wicomico River with 15 million of the disease-tolerant oysters. The project builds on more than a decade of effort by state and federal agencies and non-profit citizen groups. It marks the first large-scale restoration of an estuary system as a single unit in order to "kick start" sustained natural oyster reproduction. Members of the Great Wicomico Oyster Restoration Project include from L: Paula Jasinski (NOAA Chesapeake Bay Office at VIMS), Russ Baxter (VA Dept. of Natural Resources), Tommy Leggett (Chessie Seafood and Aquafarms, Yorktown; kneeling). Doug Martin (U.S. Army Corps of Engineers), Jack Travelstead (VA Marine Resources Commission), and Stan Allen (VIMS).

## Schooner Virginia Prints

By John Poague MacLeod



**Special Alumni  
Discount!  
15% Off!  
\$170 + tax  
and shipping:  
\$198.50**

Signed and numbered by the artist.  
130 wt. acid free paper. Dimensions: 22½" x 30"  
\$200 each plus 5% tax.  
Shipped flat for \$20 to most locations.  
200 prints donated to VIMS by the artist.  
100% of sale supports VIMS.

Buy on-line:  
<http://tethys.vims.edu/pubs/prints.cfm>  
Or send check to: VIMS, Attn: Development  
Office, PO Box 1346, Gloucester Point, VA 23062  
Call (804) 684-7099 for more information or to  
pay with credit card.



---



---

## News Briefs

---



---

### Hopper-Brill Named Education Specialist

The Sea Grant Marine Advisory Program at VIMS has hired Dr. Carol Hopper-Brill as Marine Education Specialist. Hopper-Brill will manage education programs for secondary students, including the Blue Crab Bowl and Outlook on Ocean Science classroom program. She also adds valuable expertise to the program's professional development courses for teachers. Hopper-Brill comes to VIMS from the Waikiki Aquarium in Hawaii, where she spent more than 20 years in the Education Department. Hopper-Brill has a Ph.D. in invertebrate zoology from the University of Hawaii, and M.S. and B.A. degrees in zoology from the University of California, Davis.

### Steinberg Hits the Airwaves

Associate Professor Deborah Steinberg introduced listeners to the world of plankton during an *Our Ocean World* radio spot in September. *Our Ocean World* is produced in cooperation with the National Oceanic and Atmospheric Administration and airs on more than 100 radio stations throughout the United States. Access the September 26, 2004 segment online at [www.ouroceanworld.com/2001/oceanworld.htm](http://www.ouroceanworld.com/2001/oceanworld.htm).

### Hershner Advises Bay Program Executives

Dr. Carl Hershner, Director of the Center for Coastal Resources Management at VIMS and Chair of the Chesapeake Bay Program's Scientific and Technical Advisory Committee, testified in January before the CBP's Executive Committee, which includes the governors of Virginia, Maryland, Pennsylvania, and the Mayor of Washington, D.C. Hershner touched on issues including the Asian oyster, ecosystem management plans, and the recommendations of the Bay Program's Blue Ribbon Panel.

### Former VIMS Intern in Nature

Former VIMS high school intern Kelly Dorgan, now a Ph.D. student at the University of Maine, recently published her first article in the prestigious science journal *Nature*. Dorgan participated in the VIMS Governor's School program in the early 1990s with researchers Linda Schaffner, Carl Friedrichs, and Beth Hinchey, and later worked in the VIMS Seagrass Program with Bob Orth. Dorgan's *Nature*

paper reveals that marine worms burrow through muddy sediments by cracking rather than deforming them, helping to solve a long-standing enigma in worm research. (Dorgan et al., 2005, *Burrowing mechanics: Burrow extension by crack propagation*. 433: 475.)

### Boon Authors Tide Book

VIMS Emeritus Professor Dr. John Boon has authored a new book on tides. The 212-page paperback, *Secrets of the Tide*, provides a comprehensive overview of tides, tidal currents, storm surges, and sea-level trends. One chapter is devoted to Boon's analysis of sea level during Hurricane Isabel and other storms. The chapter explains why future storms pose even greater flood risks and argues that changing storm-tide referencing could help coastal residents understand and minimize potential impacts. *Secrets of the Tide* is available in the VIMS Gift Store and at [amazon.com](http://amazon.com) and other on-line book-sellers.

