



Photo by Keith Rittmaster, NC Maritime Museum, under NOAA/NMFS permit

FALL • 2014

**CMAST by the Numbers
 FY 2013**

4 Faculty-based at CMAST:
 2 PhD Staff, 3 Faculty that
 rotate between Raleigh &
 CMAST

Total grants awarded:
 \$13,640,758 (~ \$1.5 million/
 person.

Numbers of students
 served:
 Undergraduates: 378
 Graduates: 107

Number of life-long learners/
 non-university served: 320

Number of K-12 students
 and teachers served: 407

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CMAST: *Our Newest Attraction!*

CMAST's new Marine Magnetic Resonance Facility (MMRF) went online in July 2014, allowing marine scientists to study marine life on a whole new level.

According to the project director, Dr. Michael Stoskopf, "The applications for the magnet are limited only by our imagination and the size of the animal we can fit inside the machine."

The MMRF at CMAST maintains the only wide bore instrument in the world dedicated to *in vivo* longitudinal dynamic stress-response studies in intact living marine organisms.

Most people are somewhat familiar with an MRI. These are images that are made by collecting data about individual atoms in a patient and translating that information mathematically into brightness patterns in two or three dimensions that we recognize as images. The CMAST magnet does the same thing, but has a higher resolution than routine medical MRI magnets. The MMRF at CMAST can obtain very detailed pictures of what the tissues and organs inside a marine creature look like, as well as how metabolic pathways respond to environmental stress-

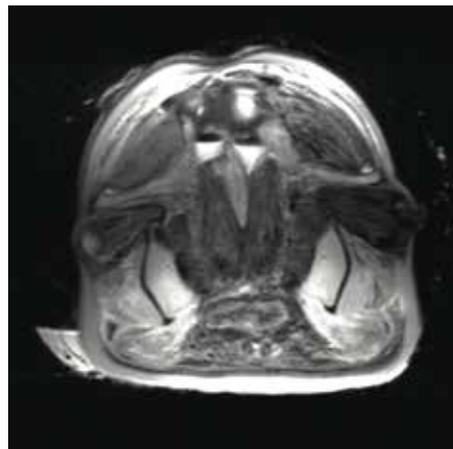
ors. Moreover, there are a wide range of industrial applications for agriculture and aquaculture industries, such as looking at metabolic efficiencies in various

strains of crops or aquatic species raised in hatcheries.

"A major feature of the magnet is that it is possible to image live animals and actually obtain real biochemical data from them without having to sacrifice them," said Dr. Stoskopf. "We usually must anesthetize all but the most sessile animals so that they will remain still through the imaging, and we are experts at marine animal anesthesia if necessary. No other analytical tool can provide these types of data on such a wide

range of metabolic pathways. Magnetic resonance techniques can also replace traditional techniques for monitoring the safety and quality of foods."

The MMRF is the brainchild of NC State's Dr. Michael Stoskopf and Dr. Jeffrey McDonald of UNC-Chapel Hill, who have been discussing and planning such a facility for decades. The reality first began to take shape with the key support provided by the



Horizontal bore magnet image of a bottlenose dolphin

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From the CMAST Director



A key part of NC State University's 2011-2020 Strategic Plan, *The Pathway to the Future*, is to enhance local and global engagement through focused strategic partnerships. In this issue of the *CMAST Communicator*, we are excited to highlight how CMAST has added two high-impact programs in the past year through leveraged partnerships: (1) Marine Magnetic Resonance and Imaging Facility (MMRF), and (2) The Science House @ CMAST.

Funding from the National Science Foundation and some cost-sharing from NC State supported an addition to the CMAST building that now houses the world's largest marine magnetic imaging system. The MMRF is a collaboration between NC State and UNC-CH, and supports a wide range of applications, such as novel understanding of how multiple stressors such as ocean acidification and warming affect the metabolism of oysters, to metabolic efficiencies of various strains of crops or aquaculture species.

The Science House @ CMAST is a partnership between CMAST, NC State's College of Sciences, and Jones County School System. The program is already "busting at the seams" in terms of meeting pent-up demand for K-12 STEM support in the Marine Sciences for students and teachers.

