



S | E | R | C

Untangling Fish Tales

The effort to
understand the
complexities of
human impacts
on aquatic
food webs

Dear Reader,

With this issue of the SERC Quarterly, I am pleased to begin my role as the new Director of SERC. I am grateful for the support of SERC's Advisory Board, the confidence of the Smithsonian's senior administration, and the dedication of SERC's energetic staff. I thank former Director Ross Simons for setting a good course for SERC over the past eight years. Having served as SERC's Assistant Director for 17 years, and as one of SERC's Principal Investigators for 26 years, I see that SERC is providing many crucial solutions to environmental challenges in the coastal zone.

This issue of the Quarterly provides good examples, showing how SERC is poised to address large-scale, long-term natural change and human impacts in land-sea interactions. You will read about our Electronic Field Trip on invasive species that was broadcast live from San Francisco Bay to more than 17 million school children in 40 states across the country. This highlights SERC's leading research, innovative approaches to environmental education, and partnerships with academic institutions and corporations. You will also learn about a SERC-sponsored workshop that takes an innovative approach to answering the key questions surrounding the inter-related impacts of over-fishing and nutrient loading on fish populations. The workshop assembled many of the nation's most active estuarine researchers to think creatively about these complex coastal problems.

Field season is in full swing at SERC, and our center is energized with the activities of our researchers and a new group of some 30 interns from across the country. About 25 graduate students and a dozen Postdoctoral Fellows are immersed in their research and a dormitory has been available for our new dormitory. This is the first field season that our new dormitory has been available for our enthusiastic students and fellows, and we are pleased with this major improvement on the SERC campus.

Sincerely,
Tuck Hines

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Smithsonian Environmental Research Center Advisory Board



Midgett S. Parker, Jr. has recently joined SERC's advisory board as its newest member. Mr. Parker is a partner in the law firm of Linowes and Blocher LLP, in Annapolis, MD, where he specializes in real estate law. He is the current chair of the Board of Trustees of the Chesapeake Bay Trust.

SERC welcomes Mr. Parker as a valuable addition to our board.

**William R. Sweeney, Jr.,
Chairperson**

Vice President, Global Government Affairs, Electronic Data Systems, Washington, DC.

Barbara Bedford, Ph.D., Senior Research Associate, Department of Natural Resources at Cornell University, Ithaca, NY.

Frank Chaney, President and CEO, Chaney Enterprises, Lothian, Maryland, and President, Eugene Chaney Foundation, Waldorf, MD.

Diane Ebert-May, Ph.D., Professor Department of Plant Biology and Director, Assessment in Science Education in the College of Natural Science at Michigan State University, MI.

Russell Faucett, General Partner, Barrington Partners, Santa Monica, CA.

James R. Gosz, Ph.D., Professor of Biology, University of New Mexico, Albuquerque, NM.

Diana MacArthur, Chair and CEO, Dynamac Corporation, Rockville, MD.

Scott Nixon, Ph.D., Professor of Oceanography, University of Rhode Island, Kingston, RI.

Midgett S. Parker, Jr., Esq., Attorney and Partner, Linowes and Blocher, LLP, Annapolis, MD.

Wayne Rogers, Chairman, Synergics Companies, Annapolis, MD.

Charles G. Rose, Former North Carolina Congressman, Westminister, VA.

Calendar of upcoming events:

2005 Evening Lecture Series:

All lectures begin at 7pm
in the Schmidt Center

August 17

Speaker: Richard Primack, Boston University
Climate change and conservation in Thoreau's Concord

September 7

Speaker: Anson Hines, SERC
Crab aquaculture and enhancing the declining stock of Chesapeake blue crabs.

October 12

Speaker: Candy Feller, SERC
Tangled Roots: The Co-mingling of Ecological, Economic, and Societal Values of Mangrove Ecosystems

November 16

Speaker: Bruce Mulliken, Green Energy News, Inc.
The State-of-the-Art of Clean, Renewable and Efficient Energy: Green Energy for Maryland and Beyond

Upcoming Science Seminars:

August 18, Speaker: Richard Primack, Boston University
"Earlier bird arrival times and plant flowering times in Massachusetts: Measuring the impact of climate change in the face of declining population size."

Intern Seminars will begin soon. Check the website to see who will be presenting their work.
http://www.serc.si.edu/public_programs/weeklyseminars.jsp

Taking the Field Trip to the Kids

by Maya Breitburg-Smith



As their names suggest, Atlantic Oyster Drills, Asian Brackish Water Clams and European Green Crabs don't belong on the Pacific Coast of the United States. But they live there now, and they are just three of more than 250 environmentally damaging non-native species to have re-located to the San Francisco Bay—the subject of this year's May 10 electronic field trip (EFT).

“Biological Invasions: The Introduction of Non-Native Species Worldwide” teamed SERC researchers with telecommunications specialists from Ball State University and funding from Best Buy Children's Foundation to broadcast by satellite, a live, interactive field trip to 17.5 million students across the country. “During this field trip, we investigated the cause and consequences of the arrival of organisms not native to America's coastal waters,” said Greg Ruiz, head of SERC's Marine Invasion Ecology Lab, and lead scientist for the field trip.

The field trip focused on defining non-native species, explaining how they reached the Bay and exploring measures to prevent them. Non-native species are a huge problem worldwide because they can compete with native organisms and may introduce new diseases into an ecosystem. These changes can have large, often detrimental effects on the balance of resources in an ecosystem affecting fisheries, tourism, and other services important to human economies.