### Hale Appears Inside Walrus

Professor Dr. Rob Hale features prominently in a lengthy article on flame retardants that appeared in the December 2004 issue of *The Walrus*, a monthly Canadian magazine with a circulation of more than 50,000. The article, *Everyday Poisons: Are fire retardants actually a toxic hazard?*, debates the safety benefits and environmental risks associated with these ubiquitous chemicals.

### Goodwin Named Facilities Manager

The College of William and Mary has approved the appointment of Mr. Wendell Goodwin as Director of Facilities Management at VIMS. Goodwin occupies the vacancy created by the promotion of Mr. Joe Martinez to the position of Deputy Associate Director for Facilities Planning, Design, and Construction at William and Mary. Martinez had served as Facilities Manager at VIMS since 2002.

Goodwin's appointment represents a homecoming. He first arrived at the Institute in 1993 to manage the design and construction of Chesapeake Bay Hall, then served as Facilities Director from 1996 until he left in 2002 to join an engineering firm in North Carolina.

"Wendell's experience with the construction of CBH will serve us in

good stead as we move forward with the new Marine Research Complex," says VIMS Dean and Director John Wells.

### Gray Wins Best Poster Award

VIMS graduate student Kurt Gray won the best student poster award during the 85th Annual Meeting of the American Society of Ichthyologists and Herpetologists (ASIH) in Tampa, Florida in early July. ASIH is the nation's largest society for the study of fishes, amphibians, and reptiles, with more than 2,400 members worldwide. Gray's poster described his work with advisor John Graves on the population genetics of the marlinsucker *Remora osteochir*. Gray is working to deter-

*Collaborative Oyster Project*  
continued from page 1

ally develop some diploid tissues. In designing this study we took great care to estimate those risks and to develop an experimental design that reduced them to a minimum. This gives me confidence that we will be granted the necessary permits."

Current knowledge of the potential performance of *C. ariakensis* in Chesapeake Bay is based on aquaculture trials in which triploid oysters were grown in floating cages, or on laboratory tests with fertile, diploid oysters grown in quarantine. Neither approach provides all the information needed by the authors of the EIS to most accurately predict the performance of an established wild population of *C. ariakensis* in Bay waters.

"Oysters grown in surface cages are likely to have higher survival and growth rates than those grown on the bottom," says Luckenbach. "Oysters on the Bay floor are exposed to lots of silt, a greater variety of predators, potential space competition, and reduced food levels."

The aquaculture trials also fail to provide information on the potential interactions between *C. ariakensis* and *C. virginica*, or on the growth form and reef-building potential of the non-native species. Luckenbach's study of *C. ariakensis* in its native habitat in Asia suggests that this species may have a lower propensity for reef-building in comparison with *C. virginica*. Oyster reefs were once a key part of the Chesapeake Bay ecosystem, providing food and cover for many Bay species. Such reefs have dramatically declined over the last

mine whether marlinsuckers from the Atlantic and Pacific oceans differ genetically. The research builds on previous genetic studies of billfish by Graves and Jan McDowell.

### Swordfish Work in the News

Dr. Rich Brill's work on the visual system of swordfish is receiving widespread notice in the nation's press. Brill and colleagues discovered that the swordfish's unusual ability to keep its eyes much warmer than surrounding waters is an adaptation that allows the fish to better track its prey. Brill directs the National Marine Fisheries Service's Marine Education and Research Program at VIMS.

century due to over-harvesting, habitat degradation, and disease.

Ongoing studies using diploid *C. ariakensis* and *C. virginica* in quarantined systems at VIMS' Eastern Shore Laboratory and the University of Maryland's Horn Point Laboratory are addressing some of the inherent shortcomings of the aquaculture studies. But these laboratory studies have shortcomings of their own.

"The limitations of the aquaculture studies are offset to a degree by comparisons with *C. virginica* grown under comparable conditions," notes Luckenbach, "but the laboratory studies are unable to duplicate conditions in natural bottom habitats, and can only provide relative rates of growth and survival to the population models under development for the EIS."

The upcoming study is designed to measure the most naturalistic rates of growth and survival of the two oyster species. It will investigate four key research areas: growth rates and environmental tolerances, head-to-head competition, reef-building potential and habitat use; and the transmission of oyster diseases. These research topics were identified as priorities by a Chesapeake Bay Program Scientific and Technical Advisory Committee established in 2003.