We also highlight CMAST-based research and extension projects ranging from exploration of the deep-sea by submersibles, to programs making a difference in food safety training, to research that will reduce bycatch mortality of important fishery species. We also report on a very positive review of CMAST and other UNC-System coastal and marine science programs by an independent team from the American Association for the Advancement of Science.

I invite you to visit our Facebook and web sites, our facility located on Bogue Sound in Morehead City, or contact any of our faculty, staff, or students with questions.

With best wishes,, Dave Eggleston

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Newest Attraction, continued from p. 1

North Carolina Biotechnology Center, which appropriated funds in 2006 to obtain and operate a large horizontal bore research magnet at the coast. An underused wide bore horizontal magnet (the MRI machine) was located at a hospital in New Jersey, who agreed to donate it to the project. All that was left was to find it a home.

Thanks to an effort spearheaded by CMAST, that home became a facility built on the CMAST campus from the ground up, specifically for the MMRI equipment. CMAST Director Dr. David Eggleston led the way to obtain the grant support from the National Science Foundation, and an equally important investment by NC State University's Vice Chancellor, Dr. Terri Lomax (Office of Research, Innovation, and Economic Development), allowed the facility to be completed.

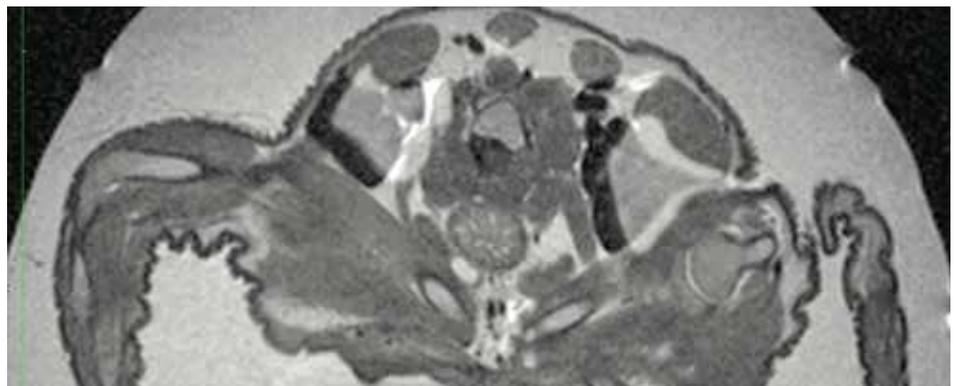
CMAST's wide bore horizontal magnet is the only one in the world dedicated to the study of marine organisms. This facility and the expertise to run it are now available to marine scientists across the country and around the world.



(Left to right) Dr. Michael Stoskopf, NC State CVM; Ken Burnette, Architect, Burnette Architecture and Planning; Merlin Huckemeyer, Project Manager of Thomas Simpson Construction; Dr. Terri Lomax, Vice Chancellor of the Office of Research, Innovation & Economic Development, NC State; Dr. David Eggleston, Director, CMAST; Ernie Yeager, Facilities Coordinator, CMAST; Carter Murdock, Burnette Architecture and Planning.



Panoramic view of the new Marine Magnetic Resonance Facility at CMAST.



Sea turtle from the outside (top) down to the inside (bottom), from an image of the turtle inside its egg. This provides an unprecetended view into the animal's life before it hatches into the world, now possible at CMAST's MMRF.



Educating the educators: Teachers expand their horizons at the Coastal Connections Summer Session. (Photo by Keith Rittmeister, NC Maritime Museum, under NOAA/NMFS permits)

The Science House @ CMAST: *Outreach takes a leap forward!*

Education outreach is alive, well, and moving forward at CMAST this year. CMAST now houses an outreach office of NC State's College of Sciences, The Science House @ CMAST, headed up by Dr. Pat Curley. Their mission is to work in partnership with K-12 teachers and students to promote the use and impact of hands-on, inquiry-based learning in science, technology, engineering and mathematics (STEM).

The Science House @ CMAST provides services and programs, as well as develops partnerships with Carteret, Craven, Jones, Onslow, and Pamlico County Schools.

The presence of The Science House greatly enhances CMAST's capability of reaching its strategic goal of increasing public information and educational outreach. The program links the research at CMAST to the needs of K-12 STEM education through teacher professional development programs, loans of laboratory equipment, the development of learning materials and programs, and facilitation of student enrichment activities and research projects.

