



A Newsletter from the New Jersey Sea Grant Consortium

# Project PORTS Reestablishes Oyster Populations in Delaware Bay

Hundreds of pounds of spat, or baby oysters were taken Sunday, Sept. 14 from the Haskin Shellfish Laboratory where they had been growing in mud flats and relocated to artificial reefs along the Delaware Bay shore.

The spat had been growing on the surface of shell-filled mesh bags since the early summer near the Rutgers University Haskin Shellfish Laboratory's Cape Shore facility in Cape May County as part of Project PORTS: Promoting Oyster Restoration Through Schools. The bags were relocated by barge to a five-acre reef



located at the Gandy's Beach Oyster Restoration and Enhancement Area in the Delaware Bay off Cumberland County. Led by Lisa Calvo, Shellfish Aquaculture Program Coordinator for Rutgers University and New Jersey Sea Grant Consortium, Project PORTS has seeded more than 20 million oysters in conservation sites like Gandy's

Beach throughout the Delaware Bay since it began in 2007.

"Scientific assessments indicate these restoration efforts have been successful," said Jenny Paterno, a Rutgers graduate student examining the fish activity in the restoration areas and nearby parts of the bay. "A viable multi-generational oyster

population, approaching natural oyster abundances, has been established in an area that was previously barren."

Oysters are critical organisms for the ecology of estuaries. The species is

recognized for its role in improving water quality, creating structural habitat, and enhancing fisheries production. Oysters are filter-feeders and eat microscopic plants, called phytoplankton, from the water as they pass over the oysters' gills. A single adult oyster can filter up to 50 gallons of water per day, which helps keep our estuaries clean and clear.

To complete their life cycle and grow to be adults, oyster larvae (oyster babies floating in the water column) must attach to a clean, hard surface. An ideal surface is a piece of shell or the shell of a live oyster. Through this process of attaching to one another, oysters form reefs over time and thus they have been called "ecosystem engineers."

South Jersey elementary school students assist with the reef building by compiling the shell-filled bags that give the spat the hard bed to which they need to attach, to begin forming new sections of reef.

These living structures provide habitat for many other animals in the bay including: fishes, shrimp, crabs, snails, worms, barnacles, and others. In addition to providing the habitat itself, oyster reefs are important foraging grounds for predatory animals. Important commercial and recreational species use oyster reefs at various stages in their lives.

Blue crab, weakfish, Atlantic croaker, striped bass, white perch, and northern kingfish—important commercial and recreational species—have been found by researchers to be using the the restoration area.



## Fisheries Fellowship Award Goes to Princeton's McManus to Study Philippines' Coral

Lisa McManus, Princeton University Ph.D. student, has been awarded a National Marine Fisheries Service Sea Grant Population and Ecosystem Dynamics Graduate Fisheries Fellowship to pursue research on her project: Assessing the impacts of connectivity on coral reef metacommunity dynamics in the Coral Triangle.

McManus plans to generate an estimate of how coral populations in the Coral Triangle will change over time, particularly under the effects of different climate change scenarios. In terms of management, it is likely that certain areas will stand out as being particularly important sources or sinks of coral larvae, warranting them extra protection. She hopes that her research results will help guide discussions of policy in the region, such as in the implementation of marine protected areas.

"With this fellowship, I will have the funding to complete the genetics portion of my research," McManus said. "It is this component that will ground my theory in the real world, since it will help determine how different coral populations in the Coral Triangle interact with each other."

The Graduate Fisheries Fellowship Program is administered through NOAA's National Sea Grant College Program and the National Marine Fisheries Service. It awards at least two new Ph.D. fellowships each year to students who are interested in careers related to marine ecosystem and population dynamics, with a focus on modeling and managing systems of living marine resources.

Princeton University is a member of the New Jersey Sea Grant Consortium, which manages McManus's award.