Funding for the first-year of the project comes from NOAA's Chesapeake Bay Program, the Virginia Marine Resources Commission, the Maryland Department of Natural Resources, and the Keith Campbell Foundation for the Environment. The team will seek support for the remaining 18 months of the study from each of these sources.

## Kirkley and Reay Win Environmental Award

VIMS researchers James Kirkley and William Reay have each received a prestigious Environmental Hero Award from the National Oceanic and Atmospheric Administration (NOAA).

NOAA presents the award each year to a small number of individuals and organizations from across the United States to honor their efforts to preserve and protect the nation's environment. For 2005, the agency recognized a total of 37 winners-34 individuals and three organizations.

"NOAA and the nation are fortunate to have such dedicated people give so much of their time," said retired Navy Vice Admiral and NOAA administrator Conrad C. Lautenbacher, Jr. "They set a perfect example for others to follow in their communities. America needs more environmental heroes like them."

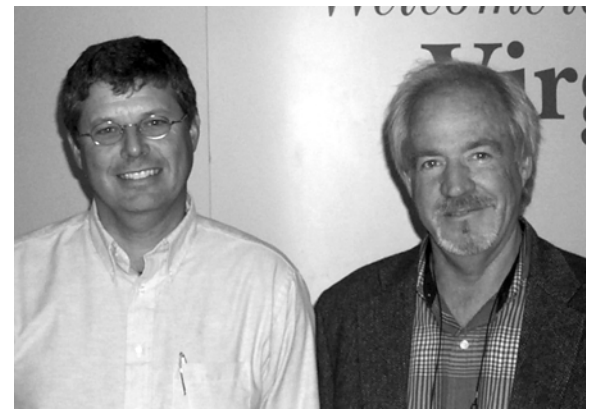
"VIMS is extremely proud that not just one but two of our faculty were

chosen for this national award," says VIMS Dean and Director Dr. John Wells. "Their efforts and accomplishments exemplify the best of what VIMS has to offer."

Kirkley, who chairs VIMS' Department of Coastal and Ocean Policy (DCOP), was recognized for his pioneering work in using economic analysis to better manage coastal and marine resources. Kirkley's many accomplishments include applying economic theory and models to help manage U.S. and international fisheries for shrimp, scallops, striped bass, and oysters; reduce sea turtle mortality; and develop effective community-impact assessments.

Reay, who directs the Chesapeake Bay National Estuarine Research Reserve program at VIMS, was recognized as a local and national leader in the effort to improve monitoring of water quality, weather, and

habitats in estuarine environments. His work has helped the Chesapeake Bay Program and the state of Virginia establish better water-quality criteria, and was instrumental in documenting the impacts of Hurricane Isabel on estuarine water quality. Reay was also recognized for his efforts to ensure that reserves around the country produce high quality data and explore the technology needed to expand the scope and parameters of monitoring data.



Drs. William Reay and James Kirkley.

## Pair Receive Faculty Awards

VIMS Associate Professors Carl Friedrichs and Debbie Steinberg were recently selected as recipients of the Alumni Fellowship Award and the Class of 1964 Distinguished Professorship by the College of William and Mary.

Friedrichs received the Alumni Fellowship Award in recognition of his prowess in teaching. The W&M Alumni Society established the award in 1965 to "recognize outstanding young members of the faculty who are particularly outstanding as teachers and who ensure that the high academic standards of the University are retained." The Alumni Society appoints five fellows annually, four from Arts and Sciences and one on an alternating basis from the schools of Business, Education, Law, or Marine Science.

Previous VIMS Alumni fellows are Drs. Liz Canuel (2001), James Bauer (1997), and Eugene Burreson (1993).

The Alumni Association will formally present the award to Friedrichs during a special recognition dinner on September 22nd.

Steinberg received the Class of 1964

Distinguished Professorship in recognition of her contributions in scholarship and teaching. Term-distinguished professorships are designed to recognize and reward excellence in research or creative activity and a demonstrated commitment to teaching. Nominations for the award must include at least three external evaluations attesting to the nominee's scholarly reputation, including published reviews of the nominee's work, agency reviews of grants, and readers' reports on manuscripts. The Professorship is awarded for a single three-year term.

Previous Class of 1964 Distinguished Professors at VIMS include Drs. Kimberly Reece (2004), Liz Canuel (2002), and Carl Friedrichs (2001).