Coastal Connections Summer Session

Sixteen teachers spent two weeks this year participating in an intense summer professional development program as part of a Math and Science Partnership Grant called *Coastal Connections*.

The Science House @ CMAST is directing

this grant, which partners with public and private schools from Craven, Carteret, Jones, and Onslow County School systems to help teachers receive coastal marine science content knowledge and to increase awareness of resources that are available to them on the coast.

The two week professional development course was led by CMAST's Dr. Vicky Thayer, who did an outstanding job of creating a course that met the needs of a diverse group of teachers ranging from elementary to high school level. The program introduced a broad spectrum of topics associated with coastal marine research.

Each day started with a field trip to a coastal research site, led by a researcher who introduced

teachers to their work. Teachers visited Shackleford Banks, NC Maritime Museum, NC Aquarium, Duke Marine Lab, UNC Institute of Marine Sciences, NOAA Labs, and other locations.

Most of the teachers had never visited these locations, and knew little of what resources were available to them prior to the field trips.

Teachers spent the afternoons in classroom instruction and hands-on labs that helped them develop a better understanding of marine science content. Area specialists and researchers, many of whom work at CMAST, conducted these lectures and labs.

The "Coastal Connections Math and Science Partnership" grant is a three year grant, which



CMAST's Dr. Vicky Thayer gives an East Carteret High School student hands-on experience in performing a dolphin necropsy. CMAST's education outreach allows students and teachers to work outside the margins of a textbook. (Photo by Keith Rittmeister, NC Maritime Museum, under NOAA/NMFS permits)

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will provide summer professional development and a year long commitment to the development of educational units that provide coastal connections to NC educational curricula.

Coastal Connections Mini-Conference

The Science House @ CMAST has expanded its *Coastal Connections* program into the school year with mini-conferences in partnership with the North Carolina Science Teachers Association, the Environmental Educators of North Carolina, and the Mid-Atlantic Marine Education Association.

The mini-conferences bring coastal resources to area teachers during three Saturday morning workshops that feature hands-on programs and resource materials presented by various agencies and organizations across North Carolina.

The *Coastal Connections* workshops will be held at CMAST on December 13, February 28th and April 25th. Speakers include Del's Diamonds Gem Mining, NC Aquarium, The Science House, The NC Dept of Wildlife, the Coastal Federation and others. Educators at any level are invited to attend.

Instructional Coaching

The Science House @ CMAST is in its second year contract with Onslow County Schools to work in the schools as an instructional coach for math and science.

The Director is spending 20 hours each week with the school system providing teacher assistance and guidance in STEM activities.

This year, Dr. Curley is working with an additional school, Sand Ridge Elementary, helping them put together a resource development team which will utilize community resources and grants to bring 21st century hands-on science and literacy into the classrooms.

Earthwise Educational Gardening Project

The Science House @ CMAST has developed a partnership with the NC Coastal Federation to develop the *Earthwise Educational Gardening Project*.

The project involves developing a piece of farm property into an educational garden which will be used as a model for providing formal and informal educators with instruction on how to develop sustainable gardens.

The end results of this development will be used as outdoor classrooms and citizen science laboratories.

Teachers will receive instruction on planning, designing, managing and making curriculum connections to their schoolyard gardens.

The partnership is currently in its planning and resource development phase and has scheduled their first teacher workshop in August of 2015.

Sea Wolves

CMAST's Sea Wolves, a 4-H program for students between the ages of 13 through 18, continues to develop and is now meeting two evenings a month at CMAST. The goals of the Sea Wolves are to: (1) provide students with leader-

ship experience, 2) increase self-confidence, and 3) learn about marine sciences. The Sea Wolves will host their first ever *Teen Science Café* in December.

Science Olympiad

Now serving as the Regional Director of the *North Carolina Science Olympiad*, Elementary Division, The Science House @ CMAST will help develop and provide support for school districts in its service area who would like to conduct elementary *Science Olympiad* competitions.

The next *Science Olympiad* competition for elementary schools will be at Northside High School in Jacksonville on January 31.