For the duration of the fellowship, McManus will study the effects of climate change on the larval dispersal of corals and how this, in turn, will affect the ability of corals to persist into the future. The region of focus is on reefs of the Philippines located within the Coral Triangle, because of the vulnerability of this system and its importance to the food security of the region. She will use a combination of mathematical modeling and population genetics techniques to address key research questions.



LISA McMANUS

McManus studied Marine Biology at the University of Miami as an undergraduate, and is now a second-year doctoral student at Princeton University's Department of Ecology and Evolutionary Biology. Her dissertation work is aimed at developing techniques to address problems regarding marine ecosystem dynamics and management. McManus has hands-on research experience working at the Pacific Islands Fisheries Science Center in Honolulu, Hawaii on a project that finalized the processing protocol for Autonomous Reef Monitoring Structures, which are settlement devices designed to mimic the structural complexity of reefs. At the Southeast Fisheries Science Center, she has conducted experiments to characterize salinity selection in goldspotted killifish.

## CURRENT EVENTS



MATTHEW McGRATH

## Matthew McGrath Joins NJSGC as Communications Specialist

Matthew McGrath joined New Jersey Sea Grant Consortium in September as the Consortium's communication specialist.

Among his duties, McGrath will take over as editor of the COASTodian, writing for NJSGC's website, and managing the Consortium's social media and other publications.

He has 10 years of newspaper journalism experience and has worked for the *Record* covering Bergen and Passaic counties in North Jersey and the *Asbury Park Press*, which covers Monmouth and Ocean counties on the Jersey Shore.

McGrath finished his Bachelor of Arts degree in history at Rutgers University.

He's a New Jersey native and grew up along the Raritan Bay shore in Keyport. McGrath lives in Middletown. He competes as in powerlifting and strongman contests.

# CURRENT EVENTS

## NJSGC's Dr. Peter Rowe Participates in Jersey City Climate Change Conference Panels

Dr. Peter Rowe, director of research and extension at the New Jersey Sea Grant Consortium (NJSGC), spoke on a panel October 1 at St. Peter's University in Jersey City to discuss how climate change is affecting coastal cities.

The panel, "Climate Change Challenges for Coastal Communities," was the first of three at the 2014 Jersey City Sustainability Conference. Dr. Jon Miller, NJSGC's coastal processes specialist and associate research professor at Stevens Institute of Technology joined Dr. Rowe on the panel along with Amanda Nesheiwat, environmental coordinator for the Town of Secaucus.

The Consortium's involvement in the conference supports the Jersey City Coastal Communities Climate Adaptation Initiative, a resiliency planning project developed by Stevens Institute of Technology and funded by a grant from the National Sea Grant program and the NJSGC.

"The call for proposals was for researcher-community partnerships to develop models, tools, or other methodologies for coastal adaptation, with the long term goal for communities to utilize these tools in their planning," Rowe said. "The Jersey City project was successful because of its innovative modeling

techniques and well coordinated collaboration between the city and Stevens."

The second and third panels were on solutions and adaptations, and implementation. Dr. Philip Orton of Stevens Institute and a principal investigator on the Jersey City grant, who built the inundation model for Jersey City, sat on the third panel.

In July, Jersey City residents had a chance to review some of the model scenarios and adaptations prepared by Dr. Orton and others at an open house coordinated by Tanya Marione, senior planner for Jersey City's Division of City Planning.

Some suggestions that were presented for making Jersey City more resistant to an overflowing Hudson River included building street levees and flood gates. Some sections of the city where the levees are proposed would require raising roads or land to between three and eleven feet above the current grade.



**DR. PETER ROWE**

## EDUCATION

## New Jersey Sea Grant Consortium Now Offering Journey Programs for Junior Girl Scouts and Brownies

Jody Sackett, Scout Program Coordinator for the New Jersey Sea Grant Consortium, has announced the addition of new "It's Your Planet, Love It!" Journey programs to the Consortium's offerings for Scouts. The Junior program, "Get Moving!" actively explores the importance of energy in our everyday lives and the marine environment. During this Journey, girls learn about different types of energy, how to conserve it and how it is transferred between organisms and the environment. They also investigate the difference between active and passive energy sources like wind and solar power, make recycled paper, examine how energy is used in nature by seine fishing in Sandy Hook Bay, and conduct an Energy Audit of the Consortium's 1890s Fort Hancock building to compare to their own homes.