Associate Professors Carl Friedrichs and Debbie Steinberg.

## Trio Tops Citation Analysis

A new analysis of articles published in leading coastal science journals between 1971 and 2003 shows that VIMS researchers have authored 3 of the 10 most highly cited works during that span.

"Having a publication cited by many other authors is a sure sign that your work has value," says VIMS Dean and Director John Wells. "VIMS is extremely proud that three of our scientists have had such a demonstrable impact on the global research community."

Researchers Bob Diaz, Hugh Ducklow, and John Milliman were recognized for seminal publications in the field of coastal biogeochemistry, an increasingly important discipline that deals with interactions in the coastal ocean among organisms, sediments, and water chemistry.

Diaz's 1995 publication in *Oceanography and Marine Biology Annual Review* was the most highly cited monograph during the study's 32-year span. It describes how areas of low oxygen affect bottom-dwelling marine organisms. These "dead zones" occur when and where nutrient pollution depletes oxygen stores, making life difficult for marine creatures. The number and size of dead zones has doubled every decade since the 1970s, with significant economic and environmental costs. About 150 dead zones now exist in the world's oceans and seas.

Ducklow's 1992 paper in *Advances in Microbial Ecology* was the seventh most highly cited paper. It revealed the key role that marine bacteria play in marine food webs and in the recycling of elements in the ocean. Ducklow's work on ocean bacteria shows them to be a critical component of the global carbon and

nitrogen cycles, and thus an important variable in accurate predictions of global climate change.

"These citations highlight one of VIMS' great strengths," Ducklow said. "We're a very diverse place, with faculty and students working around the globe in many ecosystems, and applying the knowledge and experience gained to the Commonwealth and the Bay region."

Milliman's 1992 paper in the *Journal of Geology* ranked fourth on the list. It first revealed the significance of small mountain rivers in the global sediment budget. Rivers form the major link between land and sea, discharging between 15 and 18 billion tons of suspended solids each year. Milliman's work showed that rivers draining young, rugged mountains discharge far more sediment than expected-for instance, more than 40% of the ocean's annual sediment input comes from mountain rivers in southern Asia and Oceania alone.

The citation analysis appeared in the June 2005 issue of *Marine Ecology Progress Series*. It was based on a study of a bibliographic database comprising 17,604 references from the Aquatic Science and Fisheries Abstracts and the Web of Science databases.

Overall, the analysis shows that the coastal ocean began receiving greatly increased scientific attention in the early 1990s, in step with increasing human populations in the coastal zone and consequent environmental impacts. It reveals a twofold increase in the yearly publication rate for coastal-ocean articles since 1990, and a three-fold increase relative to the publication rate of all other marine-science disciplines.



# Fisheries Partnership Aids Sturgeon Restoration

Efforts to restore Chesapeake Bay's sturgeon population took another step forward this spring when researchers transported three large Atlantic sturgeons from the James River to a spawning facility in Maryland.

The largest sturgeon was a 5'6", 85-pound fish caught in a gill net by commercial fisherman Kelly Place. Place, along with fishermen George Trice and Jimmy Moore, are partners in a collaborative project with Dr. Chris Hager, Fisheries Bycatch Specialist with the Sea Grant Marine Advisory Program at VIMS. Their partnership is part of a larger sturgeon monitoring and restoration effort among state and federal agencies in Virginia and Maryland.

The three large sturgeons were some of the first captured in Virginia waters large and mature enough to hold significant promise for spawning efforts. Captive spawning is one part of a management strategy designed by the Atlantic States Marine Fisheries Commission (ASMFC) in the mid-1990s to help restore wild sturgeon stocks to levels that will provide for a viable population and sustainable fisheries in Chesapeake Bay.

"These fish can't come back on their own," says VIMS fisheries scientist Dr. Jack Musick. "There are simply not enough spawning adults."

Researchers were hoping that at least one of the two largest fish would prove to be a reproductively capable female, but all three fish proved to be males. The good news is that hormone treatments encouraged the two large males to produce gametes. These are now being preserved in the hopes that Hager and Place will capture a reproductively capable female during next spring's spawning season.

If on-going DNA tests ultimately show that the males are of James River stock, their gametes could be used to fertilize a James River female and help jumpstart a local population in the River.

