



cmastcommunicator



AUGUST • 2011

Science Café

Date: TBA

Bonehenge - Sperm Whale Rearthuculation Project

Keith Rittmaster
Natural Science Curator
NC Maritime Museum

Sustainable Fisheries License Plates Available

Special license plate approved by General Assembly to help raise funds for CMAST research. See p.8 for info.



Join the Skeleton Crew

Bottlenose dolphin skeleton rearticulation project. Visit www.skeletoncrew.org for information.



Learning at the Coast:

Utilizing CMAST as a tool for educational innovation

An overarching goal of CMAST is “to serve all who care about the coast and its natural resources” by providing local citizens with a point of contact with NCSU’s marine science faculty, and making educational opportunities available to a broad range of students. CMAST is known for its wide variety of marine-related research and extension programs, but is increasingly becoming a destination for educational opportunities.

In the ten years that CMAST has been in existence, more than 1,600 people have been connected with a marine-related learning experience. From taking classes for college credit, to field trips for K-12 students, to workshops for seafood business owners, CMAST is becoming a central hub for learning.

The Vision

Imagine an undergraduate student being able to spend a semester at the coast, taking classes and learning from scientists who generated the discoveries being studied, and having hands-on experiences with coastal research, extension and outreach at a beautiful facility amidst some of the strongest and most

well known marine science programs in the world. Central to CMASTs future plans is to serve as the base of operations for an undergraduate “Semester-at-the-Coast” program, which would host approximately 24 students each fall and spring semester. A Semester-at-the-Coast Program would be an exciting

way to help achieve one of NCSU’s strategic goals of “enhancing the success of our students through educational innovation.”

The coastal area is where we expect to see the most dramatic impacts of increasing human population abundance, changing climate, land use, and resource extraction on both ecological and socio-economic systems. NCSU provides

a unique blend of academic programs, research, and extension activities to prepare and mitigate for global climate change and other impacts. CMAST, with its location directly on Bogue Sound in Carteret County, provides a unique off-campus experience for undergraduates, where different colleges and departments can be brought together under a single roof, and provide strong ties to other local universities (Duke and UNC-CH), state/federal programs,

continued on page 2





From the Director

The passion that a majority of people have for their chosen career in the sciences, especially the marine sciences, can be traced to a spark from a life changing experience outside of the classroom -- a research cruise, a summer research experience at a marine laboratory, an internship at a university, or a work-study experience. As the U.S. struggles to bolster the numbers of students entering STEM fields of science, technology, engineering, and mathematics, it is critical that universities provide the types of educational innovation and life changing experiences that can spark that passion for the sciences. In this issue of the *CMAST Communicator*, we highlight how CMAST has been used, and can be used, as a tool for educational innovation. In addition to the many graduate and undergraduate courses and training opportunities offered at CMAST, we provide our vision for an undergraduate "Semester-at-the-Coast" program that we hope you find exciting.

Read also, an update on other CMAST hands-on educational opportunities such as K-12 outreach, CMAST Summer Fellows Program, Veterinary Medicine workshops and residency programs, and seafood safety. CMAST-related research, ranging from deep-sea research on unique seafloor communities in the Caribbean, to hearing in juvenile leatherback sea turtles, to the effects of land use on fish ecology, rounds out some of the research updates.

Lastly, as state budgets continue to shrink, we are increasingly reliant on support from private sources. We are excited about two opportunities that will help support student research and education programs at CMAST: a CMAST Specialty License Plate, and the "Skeleton Crew" dolphin re-articulation project. I invite you to visit our web site, our facility located on Bogue Sound in Morehead City, or contact any of our faculty, staff or students with any questions.

With best wishes,
Dave Eggleston

CMAST Communicator is published quarterly and distributed electronically. If you'd like to subscribe contact Jill Miller, Editor, 252.222.6334, jill_miller@ncsu.edu or visit www.cmast.ncsu.edu.