Global trade has accelerated non-native species introductions in recent years through shipping, and the live seafood and exotic animal markets. San Francisco is a “hotspot” for invasive species, and so was the perfect place to host the electronic field trip. According to Paul Fofonoff, a research biologist in the Marine Invasions Ecology Lab who assisted in the program, “Fishes and oysters were transplanted from the East Coast, and many worms, clams, snails and others piggy-backed with the oysters. Others rode on the hulls of ships or in the ballast tanks. The Bay's mild climate was good

to them, and now in many habitats around the Bay, native animals are hard to find.” Invasive species, however, are abundant.

During the field trip, cameras were placed around the Port of Oakland: in a crane high above the port, in a boat, on the beach and on a diver’s helmet deep below the water.

While the cameras rolled, scientists and members of the port community teamed up with student hosts from Muncie, Indiana, to hunt for invasive species around the bay. Illustrating the problem in real-time, the experts and their student partners discussed causes and solutions while kids across the country joined in the process through e-mail questions and call-ins.

From the boat, sixth grader Jelyvn Williams from Burriss Lab School in Muncie, and Glenn Augustine of Ball State University fielded the phone, answering questions as simple as “What is a bay?”, and as complicated as, “Can filters be used to clean the ballast water?” (They can’t thus far, the filters get clogged too quickly). The questions were then answered by the experts on hand.

Fofonoff guided a class from St. Cecilia’s School in San Francisco on a hunt along the rocky shore for seashore creatures. “The big discovery, made by one boy, was a large Common Periwinkle,” said Fofonoff. Native to the coast of Europe, it is now found on the East Coast from Newfoundland to Virginia and only sporadically in San Francisco. It had never been spotted at this site before. “We don’t know if it’s breeding on the West Coast,” said Fofonoff, “If it is established, this snail could spread from Mexico to Alaska, and drastically change the ecology of the rocky shore.”

Meanwhile on the Beach, Greg Ruiz described how non-native species can enter the wild through the exotic pet and live seafood trades. The problem is not only the accidental release of the intended imports themselves, but the associated organisms—including parasites, competitors, and predators—that can travel with them. Ruiz assisted students as they picked through bundles of the Rock Weed that is often used in shipping live animals and then

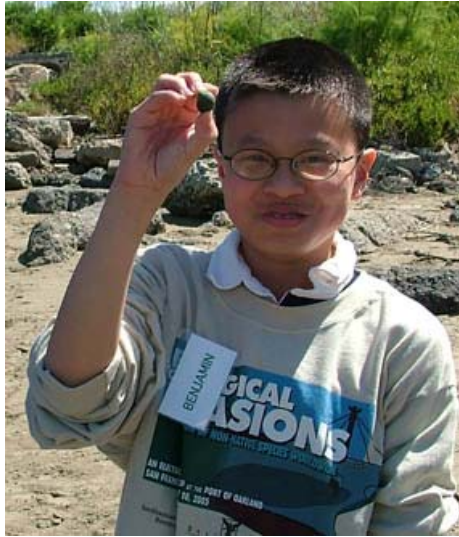
discarded into the bay. They found snails, mussels, and crabs, among other things. Ruiz described this packing material as a, “charter bus, carrying a lot of different organisms across the country and around the world.”

The large container ships that enter the Port of Oakland are another form of “charter bus” carrying organisms

around the world. From their perch high atop a crane over the port, fifth grader Hunter Banks of Cowan Elementary in Muncie and Terry Smalley, the Port of Oakland Crane Operations Manager, explained that ships are a major mechanism for the transport of non-native species. Organisms hitch a ride attached to hulls or in the large ballast water tanks that help keep the ships stable at sea. Once in a new port, ships unload their ballast water as they take on cargo and the organisms they carry can become established in the new environment. “All of the overseas ships that come into the Bay are required to exchange the ballast water 200 miles out at sea,” said Smalley as he described some of the efforts being made to minimize the number of new species arriving in ballast

water. Ruiz and his researchers are working with Port officials and shipping industry to find solutions to the problem. It was this type of work that inspired the development of this year’s EFT.

The electronic field trips are proving to be a successful way to involve millions of students across the country in a range of important scientific topics. Chris Brown, a SERC research technician who appeared in the EFT said it was “a great way to get many kids involved with a large, complex subject.” And for the children who watched as one of their peers made a true scientific finding in the discovery of the Common Periwinkle, it was a rare moment to share in the importance and excitement of real live science. To view this electronic field trip, please visit <http://ali.apple.com/invasions/>.



A San Francisco student displays his big scientific discovery made during the EFT. The common periwinkle, *Littorina littorea* is invasive in the U.S. and had not been found at that site before.

Maya Breitburg-Smith is a student of environmental science at University of Maryland, and a recent volunteer in the SERC Education Department.

Untangling Fish Tales

SERC brings scientists together to examine the interactions between overfishing and nutrient overload and their impacts on estuarine species.

By Kimbra Cutlip

Around the world overall fish catches are in decline, suitable habitat for many aquatic species is shrinking, and environmental organizations and regulators are scrambling to stem the tide.

Global fish catches peaked in the late 1980s and have been in decline ever since. According to the United Nations Environment Program (UNEP), it is unlikely they will ever increase substantially again. UNEP also reports estimates that almost 50 percent of the world's coasts are threatened by development-related activities. Waterways are engorged with an overload of nutrients and pollutants from the land.

With such straightforward numbers, it is tempting to make the conclusions that overfishing is at the root of diminished fish catch, and agricultural runoff and sewage effluence are responsible for habitat destruction. But over the past decade or so, it's become clear that very little surrounding these issues is simple and straightforward.