For now, the genetic make-up of East Coast sturgeon stocks remains an open question. Scientists are unsure if the Chesapeake Bay sturgeon population is genetically unique, or represents a blend between Hudson River and South Carolina populations.



Dr. Chris Hager nets the sturgeon from its temporary home in the York River.

If there is a unique sturgeon gene pool in Chesapeake Bay, those fish should be used for restoration, says Hager. "We need to get some Virginia genes in the spawning program," adds Musick.

Previously, the only captive sturgeons large enough to spawn have come from the Hudson River in New York. Female sturgeon typically do not reach sexual maturity until they are about 12 years old and about 6 feet long. Males mature slightly earlier, at around 7 years old. The fish may live up to 60 years and grow to 14 feet.

The James River watermen caught the sturgeon during a fishery-independent research project designed to throw light on the sturgeons' abundance, habitat, and seasonal movements within local waterways. Another aspect of the study aims to understand how sturgeons are being affected by fisheries bycatch.

The study is funded by a Fisheries Resource Grant from the Virginia Sea Grant Program to Place and Hager. These grants are designed to provide Virginia watermen with an opportunity to use their knowledge and experience to help develop new fisheries gear, restore or enhance fishery habitat, improve aquaculture operations, or advance technologies for processing and marketing seafood.

"The grants provide fishermen with a means of improving their industry through collaborative applied research projects," says Hager. "Their knowledge and experience can go a long

way toward our shared goal-to re-establish a sustainable fishery for sturgeon in Chesapeake Bay."

Musick and his graduate students are pursuing a related study to better understand the sturgeon's spawning behavior and habitat requirements. Such knowledge is needed to guide the selection of any future stocking locations.

"We're working to find the optimal spot for restoration," says Musick. One thing the researchers already know is that sturgeons need a hard-bottom for attaching their eggs. Because human activities in the Chesapeake Bay watershed have greatly increased the amount of silt blanketing the bay floor, hard bottoms are now rare. Thus "one option we're considering is the addition of rocks to certain areas," says Musick.

Efforts to restore Chesapeake Bay sturgeon populations involve numerous stakeholders, including commercial watermen, the Maryland Department of Natural Resources, the National Aquarium in Baltimore, the Horn Point Laboratory at the University of Maryland's Center for Environmental Science, VIMS, the Sea Grant Marine Advisory Program at VIMS, the Virginia Marine Resources Commission, the US Fish and Wildlife Service, the Virginia Dept. of Game and Inland Fisheries, the James River Association, the Army Corp of Engineers, and NOAA Marine Fisheries. Tanks for captive spawning are provided by Horn Point and a facility operated by Mirant Corporation, an energy provider with four power plants in the Chesapeake Bay watershed. Because sturgeon range up and down the East Coast, the restoration project is coordinated by the multi-state ASMFC.

Sturgeon restoration efforts also include a coast-wide moratorium on sturgeon harvesting, which was enacted by the ASMFC in 1997. Virginia has had a moratorium on sturgeon harvesting since 1974.

Sturgeons once supported the second largest commercial fishery on the U.S. East coast, with a peak landing in 1890 of 7.5 million pounds. But decades of over-fishing and habitat loss forced the sturgeon population into a steep decline. Populations of Atlantic sturgeon are now extirpated in Maryland and at historically low abundance in Virginia, where remnant populations exist in the James and York rivers.

**WILLIAM & MARY** VIRGINIA INSTITUTE of MARINE SCIENCE  
**Web Update** **VIMS**

Welcome   Research   Education   Advisory Services   Administration   Resources   News & Media

**Fish Collection**  
This site allows users to search the VIMS fish collection by keyword, family, genus, and species. The VIMS ichthyological collection is one of the largest and most diverse collections of fishes from Nova Scotia to North Carolina, with approximately 20,000 cataloged lots comprising 128,000 specimens in 247 families. Visit [http://tethys.vims.edu/fish\\_collection/](http://tethys.vims.edu/fish_collection/)

**ChesMMAP Trawl Survey**  
Visit [www.vims.edu/resources/databases.html](http://www.vims.edu/resources/databases.html) and click "Trawl Survey Database" to access data from the Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP). Monthly ChesMMAP surveys monitor the abundance, age, and

dietary habits of commercially and recreationally important fishes in Chesapeake Bay in light of oxygen levels and other water-quality parameters.

