

1-1-2013

## 2013 Annual Report July 1, 2012 through June 30, 2013

Virginia Institute of Marine Science

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### Recommended Citation

Virginia Institute of Marine Science, "2013 Annual Report July 1, 2012 through June 30, 2013" (2013).  
*VIMS Annual Reports*. 6.  
<https://scholarworks.wm.edu/vimsannualrpt/6>

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# 2013 Annual Report

July 1, 2012 through  
June 30, 2013

**VIMS** | WILLIAM  
& MARY  
VIRGINIA INSTITUTE OF MARINE SCIENCE

*Science for the Bay*

**- IMPACT FOR THE WORLD**



# Letter from the Dean & Director



Dear Friends of VIMS:

The 2013 fiscal year was a positive one at the Virginia Institute of Marine Science. Our scientists made many new discoveries, state support stabilized, grants and contracts increased, and the VIMS Foundation—to which many of you have contributed—continued to grow. As we approach our 75th Anniversary in 2015, we trust that our many friends will be involved in the activities we plan for the celebration. You can look for details on our website as the date nears.

The most important sign of the future was the hiring of five new faculty members—rising stars who will help carry our mission forward. Joining the VIMS faculty following national searches were Chris Hein, Matt Kirwan, and Donglai Gong in Physical Sciences; BK Song in Biological Sciences; and Andrew Wargo in Environmental and Aquatic Animal Health.

On the administrative side, Mark Luckenbach came aboard as our new Associate Dean for Research and Advisory Services. He succeeds Roger Mann, who returns to a faculty position after nearly 10 years of administrative service to VIMS and the Commonwealth.

This report highlights faculty and student research in Virginia and around the world, reports on the prestigious awards that members of the VIMS community have received for their work, and recognizes the many generous gifts from individuals, corporations, and foundations to VIMS and to the VIMS Foundation. Sea-level rise was one area where our work had particular impact, with a report on recurrent flooding requested by

the General Assembly now informing strategies for local communities to deal with this issue and the serious challenges it brings to Hampton Roads and its numerous historic and military resources.

I want to thank our extraordinary volunteer leadership for their devotion and advice—both far-reaching and practical. Tom Young continues to serve as President of the VIMS Foundation Board, and on July 1, 2013, R. Gordon Smith succeeded Rick Amory as Chair of the VIMS Council, an advisory board to the Dean and Director. Chris Bosworth, Waddy Garrett, Conrad Hall, and Governor Linwood Holton rotated off the Council; we will miss them and the expertise that has benefitted VIMS during the last decade. And sadly, as we go to print, we lost valued Council member Bob Jebson.

Joining the Council this past year were Glenda Booth, who has had a career working on Capitol Hill; Emily Davies, a William & Mary grad with a long career at Chevron; and Arthur Moye, Executive Vice President of the Virginia Maritime Association. We look forward to working with all of them.

The relatively young VIMS Foundation closed the fiscal year at \$10.7 million in combined endowment and expendable assets. Thanks to private support, the Foundation now impacts every academic department at VIMS. Since June 30, donors have added several new endowments, taking us into 2014 with some 42 separate endowment accounts.

At the end of FY 2013, several of our longest serving and dedicated members retired from the VIMS Foundation Board: Arthur Bryant, II, a founder of the foundation; former president Carroll

W. Owens, Jr.; and founding Director and longtime secretary Guilford D. Ware. All have served with dedication and distinction and literally helped build the VIMS Foundation from the ground up. Guil also served on the board of the Center for Applied Marine Science and Technology at VIMS, which facilitates partnerships with industry. Guil was recognized for his longtime service in all these ways with the Pathfinder Award in September 2012.

In 2013, the Foundation Board has been joined by Elizabeth Anderson, a W&M graduate, distinguished scientist, and Group Vice President of the scientific consulting firm Exponent, Inc; Cliff Cutchins, a distinguished lawyer with McGuire Woods and leader of the Virginia chapter of The Nature Conservancy; and Gordon Smith, another distinguished McGuire Woods lawyer who also serves as Chair of the VIMS Council. We look forward to working with all its members to take the VIMS Foundation to the next stage of growth and impact to benefit the Institute.

I also thank all others who are assisting VIMS in so many ways. We trust that this report will help you appreciate the depth and breadth of VIMS' work, and how it helps us better understand and sustainably manage our marine resources locally, nationally, and internationally. You are all helping us achieve our mission to deliver the objective science on which the Commonwealth and our nation depend, and to prepare the next generation of science leaders.

John T. Wells  
Dean and Director







The VIMS Foundation Board recognized two retiring members during their April meeting. From L: current board president A. Thomas Young, former president Carroll W. Owens, Jr (retiring); VIMS Dean and Director John Wells; and founding Director and longtime secretary Guilford D. Ware (retiring). © D. Malmquist.



Mrs. Sunny Williams (L), Mrs. Sara Boyd (2nd from R), and Mr. Robert F. Boyd, Esquire (R) joined with W&M President Taylor Reveley during a reception at the Town Point Club in Norfolk on March 7. The event, organized by the Norfolk Host Committee of the VIMS Council and VIMS Foundation Board, gave community leaders in Norfolk an opportunity to learn about VIMS' mission of research, education, and advisory service to the Commonwealth, nation, and world. © D. Malmquist.



From L: Outgoing Council Chair Rick Amory with Dean and Director John Wells and new Council Chair R. Gordon Smith. ©D. Malmquist.



From L: Dean and Director John Wells and Council Chair Rick Amory with fellow council member and former Virginia Governor Linwood Holton. Wells and Amory joined with other Council members during their April 2013 meeting to thank Holton, who retired from the Council this year, for his many years of service to the Council, VIMS, and the Commonwealth. ©D. Malmquist.



New faculty members (clockwise from upper L): Donglai Gong, Chris Hein, Matt Kirwan, Andrew Wargo, and BK Song.



VIMS' newest research vessel, the 43-foot R/V *Tidewater*, will replace the R/V *Fish Hawk* as the primary platform for VIMS' juvenile-fish abundance surveys. The vessel was designed to meet the broad interests of the VIMS community. © D. Malmquist.

# Scientific Impact

**These selected news stories highlight the many ways in which VIMS researchers use financial support from state, federal, and private sources to help address the challenges facing Chesapeake Bay, the coastal ocean, and human society.**

## Restored oyster reef worth its weight in nutrients

A study led by VIMS Assistant Research Scientist Lisa Kellogg shows that a restored oyster reef can remove up to 10 times more nitrogen from Chesapeake Bay waters than an unrestored area nearby, adding evidence that reef restoration can help improve water quality in the nation's largest estuary.

Input of nitrogen from fertilizers, wastewater treatment plants, and other sources is a main reason for impaired water quality in the Bay, with reduction and removal of this excess nutrient a key goal of Bay restoration efforts.

Kellogg says, "We found that annual denitrification rates at the restored site were enhanced by an order of magnitude and that rates in August were among the highest ever recorded for an aquatic system." She cautions, however, that oyster density on the examined reef far exceeds current success criteria for oyster-reef restoration.

The team's research also shows that the restored reef provides habitat for 10 times more bottom-dwelling organisms per square meter than a control site. Uptake into shells is particularly important for nitrogen removal because these hard parts can persist long after organisms die, removing nutrients from the water for centuries if the shells become buried.

## Researchers unravel life cycle of blue-crab parasite

Professor Jeff Shields and colleagues at VIMS succeeded in their 15-year effort to unravel the life history of *Hematodinium*, a single-celled

parasite that afflicts blue crabs and is of growing concern to aquaculture operations and wild fisheries around the world.

Knowledge of the parasite's complex life cycle—gained by rearing successive generations across a full year in a VIMS laboratory—will help guide efforts to minimize the transmission of *Hematodinium* within crab and shrimp farms, and to develop best practices for the handling of animals within Virginia's fishery for wild-caught blue crabs.

"It's an important breakthrough," says Shields. "Having all stages in culture means we can now really start picking the life cycle apart to learn what the organism does and how it functions."

## Report calls for flexible response to recurrent coastal flooding

A new VIMS report—called for by a joint resolution of Virginia's House and Senate in 2012—lays out a detailed plan for how the Commonwealth can best respond to the ongoing challenges that rising sea level and sinking land pose to residents and localities along Virginia's Chesapeake Bay and Atlantic shorelines.

Lead authors Molly Mitchell and Carl Hershner presented the 135-page document to legislators for consideration during the General Assembly's 2013 session. It also helped guide deliberations during a September 2013 conference on Adaptive Planning for Flooding and Coastal Change organized by the Virginia Coastal Policy Clinic, a partnership between the W&M Law School and VIMS, with funding from the Virginia Environmental Endowment and Virginia Sea Grant.

The report—*Recurrent Flooding Study for Tidewater Virginia*—makes clear that no single response will fully address the complex web of social, legal, and environmental issues that contribute to Tidewater's vulnerability to coastal flooding. Instead, it calls for a multi-step approach with enough flexibility to allow policymakers to adapt as conditions change and knowledge grows. It also says the time for action is now.

## Sea-level rise accelerating along northeast U.S. coast

A study by VIMS Emeritus Professor John Boon shows that the rate of sea-level rise is increasing at all of the long-term tidal stations north of Cape Hatteras, including those in Norfolk, Baltimore, New York, and Boston.

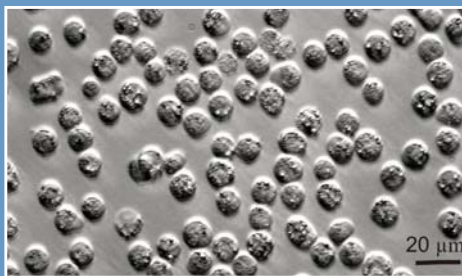
The question of whether sea level is rising at a steady or increasing rate is of critical importance to those tasked with planning for and adapting to coastal flooding in their communities.

"The trend in the rate of sea-level rise appears to have changed abruptly in 1987," Boon reports, "followed by uniform and rapidly increasing rise rates at the eight stations in the northeast. This feature is unprecedented in water-level records now spanning more than 75 years at tide stations along the Atlantic coast of the U.S. and Canada."

Boon suggests that the observed acceleration may be due to changes in the strength and position of the Gulf Stream and related ocean currents. Some climate models predict these will slow down as the planet warms and melting ice adds freshwater to the North Atlantic.



Lisa Kellogg retrieves samples during her study of nutrient removal by restored oyster reefs. ©K. Paynter.



The adult, mobile life stage of the *Hematodinium* parasite. ©J. Shields.



The impacts of coastal flooding and sea-level rise are a major focus of VIMS research. ©D. Malmquist.



## Seagrass restoration goes global

An idea that germinated along Virginia's Eastern Shore has now sent offshoots across the Atlantic, drawing a team of European entrepreneurs and scientists who hope to bring lessons learned from seagrass restoration in Virginia's seaside bays to the coastal waters of Scandinavia.

Restoration of seagrasses to Virginia's coastal bays is the brainchild of VIMS Professor Robert "JJ" Orth, who first began sowing the bays' shallow waters with eelgrass seeds in 1999. Barren at the time, the bays are now home to 4,700 acres of lush eelgrass meadow, making them the largest and most successful example of seagrass restoration in the world.

Researchers from Denmark and Sweden visited the South Bay restoration site this summer, gaining first-hand knowledge of how they can translate the strategies painstakingly developed by Orth and colleagues to even larger scale restoration efforts along the shallow coastal bays of Denmark. These have suffered drastic declines in seagrass during the last several decades due to nutrient pollution, disease, and other factors.

## "Dead zone" impacts Bay fishes

A 10-year study of Chesapeake Bay fishes provides the first quantitative evidence on a bay-wide scale that low-oxygen "dead zones" are impacting the distribution and abundance of fishes that live and feed near the Bay bottom.

The affected species—which include croaker, spot, and striped bass—are a key part of the Chesapeake Bay ecosystem and support important commercial and recreational fisheries.

The study was authored by graduate student Andre Buchheister along with VIMS colleagues Chris Bonzek, Jim Gartland, and Professor Rob Latour. All are involved in VIMS' Chesapeake Bay Multi-Species Monitoring and Assessment Program, an ongoing effort to track and

understand interactions between and among fishes and other marine life within the Bay ecosystem.