PHOTO CREDITS AND CAPTIONS: p.1 top: Graduate students sample seagrass for juvenile fish, CMAST file photo; bottom: Findings from a seine net are shown to middle school students, photo Trish Cahoon; p.2: Craig Harms, DVM, demonstrates necropsy techniques to veterinary students, photo by Vicky Thayer; p.3 top: Fisheries undergraduate student measures crab egg diameters, CMAST file photo; bottom: Graduate students haul in a netted shark for study; p.4 top: Fisherman George Leone and NC Sea Grant's Brian Eftand demonstrate safe handling of blue fin tuna; bottom left: High school students check on oyster shell strings, measuring oyster settlement, photo by Gayle Plaia; p.5 top left: *RV Oceanus* of Woods Hole, MA, stands ready for research cruise, photo by Dave Eggleston; bottom left: Team members taking part in research cruise. CMASTers from the right are Brandon Puckett, Dr. David Eggleston, and from MEAS Dr. Roy He, and Gayle Plaia; middle: Hatching leatherback turtles await hearing testing, photo by Betsy Stringer, DVM; right side top: Measuring mummichogs and PIT tag, photo by Ben Kornegay; right side bottom: Steve Poland, Research Technician (I) and Ben Kornegay, CMAST Summer Fellow (r), analyze stomach contents of mummichogs, photo by Jill Miller; p.6: Cooked brown shrimp, CMAST file photo; p.7 top left: CMAST interns, (l-r) Ben Kornegay, William Green, Eric LaRoque, and Katrina Connor, photo by Patricia McClellan-Green; headshot photos Kornegay, Green and LaRoque by Jill Miller, Connor photo by Greg Bolton; top right: Marine Mammal Medicine course students evaluate dolphin tissues from necropsies, photo by Jill Miller.

Learning continued from p.1

as well as Non-Governmental Organizations and NC Cooperative Extension Programs.

In addition to providing a unique coastal learning environment for undergraduate students, a Semester-at-the-Coast Program would (1) focus on contemporary science and societal challenges (e.g., global climate change, sustainable coastal resource use, ecosystem restoration), (2) provide integrated, interdisciplinary classes and out-of-class experiences within a given semester, and (3) integrate with NCSU's program on "Environmental Sustainability: A Living & Learning Village."

A necessary component to ensure success of a Semester-at-the-Coast Program is housing, where undergraduate students can create a learning community at CMAST. The availability of an on-site housing facility could serve more than one purpose. By demonstrating the latest in coastal sustainable building methods and materials, best management practices for stormwater and landscaping, and an emphasis on alternative energy technologies, the facility would be another great illustration of NCSU's commitment to nurturing graduates ready to enter productively into society, with an inquiring habit of mind, global awareness, and a sense of social responsibility.

We hope that you are as excited about this vision for CMAST as we are.

The Opportunities

Educational opportunities are offered at CMAST via programs through distance education of NCSU credit classes, graduate training possibilities, experiential learning opportunities for K-12 teachers and students, workshops and seminars, and internships. The multi-disciplinary faculty and staff at CMAST offer a wealth of knowledge for prospective students while the facility provides space and technology for classes, many of which are hands-on and inquiry-based.

Curriculum Courses

Classroom and laboratory space in the CMAST building has been utilized for a variety of credit courses over the past years. By keeping up with the continuous evolution of technology, CMAST can provide electronic connections to not only the NCSU main campus but also locations throughout the world. What follows are examples of the variety of coursework offered from CMAST-based faculty.

Biology

FW 314 - Coastal Ecology and Management

Dr. Jeffrey Buckel, Biology. A one-week, hands-on credit course studying the fishery and wildlife resources associated with North Carolina coastal plain habitats. Based at CMAST during the summer, students perform field identification of habitats, animals, and plants using multiple types of sampling gear including bottom and beam trawls, beach seines, and gill nets. Average annual enrollment: 15 students.

Food, Bioprocessing and Nutrition Sciences

FS 354 – Food Sanitation (distance education)

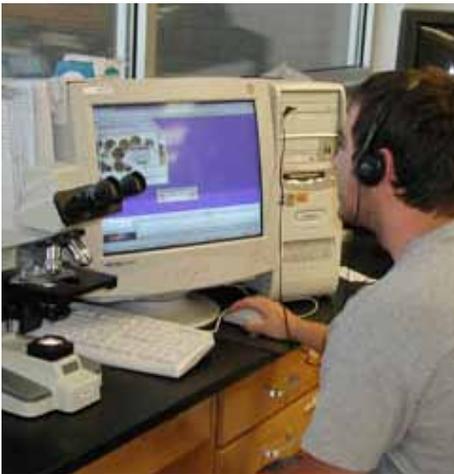
Dr. David Green, Seafood Laboratory. A credit course for Food Science majors and a required course for the Food Safety Managers Certificate program, focusing on the scientific principles associated with Food Safety and Food Science. Includes discussion of hygienic practices, the requirements for sanitation programs, and modern sanitation practices in food processing facilities. At the end of the course, students have the knowledge to develop and maintain a sanitation program within a food processing facility. Average annual enrollment: 20 students.