**Antarctic Research**  
Visit [www.vims.edu/phae/](http://www.vims.edu/phae/) to learn about a new NSF-funded research grant to Drs. Kam Tang and Walker Smith. During their 1-year project at McMurdo Station, the pair will compare the ecological roles of solitary and colonial forms of *Phaeocystis antarctica*. This marine plant plays a crucial role in polar ecology and biogeochemistry, but its physiology, life history, and place in the food web are poorly known.

## Researchers Test Beach-Nourishment Protocol

An interdisciplinary team of VIMS researchers is wrapping up a multi-year study in Virginia Beach designed to help government agencies more effectively monitor the environmental impacts of beach nourishment.

Beach nourishment involves mining sand from offshore or land-based deposits and transporting it to beach areas to make them wider and more stable.

Geologists Woody Hobbs, Scott Hardaway, and Jesse McNinch have joined forces in the project with biologist Bob Diaz and computer modeler Jerome Maa. Their goal is to test the Mineral Management Service's (MMS) protocol for monitoring the effects of sand mining on the living and physical resources of U.S. shorelines. The MMS is the federal agency charged with issuing permits for sand-mining from federally managed offshore areas.

Beach nourishment is a sometimes-controversial practice with costs and benefits to both the economy and the environment. The Army Corps of Engineers (ACOE) spends about \$80 million a year to maintain the nation's coastline against erosion and rising sea level, with local governments chipping in another \$40 million. In addition to supporting healthy a tourism economy that generates billions of dollars annually, healthy beaches can play a major role in protecting the shore from storms and erosion. Critics contend that some beach-nourishment projects actually hasten coastal erosion, and that the practice is ultimately unsustainable.

Virginia Beach, the Commonwealth's most popular seaside destination, has spent about \$110 million on its 30-year beach-stabilization project, and earns about \$40 million in taxes from the \$500 million in tourist revenue that the beach generates each year.

The current study builds on VIMS' long history of collaboration with MMS, ACOE, and other coastal-management agencies. "We've had a series of one-to-two year projects going back over a dozen years with MMS, looking at various aspects of beach nourishment in Virginia Beach," says project leader Hobbs.

The initial studies defined the available reserves of sand offshore of Virginia Beach. A more recent study focused on the potential environmental impacts of offshore mining. VIMS scientists assessed the possible biological impacts to bottom-dwelling organ-

isms and fish, and the possible physical impacts to the offshore dredge zone, the surf zone, and the nourished beach. Study results included computer models that MMS and ACOE use to evaluate and implement beach-nourishment projects.

The VIMS' studies were instrumental in guiding MMS officials during their review of Virginia Beach's (successful) request for permits to exploit the sand resources off its shoreline. In fact, the MMS was so satisfied with VIMS' efforts that the agency encouraged other institutes to use the studies as a template when submitting proposals for shoreline-impact studies in other states along the Atlantic seaboard.

"Ultimately, though," says Hobbs, "MMS realized that their studies were about the potential impacts, and that follow-through to see what really happened would be of great benefit. So they set about to create a protocol for monitoring offshore sand-mining areas."

"Monitoring would allow us to assess the accuracy of the predictions that were used in the design and consideration of the dredging process," notes Hobbs. "That would help improve the predictive models so that subsequent nourishment projects will

last longer and have fewer detrimental environmental effects."

The current VIMS study is designed to review and enhance a trial protocol that was developed by a consultant using information obtained during a December 2000 meeting of scientists, engineers, and resource managers at VIMS.

The VIMS study is multifaceted. McNinch is studying how subsurface geology in the surf zone helps controls beach erosion. Hardaway is investigat-

ing the best ways to monitor a nourished beach to ensure that it lasts as long as possible. Diaz is exploring how best to conduct long-term studies of impacts to bottom-dwelling organisms in the dredge zone. Maa is testing a low-cost radar system for monitoring wave height shoreward of the dredge area (see sidebar).

The team expects to deliver its final report to the MMS by in early 2006.



Sandbridge, Virginia (just south of Virginia Beach) before (L) and after (R) beach nourishment. The beach is much wider in the after-nourishment photo, even though that photo was taken after Hurricane Isabel.