Multiple stressor factors such as nutrient overload and fishing pressure often interact with one another, sometimes masking or even abating the effects of one another and at other times exacerbating them.

Teasing out cause and effect of environmental degradation and multiple stressors has challenged governments around the world. Establishing effective management strategies has proven even harder as stakeholders such as fishing, agricultural, development and waste treatment industries are regulated by separate agencies, increasing the tendency to point fingers and deny culpability. It appears to be time for a new approach.

“There's been a recognition that you can't deal with these problems separately,” said SERC's Estuarine Ecologist Denise Breitburg. “and there's a growing feeling that managing them separately isn't a good idea either.”

This past spring, Breitburg and her postdoctoral fellow, Richard Fulford, gathered 20 ecologists and fisheries biologists from academic institutions, government agencies and the Smithsonian for a three-day workshop to attempt to “disentangle” the effects of eutrophication (excessive nutrient input) and fishing on estuarine food webs. While there have been a variety of research conferences focused on the independent effects of each of these two stressors, the workshop was unique for its focus on their combined effects in a formal scientific forum.



Untying Knots

Disentangling the effects of multiple stressors is both the keystone to the scientists' approach, and the Rosetta stone of effective management. What makes the issues so complex is that an individual stressor can have both positive and negative effects on a system and can both influence and be influenced by other stressors.

During the workshop, Breitbart and her colleagues discussed the ways in which eutrophication can impact fisheries yields, and conversely how fishing impacts food webs thereby altering an estuarine system's response to eutrophication.

Nutrient enrichment from sources such as agricultural runoff and sewage effluents usually increases the population of microscopic plant species or phytoplankton. As a result, the phytoplankton-eaters increase in numbers, providing more prey for the larger organisms, and we see increases in the numbers of some top consumers. Sometimes these are the commercially valuable fish that managers monitor to determine the health of a system.

At the same time, however, increases in phytoplankton

reduce dissolved oxygen levels in deeper waters, diminishing habitat for bottom dwellers and other deep-water organisms. These organisms may then migrate out of the low-oxygen zones and concentrate in refuge areas where they can become concentrated prey for fishermen, and sometimes artificially boost the survey numbers.

In such instances, it may be difficult to discern if high fish landings are the result of high overall fish populations, the concentration of fish seeking refuge from habitat loss, or the result of increased fishing effort and efficiency.

To further muddy the waters, overfishing of top consumers reduces predation pressure on plankton-eating fish, and the resulting increase in this population can make it difficult to distinguish between the effects of eutrophication and fishing pressure.

Add to the equation the impacts of other stressors such as disease, sediment from new construction, chemical contaminants and pollutants from industrial areas, and it becomes more and more difficult to discern the role of individual stressors. Determining how to

CASE IN POINT:

WHEN STRESS LOOKS LIKE PROSPERITY

Contrary as it may seem, a system under stress can appear to be thriving, as was the case with the Norway Lobster in the mid-1980s.

Decades of increasingly intensifying agriculture in Sweden and Denmark led to an increase in nutrients flowing into the Kattegat Channel that divides the two countries. Like fertilizer on a bed of grass, the nutrients spurred the growth of phytoplankton, microscopic plants that float within the water. When they die, phytoplankton sink to the bottom where the process of decay uses up the available dissolved oxygen and can create low-oxygen or "hypoxic" areas. Many bottom-

dwelling species are forced to flee hypoxic zones or risk suffocation or starvation.

As the hypoxic areas grew in the Kattegat Channel in the mid-80s, Norway lobsters, which usually burrow into the sea floor, emerged from the sediment. "You could say they came out sort of gasping for breath," said Robert Diaz, professor at Virginia Institute of Marine Science, and a workshop participant. "As you can imagine, that makes them much more susceptible to trawls. So, fishermen were catching more lobsters than they ever caught before."

Although the system seemed to be

producing in abundance, the truth was that one stressor (nutrient load or eutrophication) was flushing out the lobster where it could be exploited by another (fishing). Despite the warning of scientists monitoring the hypoxic regions, a year of record landings convinced managers that everything was just fine in the Kattegat. "Well, the following year, you had mass mortality and all they trawled up were dead animals," Diaz said.

Eventually the crustaceans succumbed to hypoxia, and by 1988, the fishery collapsed. Today, there remains no viable lobster fishery in that region of the Kattegat.

manage them under these circumstances is an arduous and precarious task.

Forging Ties

Researchers and managers agree that despite the difficulties, it is imperative that we learn how to effectively manage both nutrient loading and fishing pressures. “One of the triggers for this kind of workshop was what’s going on with water quality and fisheries management in Chesapeake Bay,” Breitburg said.

“Everyone acknowledges that you should do a good job of managing fisheries in the Bay, and everyone agrees that you should do a good job of restoring water quality to the Bay,” she said, “but what happens when you start talking about numbers, setting numerical targets for reduction of input from sewage treatment plants or nutrient runoff from agriculture or targets for fish catch, is that stakeholders start pointing fingers at each other.” Unfortunately, many efforts to improve the Bay degenerate into debates over policy.

The workshop is a first step “toward looking at multiple stressors jointly and not as separate issues,” she said. Because the management of one has implications for the

other, the needs extend beyond setting targets for fish catch and nutrient input. “Management agencies need to know what to promise,” Breitburg said, explaining that interactions between multiple stressors can make this a tricky business because they can impact the outcomes of management actions. “Eutrophication increases phytoplankton and food for fish, so if we start reducing nitrogen input, we may not have an increase in some fish, but a reduction.” The question is, where is the tipping point—the point at which reducing nutrients will yield fewer fish versus more, and how does that point move with respect to different conditions and different systems?