Marine, Earth and Atmospheric Sciences

MEA 449/549 – Principals of Biological Oceanography (distance education)

Dr. David Eggleston, Marine Ecology and Conservation. A credit course focusing on





biological productivity and trophic relationships in plankton, nekton and benthos, as well as community ecology and ecosystem processes of selected habitats (estuaries, intertidal zones, coral reefs, deep sea), and adaptation of organisms to the marine environments. Lectures presented both at NCSU campus and from CMAST via teleconferencing to an annual average of 20 students.

MEA 469 – Ecology of Coastal Resources

Dr. David Eggleston, Marine Ecology and Conservation. This course covers the sampling methods and experimental design in estuarine and coastal marine ecosystems. The course includes survey of basic biological, physical, chemical and geological mechanisms underlying habitat-specific functioning, followed by discussion, in-class presentation, and critique of real and hypothetical case studies involving anthropogenic impacts. Lectures presented both at NCSU campus and from CMAST via teleconferencing to an annual average of 14 students.

Toxicology

TOX 201 – Poisons, People and the Environment (distance education)

Dr. Patricia McClellan-Green, Toxicology. An undergraduate credit course introducing chemical poisons and the many and varied effects on people as well as the environment. Students learn how and why poisons have played an important role in history, how to critically evaluate the chemical risk information reported in the media, and the underlying principles of the basic science of poisons. Average annual enrollment: 110 students.

Veterinary Medicine

VMC 950 – Sea Turtle Medicine and Rehabilitation

Dr. Craig Harms, Department of Clinical Sciences. This is a two-week course that provides practical experience in rehabilitat-

ing sea turtles at the Karen Beasley Sea Turtle Rescue and Rehabilitation Center (KBSRRC) in Topsail Beach, NC. Skills acquired in clinical and didactic settings include sea turtle husbandry and rehabilitation techniques, diagnostic sample collection and interpretation, physical examination and safe handling, medication delivery, wound treatment, and necropsy protocols. Students spend one week at CMAST and one week at the rehab center. Average annual enrollment: 6 students.

CBS 817/818 - Advanced Topics in Zoological Medicine I and II (distance education)

Dr. Craig Harms, Department of Clinical Sciences. Zoological Residents and CMAST CVM staff utilize teleconferencing from CMAST to participate in lectures and discussions held at CVM in Raleigh, NC. Average annual enrollment: 1-3 students at CMAST, 20 in Raleigh, another 5 online

VMC 991-- Marine Mammal Health Selective

Dr. Michael Stoskopf/Dr. Craig Harms. A selective course taught on site for the first time at CMAST in May 2011, this weeklong credit course for veterinary medicine students includes discussion of disease issues in free ranging and captive cetaceans, pinnipeds, sirinids, and marine mustelids with emphasis on species found in North American waters. Students attend classes and receive practical experience performing necropsies on a variety of marine mammals. Average annual enrollment: 20 students.



Graduate Training Opportunities

Marine-related research is a cornerstone of CMAST. The diversity of disciplines represented affords opportunities for students to further their education to M.S. and Ph.D. levels. With multiple laboratories available, marine vessels at hand, a close proximity to estuarine and ocean waters, and collaborations with area marine science institutions, CMAST is a valuable resource for students seeking higher degrees.

Since the opening of CMAST in 2000, over 60 graduate students have utilized CMAST for study in as many topics. A partial list includes:

- Spotted seatrout movement and mortality
- Habitat restoration as a fisheries management tool
- Overwinter ecology of juvenile bluefish off North Carolina
- Oyster population dynamics and restoration
- Potential predatory impact of non-indigenous stone crabs on oysters
- Detection of histamine-producing bacteria in fish
- Ecological acoustics – Sound as a settlement cue for estuarine larval invertebrates

K-12 Outreach

Coastal Federation Shoreline Restoration Project

CMAST essentially provides a living laboratory for K-12 students to learn about the basics of estuarine ecology. The NC Coastal Federation's education program works with Carteret County Public School classes on projects about estuaries and their importance in the coastal environment, which culminates with the planting of hundreds of marsh grass plugs along the shoreline behind CMAST.

COSEE Institute

Middle to high school educators from NC, SC and GA were hosted by CMAST in 2010 as part of the Ocean Sciences Education Leadership Institute – Center for Ocean Sciences Education Excellence/South East (COSEE). Marine science activities were scheduled with CMAST researchers in the field and in the classroom. The group of 25 teachers conducted zooplankton sampling using a net at night and used the samples in classroom microscope work to better understand the effects of increasing ocean acidification on ocean food webs.