"ChesMMAP is an essential component to a successful management strategy for the marine resources of Chesapeake Bay and the coastal Atlantic," says Latour. "Continued monitoring will be critical for detecting how the Bay ecosystem responds to continued stresses from fishing, development, and climate change."

## Partnership aims to reduce pollution from "microplastics"

A grant to researchers at VIMS will help them develop and test a biodegradable replacement for one of two main sources of microplastics—the "microbeads" found in scores of household products. Microplastics, which also form via breakdown of larger pieces of plastic trash, can adsorb contaminants and pose a threat to marine life through ingestion.

The grant, from the Virginia Innovation Partnership, was awarded to VIMS professors Kirk Havens and Donna Bilkovic. They'll collaborate on the project with Drs. Jason McDevitt, Director of William & Mary's Technology Transfer Office, Charles Bott of the Hampton Roads Sanitation District, and David Holbrook of the National Institute of Standards and Technology.

"The idea," says Havens, "is that our microbeads will biodegrade quickly, within septic tanks, wastewater treatment plants, and smaller tributaries; before they ever reach the Bay. It's a proactive approach to reducing microplastic pollution."

## EPA grant helps VIMS protect Chesapeake Bay

A 3-year, \$999,640 grant from the U.S. Environmental Protection Agency will allow VIMS researchers to develop planning tools that

will help local governments and citizens more effectively protect the upland swamps and swales that keep pollutants and excess nutrients from entering Bay tributaries.

Leading the project is Dr. Carl Hershner, Director of the Center for Coastal Resources Management at VIMS. His team will build off similar tools CCRM has created for managing tidal wetlands, and leverage a treasure trove of geographic data CCRM staff have collected and interpreted during the last two decades.

VIMS will pursue the project in cooperation with state managers and with the advice of federal regulators. The ultimate goal, says Hershner, "is to have the tools we create facilitate coordination across all levels of government."

## Oyster relay may provide low-cost solution to health risk

A study by local oyster growers and VIMS researchers shows that moving farmed oysters into saltier waters just prior to harvest nearly eliminates the presence of a bacterium that can sicken humans.

The findings—reported by VIMS professors Kim Reece and Howard Kator and local oyster growers Thomas Gallivan, A.J. Erskine, and Tommy Leggett—may offer a relatively low-cost solution to a controversial change in FDA regulations that many growers believe will eventually affect the oyster industry in Chesapeake Bay.

The Food and Drug Administration's regulatory change requires shellfish growers in the Gulf of Mexico to eliminate the *Vibrio* bacterium from shellfish through methods such as flash freezing, high pressure, or low-dose irradiation. The VIMS-industry team contends that moving oysters to saltier water—what they call an "oyster relay"—may be just as effective and much less costly. The study was funded by Virginia Sea Grant's Fishery Resource Grant Program.



Scientists worldwide benefit from lessons learned during seagrass restoration in Virginia's seaside bays. ©D. Malmquist.



From R: EPA Regional Administrator Shawn Garvin with Donna Bilkovic, Kirk Havens, Marcia Berman, Roger Mann, and John Wells of VIMS. ©D. Malmquist.



Researcher Kory Angstadt prepares microbeads in the laboratory at VIMS. ©D. Malmquist.

# Serving Virginia & the Nation

VIMS faculty and staff inform policy solutions locally, nationally, and internationally, offering practical solutions for managing fisheries, improving water quality, and restoring marine habitats. Below is a sampling of the many forms of advisory service at VIMS.

**Stan Allen** began writing a Director's Blog to encourage more frequent communication with members of the Industry Advisory Committee to VIMS' Aquaculture Genetics and Breeding Technology Center.

**Corinne Audemard** served on a panel during the Virginia Aquaculture Conference to discuss issues related to *Vibrio* bacteria and their impacts in shellfish aquaculture.

**Donna Bilkovic** is an at-large appointee to the Chesapeake Bay Program's Scientific and Technical Advisory Committee and its Habitat Goal Implementation Team.

**Carol Hopper Brill** chairs the Grants Committee for the Mid-Atlantic Marine Education Association and is VIMS' representative to the Virginia Resource Use Education Council.

**Deborah Bronk** was named acting director of the Division of Ocean Sciences at the National Science Foundation.

**Mark Brush** is president of the Atlantic Estuarine Research Society and a member of the Governing Board and Education Committee for the Coastal and Estuarine Research Foundation. He served on a technical panel convened by the National Oceanic and Atmospheric Administration to review models for the development of low-oxygen conditions in the Gulf of Mexico, and was invited to participate in a NOAA Chesapeake Bay Office workshop on nitrogen removal by oysters.

**Elizabeth Canuel** serves as past-chair of the Geochemical Society's Organic Geochemistry Division and on California's Delta Independent Science Board.

**Ryan Carnegie** is the U.S. representative for shellfish species on the International Council for the Exploration of the Sea (ICES) Working Group on Pathology and Diseases of Marine Organisms.

**Mary Fabrizio** manages VIMS' juvenile abundance surveys for fish and blue crabs in Chesapeake Bay and serves on the Atlantic Croaker Technical Committee of the Atlantic States Marine Fisheries Commission and the Board of Directors for the Hudson River Foundation.

**Carl Friedrichs** serves on the Chesapeake Community Modeling Program's Steering Committee, the Chesapeake Bay Program's Scientific & Technical Advisory Committee, and the Executive Committee of the National Science Foundation's Community Surface Dynamics Modeling System. He is also on the Editorial Board of *Continental Shelf Research* and an associate editor of *Estuaries and Coasts*.

**Marjorie Friedrichs** was elected to the Executive Board of the Chesapeake Bay Program's Scientific and Technical Advisory Committee and serves on CBP's Modeling Laboratory Action Team Advisory Board. She is a member of the Chesapeake Community Modeling Program and the Science Steering Group for the North American Carbon Program. She briefed the CBP Management Board on a collaborative project to compare the computer models used to manage shallow water habitats in the Bay, and co-edited a technical report describing the carbon budget of the U.S. East Coast.

**John Graves** continues to chair the U. S. Advisory Committee for ICCAT (International Commission for the Conservation of Atlantic Tunas).

**Rob Hale** serves on the editorial boards of *Environmental Toxicology & Chemistry*, the *Journal of Residuals Science & Technology*, and *Environmental Science & Technology Letters*.

**Kirk Havens** is one of two Governor's appointees to the Chesapeake Bay Program's Scientific and Technical Advisory Committee, which he serves as chair. He serves a similar appointment with the Albemarle-Pamlico National Estuary Program in North Carolina.

**Carl Hershner** provides technical advice to the Chesapeake Bay Program and the Albemarle-Pamlico National Estuary Program on implementation of adaptive and ecosystem-based management. He manages technical support for the Commonwealth's wetlands and shoreline regulatory programs, and oversees a variety of advisory activities related to climate-change impacts.

**Eric Hilton** serves as the Virginia representative to the Atlantic States Marine Fisheries Commission's technical committees for shad and river herring, and Atlantic sturgeon, and is on the Board of Governors of the American Society of Ichthyologists and Herpetologists. He is also a marine fishes editor for *Zootaxa*.

**John Hoenig** serves on the Science and Statistics committees of the New England Fishery Management Council, and on the Striped Bass Tagging Subcommittee of the Atlantic States Marine Fisheries Commission. He also serves on the Chesapeake Bay Stock Assessment Committee for the National Marine Fisheries Service's Chesapeake Bay Office.

**Ike Irby** briefed the Chesapeake Bay Program's Modeling Committee on the processes responsible for low-oxygen conditions in Bay tributaries.

**Rob Latour** is a member of the Menhaden Technical Committee and the Multispecies Subcommittee of the Atlantic States Marine Fisheries Commission. He is also a member of the National Marine Fisheries Service's Coastal Shark Stock Assessment Committee and the Scientific and Statistical Committee for the Mid-Atlantic Fishery Management Council.

**Lisa Ayers Lawrence** is past-president and webmaster for the Mid-Atlantic Marine Education Association, technology committee chair for the National Marine Educators Association, and serves on the Education Website Advisory Committee for the National Oceanic and Atmospheric Administration. She is also a member of NOAA's B-WET Grant Review Panel.

**Rom Lipcius** serves on the Chesapeake Bay Stock Assessment Committee for blue crabs.

**Mark Luckenbach** is a member of the Scientific and Technical Advisory committees for the Chesapeake Bay Program and the Maryland Coastal Bays Program.

**Maurice Lynch** served as a commissioner for the Hampton Roads Sanitation District and the Middle Peninsula Planning District. He is also a member of the Gloucester Cooperative Extension's



Environmental Leadership Council, and chairs the Tidewater Resource Conservation & Development Council.

**Roger Mann** served on Virginia's Invasive Species Council and the Governor's Advisory Board on Aquaculture. He is a member of the Mid-Atlantic Fishery Management Council's Invertebrate Stock Assessment Working Group, the Federal Interstate Shellfish Transport Advisory Committee, the Ballast Water Research Committee of the Aquatic Nuisance Species Task Force, and the Mid-Atlantic Panel on Aquatic Invasive Species. He continues to serve on the editorial boards of *Aquaculture* and the *Journal of Shellfish Research*.

**Ken Moore** is a member of Chesapeake Bay Program workgroups for Tidal Monitoring and Analysis and SAV Research Monitoring and Restoration. He also serves on CBP's Water Quality Steering Committee and Monitoring and Analysis Subcommittee, as well as the State Water Control Board's Surface Water Quality Standards Workgroup. He was an invited speaker at the European Union's *Restore Eelgrass Conference* in Denmark.

**Tom Murray** serves on the Virginia Aquaculture Advisory Committee and the U.S. Fish & Wildlife National Boating Infrastructure Grants Review Committee.

**Jack Musick** served on the Atlantic States Marine Fisheries Commission's Spiny Dogfish Advisory Committee, and on technical committees for coastal sharks and Atlantic sturgeon. He also serves on the International Union for the Conservation of Nature's Shark and Marine Turtle specialist groups.

**Susanna Musick** serves on the Black Drum Technical Committee and Tagging Subcommittee for the Atlantic States Marine Fisheries Commission. She is also a member of the Blueways Development Committee for Gloucester County.

**Sarah Nuss** serves as president of the Mid-Atlantic Marine Education Association.

**Robert Orth** serves on the Chesapeake Bay Program's workgroup on submerged aquatic vegetation (SAV) and gave his annual presentation on the status of SAV in the Chesapeake region to the Virginia Marine Resources Commission.

**Mark Patterson** served on the Board of Directors of the Association of Unmanned Vehicle Systems International.

**Kim Reece** and **Wolf Vogelbein** serve on Virginia's Harmful Algal Bloom Task Force.

**Rochelle Seitz** serves as a review editor for the *ICES Journal of Marine Science*.

**Jeff Shields** is a member of the editorial boards for the *Journal of Invertebrate Pathology* and *Aquatic Biosystems*. He also consults on lobster-health issues with the Maine Department of Natural Resources.

**Walker Smith** is editor of *Antarctic Science* and a member of the steering committee for the Integrated Climate and Ecosystem Dynamics project.

**Bongkeun Song** served on an ecosystem pre-proposal review panel for the National Science Foundation and is an associate editor for *Estuaries and Coasts*.

**Deborah Steinberg** continues as a council member for the University-National Oceanographic Laboratory System and The Oceanography Society, a trustee of the Bermuda Institute of Ocean Sciences, and an associate editor for *Deep-Sea Research I*.

**Troy Tuckey** serves on the Fisheries Ecosystem Workgroup for NOAA's Chesapeake Bay Office.

**Mike Unger** serves on the Board of Directors for the Elizabeth River Project.



# Awards and Recognition

**Stan Allen** received an Inventor of the Year Award from the New Jersey Inventors Hall of Fame for his “product by process” patent for oysters with two extra sets of chromosomes. The invention has revolutionized oyster aquaculture worldwide, including its recent rapid growth in lower Chesapeake Bay, where more than 90% of farmed oysters result from the production method he pioneered. The latest figures show a 20% increase between 2011 and 2012 in the number of farmed oysters sold by Virginia growers—from 23.3 to 28.1 million—with 2012 sales valued at \$9.5 million.