The Brownie "Wonders of Water" program emphasizes the importance of precious and limited fresh water for humans and the maritime environment. Scouts will wade into Sandy Hook Bay to seine brackish water to study how a salt marsh functions and learn the science of water through various activities and crafts in NJSGC's laboratory classroom, such as salinity, density, and

water tension experiments. They will also clean up a simulated oil spill, learn about pollution runoff and use a rain barrel model to collect and save water.

The Daisy Journey, "Between Earth and Sky" will become available in spring 2015.

These programs cover the entire Journey in just one day, so scouts only need to do their Take Action Project to complete the award. Classes can be taught as a single 4-hour program with a short break, or two 2-hour sessions.

Contact Jody Sackett at 732-872-1300, ext. 20 or [jsackett@njseagrant.org](mailto:jsackett@njseagrant.org) for more information or to schedule a program.





## Remotely Operated Vehicle Workshops Conducted in Jersey City for Students and Teachers

This past summer, New Jersey Sea Grant Consortium's educators led workshops and a summer camp for Jersey City middle-schoolers as part of their growing underwater robotics program.

The program is designed to increase the Consortium's Science, Technology, Engineering and Math, or STEM, offerings while continuing to focus on ocean sciences, said Diana Burich, the Consortium K-12 program coordinator.

Late last year, Executive Director Claire Antonucci and Burich were awarded \$24,000 in grants from Public Service Electric & Gas Foundation and the PADI Foundation to bring underwater robotics programs to afterschool and out-of-school settings.

"We proposed to develop and implement a four-day summer camp program for students from High Technology Middle School's Explore 2000, in Jersey City, and provide a professional development workshop for their teachers to perpetuate the underwater robotics program in Jersey City in the future," Burich said. "All of the activities for camp were student-centered and hands-on, and encouraged the children's natural sense of inquiry."

A professional development workshop was held in July at the North Hudson Environmental Education Center at James J. Braddock County Park in North Bergen for six Jersey City teachers who facilitate that district's Explore 2000 after-school program. This was followed by a four-day summer camp led by NJSJC educators for Explore 2000 students. During the camp students researched the development and implementation of scientific vessels and vehicles used for deep ocean exploration, and shared their findings with their fellow campers. They also designed and built remotely-operated underwater vehicles, or ROVs, using kits provided by the grant and the NJSJC.

The kit is a product developed by former NOAA scientist Dr. Douglas Levin, who is now a professor at Washington University, Maryland.

Burich has been able to buy nine ROV kits through a combination of donations and grants.

Each kit contains parts needed for students to build an ROV of their own design including pre-made controllers, bilge pump motors and assorted lengths of PVC tubing. A 12-volt battery is included to power the vehicle.

The NJSJC's underwater robotics program has its roots in several programs that have been held at the Consortium's headquarters in Fort Hancock in the Sandy Hook National Recreation Area.

Burich first learned about the ROV kits through a National Science Foundation grant-funded workshop, which featured Dr. Levin as a guest. He shared his ROV kits and Burich was hooked.

The program continued to grow through NJSJC's summer camp, a visiting high school class field program and the Stars Challenge ([www.starschallenge.org](http://www.starschallenge.org)), Burich said.

At the Explore 2000 camp, students participated in a



### Explore 2000 teachers prepare to launch ROVs.

presentation on underwater exploration that covered why it is important to explore the ocean, and how ROVs can be used when circumstances or finances do not allow humans to physically explore. Students were then given the opportunity to design and build the housing for the ROVs, and then test them right away in a children's swimming pool to perfect their designs.

Ultimately, manipulatives like sand shovels and plastic hooks, were added to the designs so the students could run a mission by retrieving a pool toy.

"It was well-received with accolades from students and teachers alike, so we thought it worthwhile to pursue continued development," Burich said.