Marine Science Academy – Carteret County Schools

Each summer over 50 middle school students visit CMAST for hands-on activities – with the CMAST-based Seafood Laboratory, CVM Aquatic Animal Health Program, and Estuarine and Coastal Fisheries Program – as

continued on page 4

part of a weeklong, marine science adventure held by the Carteret County Public School system. Students learn about different types of seafood, where it comes from and what it looks like in its natural form before cooking, as well as food science and seafood safety. Sea turtle and dolphin anatomy are topics presented by the Aquatic Animal Health group, as students are shown actual specimens during a research necropsy performed by resident veterinarians and technicians. Beach seining is also done along the shore at CMAST where students learn about the life history of the organisms captured with the net.

School Groups

Additional programs are developed occasionally on a request basis. For example, the NCSU Fisheries and Wildlife group of the Department of Biology provides presentations, lab tours and hands-on activities for school groups, 4-H groups, and others.

Integrating high school students into research

Since 1996, Dr. David Eggleston has integrated middle and high school students in the



Pamlico Sound area into his blue crab and oyster research programs. The research typically involves students measuring the recruitment (settlement) of early life stages of these organisms, an important stage for establishing local population size, and a life stage that can be strongly influenced by climate and weather. For example, from 1996-2005 students measured the influx of blue crab postlarvae throughout the entire Pamlico Sound area. During this



valuable decade-long study there were 35 named tropical storms of varying magnitudes and tracks to determine the effects of hurricane track, wind speed and direction on blue crab recruitment. Since 2006, students have been quantifying the settlement of oyster larvae on "shell-strings" hanging from docks in an effort to see if increasing oyster reef restoration is leading to increasing levels of oyster settlement.



Over the years these students have used this valuable research experience for senior honors projects, community service and Eagle Scout requirements. Perhaps even more importantly, the hands-on experiences and direct connections they receive with scientists may help guide their decisions to pursue a career in science.

Workshops and Training

Basic Seafood HACCP

The Seafood Laboratory at CMAST teaches a Basic Seafood HACCP (Hazard Analysis and Critical Control Point) Workshop, which is necessary for those who need to become certified to meet federal Food and Drug Administration requirements for processing and handling seafood. Over 1,000 people have been certified through the NCSU Seafood Laboratory-sponsored workshops held at CMAST and other locations over the past 10 years.

Bluefin Tuna Workshop

NC Sea Grant at CMAST collaborates with other agencies on a Bluefin Tuna Safety Requirements, Enforcement and Post-Catch Handling workshop. Held annually, the workshop is intended to help those commercial fishermen targeting giant Bluefin tuna to decipher some of the complex regulations and learn safe handling techniques.

Seminar Series

CMAST hosts a seminar series each year in which invited speakers present an hour-long presentation on a marine-related scientific topic. Open to the public, seminars are usually held on Fridays during the fall and spring semesters.

Coastal Science Café

CMAST is a charter member of the Coastal Science Café planning committee, formed in 2009, which represents Carteret County marine

science facilities and other coastal-related organizations, and plans bimonthly cafés on marine-related topics. Science cafés are live events that involve a face-to-face conversation with a scientist about current science topics and are open to everyone, and take place in casual settings such as restaurants and coffeehouses.

Residencies and Fellowships

Zoological Medicine Residency Program

Offered through NCSU's College of Veterinary Medicine, this three-year, post-graduate program trains veterinarians pursuing board certification in zoological medicine and is the first program in the country to include an aquatic animal focus. Depending on the chosen field of study a resident would have a one- or two-year rotation located at CMAST. During this time, opportunities for hands-on experiences with aquatic animals are made available by partnerships with the Topsail Island Turtle Hospital, three NC Aquariums, and the Marine Mammal Stranding Network.

Marine Fisheries Fellowship

NC Sea Grant and the NC Division of Marine Fisheries (DMF) cosponsor this annual fellowship at CMAST. The program places a recent post-graduate (M.S. or Ph.D.) at CMAST to work with Dr. Jeff Buckel (Biology, NCSU) and a mentor from NC DMF. There have been 10 fellows since 2002.

CMAST Summer Fellows Program

The Summer Fellows Program is a ten-week program that provides support for undergraduate students who collaborate with a faculty advisor to conduct research in a subject area that matches their interest. Anywhere from two to four students are chosen each year. There have been 18 fellows since 2005.