**Iris Anderson** and **Mark Brush** are part of a team that received one of six “Project of the Year” awards from the U.S. Department of Defense. The award recognizes the team’s long-term effort to conserve and protect the natural resources of Marine Corps Base Camp Lejeune in North Carolina.

**Emmett Duffy** was named one of the Commonwealth’s outstanding faculty members by the State Council of Higher Education for Virginia. Duffy, an internationally known expert in marine ecology, studies biodiversity in Chesapeake Bay and other marine ecosystems worldwide. That work includes establishing a global network of experiments to study how nutrient pollution and changes in biodiversity impact the world’s threatened seagrass ecosystems. His challenging and popular courses include “Principles of Oceanography,” “Evolutionary Ecology,” “Trophic Ecology,” and “Biodiversity and Human Well-Being.”

**Carl Friedrichs** was recognized with the J.J. Mehta Award during the 12th International Conference on Cohesive Sediment Transport Processes for his outstanding achievements in research and teaching related to muds and other fine-grained sediments. A better understanding of these sediments—ubiquitous in estuaries and ports worldwide—is key for efforts to improve water clarity, maintain shipping channels, and clean up chemical contaminants.

**Jim Gartland** received one of two Annual Awards of Excellence from the Atlantic States Marine Fisheries Commission. The ASMFC—established by the 15 Atlantic coastal states in 1942 to conserve and manage their shared migratory fishery resources—honored Gartland for his exemplary management of VIMS’ Multispecies Fisheries Research Program. Data from the program inform the stock assessments that are used to sustainably manage commercially, recreationally, and ecologically important species of fish and shellfish along the Atlantic seaboard.

**John Graves** and **Robert “JJ” Orth** were among 20 exceptional William & Mary faculty members receiving prestigious Plumeri Awards for Faculty Excellence in 2013. The awards, now in their fifth year, recognize exemplary achievements in teaching, research, and service.

**Kirk Havens** and **Donna Bilkovic** won a TechConnect Innovation Award for their efforts to develop a biodegradable replacement for plastic microbeads, which can adsorb contaminants and pose a threat to marine life through ingestion.

**Eric Hilton** received the 2013 W&M Alumni Fellowship Award and the Cornelia Brackenridge Talbot Term Professorship.

**Jim Kirkley** was recognized by the authors of *Fisheries Economics* of the U.S., who dedicated the 2011 edition to the late VIMS professor, noting that he

“provided invaluable expertise in development of the Commercial Seafood Impacts model.” Data from the model are a key tool for public understanding of how commercial fishing impacts the national economy.

**Tom Murray** was presented with a Recreational Boating Access Award from the Boat Owners Association of the United States (BoatUS) during the 2013 National Working Waterfronts and Waterways Symposium. Murray was recognized for his commitment to keeping the nation’s waterfronts at work for recreational boating, and championing water-dependent businesses and industry that drives local economic development.

**Susanna Musick** received the Dr. James C. Wright Conservation Honorary Award from the Virginia Beach Angler’s Club. The award recognizes her lead role in the Virginia Game Fish Tagging Program, which trains volunteer taggers to provide fisheries managers with data on migration patterns and habitat use of recreationally important finfish.

**Mark Rogers** and **Mike Kershner** represented VIMS in accepting a Diamond Excellence award from the Hampton Roads Sanitation District in recognition of exemplary management of wastewater on VIMS’ 40-acre campus. VIMS was recognized for 13 consecutive years of perfect compliance with its wastewater permit.

**Justin Vandever** (MS ’07)—a Coastal Engineer with AECOM in Oakland, California—was named one of 10 New Faces of Engineering by the American Society of Civil Engineers.

**VIA design architects, pc**, designers of the Seawater Facility at VIMS’ Eastern Shore Laboratory, won a Best Institutional/Public Building Award of Merit from the Hampton Roads Association for Commercial Real Estate.

## VIMS Service Awards

### Facilities/Safety/Trades

Ms. Dorothy Robinson

### Research/Advisory Service

Ms. Sarah Nuss

### Technical Support

Mr. Steve Snyder

### Administrative Support

Ms. Connie Motley

### Outstanding Professionals Award

Ms. Jennifer Latour

### Outstanding Faculty Advisory Service Award

Dr. Rob Latour

### Freeman Volunteer of the Year Award

Dr. Ken Neill

### Community Service Award

Dr. Drew Luellen



# Grants and Contracts

**VIMS researchers earned 119 grants and contracts during fiscal year 2012-2013, for a total value of \$16,670,000 in federal, state, and private funding. In addition to supporting critical research and advisory activities within the Commonwealth, this funding provided opportunities to enhance educational programs and conduct cutting-edge research nationally and internationally. A few highlights include:**

**Iris Anderson** and **Mark Brush**, "Defense Coastal/Estuarine Research Program Phase III," US Department of Defense SERDP, \$1,596,239

**Aaron Beck**, "Trace metal micronutrition of natural phytoplankton communities in a coastal marine ecosystem," Jeffress Memorial Trust, \$26,700

**Marcia Berman**, "Planning tools for aquaculture expansion and management within Chesapeake Bay," National Oceanic and Atmospheric Administration, \$296,069

**Marcia Berman** and **Scott Hardaway**, "Shoreline management planning and development," National Oceanic and Atmospheric Administration, \$135,000

**Julie Bradshaw**, "Development of a Coastal Resources Certificate program for marine contractors & consultants," William & Mary, \$19,084

**Deborah Bronk**, **Kim Reece**, and **Aaron Beck**, "MRI: Acquisition of a flow cytometer with high-speed sorting to advance aquatic science research and education," National Science Foundation, \$580,488

**Deborah Bronk** and **Rachel Sipler**, "How will marine food webs in the coastal Arctic respond to increased runoff associated with permafrost melt?," US Department of the Interior Fish and Wildlife Service, \$33,211

**Mary Fabrizio**, "Dynamics and role of blue catfish in tidal rivers of Virginia," Virginia Department of Game and Inland Fisheries, \$68,191

**Mary Fabrizio** and **Troy Tuckey**, "Estimating relative juvenile abundance of important finfishes in the Virginia portion of Chesapeake Bay," US Department of the Interior Fish and Wildlife Service, \$496,454

**Robert Fisher**, "Cownose ray movement in Chesapeake Bay," Virginia Marine Resources Commission, \$26,123

**Carl Friedrichs**, "Acoustic assessment of subsea chemical dispersant efficacy," US Department of the Interior, \$76,478

**John Graves** and **Lela Schlenker**, "Reducing post-release mortality of Istiophorid billfishes in the recreational fishery: Biochemical and physiological indicators of lethal stress," Offield Family Foundation, \$130,000

**Rob Hale**, **Drew Luellen**, and **Mark LaGuardia**, "Determination of PCBs in fish tissue and sediment," Virginia Department of Environmental Quality, \$103,800

**Troy Hartley** and **Susan Park**, "Creating and bringing to market value-added seafood products," National Oceanic and Atmospheric Administration, \$11,750

**Kirk Havens** and **Donna Bilkovic**, "Ocean-safe biodegradable microspheres for the cosmetic and toiletries industry," US Department of Commerce Economic Development Administration, \$60,000

**Carl Hershner**, **Kirk Havens**, **Donna Bilkovic**, and **Marcia Berman**, "Development of strategies to improve protections of wetland and headwater resources in Virginia," Environmental Protection Agency, \$1,014,640

**John Hoenig**, "Evaluation of striped bass stocks in Virginia: Tagging and monitoring studies," US Department of the Interior Fish and Wildlife Service, \$395,323

**Rob Latour** and **Chris Bonzek**, "Data collection and analysis in support of single and multispecies stock assessments in Chesapeake Bay: the Chesapeake Bay Multispecies Monitoring and Assessment Program ChesMMAP," US Department of the Interior Fish and Wildlife Service, \$496,881

**Lisa Ayers Lawrence** and **Carol Hopper Brill**, "Collaborative professional development: Scientists and educators learning from one another," National Oceanic and Atmospheric Administration, \$52,065

**Rom Lipcius**, "Blue crab dredge fishery field study of incidental mortality," Virginia Marine Resources Commission, \$98,806

**Roger Mann**, "Industry/University Cooperative Research Center: Science Center for Marine Fisheries S<sub>Ce</sub>M<sub>FIS</sub>," National Science Foundation, \$60,000

**Sarah McGuire** and **William Reay**, "Chesapeake studies for Virginia middle schools," National Oceanic and Atmospheric Administration, \$49,988

**Donna Milligan** and **Scott Hardaway**, "City of Norfolk Chesapeake Bay shoreline aerial photography, rectification and shoreline digitization," Moffat and Nichol, Inc., \$12,700

**Thomas Murray**, "Developing a working waterfronts plan for Virginia's coastal zone," National Oceanic and Atmospheric Administration, \$50,000

**Michael Newman**, "Assay of sediment sorbent amendment efficacy and effect," E I DuPont Nemours, Inc., \$79,413

**Robert "JJ" Orth**, "Submerged Aquatic Vegetation (SAV) Annual Aerial Survey," Environmental Protection Agency, \$240,000

**William Reay**, "Maintenance of NOAA Chesapeake Bay Interpretive Buoy System in Virginia waters," National Oceanic and Atmospheric Administration, \$81,610

**Kimberly Reece**, "Enhanced surveillance of risk factors & health effects related to harmful algal blooms," Centers for Disease Control, \$26,037

**David Rudders**, "A synoptic survey of the sea scallop resource in the mid-Atlantic," National Oceanic and Atmospheric Administration, \$1,592,471

**Mac Sisson** and **Jian Shen**, "GIS-Based modeling system development for point source/sewage spill impact assessment for management of marinas and outfalls," US Food and Drug Administration, \$60,000

**Walker Smith**, "Penguin foraging reveals phytoplankton spatial structure in the Ross Sea," National Science Foundation, \$260,367

**BK Song**, "Microbial regulation of greenhouse gas N<sub>2</sub>O emission from intertidal oyster reefs," National Science Foundation, \$331,655



# School of Marine Science

Graduate students in the School of Marine Science at VIMS have an unparalleled opportunity to conduct research that benefits society, with many pursuing studies that involve collaborations with industry and management agencies at the state, regional, and international levels. Here are highlights of accomplishments by some of our more than 100 currently enrolled graduate students. A full list of recent theses and dissertations is available at [vims.edu/library](http://vims.edu/library).

## External Student Awards

**Ann Arfken** received an Outstanding Graduate Student Poster Presentation Award at the 2013 spring meeting of the Atlantic Estuarine Research Society.

**Andre Buchheister** received his fourth annual scholarship from the International Women's Fishing Association. IWFA scholarships support marine science graduate students as a way of promoting conservation of fisheries resources. He also received the Eileen Setzler-Hamilton Memorial Scholarship from the Tidewater Chapter of the American Fisheries Society and the George R. Healy Fellowship from William & Mary.

**Allison Colden** received the Michael Castagna Applied Research Award from the National Shellfisheries Association for her study of oyster-reef morphology. The annual award honors VIMS' shellfish pioneer Mike Castagna.

**Jeanna Hudson** won an Outstanding Student Presentation Award during the 2012 Ocean Sciences Meeting in Salt Lake City, Utah. The awards are given to the top 7% of student presentations. The meeting—sponsored by The Oceanography Society, the American Society of Limnology and Oceanography, and the American

Geophysical Union—is an international gathering of more than 4,000 attendees.

**Mike Kuschner** won the award for Best Graduate Student Poster during the 2013 annual meeting of the Coastal and Estuarine Research Federation in San Diego, California.

**Sam Lake** was awarded the 2013 Thatcher Prize for Excellence in Graduate and Professional Study during William & Mary's 2013 commencement ceremony. The Thatcher Prize, the university's highest award for a graduate or professional student, was created in 2000 in honor of W&M's 21st Chancellor, Margaret, The Lady Thatcher. Lake was recognized for his exemplary blend of scholarship, character, leadership, and service.