The Good News Is:

While the workshop was only a first step, some preliminary findings indicate that this approach is headed in the right direction.

“One thing that really came out in this workshop,” Breitburg said, “is that estuaries tend to be pretty resilient to the insults people throw at them.” The nature of estuaries, with their mix of salt and fresh water and widely varying conditions, is exactly what makes them so hardy. Estuarine species tend to be generalists and can withstand

CASE IN POINT:

PLAYING CATCH UP



In the Chesapeake Bay, more than 100 years of over-harvesting the Eastern oyster not only depleted their numbers, but destroyed reef habitat for new oysters to settle. Vulnerable from the assault of overfishing, oyster populations finally succumbed to the effects of two parasites MSX and Dermo.

The fishery survives as a skeleton of what it once was with annual harvests now measured in the thousands of bushels instead of millions. Efforts to restore the once thriving oyster population in the Bay have been complicated, however, by the interactive impacts of fishing, habitat loss, disease and water

quality.

“There are subtle effects that we don’t factor in well because we don’t understand them” Breitburg said. For instance, it turns out that oysters, and many other species are more susceptible to certain diseases in low oxygen conditions than in normal conditions. “We’re finding that dissolved oxygen levels that you wouldn’t think would harm an adult oyster increase the prevalence of a disease called Dermo.”

Breitburg, who studies the effects of low oxygen on oysters and other marine organisms, suggests that while these low dissolved oxygen levels may not cause

an immediately obvious effect, they are in fact suppressing the immune system, thereby opening species to disease.

“An already stressed system can’t recover from disease as well as a healthy system,” said SERC researcher Denise Breitburg.

Another complicating factor in the Chesapeake Bay, where soft bottom is the predominant substrate, is that oysters need oysters to thrive. Oyster larvae must attach to hard substrate—not mud—to grow into adults. In Chesapeake Bay, formerly extensive oyster reefs provided the main hard substrate available to settling oyster larvae. The fewer oysters there are in the Bay, the fewer opportunities there are for new oysters to become established. Hope for the oyster lies in a multi-faceted approach.

a wide range of conditions. Although overfishing can nearly decimate a population, fishing stops when it is no longer a viable source of income. According to Breitburg, “you rarely get a complete local extinction. So, once you take proper management steps for recovery most species rebound.”

Workshop participants identified instances where management of both nutrient input and fisheries has resulted in some level of recovery, and compared them to cases in which only one stressor had been managed. They noted that estuarine systems with the highest nutrient loading and recurrent low-oxygen zones are also the ones

with the highest fish landings. This could indicate high fish production or heavier fishing pressure that further stresses the system. They also acknowledged that there are some impacts of multiple stressors that, if allowed to progress can be resistant to restoration efforts.

Breitburg is hoping that as discussions began at the workshop continue, a conceptual model of how multiple stressors impact estuarine systems will emerge. Quantitative models are being developed by workshop participants and other researchers that will help resource managers analyze the simultaneous effects of eutrophication and fishing, and guide them in restoring what’s been lost.

CASE IN POINT:

DOUBLE JEOPARDY



Just a century ago, sturgeon were commercially important in the Eastern United States, valued for both their flesh and their roe which graced tables around the world as caviar. But the sturgeon catch dwindled by 95 percent between 1905 and the 1920s. Today, there is no commercial fishery for any of the three species of east coast sturgeon in the United States. Similar fates have befallen sturgeon around the world, and from the Caspian Sea to the Chesapeake Bay, many species of sturgeon are now in jeopardy of becoming extinct.

The sturgeon’s unique biology and complicated lifecycle mean that recovery efforts must attempt to untangle and manage a web of interacting stressors if they are to have any hope of success.

According to David Secor, fisheries ecologist at University of Maryland Center for Environmental Science and workshop participant, the sturgeon’s long life cycle contributes to the complications. “There’s going to be a lag between when you fish them and when you see a decline in the population,” he said. Because sturgeon can take

15 to 20 years to mature, removing 90 percent of the females in one year, means you won’t see a corresponding decline in population for another 15 to 20 years when the juveniles those females should have spawned are missing from the system. Similarly, recovery will be just as slow.

But the sturgeon is particularly sensitive to stressors such as habitat loss, temperature, and low dissolved oxygen, so recovery will mean more than just waiting out a moratorium on the fishery until the populations have a chance to grow up.

“Sturgeon might have recovered on their own in the Chesapeake if the environment hadn’t changed so dramatically,” said Secor, “but it did.” The 1940’s and 1950s heralded the new age of agriculture with a massive increase in the use of chemical fertilizers and a dramatic rise in the amount of nutrients running off into the water. “There was a shift in the 1950s and 1960s in terms of bottom water quality conditions” Secor said. As a result of “over fertilization” from nutrient runoff, areas of low dissolved

oxygen now dominate in the deeper waters of the Chesapeake Bay during the summer.

Low oxygen not only limits survival, growth and activity, but reduces the amount of food available to all bottom feeders like sturgeon. Also, runoff from development can cover their spawning grounds upstream in fresh water rivers with a layer of sediment unsuitable for their young.

The young sturgeon that do survive must migrate downstream and out of the Bay into the Atlantic by adulthood. During the journey, they are squeezed for suitable habitat as they encounter low-oxygen zones in the cooler bottom waters and unsuitably warm temperatures in the shallow, better oxygenated areas. And yet, they can’t seek refuge in the cooler, more oxygen-rich coastal waters farther down stream until they mature enough to become tolerant of the higher salinity levels in those areas.