Fisheries and Wildlife Internships

The Hutton Junior Fisheries Biology Program, is a summer mentoring program for high school students, sponsored by the American Fisheries Society. The goal of the program is to stimulate interest in careers in fisheries science and management among groups underrepresented in the fisheries professions, including minorities and women. The program is open to 11th and 12th grade high school students regardless of race, creed, or gender. Students selected for the program are matched with a professional mentor in their area for a summer-long, hands-on experience in a marine or freshwater setting. A scholarship is also awarded to each participant accepted in the program. Dr. Jeff Buckel is the mentor for students placed at CMAST and has participated in the program since 2004.



Collaborative deep-sea research on western Atlantic seep populations

In May, an interdisciplinary team of researchers from NC State University, Duke University, and the University of Oregon, took part in a National Science Foundation-funded project “Connectivity in western Atlantic seep populations: Oceanographic and life-history processes underlying genetic structure.” A cold seep (sometimes called a cold vent) is an area of the ocean floor where hydrogen sulfide, methane and other hydrocarbon-rich fluid seepage occurs, often in the form of a brine pool. Cold seeps develop unique topography over time, where reactions between methane and seawater create carbonate rock formations and reefs, and harbor unique ecosystems.

The team integrated studies of oceanographic circulation, larval dispersal, invertebrate life histories, population genetics and phylogeography to explore questions of contemporary and historical connectivity in relatively unexplored deep-sea chemosynthetic ecosystems.

Team members participated in a week-long mooring cruise aboard the *RV Oceanus* of Woods Hole, MA, which embarked from Barbados and focused on three nearby deep-sea seep (El Pilar, Orenoque A, Orenoque B). Moorings were deployed at each site to capture larval stages of seep organisms, as well as



characterize currents that could disperse such larvae.

From NCSU and CMAST, participants included Drs. David Eggleston and Roy He, Marine, Earth and Atmospheric Sciences (MEAS), Ph.D. student Brandon Puckett, M.S. Student Joe Zambone, and research associate Gayle Plaia.

Marine Mammal Stranding Update

From April to June, the Central NC Marine Mammal Stranding Network responded to 15 marine mammal strandings along the central NC coast. The strandings were bottlenose dolphins, including two yearling female calves, and one pygmy sperm whale. One of the dolphin strandings, which holds a new record for the westernmost inshore stranding in this part of the state, was found in the Tar River. In addition, five other marine mammals provided from Dare and Currituck county stranding partners were necropsied and used as teaching tools for a Marine Mammal Course held at CMAST.

- contributed by Vicky Thayer, DMF/CMAST Marine Mammal Stranding Coordinator



Leatherback turtle hearing research

Veterinarian Dr. Craig Harms of CMAST traveled to Trinidad in June to assist in a research project evaluating the hearing capabilities of leatherback turtles. Duke Marine Lab researcher Scott Eckert and doctoral student Wendy Dow Piniak headed up the project. Piniak’s dissertation focuses on measuring the in-water and in-air hearing sensitivity of sea turtles and evaluating the effects of marine sound on the hearing and behavior of sea turtles. CMV Resident Dr. Betsy Stringer also assisted with the project.

To gain test results, innovative procedures to test turtle hearing were put in place and are similar to hearing tests performed on human infants using electrodes connected to the head to determine conductivity of sound. Dr. Harms provided the veterinary expertise necessary to sedate the turtles long enough to perform the

tests. Hatchling turtles are used for the experiments, as adult leatherbacks are too large and more difficult to handle as they are only found in the wild. There are no leatherbacks in captivity, which would provide a better environment for testing. Trinidad was chosen for the study as it is the second largest leatherback nesting colony in the world.

The project was done with the support from WIDECAST (Wider Caribbean Sea Turtle Conservation Network) and NatureSeekers conservation group.

Mummichog research

Paul Rudershausen, doctoral student in Dr. Jeff Buckel’s Fisheries Lab at CMAST has begun a new study. He is looking at the effects of habitat alteration on the growth and survival of the mummichog (*Fundulus heteroclitus*). This species is the dominant resident fish species in saltwater marshes in the Carteret County region. The research involves implanting mummichogs with passive integrated transponder (PIT) tags that collect vital rates needed for the study. PIT tags allow for the monitoring of growth and survival on a fish-by-fish basis. The tags have a very long ‘life-span’ so fish can be monitored over a long period of time.

Additionally, Rudershausen is looking at the diets of this species between altered and

continued on page 6



cmastoutreach

Middle school students learn about seafood safety, food science and veterinary medicine

Over 50 students visited CMAST in June, part of the annual Brad Sneed Marine Science Academy program sponsored by Carteret County Public Schools.