At the camp this summer, students also determined the mass and volume of various materials, calculated their densities, and then used these materials to construct a submersible device that would exhibit neutral buoyancy.

Since ROVs can be used to observe fish habitat, the students were familiarized with fish anatomy and morphology in an observation lab, and they learned about how fish utilize camouflage making them difficult to detect underwater. Teams created "fish" from office supplies and hid them in the lab for their classmates to find.

ROVs utilize sonar to locate submerged objects and for bathymetric mapping, so students played a game to investigate how sound can be used to navigate, communicate and locate objects. They created bathymetric maps by measuring "submerged" landscapes hidden in boxes and converting their distance readings to time measurements and plotting the information on numerical grids.

They also hypothesized the effects of sea level rise on a given landscape and tested their hypotheses in another mapping activity. ROVs can determine the physical and chemical parameters in an underwater environment so students explored water quality by analyzing pH, salinity and dissolved oxygen. Buoyancy, density, gravity, volume and pressure were explored utilizing various activities such as making Cartesian divers and creating "boats" from clay that held pennies as ballast. All of these activities led up to student teams building, testing, and

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## Coastal Resilience Lesson Plans Developed by NJS GC Education Staff

Lesson plans for elementary and secondary school students that integrate coastal town resilience to sea level rise and climate change are being developed and disseminated by Education Specialist Mindy Voss in conjunction with New Jersey Sea Grant Consortium educators, extension agents and researchers.

The lesson plans help teachers craft lessons around coastal resilience, or the ability for a community to “bounce back” after hurricanes, severe storms and flooding rather than reacting to impacts from those emergencies. Specifically, the materials include lessons on flooding, coastal erosion and extreme weather conditions.

“In correlation with the Common Core and Next Generation Science Standards, the lesson plans help students discover the impact the ocean has on weather and climate,” Voss said. “They will also learn how changes can impact the coastline specifically in New Jersey, while discovering steps that can be taken to create a resilient coast for their future.”

Changes in climate and sea level rise have made coastal areas more vulnerable to extreme weather, which is driving the need for communities to mitigate effects in preparation for these changes.

NJS GC educators determined that some of the most important ideas to demonstrate to children were that the environment is energetic and constantly changing, and that human impact can have far-reaching effects on natural dynamics.

The lesson plan project began last spring with funding provided by the Jersey Shore Partnership Foundation and TD Bank which also supported four teacher workshops to disseminate the materials. Additional funding recently received from the National Sea Grant Program has allowed for the expansion of the program and Consortium educators continue to work with their colleagues to further develop resilience-related educational materials.

A recent meeting with Dr. Ryan Orgera, NJS GC’s coastal community resilience project manager, and NJS GC education staff helped identify areas where common public misconceptions are related to coastal resiliency. One such area where there are misconceptions is how basic natural processes effect the Garden State coastline.

“There may be a political debate, but there is not much of a scientific one,” Orgera said. “Climate change is a reality and communities along our coasts need to work towards becoming more resilient.”

Since late April, Consortium educators have offered three professional development workshops featuring the new lesson plans. The most recent session was held for a standing room only crowd at the New Jersey Science Convention. A fourth session is slated for the Alliance of New Jersey Environmental Educator’s annual convention in January 2015.

The workshops also included the presentation of a lesson plan on the biology of Cape-variety American Beach Grass, or *Ammophila breviligulata*, that was developed by Rose Higgins,

NJS GC’s college and special programs coordinator. The beach grass lesson plan was developed to compliment a 2010 NJS GC funded research project awarded to Dr. Michael Peek of William Paterson University which examined the appropriate volume of beach sand in coastal protection, the importance of botanical components in securing dunes, the effects of human development to coastal ecosystems, and future effects of climate-induced sea level rise.

## ROV Workshops

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running their ROVs at James J. Braddock County Park’s lake in front of the Center.