**Hadley McIntosh** and **Anna Mosby** each received a Student Presentation Award during ASLO's 2013 Aquatic Sciences Meeting in New Orleans. ASLO is the Association for the Sciences of Limnology and Oceanography. Awards were given to the top 3% of student presentations (23 awards out of 721 presenters).

**Lela Schlenker** was the recipient of the Manuel Caboz Memorial Fund in recognition of the quality of the abstract and essay she submitted to the 2013 Tuna Conference.

**Lori Sutter** won an honorable mention poster presentation award from the Society of Wetland

Scientists during their 9th International Wetlands Conference, in Orlando, Florida.

The **William & Mary chapter of the Marine Science Society** was honored with the Outstanding Student Section Award from the Marine Technology Society for 2012. Many of the chapter members are pursuing W&M's new marine sciences minor in collaboration with VIMS.

## Best Student Papers

### Master's

Sumoski, Sarah E... and Robert J. Orth. 2012. Biotic dispersal in eelgrass *Zostera marina*. *Marine Ecology Progress Series*.

### Ph.D.

Lynch, Patrick D., Kyle E. Shertzer, and Robert J. Latour. 2012. Performance of methods used to estimate indices of abundance for highly migratory species. *Fisheries Research*.

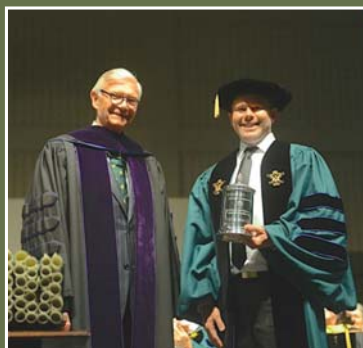
## Student Research Highlights

### Class project inspires *Ecology* article

A study that began as a class project among VIMS graduate students is now a research article in *Ecology*, the flagship journal of the Ecological



Dr. Nalani Schnell and students during the 2013 larval fish course. ©D. Malmquist.



Sam Lake receives the Thatcher Prize from W&M President Taylor Reveley. ©R. Boag.



Students and faculty collect fish in an Appalachian stream as part of the 43rd annual Roanoke Round-Up. ©S. Huber.

Society of America. The article was co-authored by students Jonathan Lefcheck, Matt Whalen, Theresa Davenport, and Josh Stone, along with VIMS Professor J. Emmett Duffy.

Duffy teaches the Evolutionary Ecology course that inspired the students to pursue their research question: whether it's better for an animal to have a diverse diet or instead stick to a single favorite prey item. "Specialization versus generalism is an essential issue in ecology," says Lefcheck. "It's been studied for a long time but many questions remain." One major question is why so many generalists persist in nature despite theoretical support for specialization.

The results of their study—based on an analysis of more than 150 research reports—were surprising. "Getting balanced nutrition seems rarely to be the reason animals eat a variety of foods," says Duffy. "Instead, generalized diets probably have other benefits: being less picky gives you more food and more flexibility, like being able to feed in safe places where there's less risk of getting eaten yourself."

"Our project shows the work produced in your classes can actually impact the field," says Lefcheck.

### Animals may spread eelgrass seeds

A study in Chesapeake Bay by Master's student Sarah Sumoski is the first to show that marine animals can disperse eelgrass seeds. A featured article in *Marine Ecology Progress Series*, it was co-authored by Dr. Robert "JJ" Orth, head of the Seagrass Monitoring and Restoration program at VIMS and Sumoski's major professor.

Eelgrass reproduces both by sending out rhizomes and producing tiny underwater seeds. Eelgrass beds play a key role in coastal ecosystems but

are in decline worldwide due to impaired water quality. Understanding how eelgrass seeds are dispersed helps guide efforts to restore eelgrass meadows in the Bay and elsewhere, and informs the models that are used to guide seagrass management plans internationally.

"Traditional thinking is that eelgrass disperses via floating seeds, floating reproductive shoots, or currents pushing seeds along the seafloor," says Sumoski. "Our study shows that eelgrass seeds can also be dispersed through consumption and excretion by fish, terrapins, and birds—providing a means to bring seeds to isolated areas unlikely to receive seeds via abiotic mechanisms."

### VIMS alumna serves in Peace Corps

Natalia "Jaime" Blackburn (MS'12) is now in the second year of her Peace Corps assignment in Zambia, where she continues to help villagers in the Chibombo district establish ponds for farming tilapia and other fishes.

Fish farming is seen as an effective way to help rural Zambians—64% of the nation's population—raise their standard of living and add needed protein to their diet.

Blackburn continues to blog about her Peace Corps experience via posts at [vims.blogs.wm.edu](http://vims.blogs.wm.edu). She posts blog entries and photos as time and bandwidth permit, reporting on the progress of her fish-farm project as well as her personal interactions with her newfound Zambian friends.

Blackburn says she decided to join the Peace Corps "because I've been in school for so long, learning how to make the world a better place, and I saw this as a great opportunity to give back by making a substantial improvement in someone's life."

### Bickel chosen as Knauss finalist

Samantha Bickel was honored with a Knauss Marine Policy Fellowship for 2014, continuing a long tradition of VIMS graduate students earning these prestigious fellowships through the National Sea Grant Federal Fellows Program.

Bickel will join the US. Department of Energy's Offshore Wind and Ocean Renewable Energy program in Washington, D.C. She says she's excited to gain exposure to the policymaking process and to interact with staff in other government agencies as well as industry partners and NGOs.

Of the 70 students from institutes of higher education in Virginia who have served as Knauss fellows since the program began in 1979, 42 (60%) have hailed from William & Mary's School of Marine Science at VIMS.

### REU program nears a quarter century

The Research Experience for Undergraduate (REU) program entered its 24th year at VIMS, with 13 students from colleges and universities around the nation enjoying 10 weeks of hands-on field and laboratory experience in coastal marine science.

The program is funded by the National Science Foundation and managed by Associate Dean of Academic Studies Linda Schaffner and Research Associate Professor Rochelle Seitz. VIMS faculty and graduate students mentor the students during their stay.

Schaffner notes that the REU program serves as an excellent "feeder" program for the graduate program at VIMS and provides a valuable opportunity for undergraduates in W&M's new marine science minor.



Graduate students visit Chesapeake Bay as part of their class on Sediment Biogeochemistry. ©S. Kuehl.



Undergraduates in the marine science minor at W&M explore an Eastern Shore mudflat. ©M. Gleiber.



2013 REU students at VIMS. ©D. Malmquist



# Public Programs

VIMS' outreach programs reached more than 15,000 individuals through events designed to inform and engage the public, marine industry workers, policymakers, and other stakeholders. We also reached nearly 4,500 subscribers through our monthly e-Tidings newsletter, exceeded 2,000 friends on Facebook, and engaged with more than 700 followers on Twitter.

## After Hours Lectures

This monthly lecture series explores the hot issues facing Chesapeake Bay and the coastal ocean.

<i>The Costs and Benefits of "Fracking"</i>	6/27/13
<i>Osprey</i>	4/18/13
<i>Menhaden</i>	3/28/13
<i>Uranium Mining in Virginia</i>	2/28/13
<i>Recurrent Coastal Flooding</i>	1/31/13
<i>The Secret Social Lives of Shrimp</i>	10/25/12
<i>Natural Selection in Chesapeake Bay Oysters</i>	9/27/12
<i>A New Tool for your Hurricane Toolkit</i>	8/23/12

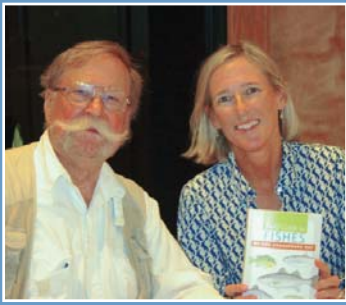
## Discovery Labs

This monthly hands-on series provides fun, family-friendly experiences and lifelong learning.

<i>Sport Fishing</i>	6/11/13
<i>Sharks</i>	3/19/13
<i>Mammals</i>	2/16/13
<i>Sturgeons</i>	1/15/13
<i>Mad Lab</i>	10/30/12
<i>Stems to Sea—Watersheds</i>	8/21/12
<i>Fishes of the York River</i>	7/17/12

## Outreach Highlights

- Five weeklong summer camps gave 103 rising 1st through 8th graders a hands-on opportunity to explore wetlands, environmental stewardship, and Chesapeake Bay.
- In 2012, anglers in the Virginia Game Fish Tagging Program devoted more than 15,000 hours to tag more than 31,000 fish.
- It was sweet 16 for the Blue Crab Bowl, in which 16 high school teams competed for the top spot in the 16th-annual episode of Virginia's regional competition of the National Ocean Science Bowl. Bishop Sullivan Catholic High School's Team A (Virginia Beach) took first place for a record sixth-straight time. Competition officials included 43 VIMS faculty, students and staff volunteers, and 40 colleagues from Old Dominion University.
- Swordfish were a theme at the 2013 Chefs' Seafood Symposium, with Chef Kyle Woodruff choosing the species for his cooking demonstration and VIMS Professor John Graves discussing how U.S. regulations have aided the recovery of swordfish populations. The symposium is a partnership between Virginia Sea Grant, VIMS, and the Virginia Chefs' Association.



Marine science illustrator Val Kells and VIMS Emeritus Professor Jack Musick signed copies of their *Field Guide to Fishes of Chesapeake Bay* as part of Kells' After Hours lecture. © D. Justis.



Viewers enjoyed watching a successful nesting season via the VIMS OspreyCam. © I. Sivaipram.

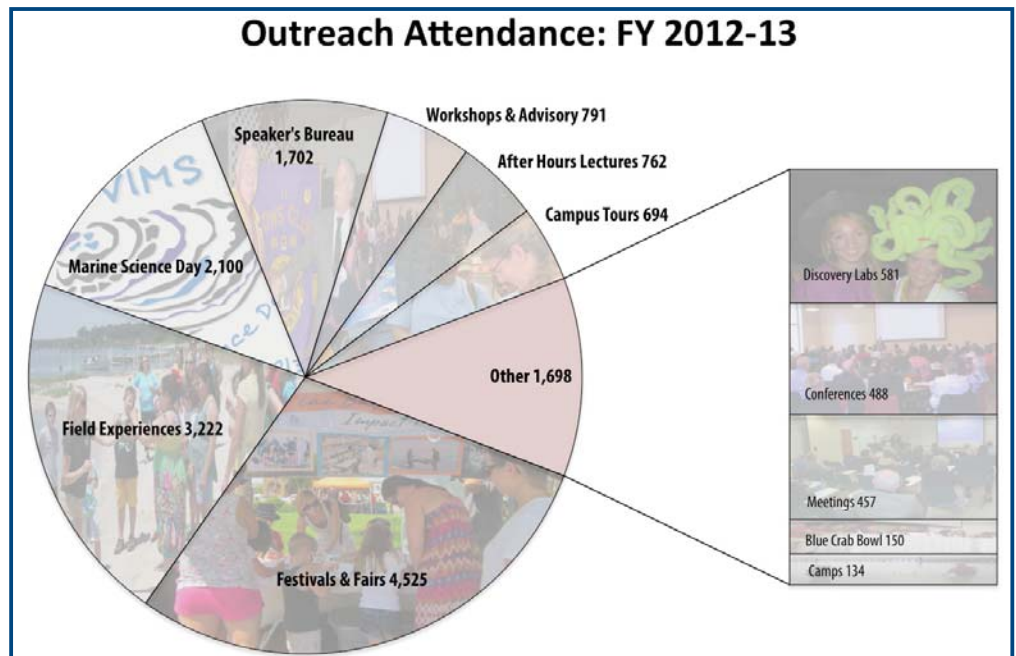


Mark Luckenbach introduced reporters from the U.S. State Department's Foreign Press Center to the VIMS campus and local waters. © D. Malmquist.



Graduate student Alison Deary welcomes members of the US Coast Guard's Southeast Regional Fisheries Training Center. © E. Kelly.