### Maa Rises to the Occasion

The Mineral Management Service's initial protocol for monitoring beach-nourishment projects called for use of a buoy to monitor waves at project sites, but VIMS researcher Jerome Maa and others were concerned that a single buoy would not provide broad enough spatial coverage for meaningful results. Maa is thus testing the effectiveness of using a low-cost radar system to monitor wave height along the beach. The current radar unit provides coverage over a radius of about 2.5 kilometers.

"The long-term goal is to use easily available X-band radar to monitor the wave height and current field," says Maa, "That's important because wave conditions affect sediment transport, the beach profile, and erosion along the beach."

Maa stationed his radar unit atop the 12-story Clarion Resort and

Conference Center in Virginia Beach. "They were very kind to provide this high ground," says Maa. "You need a certain height to use radar for better wave images. The ideal height is 30 meters or more."

Unlike traditional wave gauges, which measure actual vertical displacement, radar images provide only a relative measure of wave height. Maa's most recent research effort was thus to place a pressure gauge within the radar's field of view in order to calibrate or "ground truth" the radar data. The gauge was deployed this past spring by marine technicians Bob Gammisch, Tim Gass, and Wayne Reisner, and graduate student Ho Kyung Ha.

Maa has also been working to develop the software needed to interpret and analyze the radar images,

potentially saving the agency about \$50,000 dollars at each radar-monitored sand-mining site.

Preliminary results suggest that the radar holds promise for long-term monitoring of beach-nourishment efforts. "Radar is not a perfect technique, but it is reasonable," says Maa. Land-based radar units are cheaper to maintain and operate than traditional marine gauges, and provide much wider coverage.

Due to budget cuts, the Army Corps of Engineers no longer operates a wave gauge for Virginia Beach. "But there is a need to know wave conditions and to use that as input to better simulate shoreline response," says Maa, "so I think that with local support, we will go back. Everyone is interested in maintaining a stable beach."

## Emeritus Professor George Grant Dies

Dr. George C. Grant, Professor of Marine Science Emeritus, passed away on April 2, 2005 at Riverside Regional Medical Center.

At the time of his retirement in 1993, Grant had been a productive scientist and member of the VIMS faculty for 25 years. During that period, he gained high regard among his colleagues as an expert in the taxonomy and ecology of marine zooplankton, and contributed greatly to understanding of fisheries and planktonic communities in estuarine and coastal systems.

As Chair of the VIMS Editorial Committee, Grant facilitated scientific

publication and ensured quality in scholarly works for more than 22 years. He continued to work for VIMS as a Journal Publications Editor after his retirement, helping foreign students edit their theses and dissertations. He also tutored students in English. Many students remember Grant for teaching a Scientific Writing course that helped them during the writing of their theses and dissertations.

As department chair and then Head of the Division of Biological Oceanography for 15 years, Grant contributed significantly to Institute administration. He also served as a mentor to newly appointed faculty

members, helping them orient to their research field at VIMS.

Grant first arrived in Gloucester Point in 1960 as a graduate student at the then Virginia Fisheries Laboratory. He earned his Master's from VIMS in 1962, and a Ph.D. in Oceanography from the University of Rhode Island in 1967.

He then returned to Gloucester Point to continue what became a life long connection with VIMS and the College of William & Mary.

During retirement, Grant served as a founding member of the VIMS Annual Fund Board and as President of the Botetourt Chapter of the William and Mary Alumni Association, which presented him with the 2003 Alumni Service award for his efforts.

Grant had an international reputation as a specialist in the taxonomy of the invertebrate Phylum Chaetognatha, and made significant advancements to



Dr. George Grant

knowledge of morphological diversity in the genus *Sagitta*. Commissioned by the prestigious and multi-national Chaetognath Group, he compiled and distributed a comprehensive bibliography of the phylum, thereby expediting future inquiry into the biology and evolutionary history of the group.

Dr. Grant is survived by his wife Eileen, two children, four grandchildren, and one great-grandchild. The family suggests that memorial contributions may be made to the William J. Hargis Jr. Library Fund in care of VIMS. —John Olney

## Virginia Governor's School

VIMS again hosted a group of high school students this summer as part of the Virginia Governor's School program.

The VIMS Governor's School is a four-week summer residential school provided in cooperation with Christopher Newport University. The program has provided high-achieving Virginia high school students with authentic experiences in marine research for more than 15 years. The program is structured as an apprenticeship in which each student works with a faculty sponsor on an authentic VIMS research project.