Burroughs-Wellcome Coastal Inquirers

The Science House @ CMAST has just been funded for the *CMAST Coastal Inquirers Program* grant through the Burroughs-Wellcome Fund.

The *Coastal Inquirers Program* will target low-resourced 5th grade students and provide them with a place-based environmental inquiry STEM camp the summer prior to their entry into 6th grade.

Throughout the school year, sixth-graders will be exposed to authentic STEM projects and provided with the resources to participate in STEM competitions and projects. The project will be administered through the Science House @ CMAST office.



The Science House @ CMAST allows educators to get their feet wet, sometimes literally, to gain knowledge and experience they bring back to the classroom. (Photo by Keith Rittmeister, NC Maritime Museum, under NOAA/NMFS permits)

AAAS Finds CMAST Occupies Unique Niche



The American Association for the Advancement of Science Research Competitiveness Program (AAAS) recently found that CMAST, along with other UNC System marine science programs, occupied a unique niche and served a distinct group of stakeholders in North Carolina.

At the conclusion of the study, the AAAS presented their assessments to UNC President Tom Ross and the UNC General Administration in Summer 2013. The full report can be found in the archive of reports on the CMAST home page.

The AAAS panel also determined that the UNC System has an extraordinarily rich assemblage of intellectual assets, facilities, and capabilities that underlie research, education, and outreach related to the coastal North Carolina marine environment, and more broadly to a regional,

national, and global environment.

A significant finding was that there is little redundancy or overlap among the various university labs and programs.

The AAAS External Review Team concluded that (1) independent coastal marine science units are a major strength to

the UNC-System portfolio, and (2) that “formidable programs” in Carteret County, such as CMAST and IMS, in concert with the Duke Marine Lab, could become a “National Center of Excellence” with very little additional investment.



Coastal and Marine Sciences External Review Team from the American Association for the Advancement of Sciences, as well as members of the UNC General Administration and NC State University. From left to right: Dr. Rieko Yajima (AAAS), Dr. Nancy Targett (University of Delaware), Dr. Steven Lohrenz (University of Massachusetts), Dr. Jackie Dixon (University of South Florida), Dr. Chris Brown (UNC General Administration), Dr. Terri Lomax (NC State University), Dr. Chris D'Elia (Louisiana State University), and Dr. Courtney Thornton (UNC General Administration).

Director of The Science House @ CMAST, named Outstanding Veteran of the Year



Each year, the city of Jacksonville, NC seeks nominations from local veterans groups to recognize the area's "outstanding veteran of the year." This year, one of those recognized was Dr. Pat Curley, Program Leader of the Crystal Coast Project Healing Waters program. Dr. Curley is the Director of The Science House @ CMAST.

2014 CMAST Summer Fellows Shine



(Left to right): Cameron Luck, Holly Modlin, Olivia Phillips, and Dr. Jeff Buckel.

The CMAST Summer Fellows Program provides hands-on research opportunities for undergraduate students. In collaboration with a faculty advisor that matches their interests, each student: 1) identifies an independent study project addressing a current issue in marine science; 2) participates in research design, implementation, and effective presentation of research results; and 3) gains an understanding for the logistical challenges, ethical issues, and positive experience of independent research.

Cameron Luck's project was entitled "Encysted Trematodes in the Stomach Linings of

Weakfish from Pamlico Sound, NC: Frequency of Occurrence and Effect on Condition." Cameron was mentored by Samantha Binion in Dr. Jeff Buckel's laboratory.

Holly Modlin's project was entitled "Refrigerated Minced Ocean Clams Shelf Life Study." Holly was mentored by Greg Bolton in Dr. David Green's laboratory.

Olivia Phillips's project was entitled "Understanding the Role of Eastern Oysters (*Crassostrea virginica*) in Estuaries as Natural Water Quality Enhancers." Olivia was mentored by Seth Theuerkauf in Dr. Dave Eggleston's laboratory.

CMAST Explores the Deepest of the Deep

Scientists plunged more than 6,500 feet in the submarine *Alvin* to investigate the underwater communities that thrive among methane gas bubbles and seeping hydrogen sulfide in the Gulf of Mexico. Activated floodlights revealed the mysterious creatures living in one of the most extreme environments on Earth—cold seeps.

As scientists peered through a tiny porthole to the ocean's abyss, they wondered: How did these animals get here?