It’s a double jeopardy that can only be untangled by addressing a multitude of stressors in concert.

Open House 2005



Chip Clark

Chip Clark

Our Visitors Said . . .

"Loved every minute"

*"Informative staff
was very helpful
with questions"*

*"Very educational
for young and old"*

*"The family looks forward
to this every year"*

*"Nice event for kids to
learn about the bay"*

*"Thanks, see
you next year"*

The 2005 Open House for Nature, hosted May 7, served as a great way for young and old alike to tour SERC and learn about the impressive science that happens here. Eleven hundred visitors from Maryland, Virginia, DC, and as far away as the United Kingdom participated in a multitude of activities around the SERC campus. Visitors were lifted high into the air to experience the tree canopy from the basket of a crane, and they were guided down to the microscopic level to view samples of live plankton through a stereoscope. Lab displays and demonstrations introduced visitors to SERC's research, while hiking trails, boat trips down the Rhode River, and canoe tours introduced them to the environment around the campus. Kids squirmed almost as much as the fish and crabs they got to hold in the touch tanks. They also enjoyed face painting, crafts, and bouncing around on the hay ride shuttle between the main lab complex and the Reed Education center.

With an enthusiastic demonstration of support from the SERC community, 110 dedicated staff members and 18 volunteers participated. According to Darrick Sparks, the Chair for this year's event, the 2005 Open House for Nature "opened our doors to the local community, educating them about SERC, the environment, and all of the different global research conducted right in their backyards." For the past three years, the Open House has been generously supported by the Chaney Foundation.

NEXT GENERATION

INTERN DAY

On June 27th the SERC interns presented their projects to 115 visitors during the fifth annual SERC Intern Day. Representing the largest number of visitors for this event, they came from Norfolk State University, University of Maryland Eastern Shore, Hampton University's MAST Program, Morgan State University, University of Virginia's Blandy Experimental Farm, Smithsonian Minority Internship Program (including interns from NMAH, STRI, Office of Contracts, Office of Fellowships), National Zoological Park and Smithsonian Office of General Counsel.

A BUSY SUMMER

This summer, SERC supported 26 interns from 12 U.S. states, Puerto Rico, Sweden and South Korea. Two interns from the Institute for Estuarine Studies in New York came to work with the Avian Ecology Lab.

This is also the first year of the Research Experience for Teachers grant in which local high school teachers participate in an active research project in the hopes that they will then translate some of their experiences into classroom curriculum during the school year. Three local science teachers participated in the program this year.

Eye on Education



Mark Haddon

High school senior Brittany McBride presents her research project to the audience during this year's Student Training in Aquatic Research program. McBride is from C.H. Fowler High School in Springdale, MD.

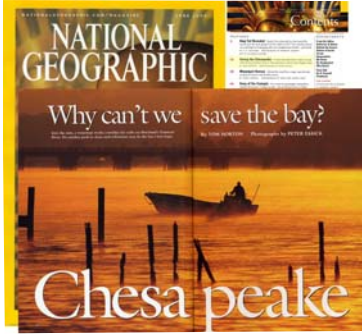
◆ This May, SERC became a Chesapeake Bay Gateway Network site, linking it to a network of sites established around the Chesapeake Bay watershed. The program, started by Senator Paul Sarbanes, is designed to increase public access to and knowledge of the Chesapeake Bay watershed.

◆ Students ranging from kindergarten to eighth grade hailing from 75 schools around the region visited SERC on field trips. Participating in Estuary Chesapeake, Marsh Explorations, and Canoe trips, they learned about the Bay, marshes, and environmental issues within the Bay.

◆ The annual Student Training in Aquatic Research (STAR) Symposium was held May 18, 2005 on the grounds of the Reed Education Center. Through the STAR program, 30 high school students conducted environmental research projects on topics ranging from gill lice in fish to correlations between fish populations and turbidity. At the symposium, projects were presented using power point presentations and poster displays to scientists from SERC, staff from the NOAA Chesapeake Bay Office, families, and fellow STAR students.

◆ Mark Haddon led video conferences for kindergarten through 12th grade classes across the country on blue crabs, the Chesapeake Bay, birds, turtles, global climate change, and aquatic ecosystems.

◆ The education department said farewell to two valued staff members this spring. Web Master Anna van der Heijden and Distance Learning Coordinator Dottie Klugel have moved on to pursue other interests.



SIGHTINGS

Anson Hines was quoted in an article on the state of the Chesapeake Bay in the June issue of National Geographic magazine.

May 16th issue of *Newsweek* listed SERC's Electronic Field trip on Invasive Species in their Tip Sheet section and provided the url for field trip archive.

May 12 *Washington Post* ran a photo essay on Open House in the Anne Arundel section titled "Nature's Open House at Smithsonian Center."

On May 12, NPR/WYPR- Baltimore aired a spot titled "Crab Hatcheries: Replenishing the Chesapeake Bay's Crab Population". The spot focused on the crab project and included an interview with Tuck Hines. It can be heard on the web at the following link:

http://www.publicbroadcasting.net/wypr/news/news.newsmain?action=article&ARTICLE_ID=772093 .

May 11, *Oakland Tribune* featured an article covering the Electronic Field Trip titled "Students Hit the Beach in Name of Research."