To conclude, students were introduced to working scientists as well. meeting researchers helped make connections between



**Students assembled their ROVs.**

The team not only presented on their project, but explained what areas of engineering were involved such as mechanical, electrical, nautical and computer, and provided the opportunity for campers to “drive” their vehicle.

The camp culminated in a two-hour visit to NOAA’s Sandy Hook Marine Fisheries Service facility with a comprehensive tour of the lab by Dan Wizeoreck, a screening of a video of ROV use in exploring hydrothermal vents in Hudson Canyon, and a demonstration of the video game “Hudson Canyon Fly-Through” by its designer, Jeff Pessutti.

“Development of this project was not only exciting but a learning experience as well, and we hope to continue utilizing the materials compiled in program offerings for NJS GC,” Burich said.

The program will continue to expand. Burich is now hoping to gain access to use Monmouth University’s swimming pool and classroom space to offer the program to school groups interested in exploring STEM education using remotely operated vehicles.

what they learned in camp and how it is applied in a real-world setting. A team of undergraduates from Stevens Institute of Technology, led by Professor Michael Delorme, visited the campers with an ROV they designed and built for the Department of Defense to locate metals underwater.

## NJSGC Collaborates on Campaign to Combat Aquatic Invasive Species



Live bait is one path that invasive aquatic life can use to hitch a ride to New Jersey, and New Jersey Sea Grant Consortium Extension Agent Michael Danko is reaching out to the owners of bait and tackle shops to enlist them in a interstate campaign to prevent them from reaching Mid-Atlantic waterways.

New Jersey Sea Grant Consortium is working with Sea Grant programs from Maryland, Delaware, Virginia, and North Carolina, as well as the Smithsonian Research Center and the University of Maryland to limit that pathway for invasive species.

On a recent Monday, Danko criss-crossed the state to reach out to shop owners to provide them with fliers, research and brochures to help spread the word about preventing invasive species, and more shop owners, especially in South Jersey where the bait is most used, will be recruited.

Bait shop owners are thought to be the educators about invasive species because their customers trust their information and recommendations, Danko said.

Aquatic nuisance species, or invasive species, are plants, animals and pathogens that have been unintentionally or illegally introduced into aquatic ecosystems. These organisms can cause physical and economic damage to our recreational, commercial, environmental, cultural or historic resources, and/or create public health problems. The ecological and economic damage from invasives, such as water chestnut, hydrilla, didymo (rock snot), and zebra mussels is well documented in the Mid-Atlantic region. Once an invasive species has established a population, attempts to eradicate the species completely have been unsuccessful.

New Jersey has been lucky. There are relatively few invasive species to combat. In wetlands, there is the common reed. And

anglers have long used green crabs, a transplant from Europe, for bait. But, in New York and Pennsylvania zebra mussels are among the most notorious invaders.

Most of the live bait sold in South Jersey—bloodworms and sandworms—are harvested in Maine and they are packed in seaweed from the same state. The worms aren't the problem, the seaweed is. Crabs, snails, mites and other species can hitch a ride in the plants, and a common practice among anglers has been to dump the unused worms and seaweed back into the water.

The effort to prevent invasive species from entering New Jersey and the larger Mid-Atlantic region is being led by Maryland Sea Grant. Maryland's Chesapeake Bay is home to about 200 invasive species.

The project is focused on the pathway plants, animals and pathogens are transported along to areas outside of their normal range through the sale of marine bait worms and packing algae from Maine. The research component was completed in early 2014 and the results indicated that proper disposal of the bait worms, algae or other packing material and containers provided the potential to help limit the spread of invasive species.

The message developed as part of the education effort is simple "Protect Our Fisheries—Trash Extra Worms & Packing." This message is the focus of the education materials that will be piloted in selected bait and tackle shops from New Jersey to North Carolina. Sea Grant staff from these states recently met with bait and tackle shop owners in their states to get feedback on the materials developed, to enlist their help with distributing final versions of the materials, and to educate their customers on the importance of preventing the spread of invasive species through bait worm packing materials. Bait and tackle shop owners began distributing the materials to their customers in October 2014.