## Outreach Attendance: FY 2012-13







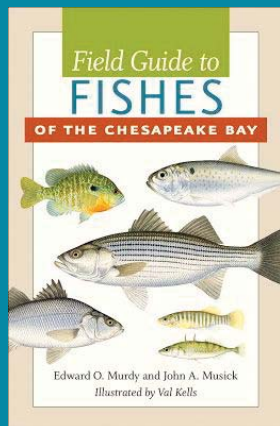
Marine Science Day drew more than 2,000 people to Gloucester Point on May 18 to enjoy a behind-the-scenes look at how VIMS research helps empower Virginians to protect and restore Chesapeake Bay and the coastal ocean. © E. Kelly.

- VIMS continued its unique partnership with Yorktown Sailing Charters LLC and their 105-foot schooner *Alliance*, offering 4 cruises on the York River during which guest scientists from VIMS shared knowledge on local fishes, jellyfish, derelict or “ghost” crab pots, and robotic subs.
- Professor Deborah Steinberg shared the mysteries of zooplankton with a capacity crowd of nearly 400 people during W&M’s Fall 2013 Tack Faculty Lecture at the Kimball Theater in Williamsburg.
- Virginia Sea Grant and Marine Advisory Program educators provided professional development opportunities and marine science enrichment presentations to more than 1,050 teachers and students.
- The “Chesapeake Studies for Virginia Middle Schools” program continued under the leadership of education coordinator Sarah Nuss, bringing meaningful field and classroom experiences to 1,500 7th-grade students and 14 teachers in Gloucester, Mathews, and York counties. The program, offered by the Chesapeake Bay National Estuarine Research Reserve at VIMS, is funded by a series of one-year grants from NOAA.
- VIMS outreach staff and graduate students engaged more than 4,500 members of the public through invited talks or a display booth at 22 festivals and fairs, including Dragon Run Day, Ft. Eustis Earth Day, the Gloucester Daffodil Festival, Hampton Bay Days, James RiverFest, and the Poquoson Seafood Festival.
- VIMS’ Eastern Shore Laboratory in Wachapreague drew an enthusiastic crowd of more than 300 to its first Marine Science Day open house. The event gave the Eastern Shore community a chance to learn how VIMS scientists and students help restore oysters, scallops, eelgrass, and other marine species to Virginia’s coastal bays. Open tanks provided opportunities for children and parents to observe sea urchins, hermit crabs, and other marine life first-hand.

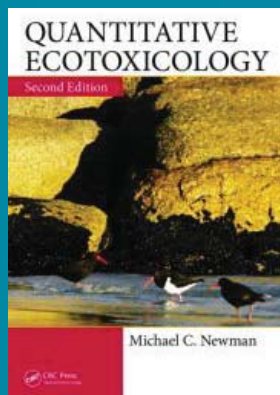


Guided campus tours, lectures, workshops, and offsite programs gave more than 1,500 adults and older children a deeper understanding of the benefits of VIMS research. Tours typically included a visit to a research laboratory and the VIMS’ Visitors Center and Aquarium, Fisheries Collection, and Teaching Marsh.

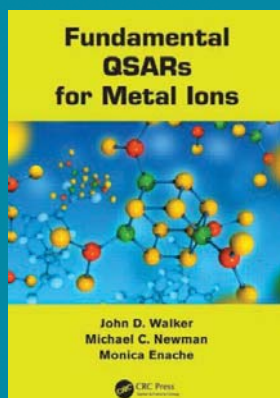




Murdy, E.O., John A. Musick, and V.A. Kells. *Field Guide to Fishes of the Chesapeake Bay*. Johns Hopkins University Press, 2013.



Newman, Michael C. *Quantitative Ecotoxicology*, 2nd ed. CRC Press, 2012.



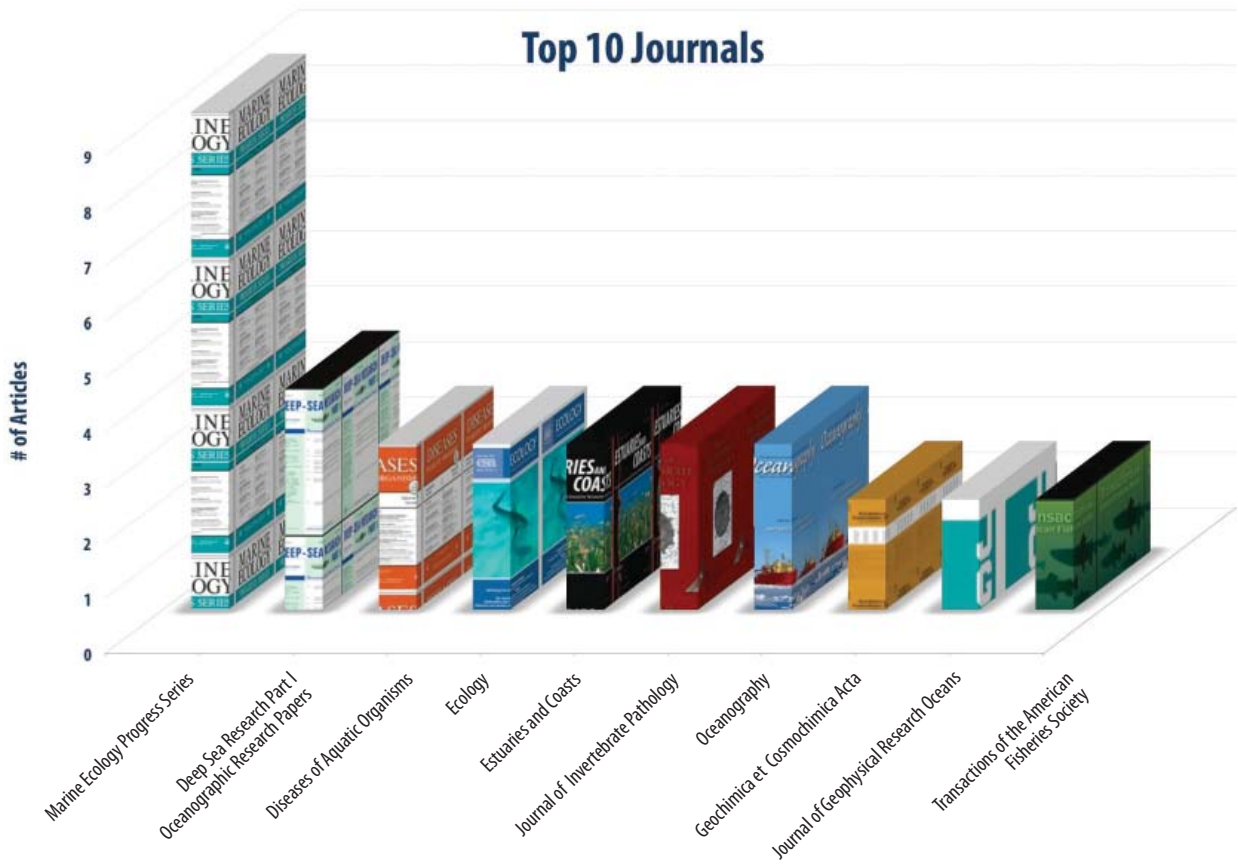
Walker, J.D., Michael C. Newman, and Enache M. *Fundamental QSARs for Metal Ions*. CRC Press, 2012.

# Publications

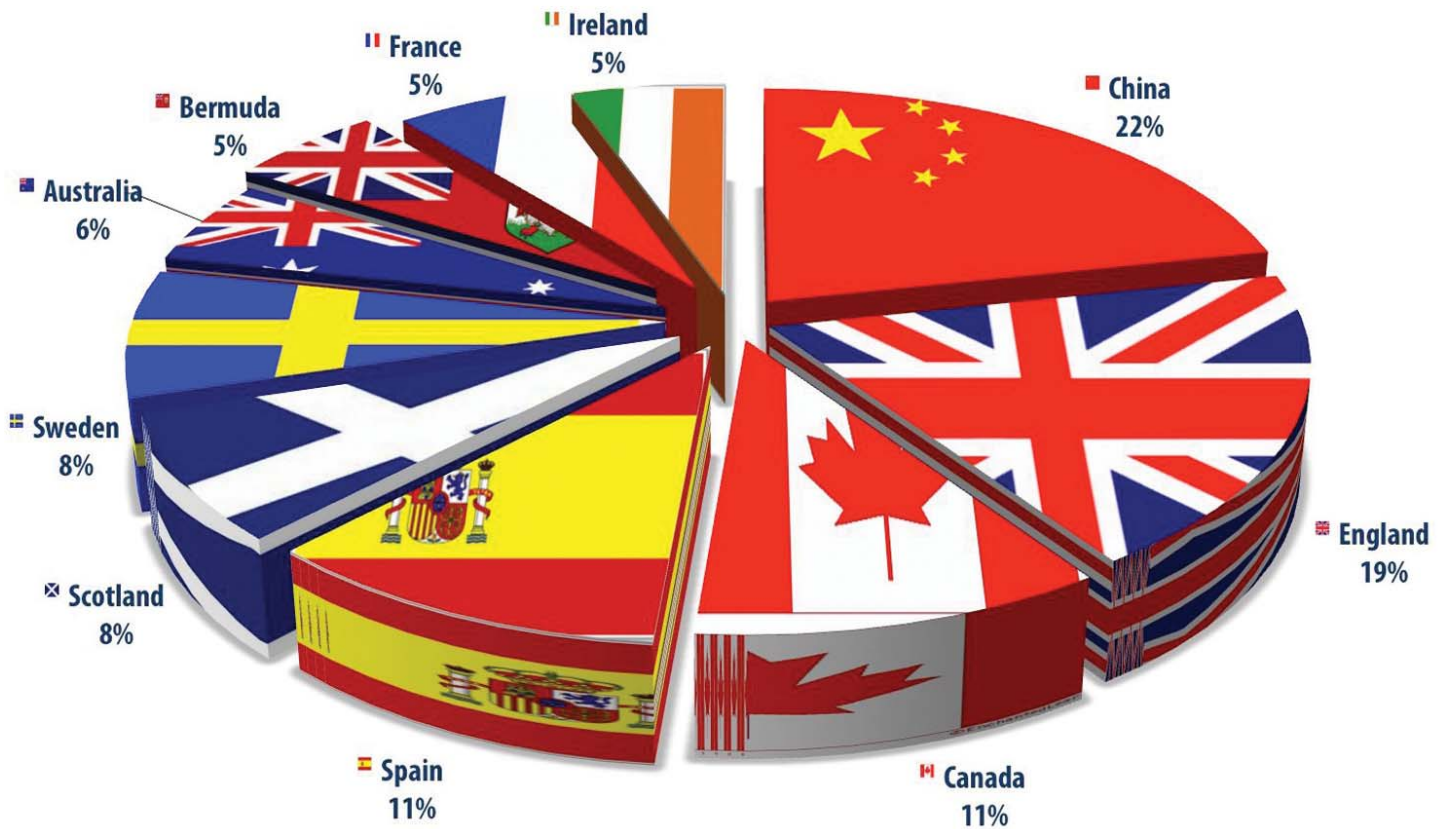
**VIMS faculty, staff, and students were first authors on 38 research articles during the 2013 calendar year as listed here, and co-authors on 43 more. A full list of VIMS-authored journal articles is available at [vims.edu/library](http://vims.edu/library).**