1. Dr. Trey Clarke, CVM Zoological Medicine Resident at CMAST, starts a necropsy on three sea turtles, showing students turtle anatomy and procedures on collecting tissue samples for analysis.
2. Katrina Connor, CMAST Summer Fellow and NCSU Food Science major, presents information about senses and tastes.
3. Students sample foods during a sensory experiment.
4. Greg Bolton, Seafood Laboratory Research Specialist, shows students a sample of a dolphin fish (mahi). Many have never seen fish in natural state.
5. Heather Broadhurst, CVM Department of Clinical Sciences Research Technician, talks to students about the scientific procedures used when taking research samples of a stranded marine animal.



CMAST research continued from p.6

unaltered habitats. The study systems are seven creeks in Carteret County that have a variety of anthropogenic alterations.



Gulf Seafood Safety

David Green, Professor and Director of NC State University's Seafood Laboratory, attended the 2011 Institute of Food Technologists (IFT) Annual Meeting and Food Expo in New Orleans last June, where he co-chaired a panel of seafood safety experts addressing concerns that Americans remain deeply suspicious about the safety of consuming Gulf fish, shrimp and crabs because of the BP oil spill in 2010, despite scientific research that revealed Gulf of Mexico seafood is safe for consumption.

In a published release from IFT, the panel said results from all seafood tested for oil contamination and chemical dispersants used to break up the oil by the Food and Drug Administration (FDA) and the National Oceanic and Atmospheric Administration (NOAA) were well below the level of contamination that could be harmful for humans to consume. "The data strongly indicates that Gulf seafood is safe to eat," said Calvin Walker, a NOAA Fisheries scientist and head of the Gulf oil-spill surveillance team based in Mississippi. "The continuing challenge is trying to get the public to understand the seafood from the Gulf is safe to eat." Ewell Smith, head of the Louisiana Seafood Promotion and Marketing Board, said, "Gulf seafood is literally the most tested food source in the entire world right now." The expert panel was part of IFT's Aquatic Food Product Division's annual program that adds additional symposiums on value-added seafood product development and safety of seafood in light of the Tsunami disaster in Japan.

"What happens in the Gulf and around the world affects the availability and price of seafood in North Carolina for dealers and consumers," says Dr. Green. "By consumers not buying Gulf seafood, the price to dealers and consumers has been inflated, keeping the prices high. With recent announcements on the safety of Gulf seafood, the best thing for people to do is to purchase Gulf seafood products to help support the domestic industry, stabilize the market and thereby reduce prices" says Green.

cmastvisitors

Southern Association of Marine Laboratories meeting at CMAST

In early June, CMAST hosted 35 marine laboratory directors from across the southeast including Bermuda, the Virgin Islands, and University of Mexico for the annual meeting of the Southern Association of Marine Laboratories (SAML). Visitors were welcomed with a reception and tour of CMAST. Dean Dan Solomon from PAMS also attended and welcomed the group.



Summer Fellows 2011

The CMAST Summer Fellows Program supported the work of four undergrads this past summer. The program offers students an opportunity to take part in research activities which matches their area of interest or study. Students are mentored by CMAST faculty on a project for a ten-week period. Descriptions for the current students and their projects follow.



Ben Kornegay

NCSU Biology Fisheries Lab
Topic: Diets of Mummichogs
Major: Fisheries & Wildlife Science,
NCSU '12

Ben Kornegay will be a senior at NCSU next year in the Fisheries and Wildlife program with a concentration in fisheries science. This is his second summer working for Dr. Jeff Buckel. His summer project was comparing the diets of Mummichogs (*Fundulus heteroclitus*) in four different creeks that all have different habitat alteration scores. "The goal of my research was to see if Mummichogs living in a more altered environment, by humans or other sources, have different diets than those living in less altered, more pristine environments," Kornegay said. "After graduation from NCSU, I would like to pursue graduate school in marine biology and ultimately have a career in fisheries research."



Katrina Connor

NCSU Seafood Laboratory
Topic: Fresh Water Trout Caviar
Major: Food and Bioprocessing Science,
NCSU '13

Katrina Connor's summer research was on caviar production. Her research required learning several techniques for monitoring food quality and safety including salt extractions and titrations, water activity, moisture content, and micro tests. The tests were performed multiple times to get a more complete sense of the quality of the caviar. This research determined the correlation between water activity and salt

content, which could potentially be used as a validation study by North Carolina caviar processors. If a correlation can be established through scientific studies, then a processor could use a rapid on-site test for water activity to verify the safety of their caviar and meet FDA record-keeping requirements.