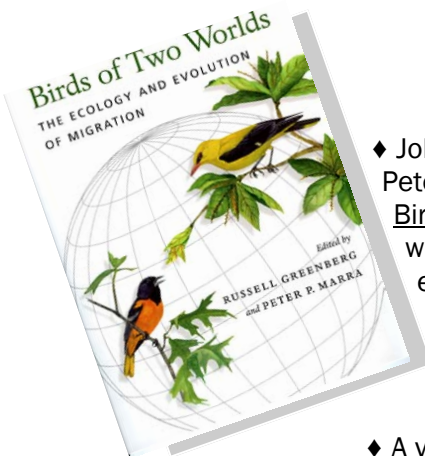
On April 20, PBS aired a film on invasive species as part of the National Geographic's series called "Strange Days on Planet Earth" <http://www.pbs.org/strangedays/episodes/invaders/> The Smithsonian Environmental Research Center was mentioned and two SERC employees appeared in the: one current technician (Chaundra Schofield) and one former technician (Andrew Chang). Additionally, PBS linked to the NEMESIS web site as a web resource for information on marine invaders.

Tom Jordan was quoted in the online SeaGrant news story available at the following link.

<http://www.mdsg.umd.edu/news/phosphorusinlakes.html> The story also includes a link to Jordan's web site.

Thomas Jordan was interviewed by Erica Goldman about nitrogen issues in the bay for an article in the Chesapeake Quarterly. The current issue focuses on farms and the bay and appears at: <http://www.mdsg.umd.edu/CO/>

April 10, Anson Hines was quoted in an article about the blue crab fishery in the Virginia Pilot. The article was titled: "Nature, Man Conspire to Endanger Blue Crabs", by Scott Harper.



STAFF NEWS

◆ Johns Hopkins University Press recently released a new book edited by Peter Marra of SERC and Russell Greenberg of SI's Migratory Bird Center. *Birds of Two Worlds* explores answers to questions about where birds go and why, why some migrate while others do not, how they adapt to a changing environment, and how migratory systems evolve. The book is intended for readers interested in biology, behavior, ecology, and evolution of birds and will appeal to serious birders, ornithologists, evolutionary biologists and interested public.

◆ A video interview of Candy Feller will soon be available for visitors to the National Museum of Natural History and the Insect Zoo via personal digital assistants (PDAs). The PDA's will replace the audio wands visitors currently use as they move around the museum. The exhibit will also feature Feller's mangrove and insect research at Carrie Bow Caye in Belize.

Strength in Numbers

Fritz Riedel received two awards from the DC Department of Health, Water Quality Division, For SERC's collaboration in "Tidal Basin and Washington Ship Channel Toxics Monitoring." Reidel received \$42,285 from a total grant of \$112,868. He also received \$64,967 collaborative work on "Kenilworth/Beaver Dam Creek Toxics Monitoring."

Patrick Neale received \$95,986 from the National Science Foundation for a collaborative project on "Interactive Effects of UV and Vertical Mixing on Phytoplankton and Bacterioplankton in the Ross Sea." He also received \$27,687 from Miami University for "Interactive Effects of UV Radiation and Temperature of Pelagic Food webs."

Wayne Coats and SERC fellow Mario Sengco, received \$67,112 from Woods Hole Oceanographic Institution for "Control of Harmful Algal Blooms Using Clays: Phase II."

Wayne Coats received \$67,112 from Woods Hole Oceanographic Institution for "Control of Harmful Algal Blooms Using Clays: Phase II."

Cynthia Gilmour received \$272,501 from NSF for "METAALICUS: A Whole-watershed, Stable Isotope Study of the Mechanisms of Net Microbial Methylmercury Production."

Gregory Ruiz received \$22,215 from Portland State University for "Evaluating Ballast Water Treatment Systems Onboard Ships."

Dennis Whigham received \$35,000 from Penn State University for "Ecological and Socioeconomic Indicators for Integrated Assessment of Aquatic Ecosystems of the Atlantic Slope."

Jess Parker received an award of \$40,000 from University of California, Davis, for Multisite Integration of LIDAR and Hyperspectral Data for Improved Estimation of Carbon Stocks and Exchange. Parker also received a \$13,041 grant from the State University of New York for research into "Periodic, Transient, and Spatially Inhomogeneous Influences on Carbon Exchanges in Amazonia."

Peter Marra received his second \$10,000 grant from The Nature Conservancy on a project that compares the bird communities of restored and natural Delmarva bays during the breeding and non-breeding seasons. Delmarva bays are seasonally flooded depressional wetlands, once found in abundance on Maryland's Eastern Shore but many have since been converted to agriculture.

Denise Breitburg received notification of an award for \$463,000 from the NOAA Coastal Ocean Program. The award for "Watershed-estuary-species nutrient susceptibility" is part of a grant for \$2,511,844 shared between collaborating agencies and covers the period June 1, 2005 through May 31, 2010.

Civil Science

On June 24th, SERC hosted a tour of the research and educational facilities for congressional staff members.

On June 8, SERC hosted a tour for 12 members of the US Department of Commerce Science and Technology Fellowship Program. These upper-level federal government employees are all in a professional or management series and have backgrounds in science and technology-related areas.

Cindy Gilmour presented an update/synopsis of the METAALICUS study on mercury cycling in the environment to a group of state and federal regulatory, and industry representatives, April 28, at the Electric Power Research Institute in Washington, DC.