In May and June, 2014, researchers at NC State, Duke University, and the University of Oregon ventured out in to the Gulf of Mexico on the *R/V Atlantis*, the 274-foot research vessel home to the deep-sea submersible *Alvin*. The three universities banded together—each equipped with a unique skill set—on a mission to understand the interconnectedness of cold-



CMAST Director David Eggleston and PhD student Doreen McVeigh conducted their first DSV *Alvin* dives of 4,000 to over 6,000 feet in the Gulf of Mexico as a part of the SEEP Connectivity Research program.

seep communities there, Barbados, and along the US East Coast.

Cold seeps have a typical deep-sea temperature of 35 to 39 degrees Fahrenheit and leak gases from the seafloor. Hydrogen sulfide and methane ooze and bubble, providing chemical food to bacteria that live in the sediment and inside the guts of animals such as worms and clams.

Cold seeps are scattered like islands across the ocean floor. They appear disconnected, but ocean currents carry larval spawn to seeps near and far. Even though seeps are some of the largest and most abundant geologic features on the planet, scientists are just beginning to understand how these communities are colonized.

Researchers from the three universities partnered to study cold-seep communities as part of a multi-year project funded by the National



A Chimera glides along the ocean floor, over 6,500 feet below the surface.

Science Foundation. “It was like getting the A-team together,” said Cindy Van Dover, the lead scientist on the project. She’s a biology professor and director of the Duke University Marine Lab.

David Eggleston, NC State biologist and Director of the Center for Marine Sciences and Technology (CMAST), and NC State physical oceanographer Roy He brought expertise on the movement of marine larvae and ocean currents.

The collaboration allowed scientists to compare results and synthesize their information to form a more holistic study of cold-seep communities.

NC State graduate student Doreen McVeigh is building a particle-tracking model to simulate the movement of larvae. Her model predictions are compared against genetic information to see if they match up. These tools reveal whether cold-seep “island” populations are isolated or connected.



A bed of giant tube-worms near a deep-sea hydrocarbon seep in the Gulf of Mexico. (Photo by Dr. David Eggleston)

Scientists deployed larval traps, plankton nets, and hydrophones on mooring lines anchored to the sea floor by train wheel weights to collect their data. The most advanced technologies on the ship were the submarine *Alvin* and the unmanned remotely-operated vehicle *Sentry*. *Sentry* used sonar to map the seafloor and target areas for *Alvin* to explore. “This was a tremendous asset,” said Eggleston. “We can have maps of targets in hand before going down in the submarine.”

Guided by *Sentry*'s map, Eggleston directed *Alvin* to a deep-sea brine lake surrounded by mussels, a location not seen since the late 1990s. The close proximity to the brine pool of mussels suggests that they are consuming bacteria seeping from the pool, an exciting find for the scientists. *Alvin*'s large robotic arm collected specimens and captured video footage of the sea-floor teeming with mussel beds, 150-year-old tube worm forests, bizarre fish and a type of sea cucumber called the headless deep-sea chicken. Calm seas enabled *Alvin* to complete all of its scheduled dives, giving more students the opportunity to direct an expedition.

The team collected and deployed large moorings equipped with time-release larval traps, current meters, and sound-recording hydrophones. These hydrophones recorded the sounds of deep-sea life for the first time. Traveling larvae may use sound to find the right habitat to live.

In the ship's laboratory, scientists identified specimens, studied their behavior, and preserved samples for genetic analysis.

“By studying how these organisms are adapted to extreme environments,” Van Dover said, “we can learn a lot about the diversity of life.”

Making a Difference in Food Safety Training

Members of a project team, led by Dr. David Green (CMAST, Seafood Laboratory), are making their mark nationally in an effort to establish an integrated food safety system for the US Food and Drug Administration. The Seafood Laboratory is part of the NC State Department of Food, Bioprocessing and Nutrition Sciences (FBNS).

In 2011, FBNS was awarded a five-year collaborative grant by the Food and Drug Administration's Division of Human Resource Development (DHRD) to help establish the system through uniform national standards in training and certification of federal, state, local, territorial and tribal public health authorities.