"The validation process and lab experience has been great but, I think the best part of being at the coast is the exposure I received to other research," Connor said. "I have been able to do additional work with the Biology lab and look at some other food science projects going on. I know the experience I gained this summer at CMAST will help me as I continue on in my schooling and career."



William Green

NCSU Toxicology Lab
Topic: Spawning characteristics and reproductive capacity of blueback herring
Major: Biology, Davidson College '12

Will Green worked in the Toxicology lab processing hundreds of tissue samples taken from blueback herring, assisting with a project assessing their spawning and reproductive capacity. A biology major with aspirations of medical school, Green is a veteran of laboratory internships. Even though this was his third year in a laboratory, he learned new techniques including aging of fish, assays for oxidative stress, tissue pathology and measurement of steroid levels in blood plasma.

"I know that this opportunity has allowed me to learn the very basics of laboratory procedures and will enhance my classwork in the future," Green said.



Eric LaRoque

NCSU Toxicology Lab
Topic: Spawning characteristics and reproductive capacity of blueback herring
Major: Nursing, Barton College '14

Eric LaRoque also worked in the Toxicology lab on the same project as William Green. However, LaRoque's experience will help his studies in a different way as he is studying nursing at Barton College and has interests in gerontology and physical therapy. He, too, learned very basic laboratory procedures and tests over the summer. Although the tests were conducted on fish tissues, he found that many of the tests performed are similar to those conducted on human tissues.

"I have learned a lot in the lab this summer. I gained knowledge on laboratory protocol. I know this will carry over into my studies in human medicine," he said.



Marine Mammal Medicine

NCSU veterinary faculty Dr. Michael Stoskopf and Dr. Craig Harms taught a weeklong CVM selective course for the first time at CMAST entitled "Marine Mammal Medicine." Dr. Stoskopf developed the Marine Mammal Medicine course at the Raleigh CVM campus over 10 years ago to help fill a need for graduate students in marine-related disciplines. Over 100 students have participated in the course since its initial offering. CMAST was chosen as for the course this year to utilize the research facility and its proximity to the coastal area.

While the main focus was the students' ability to diagnose diseases in marine mammals, the Marine Mammal Medicine course had clear objectives for students – to understand current major health management issues of captive and free ranging mammals, to understand and be able to communicate the appropriate approaches to management of marine mammal strandings and environmental disasters, and be able to outline an appropriate diagnostic and therapeutic course for a variety of marine mammal diseases. The college credit course offered in-depth study on cetaceans and pinnipeds (dolphins, whales, and seals), with emphasis on species found in North American waters. Further study included sirenians (manatees) and marine mammals seen in zoos aquariums such as sea otters, sea lions, and polar bears.

Twenty, third-year DVM students attended class lectures, worked in labs and performed necropsies on bottlenose dolphins. Guest lecturers included Dr. Aleta Hohn, Director of NMFS Programs at NOAA Beaufort Laboratory and Dr. Vicky Thayer, Marine Mammal Stranding Coordinator for the Central North Carolina coast.

Seafood Laboratory offers updates on FDA Seafood HACCP guidance

Understanding and complying with state and federal regulations on fish and shellfish safety can be daunting to members of the seafood industry, but even more so when an agency updates its interpretation of the rules.

In April 2011, the US Food and Drug Administration (FDA) released the Fish and Fishery Products Hazards and Controls Guid-

continued on page 8

ance (4th Edition), which contains all the new changes in its regulatory guidance for the seafood industry.



NC State University's Seafood Laboratory has started offering half-day update sessions to inform North Carolina seafood industry members on the changes contained in the new FDA guidance document.

The guide and seafood safety regulations are based on HACCP (Hazard Analysis and Critical Control Point), a science-based system for

assuring that many types of food remain safe from chemical, physical and biological hazards at critical points along the journey from production to consumption.

In addition to update sessions, Basic Seafood HACCP workshops and Segment 2 workshops are being planned. The Seafood Laboratory, part of the NCSU Department of Food, Bioprocessing and Nutrition Sciences, has presented over 40 workshops on seafood HACCP to over 1,000 participants since the regulations were mandated in 1997.

For more information on the FDA update session and other Seafood HACCP workshops, contact the lab at 252-222-6334 or visit www.ncsu.edu/foodscience/seafoodlab/ for details.

CMAST specialty license plate authorized to raise funds for research



Demand for fisheries products is increasing rapidly while supplies decline. Fisheries and aquaculture research performed at CMAST, in partnership with other major universities, has identified information leading to sustainable fisheries and habitat management in North Carolina.