Denise Breitburg presented oral testimony to the Environmental Matters Committee of the Maryland House of Delegates in relation to House Bill 1250, which was introduced by Delegate Barbara Frush. During her testimony and questions, Breitburg addressed research recommendations and scientific uncertainty surrounding the proposed introduction of a non-native oyster (*Crassostrea ariakensis*) to Chesapeake Bay. The legislation (described below) requires Maryland Department of Natural Resources to meet the research recommended in the report of the Scientific and Technical Advisory Committee (STAC) workshop, which Breitburg chaired along with Jonathan Kramer (MD Sea Grant) and Mark Luckenbach (VIMS). Description of legislation from the Chesapeake Bay Commission web site: Introduction of Non-native Oysters. Legislation addressing the research and reporting requirements that must be met before the Maryland Department of Natural Resources (DNR) can introduce a non-native oyster into state waters was passed this session. These requirements include meeting the recommendations set forth in the 2004 National Research Council report on the Asian oyster, *C. ariakensis*, as well as the research recommendations established by the Chesapeake Bay Program's Scientific and Technical Advisory Committee. An independent oyster advisory panel will review and approve specified data and assessments and identify any additional research needs.

Minutes: scientific and professional meetings and presentations by SERC staff

The Atlantic Slope Consortium (ASC), part of the EPA's Science to Achieve Results (STAR) Estuarine and Great Lakes (EaGLe) program held their final all-hands meeting at SERC. ASC is preparing their final report on the five-year (\$6,000,000) project.

Eric Johnson, Anson Hines, Alicia Young-Williams, Michael Goodison, Margaret Kramer, Robert Aguilar, and Jana Davis presented the following talks at the Blue Crab Advanced Research Consortium in Ocean Springs, Mississippi: "Performance of hatchery-reared versus wild juvenile blue crabs: Overview of lab and field comparisons of morphology, behavior, and demographics."

"Assessing feasibility of stock assessment of Chesapeake blue crabs: Overview of lab and field comparisons of morphology, behavior, and demographics."

SERC research was well represented at the Benthic Ecology Meeting sponsored by Virginia Institute of Marine Science, College of William & Mary in Williamsburg, VA. with the following presentations:

"Field Assessment of the feasibility of enhancing blue crab stocks in Chesapeake Bay." **Eric Johnson, Anson Hines, Alicia Young-Williams, Michael Goodison, Margaret Kramer, Robert Aguilar, and Jana Davis** with Yoni Zohar and Odi

Zmora of University of Maryland. **Eric Johnson, Alicia Young-Williams, and Anson Hines** presented "Density-dependent aggregative response of blue crabs to infaunal blue crab prey." **Martha Bademan, Anson Hines and Eric Johnson** presented "Predation rates on hatchery-reared and wild juvenile blue crabs (*Callinectes sapidus*) in upper Chesapeake Bay." **Gerald Bright, Jr., Eric Johnson, and Anson Hines** presented "Comparison of habitat utilization between juvenile hatchery-reared and wild blue crabs."

Richard Osman also presented "A coupled hydrodynamic-larval transport model for assessing source-sink recruit-

ment dynamics in estuarine habitats," Hamilton, Whitlatch, and Osman. "The interactive effects of climate change and land use on the alteration of coastal marine systems by invasive species," Whitlatch, Osman, Zajac, and Mercer.

Richard Osman presented the following at the International Invasive Sea Squirrels Conference in Woods Hole, MA:

- Osman, Whitlatch. "Habitat variability in the invasion of Long Island Sound by *Didemnum* sp. and its interaction with the resident community."
- Osman, Whitlatch and McCarthy. "Effects of temperature on growth rates of colonial ascidians: A comparison of *Didemnum* sp. to *Botrylloides violaceus*."
- Whitlatch, Osman. "Post-settlement predation on ascidian recruits: predator-responses to changing prey density."

Eric Johnson attended the assessment workshop of the Southeast Data Assessment and Review (SEDAR) Caribbean spiny lobster data assessment and review in Marathon, FL.

Anson Hines gave an invited seminar "Testing the Feasibility of Enhancing Chesapeake Blue Crab Stock with Hatchery-Reared Juveniles" at the University of Washington Department of Aquatic and Fishery Science, Seattle.

Don Weller, Tom Jordan, Dennis Whigham, Pat Megonigal and Jess Parker presented a training course on April 6 for nutrient management consultants certified by the Maryland Department of Agriculture. The course was held at SERC and included three one-hour lectures and visits to field research sites.

Thomas Jordan attended meetings at the University of Southern Mississippi Gulf Coast Research Laboratory, Ocean Springs, MS. Jordan served on the scientific advisory board of the EPA-funded Consortium of Estuarine Ecoinicator Research – Gulf of Mexico Program.

Don Weller has accepted an appointment to be a member of STAC, and has been participating in the STAC task

force: Chesapeake Bay Program Scientific and Technical Advisory Committee Task Force on Analysis of Non-tidal Water Quality Monitoring Results.

Dennis Whigham presented a talk at Utrecht University titled: Linking catchment land-use patterns to estuarine condition.

Dennis Whigham taught a two-week field-based course (ecosystems of the mid-Atlantic) for a group of 14 students from Utrecht University (The Netherlands). Co-leaders of the group are Professor Jos Verhoeven and Dr. Roland Bobbink of the Landscape Ecology section within the Biology faculty at Utrecht.

Melissa McCormick gave two talks at Trinity University. The first was titled "What's an orchid to do when its fungus goes astray?" The second entitled "Conservation in a world of interacting species" was presented to the national biology honor society Tri Beta's colloquium "Striving to Survive."

Denise Breitburg presented a seminar titled "Ctenophores and nettles in a changing Bay. . .or, Why my research has lost its backbone" at Horn Point Laboratory, University of Maryland Center for Environmental Science, Cambridge, MD.