The project team, an eleven member group representing not only NC State, but other universities and regulatory interests, is responsible for development and delivery of four national training courses—acidified food products, aseptic processing foods, low acid canned foods and shellfish evaluation.

The model program, now in the third year of development, has to date delivered five acidified food courses and one aseptic food course to 200 federal and state investigators. The new FDA acidified foods and aseptic food processing courses are being offered online in Fall 2014. Each course also requires a face-to-face segment in order to receive certification and continuing education unit (CEU) credits.

Additionally, the acidified food products course was adapted in 2014 for use in food industry training.



Can Fish Shape Predict Optimal Mesh Size in Traps?

Minimum fish size limits have increased several times over the history of the commercial trap fishery for black sea bass in ocean waters off the US South Atlantic states. However, minimum trap mesh size limits have not always increased at the same time. This has led to the use of trap meshes smaller than required to maintain catches of legal black sea bass, yet also increases the bycatch of sub-legal black sea bass.

Dr Jeff Buckel and Paul Rudershausen, both of CMAST, teamed up with Joe Hightower of NC State's Department of Applied Ecology. They used a relationship between black sea bass body depth and total length to predict what mesh size would be sufficiently small enough to retain fish larger than the current 11-inch minimum, yet also maximize escapement of fish smaller than

10-inches.

Custom wire mesh sizes of 2.25-inch and 2.5 inches square were made by C.E. Shepherd Co. and fished offshore of North Carolina alongside traps made of the minimally legal 2-inch mesh size.

The researchers found that the 2.25-inch mesh maintained catch rates of legal black sea bass, while reducing bycatch rates of sub-legal individuals.

The use of this mesh size in the commercial fishery in the US South Atlantic would result in a substantial reduction in the number of dead fish which must be discarded, compared to the number discarded when using the 2-inch mesh size.



Finding the perfect fit: researchers work to find a mesh-size that will reduce the bycatch of fish below the legal size limit for harvest. (Photo by Paul Rudershausen)

Boat Donation to CMAST Increases the Fleet



The CMAST facility and its programs are very grateful to Dr. Rick Weisler of Raleigh, NC for the donation of a 26-ft. Regulator center console boat. This boat will facilitate CMAST research programs offshore, such as scuba-diving support for research (including instrument deployment and retrieval), tag-recapture of mobile animals, and behavioral observations of animals (see above).

cmastpeople

The Marine Health Program at CMAST, led by **Dr. Craig Harms**, has recently acquired a portable CR digital radiology reader so that the program can x-ray and view digital radiographs at distant sites without having to return cassettes to Morehead City for downloading. This new capacity was recently applied during a field services visit to the NC Aquarium at Fort Fisher to assess the spinal columns of their young sand tiger sharks.

CMAST Director Dr. David Eggleston co-hosted a fisheries workshop with Dr. Mary Fabrizio at VIMS entitled, "Improving the Accuracy of Fishery-Independent Survey Indices." Dr. Eggleston also participated in an international ICES working group in Lisbon, Portugal entitled, "Value of Coastal Habitats for Exploited Species."

Samantha Binion (PhD Student) is conducting a large scale food habits survey for multiple finfish species in NC estuaries. She is using these data to improve upon methods in collecting and describing the diets of fishes. Additionally, she is developing a Bayesian hierarchical model to estimate the probability of detecting a new prey type with continued predator sampling. This information is key to multi-species fisheries management by the NC Division of Marine Fisheries.

Jacob Krause is in his second year of working on his PhD project: "Sources of Mortality and Movement of Weakfish Tagged in North Carolina." The weakfish stock is at record lows; his study seeks to understand the reasons for this decline. Publicity for this study is being done through posters at local bait shops and boat ramps, the radio, and online at www.weakfishtagging.cmast.ncsu.edu.

Dr. Tim Ellis, who successfully defended his PhD last summer, is continuing on at CMAST as a post-doc. Tim's post-doc project aims to better understand the stock structure of spotted seatrout found throughout coastal NC. This study is a collaborative research effort between NC State CMAST and VIMS, with considerable sampling support from the NCDMF.