1. Beck, A. J., M. A. Charette, et al. "Dissolved strontium in the subterranean estuary - Implications for the marine strontium isotope budget." *Geochim Cosmochim Acta*. 117: 33-52.
2. Beck, A. J. and M. A. Cochran. "Controls on solid-solution partitioning of radium in saturated marine sands." *Mar Chem*. 156: 38-48.
3. Bernard, K. S. and D. K. Steinberg. "Krill biomass and aggregation structure in relation to tidal cycle in a penguin foraging region off the Western Antarctic Peninsula." *ICES J Mar Sci*. 70(4): 834-849.
4. Blackburn, N. J. and R. J. Orth. "Seed burial in eelgrass *Zostera marina*: the role of infauna." *Mar Ecol Prog Ser*. 474: 135-145.
5. Buchheister, A., C. F. Bonzek, et al. "Patterns and drivers of the demersal fish community of Chesapeake Bay." *Mar Ecol Prog Ser*. 481: 161-180.
6. Capossela, K. M., M. C. Fabrizio, et al. "Migratory and within-estuary behaviors of adult Summer Flounder (*Paralichthys dentatus*) in a lagoon system of the southern mid-Atlantic Bight." *Fish Bull*. 111(2): 189-201.
7. Cartwright, G. M., C. T. Friedrichs, et al. "A test of the ADV-based Reynolds flux method for in situ estimation of sediment settling velocity in a muddy estuary." *Geo-Marine Lett*. 33(6): 477-484.
8. Duffy, J. E., L. A. Amaral-Zettler, et al. "Envisioning a Marine Biodiversity Observation Network." *BioScience*. 63(5): 350-361.
9. Duffy, J. E., K. S. Macdonald, et al. "Decline and local extinction of Caribbean eusocial shrimp." *PLOS One*. 8(2).
10. Fabrizio, M. C., J. P. Manderson, et al. "Habitat associations and dispersal of black sea bass from a mid-Atlantic Bight reef." *Mar Ecol Prog Ser*. 482: 241-253.
11. Garzio, L. M. and D. K. Steinberg. "Microzooplankton community composition along the Western Antarctic Peninsula." *Deep Sea Res I (Oceanogr Res Pap)*. 77: 36-49.
12. Garzio, L. M., D. K. Steinberg, et al. "Microzooplankton grazing along the Western Antarctic Peninsula." *Aquat Microb Ecol*. 70(3): 215-232.
13. Gaylor, M. O., E. Harvey, et al. "Polybrominated diphenyl ether (PBDE) accumulation by earthworms (*Eisenia fetida*) exposed to biosolids-, polyurethane foam microparticle-, and Penta-BDE-amended soils." *Env Sci & Technol*. 47(23): 13831-13839.
14. Hardison, A. K., E. A. Canuel, et al. "Microphytobenthos and benthic macroalgae determine sediment organic matter composition in shallow photic sediments." *Biogeosciences*. 10(8): 5571-5588.
15. Hilton, E. J. and D. E. Stevenson. "Osteology of the prowlfish, *Zaprora silenus* (Cottiformes: Zoarcoidei: Zaproridae)." *J Morphology*. 274(10): 1143-1163.
16. Kellogg, M. L., J. C. Cornwell, et al. "Denitrification and nutrient assimilation on a restored oyster reef." *Mar Ecol Prog Ser*. 480: 1-19.
17. Killberg-Thoreson, L., R. E. Sipler, et al. "Anthropogenic nutrient sources supplied to a Chesapeake Bay tributary support algal growth: A bioassay and high-resolution mass spectrometry approach." *Estuaries and Coasts*. 36(5): 966-980.
18. Kirwan, M. L. and J. P. Megoñigal. "Tidal wetland stability in the face of human impacts and sea-level rise." *Nature*. 504(7478): 53-60.
19. Lake, S. J., M. J. Brush, et al. "Internal versus external drivers of periodic hypoxia in a coastal plain tributary estuary: the York River, Virginia." *Mar Ecol Prog Ser*. 492: 21-39.
20. Lefcheck, J. S., M. A. Whalen, et al. "Physiological effects of diet mixing on consumer fitness: a meta-analysis." *Ecology*. 94(3): 565-572.
21. McGrath, P. E., E. J. Hilton, et al. "Temporal and spatial effects on the diet of an estuarine piscivore, Longnose Gar (*Lepisosteus osseus*)." *Estuaries and Coasts*. 36(6): 1292-1303.
22. Moss, J., D. Behringer, et al. "Distribution, prevalence, and genetic analysis of *Panulirus argus* virus 1 (PaV1) from the Caribbean Sea." *Dis Aquat Org*. 104(2): 129-140.
23. Ralph, G. M., R. D. Seitz, et al. "Broad-scale association between seagrass cover and juvenile blue crab density in Chesapeake Bay." *Mar Ecol Prog Ser*. 488: 51-63.
24. Reynolds, P. L. and J. F. Bruno. "Multiple predator species alter prey behavior, population growth, and a trophic cascade in a model estuarine food web." *Ecol Mono*. 83(1): 119-132.
25. Rodriguez-Calderon, C. and S. A. Kuehl. "Spatial and temporal patterns in erosion and deposition in the York River, Chesapeake Bay, VA." *Estuarine Coastal and Shelf Sci*. 117: 148-158.
26. Shields, J. D. "Complex etiologies of emerging diseases in lobsters (*Homarus americanus*) from Long Island Sound." *Can J Fisheries Aquatic Sciences*. 70(11): 1576-1587.
27. Sipler, R. E., D. A. Bronk, et al. "*Trichodesmium*-derived dissolved organic matter is a source of nitrogen capable of supporting the growth of toxic red tide *Karenia brevis*." *Mar Ecol Prog Ser*. 483: 31-45.
28. Small, H. J., T. L. Miller, et al. "Discovery of an opportunistic starfish pathogen, *Orchitophrya stellarum*, in captive blue crabs, *Callinectes sapidus*." *J Invertebr Pathol*. 114(2): 178-185.
29. Smith, W. O., S. Tozzi, et al. "Spatial and temporal variations in variable fluorescence in the Ross Sea (Antarctica): Oceanographic correlates and bloom dynamics." *Deep Sea Res I (Oceanogr Res Pap)*. 79: 141-155.
30. Sobocinski, K. L., R. J. Orth, et al. "Historical comparison of fish community structure in lower Chesapeake Bay seagrass habitats." *Estuaries and Coasts*. 36(4): 775-794.
31. Sturdivant, S. K., R. D. Seitz, et al. "Effects of seasonal hypoxia on macrobenthic production and function in the Rappahannock River, Virginia, USA." *Mar Ecol Prog Ser*. 490: 53-68.
32. Sweetman, C. J., T. T. Sutton, et al. "Distribution of the biomass-dominant pelagic fish, *Bathylagus euryps* (Argentiniformes: Microstomatidae), along the northern Mid-Atlantic Ridge." *Deep Sea Res I (Oceanogr Res Pap)*. 78: 16-23.
33. Tuckey, T. D. and M. C. Fabrizio. "Influence of survey design on fish assemblages: Implications from a study in Chesapeake Bay tributaries." *Trans Am Fish Soc*. 142(4): 957-973.
34. Wang, J. C., M. C. Newman, et al. "Higher and more variable methylmercury biomagnification factors for floodplain than the contiguous river (South River, Virginia USA)." *Ecotox Env Safety*. 92: 191-198.
35. Whalen, M. A., J. E. Duffy, et al. "Temporal shifts in top-down vs. bottom-up control of epiphytic algae in a seagrass ecosystem." *Ecology*. 94(2): 510-520.
36. Xu, X. Y., M. C. Newman, et al. "An ecologically framed mercury survey of finfish of the lower Chesapeake Bay." *Arch Environ Con Tox*. 65(3): 510-520.
37. Ye, J., I. Kaattari, et al. "Enhancement of protein immunogenicity via priming with a protein-LPS chimeric antigen is associated with the increase of antibody and memory B cell responses." *Fish Shellfish Immunol*. 34(6): 1686-1686.
38. Zhang, J. F., Q. H. Zhang, et al. "Lattice Boltzmann simulation of turbulence-induced flocculation of cohesive sediment." *Ocean Dynamics*. 63(9-10): 1123-1135.

## Top 10 Journals



## Top 10 International Collaborations





# Giving Highlights

*While we can only highlight a few gifts here, we deeply appreciate the support of the many friends, alumni, foundations, and corporations listed on our donor-recognition pages. All are advancing our important scientific work for Virginia and the nation. VIMS receives gifts directly as well as through the VIMS Foundation, with private philanthropy accounting for a growing percentage of our total support. For FY 2013, VIMS received \$1,590,558 in private support from 2,320 donors. Of this, \$1,455,957 came through the VIMS Foundation. As of June 30, 2013, the VIMS Foundation held \$10,719,173 in assets in various endowments and expendable funds to support students, faculty, and programs. Endowed funds in the VIMS Foundation are invested with the William and Mary Investment Trust. A summary of WAMIT's performance is included in this report.*

## Private support promises five more years of popular summer camps

Local children swam, splashed, fished, and crabbed their way to becoming stewards of Chesapeake Bay during a series of five weeklong day camps offered by VIMS this summer. They join more than 500 other children who have benefitted from a gift by an anonymous donor to the VIMS Foundation that initiated the summer camp program at VIMS in 2009.

Now, gifts from the same anonymous donor and Ron and Bonnie West through the Ronald West Family Foundation will provide a total of \$150,000 to continue the program for another 5 years.

The camps, led by Education Coordinator Sarah Nuss and Education Specialist Jaclyn Beck of the Chesapeake Bay National Estuarine Research Reserve at VIMS, enable children in first through eighth grades to gain hands-on experience and are tailored to complement the learning stages of each age group.

## Professor's legacy lives on through gift

The family of the late VIMS Professor Rebecca Dickhut has provided a generous gift of \$300,000 to the VIMS Foundation to establish the Rebecca Dickhut Endowment for Support of Students and Young Early Career Scientists in celebration of the revered professor's life and accomplishments.

The endowment—developed in accordance with Dickhut's wishes—will support graduate students, post-doctoral researchers, and early career

scientists in William & Mary's School of Marine Science at VIMS and at the Institute. The endowment will focus on Dickhut's primary interests—physical and environmental science—with preference given to the field of chemistry and cross-disciplinary collaboration.

During her 22-year tenure at VIMS, Dickhut impacted the minds and lives of numerous students, serving as major professor to 16 graduate students and sharing her knowledge with hundred of others during the core courses in the School of Marine Science.

## Interns gain hands-on experience in oyster aquaculture

Janet Hanson, Jim LaChance, Cyrene Grover, and Marisa Franks, the most recent graduates from VIMS' Oyster Aquaculture Training Program, hope to continue the program's exemplary success in placing its graduates, with 80% of OAT alumnae so far having gained employment in oyster aquaculture—from algologists to farm managers.

While most aquaculture training program require participants to underwrite the cost of learning the skills needed to work in the field, the OAT Program is unique in that the trainees get paid to learn and—what's more—the opportunity work alongside the team from the Aquaculture and Genetics and Breeding Technology Center (ABC) at VIMS. The training program began in 2009 with the support of an anonymous donor who continued support through 2013.



The Colonial Sail & Power Squadron's fourth annual "Dinghy Poker Run"—held at Dare Marina in Yorktown—raised more than \$3,000 for VIMS. Event organizer Bill Walsh is deeply involved in the squadron and has been the man behind the Poker Run since its inauguration in 2010. © E. Kelly.



OAT Graduates (L to R) Marisa Franks, Janet Hanson, and Jim LaChance celebrate the end of a successful internship. © E. Kelly.

## The Nunnally Family—three generations of commitment

The Nunnally family through its Moses D. Nunnally, Jr. Foundation has been a partner in marine science for three generations. In 1991, the family supported construction of Nunnally Hall, which continues to house the faculty, staff, and students of VIMS' Fisheries Science Department, and to facilitate their key contributions to the Commonwealth's environment and economy.

In 2006, the Nunnally family made a commitment to establish the Nunnally Term Professorship at VIMS, which has supported some of our most promising faculty—Robert Latour and Mary Fabrizio.

Latour—VIMS' inaugural Nunnally Professor—is a world leader in the development of multi-species fisheries management, an approach that is benefitting fisheries in the Bay, the Atlantic, and worldwide. Fabrizio, the current Nunnally Professor, heads several field projects at VIMS, including the trawl survey for juvenile fishes, the juvenile striped bass seine survey, a study of recruitment of American eels to Virginia tributaries, and an investigation of how low-oxygen dead zones impact the physiology of healthy and *Mycobacterium*-infected striped bass.