Denise Breitburg conducted a workshop titled "Predicting effects of overfishing, eutrophication and disease on estuarine fish assemblages: disentangling effects of multiple stressors on estuarine food webs." The three-day workshop will result in a conceptual model, and began work on data comparisons and collaborative efforts on quantitative models that predict the individual and interactive effects of nutrient enrichment, overfishing and disease on estuarine fish assemblages. Representatives from a broad spectrum of disciplines and organizational affiliations were present. (See feature article on page 6.)

Denise Breitburg attended the Scientific and Technical Advisory Committee (STAC) quarterly meeting, and represented SERC at both the Chesapeake Research Consortium meeting and the Maryland Sea Grant Institutional Council

in which they reviewed the MD Sea Grant Strategic Plan and upcoming external program review.

Cindy Gilmour gave a seminar in the Dept. of Geography and Environmental Engineering at Hopkins.

Wayne Coats participated in the 12th East Coast Conference on Protozoology where he chaired two sessions, coauthored four poster presentations, participated in an Executive Committee Meeting of the International Society of Protozoologists (ISOP), and transitioned from the President-Elect to the President of ISOP. Coats will serve one year as President and remain on the Executive Committee.

Wayne Coats gave a seminar entitled "Microbial Controls of Chesapeake Bay Phytoplankton" to three audiences; at NOAA in Silver Spring, MD, Pukyong University in Busan, Korea, and Korea's largest university in terms of number of students, Hanyang University in Seoul. He also participated on the PhD defense for a colleague's student Sunju Kim, of Pukyong University.

Matt Baker gave an invited presentation summarizing SERC involvement in the US-EPA EaGLes Coastal Initiative to an all-hands meeting of the Chesapeake Bay Program entitled: "Indicators of linkages between watersheds and shallow sub-estuary habitats." Baker has subsequently been invited to present our findings again to the Bay Program's Implementation Committee (IC) in June.

Research Fellow **Mark Minton** presented an invited talk to the Botanical Society of Washington. The talk was entitled "Plant Naturalizations: Surviving the Gauntlet of Environmental Stochasticity."

Mark Minton attended a US Coast Guard workshop that evaluated potential treatments of residual sediments and water in ballast tanks of ships arriving to the Great Lakes with no ballast on board (NOBOB).

Matt Baker presented the paper “Transport-distance effects in regional predictions of nitrate discharge: implications for nitrogen transformation” at the NABS/AGU Joint Session in New Orleans.

Whitman Miller attended the semi-annual Aquatic Nuisance Species Task Force Meeting held in Monterey, CA (May 24-26). SERC is an Ex-Officio member of this interagency body.

Whitman Miller attended the National Invasive Species Council’s Pathway Assessment Conference in Riverdale, MD.

Greg Ruiz, Anson Hines, Whitman Miller, Kate Murphy and George Smith attended the Ballast Water Workshop – Evaluating Ballast Water Treatment Systems Onboard Ships: Technical and Scientific Approaches in Portland, OR. This workshop was organized and run

by the Aquatic Bioinvasion Research and Policy Institute (SERC/PSU – **Greg Ruiz** and **Mark Sytsma**) in collaboration with the Pacific States Marine Fisheries Commission and sponsored by the Alaska Department of Fish & Game, the Pacific States Marine Fisheries Commission, Prince William Sound Regional Citizens’ Advisory Council, US Coast Guard Aquatic Nuisance Species Program.

SERC was well represented at the American Society of Limnology and Oceanography (ASLO) meeting in Santiago de Compostela, Spain.

Wayne Coats coauthored four poster presentations and one oral presentation. He also co-chaired a special session on Parasites of Plankton.

Denise Breitburg presented the talk: “Opposing waves of medusa and ctenophore spread and trophic control

across an estuarine landscape.”

Patrick Neale and members of the photobiology lab **Christina Sobrino, Maria Tortziou, Jesse Phillips-Kress,** and **Linda Franklin** presented their work, as did **Patrick Megonigal** and **Charles Gallegos**. Their presentations were titled:

“UV inhibition of phytoplankton photosynthesis during the late stage of an extensive Ross Sea polynya bloom.”

“Interaction of UV-radiation and temperature in the inhibition of photosynthesis: spectral and temporal responses of estuarine diatoms.”

“Sources and cycling of chromophoric dissolved organic material in the estuarine waters of the Rhode river sub-estuary and the Chesapeake bay.”

NEW PUBLICATIONS

Gallegos, C.L., Jordan, T.E, Hines, A.H., Weller, D.E. 2005. Temporal variability of optical properties in a shallow, eutrophic estuary: Seasonal and interannual variability. *Estuarine, Coastal and Shelf Science* 64:156-170.

Parker, G.G., Tinoco-Ojanguren C., Martínez-Yrizar A., Maass, M. 2005. Seasonal balance and vertical pattern of photosynthetically active radiation within canopies of a tropical dry deciduous forest ecosystem in México. *Journal of Tropical Ecology* 21: 283-295.

Utz, L.R.P., Coats, D.W. 2005. Spatial and temporal patterns in the occurrence of peritrich ciliates as epibionts on calanoid copepods in the Chesapeake Bay, USA. *J. Euk. Microbiol.*, 52:236-244.

Sobrino, C., Neale, P.J., Lubian, L.M. 2005. Interaction of UV radiation and inorganic carbon supply in the inhibition of photosynthesis: spectral and temporal responses of two marine picoplankters. *Photochemistry and Photobiology*, 81: 384–393.

Huber, H., Whigham, D.F., O’Neill, J. 2004. Timing of disturbance changes the balance between growth and survival of parent and offspring ramets in the clonal forest understory herb *Uvularia perfoliata*. *Evolutionary Ecology* 18: 521-539.

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