In the 2011 session, the North Carolina General Assembly ratified a bill that authorizes the Division of Motor Vehicles to issue several types of special registration plates, including a Sustainable Fisheries license plate. Funds allotted from the sale of these plates will be used to support CMAST research, undergraduate and graduate student training, and education outreach in support of sustainable fisheries in NC.

Three hundred paid orders must be placed before the plates can be produced. To pre-order your specialty license plate, contact CMAST at 252-222-6302 for an application or visit www.cmast.ncsu.edu for details.

Marine Biotechnology Center of Innovation grant announced

A grant for as much as \$2.5 million has been awarded by the NC Biotechnology Center for the development of a Marine Biotechnology Center of Innovation. The purpose of the center is to foster commercial development and jobs based on North Carolina's marine life. The four-year grant will help get the center started, giving time for organizers to secure other sources of funding in order to become self-sustaining. To develop the center, the Biotechnology Center is working with regional economic development groups for North Carolina's Eastern and Southeastern regions as well as representatives from CMAST, UNC Wilmington and MARBIONC, UNC Chapel Hill Institute of Marine Sciences, and Duke Marine Lab.

CMAST shares in \$4.6 million in Green Business Fund Awards

North Carolina Commerce Secretary Keith Crisco announced this spring that NC State's Center for Marine Science and Technologies (CMAST) would be one of 16 small businesses and organizations across the state that will receive awards from the North Carolina Green Business Fund, totaling \$4,580,686.45. These projects will result in a total of approximately 35 jobs being created or retained.

"Encouraging investments in the green economy is a centerpiece of our job creation strategy," Secretary Crisco said in an April announcement. "This fast growing industry holds vast potential for the future and we must continue to support its development in North Carolina."

The CMAST project will receive \$228,519 in funding to install and demonstrate a small hybrid photovoltaic-wind system to power pumps and heat water for application to the state's growing aquaculture industry. Projected energy generation is 21,500 kilowatt hours annually, which will be used to offset energy usage at the Marine Aquaculture Research Center facility in Carteret County.

cmastpeople

Dr. Eric Anderson completed a two-year Veterinary Medicine residency at CMAST in May, and has relocated to Tennessee and is currently studying for ACZM board examinations.

Becky Bartel, CMAST Visiting Scholar, has accepted a position as Terrestrial Ecologist of the Southeast Region for the Inventory and Monitoring Program of the U.S. Fish and Wildlife Service in Manteo, NC.

Jody Callihan has been named the NC Marine Fisheries Fellow, a one-year appointment sponsored by NC Sea Grant and NC Division of Marine Fisheries (DMF). Callihan, just completed his Ph.D. from Louisiana State University, will be working with Dr. Jeff Buckel and personnel from the Elizabeth City NC Division of Marine Fisheries office researching anadromous fish movement and abundance data.

Robert Dunn, MEAS graduate student has been awarded a National Science Foundation Graduate Fellowship for his studies on "Disentangling trophic webs on oyster reefs and application to ecosystem-based management."



Dr. Suzanne Kennedy-Stoskopf, Research Professor in Clinical Sciences, CVM, took to the stage (far right above) portraying health nut leader 'Sheree' in *The Dixie Swim Club* during the NCSU theatrefest 2011 in May. A review in the *Independent Weekly* cited "... Kennedy [was] a stand out as Sheree..."

Ashlee Lillis, Graduate Research Assistant was second runner up for a scholarship from the NC Association of Environmental Professionals. She received a one-year membership to the NCAEP. Additionally, Lillis has been awarded funding from the PADI (Professional Association of Dive Instructors) Foundation for her research on "Underwater sound as an orientation and settlement cue for estuarine larvae."

Brandon Puckett, Ph.D. student, will take part in a NOAA-led research diving expedition in the Tortugas Ecological Reserve to assess snapper/grouper spawning aggregations.

Ryan Rindone, M.S. MEAS '10, is the SEDAR Coordinator for the Gulf of Mexico Fishery Management Council in Tampa, Florida.

The second edition of *Fish Medicine* by **Dr. Michael Stoskopf** has been published. A popular book among fish health professionals, it has been reformatted to two volumes and includes original general medicine chapters as well as new dated sources and diagnostic lab appendices.

Jen Weaver, Marine Fisheries Fellow since 2009, has accepted a position as a biologist with RPI (Research Planning, Inc.) in Columbia SC. Her primary role will be coastal resource mapping.