In 2015, **Brendan Rundle** will begin a project studying discard mortality in gray triggerfish. Gray triggerfish (*Batlistes capricus*) are a commercial and recreationally important species in the US South Atlantic (and thus NC). Because triggerfish are bottom-dwellers, they

often experience life-threatening baro-trauma when brought to the surface by hook and line. By comparing fish with baro-trauma to those that have not experienced life-threatening trauma, Brendan will be able to estimate the survival rate of discarded fish. Brendan is excited to cooperate with Mr. Tom Burgess, a commercial fisherman in Snead's Ferry, NC, for the tagging portion of this study.

Dr. Emily Christiansen (CVM Resident, 2014) has been snatched up by the NC Aquariums as their first fulltime veterinarian in a unique partnership with CMAST. This partnership between the NC Aquariums and NC State CVM CMAST continues with support and operation of CMAST's highly regarded Zoological Medicine Residency program focused on aquatic animals. CMAST looks forward to an enhanced veterinary health care delivery to the NC Aquariums, and the opportunity to continue working with Dr. Christiansen, whose office remains at CMAST.

PhD student **Seth Theurerkauf** was awarded a highly competitive 3-year graduate fellowship from the Department of Defense's National Defense Science and Engineering Fellowship Program for his proposal entitled, "Hierarchical Habitat Suitability Modeling to Guide Shoreline Habitat Protection and Oyster Restoration." There were over 3,000 fellowship applications submitted. Seth was also the recipient of the 2014 Beneath the Sea Foundation "Spirit of the Sea" Scholarship.

Dr. Ashlee Lillis received her PhD and became a post-doctoral student at NC State. The second chapter of her dissertation was published in *Marine Ecology Progress Series* as the featured article entitled, "Estuarine Soundscapes: Distinct Acoustics Characteristics of Oyster Reefs Compared to Soft-bottom Habitats." Dr. Lillis also received a grant from Project PADI AWARE for her proposal, "Racket on the Reef: Ambient Reef Sound as a Coral Settlement Cue and the Potential Impact of Anthropogenic Noise." In addition, the third chapter of Dr. Lillis's dissertation was published in *MEPS* and the first chapter in *PLOS ONE*.

MS student **Shannon Brown** was awarded a graduate coastal research fellowship by the NC Coastal Reserve and NC Sea Grant

MS student **Beatriz Perez** successfully defended her thesis entitled, "Density and Diversity of Migratory Shorebirds and Their Prey in Hypersaline Lagoons of the Caribbean."

Where Are They Now?

Dr. JB Minter (CVM Resident, 2013) has, after a tour in the Midwest as veterinarian for the Great Plains Zoo in Sioux Falls, South Dakota, returned to NC as an associate veterinarian at the NC Zoological Park in Asheboro. Despite being a zoo-focus Zoological Medicine resident, Dr. Minter was active in aquatic animal programs as well, and published on anesthesia of koi carp and blue crabs.

Former PhD student and post-doc **Dr. Brandon Puckett** became the new Research Coordinator of the National Estuarine Research Reserve program in NC. Dr. Puckett also served on the planning committee on a recent NC Oyster Summit, as well as very effectively representing the oyster research program at NC State.

Former NC Seafood Lab intern **Brandon Eudy** is working towards his MS in fermentation at the University of Florida.

Dana Bethea received her MS in Zoology from NC State in 2003 and is currently a research ecologist with NOAA National Marine Fisheries Service in Panama City, FL. Dana is co-investigator for the Gulf of Mexico States Shark Popping and Nursery Area (GULFSPAN) project, as well as a Smalltooth Sawfish Abundance Survey in Everglades National Park and Ten Thousand Islands National Wildlife Refuge.

Former MS student **Jason Peter's** poster was awarded Best Student Poster at the Spring meeting of the American Fisheries Society in VA. His poster was entitled: "Spill-In to Marine Reserves: The Eastern Oyster Example."

Ryan Dowdy, former NC Seafood Lab intern, is pursuing a PhD at the University of California, Davis. Ryan is working on sustainable microbial desalination at the Simmons Lab.

Former MS student **Robert Dunn** is in the joint doctoral program in Ecology at San Diego State University and University California, Davis.

Former MS student **Ray Mroch's** thesis paper published in 2012 in the *Journal of Shellfisheries Research* was awarded Best Paper by a Student in 2012 by the National Shellfisheries Association at their annual meeting in March 2014 in Jacksonville, FL.