Dr. Rochelle Seitz of VIMS manages the program, which this year ran from June 27th through July 22nd. She was assisted by Lee Larkin and Carol Hopper Brill of the VIMS Sea

Grant Marine Advisory Program and Gloucester High School teacher Ms. Cathy Metcalf.

Ms. Caterji is working with Dr. Kam Tang and VIMS graduate student Emily Yam to study the ecological interactions between zooplankton and "marine snow." Ms. Hutchinson is working with Dr. Rochelle Seitz to investigate habitat quality and food resources for juvenile blue crabs that are being tested for possible use in population enhancement efforts. Ms. Smith is working with Drs. Fu-Lin Chu and Eric Lund to examine the effect of the drug Triclosan on oyster hemocytes and on the viability of the oyster parasite *Perkinsus marinus*. Ms. Seid is working with Dr. Rom Lipcius to explore the ecology of juvenile blue crabs in the context of joint crab and oyster restoration efforts.



The 2005 Governor's School students are from L to R: Katia Chaterji (Hampton Roads Academy), Katie Hutchinson (John Randolph Tucker High School), Samantha Smith (Chatham High School), and Charlotte Seid (Thomas Jefferson High School for Science and Technology).

## Researchers Track Sea Turtles



Graduate student Kate Mansfield and a team of researchers from VIMS and the Army Corps of Engineers released two rehabilitated loggerhead sea turtles into Chesapeake Bay on June 17th. Mansfield will track the pair, nicknamed "Elvira" and "Dewey Decimal," using satellite tags that she glued to their shells. To follow the turtles' journeys online, visit [www.seaturtle.org/tracking/](http://www.seaturtle.org/tracking/) From L: Meredith Fagan, Tara Fitzpatrick, and Trish Bargo.



# Calendar of Events

—August 2005—

—September 2005—

—October 2005—

—November 2005—

—December 2005—

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

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

*Visit our website at [www.vims.edu](http://www.vims.edu)*

## Beazley Foundation Endows Tidewater Fellowship

The Beazley Foundation of Portsmouth has awarded the VIMS Foundation a \$50,000 endowed student fellowship to attract students from the Tidewater region of Virginia.

Beazley Foundation President Judge Richard Bray traveled to VIMS in early June to announce the award.

“The work VIMS does in the Commonwealth is critical to sustaining our natural resources,” says Bray. “We are proud to partner with VIMS to educate future generations of scientific leaders.”

VIMS Dean and Director John Wells adds that “We’re grateful to the Beazley Foundation for their support of VIMS and applaud their advocacy for education, health, and human services in the community.”

The Beazley Foundation was established in 1948 to support educational, charitable, and religious organizations serving southeastern Virginia. The Foundation is supported with funds provided by the late Fred W. Beazley, his wife, Marie C. Beazley, and son, Fred W. Beazley, Jr., all of Portsmouth, Virginia.



Beazley Foundation President Judge Richard Bray (C) discusses biodiversity research with Dr. Emmett Duffy (L) and graduate student Kristin France (R).

## VIMS Art Show and Auction

VIMS’ annual Art Show and Auction drew more than 200 people to Gloucester Point in late April to view and bid on trips, jewelry, boats, and the works of featured artists John MacLeod and Robert Swain. The event raised more than \$55,000 for research and education programs at VIMS.

“The Auction was a great evening for both our guests and for VIMS,” says Development Director Page Hayhurst. “Our guests consistently told us they had a wonderful time. They especially enjoyed meeting and speaking with the student hosts.”

Hosts Aaron Bever, Jessie Campbell, Heidi Geisz, Amber Hardison, Lynsey LeMay, and John Walter helped inform attendees about VIMS research while assisting with the evening’s activities.

The Auction was organized and managed by Ann Berry, Nicoll Brinley, Candy

Campbell, Peter Clay, Champ Johnson, Ginny Lascara, Bob Middleton, Carroll Owens, Gary Robertson, Bootsie Rogers, and Joseph and Lindy Van Burik.

“Bootsie and Ginny were especially dedicated, generously giving more than 200 hours of time in addition to their financial support,” says Hayhurst.

Next year’s event will feature renowned marine artist Guy Harvey.



Bootsie Rogers (Auction Co-Chair) and Carroll Owens (VIMS Council Chair and Committee Member) joined more than 200 other guests at the VIMS’ annual Art Show and Auction on April 29th.