This past year the Nunnally Foundation completed a major pledge to establish an endowment for the VIMS Ichthyology Collection, a national and international resource for science and education. Thanks to the endowment, Collection staff have been able to continue digitizing the data records that accompany each of the collection's 128,000-plus specimens, thus facilitating availability to researchers worldwide. Endowment funds are also supporting efforts to stabilize the collection's preserved fishes and expand its outreach. These improvements have helped leverage funding from additional sources, including the federal Institute of Museum and Library Services, which recently provided a grant to help the VIMS community conduct a full evaluation of Collection programs and plan for its future.

Professor Eric Hilton, Collection curator, says "The Nunnally Endowment has made a great difference by providing stable support that has strengthened our ability to serve science and the public."

VIMS Dean and Director John Wells adds, "We are very grateful to three generations of the Nunnally family for their generosity and their understanding of the importance of VIMS' mission to our environment and our marine resources."

A \$30,000 gift from former W&M Board of Visitor's member Cliff Schroeder's Virginia Oyster Reef Heritage Foundation supports research by VIMS Professor Roger Mann to increase understanding of how oyster populations respond to



disease, climate change, and different management strategies. Mann says the grant "will allow an extra layer of investigation beyond that typical of a grant focused on short-term data collection." ©R. Carnegie.

## New endowment gifts support future students and programs

The Rogers family and the Olsson family have established new fellowship endowments to support graduate students in the School of Marine Science at VIMS. The James E. and Anne McCracken Rogers Graduate Student Fellowship will support marine science students who also have an interest in public policy. The Olsson Family Graduate Student Fellowship was established in memory of Mary Hedrick Causey, a VIMS graduate and longtime friend of the Olsson family.

During the 2013 fiscal year, a number of donors added to the challenge from an anonymous donor to build the VIMS Eastern Shore Laboratory Endowment for Research and Education. At press time, we have almost completed this \$100,000 challenge to support the work at this lab, which is so critical to the health of the coastal ocean and Chesapeake Bay. We will report on this endowment next year. The Owens family also added to its Owens Family Foundation Education Endowment for the Eastern Shore Lab, which will support William & Mary undergraduates and VIMS graduate students pursuing research at the facility.

## Interns pursue Eastern Shore research

High-school and college students from Virginia's Eastern Shore had the opportunity this summer to pursue marine research close to home at VIMS' Eastern Shore Laboratory in Wachapreague.

This year's interns were Emilee Dize (Onancock, James Madison University); Daniel Lassiter (Onley, University of Virginia); Sarah Puchalski (Wachapreague, Nandua High School); Rachel Seaman (Painter, William & Mary); and Shane Taylor (Bloxom, Randolph-Macon College).

The intern program is entirely funded by private donations. Private donors are Marsha and Rick Amory, Cynthia Bailey, Chris and Kirkie Bosworth, Barbara and Steve Johnsen, the E. Polk Kellam Foundation, E. Polk Kellam, Jr. and Roberta Kellam, Caramine Kellam, Debbie and Peter Lalor, Page and Tom Young, H.M. Terry Company, Inc., J.C. Walker Brothers, Inc., and Dr. Lucy Spigel Herman.



ESL interns at the VIMS Eastern Shore Lab in Wachapreague. From L: Daniel Lassiter, Rachel Seaman, Emilee Dize, Shane Taylor, and Sarah Puchalski. © P.G. Ross.



# VIMS Foundation Fellowships & Awards

Fellowships for students in William & Mary's School of Marine Science at VIMS support a wide range of student needs including research equipment, travel, tuition, and stipends. Student awards recognize and reward qualities that lead to success in graduate school and subsequent careers—including commitment, initiative, scholarship, and interdisciplinary research.

## Nichols Student Travel Fellowship

**Steven Baer** Seasonal nitrogen uptake in the coastal Arctic

**Hadley McIntosh** Composition and age of dissolved and particulate organic matter in the Delaware Estuary

## VIMS Council Fellowship

**Solomon Chak** Evolution of eusociality and host specificity in *Synalpheus* shrimp

**Hadley McIntosh** Composition and age of dissolved and particulate organic matter in the Delaware Estuary

**Kristin Omori** Population dynamics of elasmobranchs

## Barbara & Harry Hager Fellowship

**Kelsey Fall** Observations and modeling of muddy estuarine suspensions

**Erika Schmitt** Predation on bay scallops for restoration on the Virginia Eastern Shore

## John E. Olney, Sr. Ichthyology Award

**Casey Dillman** Morphology, molecules, and the evolution of sturgeon

**Peter Konstantinidis** The evolution and development of jaw muscles in primitive ray-finned fishes

**Katie May Laumann** Sturgeon phylogenetics and biogeography

## Hunter Booker Andrews, Jr. Fellowship

**Steven Baer** Seasonal nitrogen uptake in the coastal Arctic

**Eric Miller** High-resolution sediment records from Prince William Sound, Alaska

## Juliette B. & Carroll W. Owens, Sr. Fellowship

**Miram Gleiber** Long-term change in copepod community structure along the Antarctic Peninsula

## Tidewater Oyster Gardeners Association Fellowship

**Wenda Quidort** Detection and infectivity of human adenovirus in wastewater effluent, shellfish, and biosolids

## Kathleen & Robert Roper, Jr. Fellowship

**Alison O'Connor** Biogeochemistry of redox-sensitive elements in the subterranean estuary

## Norfolk Southern Fellowship

**Julia Moriarty** Riverine delivery and re-suspension of particulates in coastal systems

## Beazley Fellowship

**Andrew Johnson** Role of abiotic factors influencing eelgrass flowering

**Lauren Nys** Recruitment dynamics of young-of-the-year summer flounder in Chesapeake Bay

## Gloucester Point Rotary Club Warinner Fellowship

**Anna Murphy** Investigating nitrogen cycling within a hard clam aquaculture site

**Lela Schlenker** Stress physiology and post-release mortality of white marlin

## SunTrust Fellowship

**Daniel Kaufman** Ross Sea biogeochemical variability: Glider observations and data assimilative modeling

## Grey Allison & H. Renwick Dunlap Fellowship

**Carissa Gervasi** Effects of mycobacteriosis on the reproductive biology of Chesapeake Bay striped bass

## Edward Holland Fellowship

**Mark Stratton** Ecosystem analysis of the nearshore U.S. East Coast fish assemblage

## Matthew Fontaine Maury Fellowship Award

**Kathryn Sobocinski** Fish-mediated production and export from seagrass beds in lower Chesapeake Bay

## Rouse-Bottom Fellowship

**Diane Tulipani** Diamondback terrapin foraging and habitat use in Chesapeake Bay

## Kelly Watson Fellowship

**Miram Gleiber** Long-term change in copepod community structure along the Antarctic Peninsula

**Daniel Kaufman** Ross Sea biogeochemical variability: Glider observations and data assimilative modeling

## Zeigler Fellowship

**Lela Schlenker** Stress physiology and post-release mortality of white marlin

## William J. Hargis, Jr. Fellowship

**Anna Mosby** Phytoplankton growth rates in the Ross Sea, Antarctica

**Mark Stratton** Ecosystem analysis of the nearshore U.S. East Coast fish assemblage

## Craig L. Smith Memorial Educational Fellowship

**Jennifer Elliott** Conservation of coral reefs in Mauritius

## John M. and Marilyn Zeigler Student Achievement Award

**Julia Moriarty** Riverine delivery and re-suspension of particulates in coastal systems

## Dean's Fellowship\*

**Samantha Bickel** Abundance, structure and function of zooplankton-associated bacterial communities

**Andre Buchheister** Structure, drivers, and trophic interactions of the Chesapeake Bay demersal fish community

**Alison Deary** Development of sensory modality in larval drums from Chesapeake Bay

**Jon Lefcheck** Global patterns and ecosystem consequences of functional trait diversity

\*Funded by the Office of Academic Studies.

The following fellowship and student-support endowments are building and will support students in the future: The Ferguson Enterprises Fellowship, the R. Gordon & Catherine B. Smith Fellowship, the James E. and Anne McCracken Rogers Fellowship, the Olsson Family Fellowship, and the General Graduate Student Support Endowment, which has been supported by numerous friends and alumni of VIMS.

# VIMS Financials

## Fiscal Year 2012-2013

Unaudited

### REVENUE

General Funds	\$18,091,876
Nongeneral Funds	
Tuition and Other Funds	1,773,298
Federal Stimulus	0
Sponsored Programs*	21,266,233
Private Funds**	<u>875,720</u>
<b>Total Revenue</b>	<b>\$42,007,127</b>

### EXPENDITURES

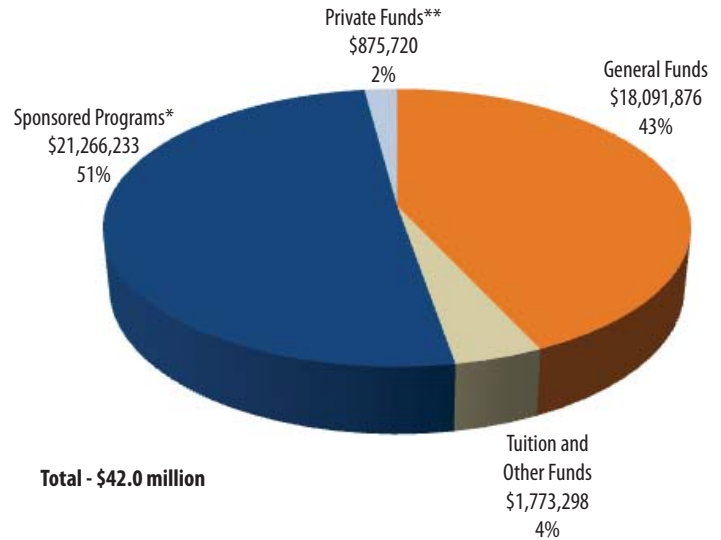
Instruction	\$1,486,421
Research and Advisory Services	8,242,518
Public Service	1,000
Academic Support	4,424,085
Institutional Support	2,330,363
Plant Operations	3,847,210
Student Financial Assistance	311,458
Sponsored Programs	21,266,233
<b>Total Expenditures</b>	<b>\$41,909,288</b>

<b>CAPITAL EXPENDITURES</b>	<b>\$2,344,136</b>
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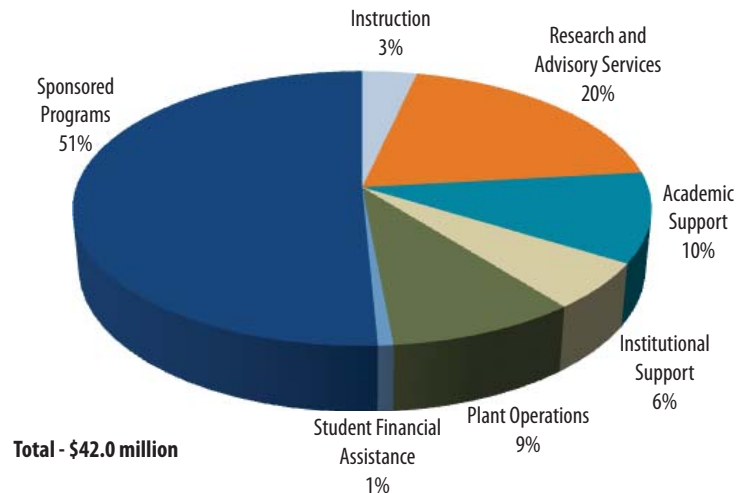
\* Sponsored Programs revenue includes Grant & Contract expended revenues.

\*\* Private Funds revenue includes program support to VIMS from the VIMS Foundation.

### FY 2012-13 Revenue



### FY 2012-13 Expenditures





# VIMS Foundation Financial Statements

## Statement of Financial Position as of June 30, 2013

<b>Assets</b>	<b>FY 2013</b>
<b>Current Assets</b>	
Cash and cash equivalents	\$ 616,674
Pledges receivable	<u>232,713</u>
<b>Total Current Assets</b>	<b><u>849,387</u></b>
<b>Investment in William &amp; Mary Investment Trust</b>	<b>9,643,706</b>
<b>Other Assets</b>	
Pledges receivable	226,080
<b>TOTAL ASSETS</b>	<b><u>\$ 10,719,173</u></b>
<b>Liabilities and Net Assets</b>	
<b>Liabilities</b>	
Accounts payable	\$ <u>11,260</u>
<b>Net Assets</b>	
Unrestricted	1,136,767
Temporarily restricted	2,593,325
Permanently restricted	<u>6,977,821</u>
<b>Total Net Assets</b>	<b><u>10,707,913</u></b>
<b>TOTAL LIABILITIES AND NET ASSETS</b>	<b><u>\$10,719,173</u></b>

*\*The selected financial information presented was extracted from the financial statements audited by McPhillips, Roberts & Deans, PLC.*

## Statement of Activities for the Year Ended June 30, 2013

	<b>Unrestricted</b>	<b>Temporarily Restricted</b>	<b>Permanently Restricted</b>	<b>Total</b>
<b>Revenue, Gains and Other Support</b>				
Contributions	\$ 285,874	\$(16,891)	\$916,062	\$1,185,045
Net investment income (loss)	<u>336,941</u>	<u>563,391</u>	-	<u>900,332</u>
	622,815	546,500	916,062	2,085,377
Net assets released from restrictions	<u>471,645</u>	<u>(471,645)</u>	-	-
<b>Total Revenue, Gains and Other Support</b>	<b><u>1,094,460</u></b>	<b><u>74,855</u></b>	<b><u>916,062</u></b>	<b><u>2,085,377</u></b>
<b>Expenses</b>				
Grants to VIMS restricted for:				
Instruction	90,439	-	-	90,439
Research	306,219	-	-	306,219
Academic support	10,931	-	-	10,931
Institutional support	204,125	-	-	204,125
Student financial assistance	63,056	-	-	63,056
Public support	1,000	-	-	1,000
Management and general	68,519	-	-	68,519
Fundraising	<u>30,553</u>	-	-	<u>30,553</u>
<b>Total Expenses</b>	<b><u>774,842</u></b>	<b>-</b>	<b>-</b>	<b><u>774,842</u></b>
<b>Change in Net Assets</b>	<b>319,618</b>	<b>74,855</b>	<b>916,062</b>	<b>1,310,535</b>
Net assets, beginning of year	<u>817,149</u>	<u>2,518,470</u>	<u>6,061,759</u>	<u>9,397,378</u>
<b>NET ASSETS, END OF YEAR</b>	<b><u>\$1,136,767</u></b>	<b><u>\$2,593,325</u></b>	<b><u>\$6,977,821</u></b>	<b><u>\$10,707,913</u></b>

# W & M Investment Trust

The VIMS Foundation benefits from a larger investment pool by participating in the William & Mary Investment Trust (“WAMIT”) for its investable assets. VIMS and its School of Marine Science are a part of the College of William & Mary.

As of June 30, 2013, the consolidated endowment for the College totaled \$697.7 million—another new high-water mark and 8.3 % higher than last year’s total of \$644.2 million. Strong gift flow and investment performance were the main drivers of asset growth. With improving conditions in global markets, WAMIT earned a 10.7 % rate of return for the fiscal year. WAMIT’s Blended Policy Benchmark returned 9.9 %. Its composition reflects the broad diversification in WAMIT’s investment allocation.

Domestic stocks, representing all cap sizes, returned 22.2 %, outperforming the benchmark of the broad Russell 3000 Index (21.5 %) and the S&P 500

Index (20.6 %). An increased weighting to domestic equity, particularly in high-quality blue chips, proved to be a successful catalyst for overall portfolio appreciation in 2013. Improved buoyancy in the U.S. economy and confidence in domestic stocks contributed significantly in the raised exposure level to domestic equity, going from 18.4 % at the end of June 2011, to 19.9 % at the end of June 2012, to its current 22.9 % weighting.

Foreign equity invested in developed regions of Europe, Asia, and the Far East had a portfolio representation of approximately 12.9 % on June 30, up slightly from last year’s weighting at 10.3 %. Investment performance of 18 % slightly trailed the asset class benchmark of the MSCI EAFE Index of 18.6 %. Emerging markets continued to be difficult for investments during the past year. WAMIT’s performance in this asset class was a disappointing -2.1 % return, trailing the MSCI Emerging Markets Index return of 3.2 % by 530 basis points. WAMIT dealt with the underperforming managers either by termination or reducing their account size. Some new managers are already in place and others are still being evaluated.

WAMIT’s exposure to Marketable Alternatives comes in two component asset classes: Absolute Return and Special Situations. Generally, investments in Absolute Return are those designed to consistently produce a positive return that would, at a minimum, equate to the yield of inflation plus spending (typically high single digits). Investments in Special Situations are opportunistic and consequently reflect strategies that seek to maximize returns from situations perceived to be temporary aberrations in market pricing or where specific financing can measurably improve asset quality and a company’s balance sheet. Together, Absolute Return and Special

Situations comprised approximately 26.5 % of the WAMIT portfolio as of June 30, 2013, down measurably from 33.1 % in 2012 and 36.2 % in 2011. Reduced exposure levels to credit strategies and multi-strategy type hedge funds account for the gradual decline in weighting. Combined, these marketable alternatives produced a 10.7 % return in 2013. Individually, managers in the Absolute Return category returned 7.4 %, the same as the benchmark HFR Fund of Funds Composite. Managers in Special Situations collectively produced a 16.9 % return, exceeding the HFR Distressed Securities benchmark (14.9 %).

Private equity constituted approximately 10.6 % of total assets on June 30, 2013, up from 9.3 % in 2012 and 6.6 % in 2011. With WAMIT’s targeted policy allocation at 12 %, the private equity portion of the portfolio remains beneath the preferred exposure level. However, some newer commitments

are beginning to call capital more frequently and other opportunities continue to be examined with careful due diligence. WAMIT’s private equity returned 11.1 % in 2013. Its benchmark, the Russell 3000 Index, reflecting the opportunity cost in deviating from the broad public market, returned 21.5 %. While the expectation is that, over the long term, a successful private equity

portfolio will outperform public market investments, individual years such as 2013 are the exception where strong U.S. stock market performance dominated all asset classes.

The fixed income portion of the portfolio returned 1.6 % for the fiscal year. This compares to the -0.7 % return of the Barclays Capital U.S. Aggregate Bond Index. In Real Assets, an asset class comprised of investments in commodities, natural resources (oil, gas, and timber) and equity real estate, WAMIT’s blended exposures had a combined return of 2.6 %, outperforming the Dow Jones-UBS Commodity Index of -8.0 % by 1,062 basis points. On June 30, 2013, fixed income carried a 7.7 % weight in the portfolio; real assets a 7.9 % weight; and cash, a 4.1 % weight with a corresponding amount of slightly more than \$19 million.

As of June 30, 2013, the Investments Committee had oversight responsibility of approximately \$472 million in investable assets contained within WAMIT. At that time, 86.9 % of representative ownership in WAMIT belonged to The College of William & Mary Foundation, 6.4 % belonged to the Marshall-Wythe School of Law Foundation, 4.7 % belonged to the William & Mary School of Business Foundation, and 2 % belonged to the VIMS Foundation. Collectively, WAMIT investments represent approximately 68 % of the \$697.7 million in total endowment resources that benefit the College.

## Investment Results

### As of June 30, 2013 - Net of Fees

	1 YR	3 YRS	5 YRS	10 YRS
The William and Mary Investment Trust (WAMIT)	10.7%	7.8%	3.6%	7.9%
Blended Benchmark	9.9%	10.9%	3.9%	6.6%
Value Added	+0.8%	-3.1%	-0.3%	+1.3%

*Policy Benchmark: 56% MSCI All Country World Index, 24% Barclays Capital U.S. Aggregate Bond Index, 2% Barclays Capital U.S. Credit Index, 8% Barclays Capital U.S. High Yield Index, 10% Dow Jones-UBS Commodity Index*

## The William and Mary Investment Trust: Asset Allocation of Policy Portfolio

Fiscal Year 2013	June 30, 2013 Allocation
Domestic Equities	22.9%
Foreign Equities	12.9%
Emerging Market Equities	7.3%
Fixed Income	7.7%
Special Situations	9.6%
Absolute Return	16.9%
Real Assets	7.9%
Private Equity	10.6%
Cash	4.1%
Distributed Securities	0.1%



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## Pathfinders—Lifetime Giving of \$100,000 or more to VIMS or the VIMS Foundation

The Virginia Institute of Marine Science is proud to recognize the following individuals, corporations, and foundations.

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## The Maury Society

Named for the "Pathfinder of the Seas" Matthew Fontaine Maury, the Maury Society recognizes donors who make an annual gift of \$1,000 or more. This group of dedicated patrons helps VIMS to continue Maury's tradition of scientific discovery.

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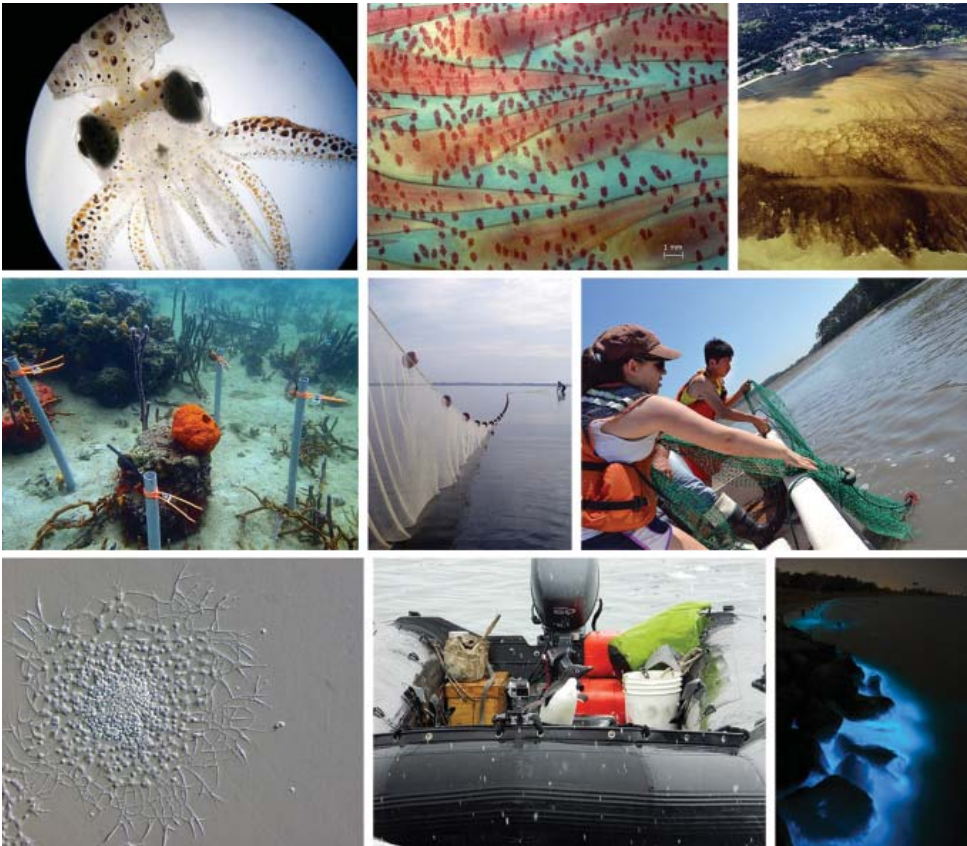
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From L: 1st Place: Juvenile squid, ©B. Turley. 2nd Place: White marlin skin cells, ©E. Loose. 3rd Place: Harmful algal bloom in York River, ©W. Vogelbein. Honorable mentions: Panama field study, ©S. Chak. Seining on the Rappahannock River, ©C. Davis. REU students retrieve a trawl net, ©J. Dreyer. Microphotograph of blue crab parasite, ©P. O'Leary. Adélie penguin in Zodiac, ©J. Stone. Bioluminescence in York River, ©W. Vogelbein.



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From L: Guil Ware, Taylor Reveley, and Carroll Owens. © J. Paul.



Council Chair Gordon Smith with graduate student Jon Lefcheck. © J. Paul.



From L: Council member Ron West with John Wells and Bonnie West. © J. Paul.



A festive affair. © J. Paul.



*Save the Date!*  
Marine Science Day - May 17, 2014

