COLLEGE of CHARLESTON

GRICE MARINE LABORATORY

GRICE LOGBOOK

A Newsletter of the Grice Marine Laboratory and the Graduate Program in Marine Biology, College of Charleston

April 2011, Volume 10

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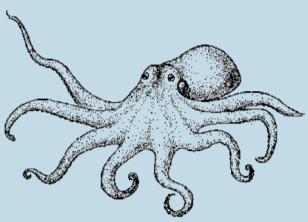

Back for 2011- Grice Research Experiences for Undergraduates (REU) Program

Armed with new funding from the National Science Foundation, the Fort Johnson Undergraduate Summer Research Program is back in action for 2011-2013, centered on the theme "Marine Organism Health: Resilience and Response to Environmental Change." First established in 1992, the Program provides an experience in independent research for 10 undergraduates from around the country, with an aim to foster interest in science-related careers. Interns develop independent research projects under the guidance of mentors from the College of Charleston's Grice Marine Laboratory or one of the partner institutions at Fort Johnson, including SCDNR, MUSC, NOAA and NIST. Interns live in the Grice Marine Lab dormitory and participate in workshops, journal clubs and field trips that emphasize the program theme. In parallel with their lab work, interns will pair with the College's Upward Bound and Ronald McNair Scholars to develop and implement better ways to communicate their research to the public, K-12 and professional audiences.

REU alum Robin Garcia

McElroy Lab Gets Fishy

Dr. Eric McElroy's laboratory is broadly interested in the physiological and biomechanical basis of whole animal performance and how this is related to animal behavior and ecology. Performance is a metric for how well an organism can accomplish fitness-related behaviors and as such performance is a key link between organismal form-function and behavior, ecology, and fitness.

The summer of 2010 was Eric's first venture away from the terrestrial realm (lizard and mammal locomotion) and into the deep, embarking on three new areas of research all made possible through collaborative efforts.

Carrie Umberger & Eric McElroy

CofC Undergraduate Carrie Umberger examined the impact of a philometrid parasite on swimming performance in

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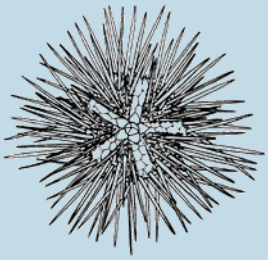

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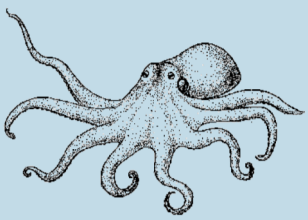


GML Partners with Michael Mitchell Art Gallery for 2011 SEWE

For nearly 30 years, the Southeastern Wildlife Exposition (SEWE) has been a staple of the spring season in Charleston. This event showcases experts in wildlife art, environmental education and conservation research. Grice Marine Laboratory participated in the 2011 SEWE festivities by partnering with the Michael Mitchell Gallery located on upper King Street. Graduate Program in Marine Biology (GPMB) students and Grice Marine Lab staff set up three large aquariums and a touch-tank filled with local marine and estuarine animals within the art gallery. College of Charleston students informed visitors of the importance of marine life in the lowcountry. Besides educating the SEWE community, this outreach event aimed to raise money for graduate students through the collection of donations and 10% of the profits generated from art sales. This partnership with Michael Mitchell gallery was a unique way to blend Charleston's art and science communities while raising awareness of the local marine environment.

CORAL

Our CORAL (Community Outreach Research And Learning) Program had a very successful year in 2010. We reached over 2,300 individuals both in the classroom and at the Grice Marine Laboratory with our touch-tank and microscope workshops. The program continues to grow and inspire young minds to become the next generation of marine scientists. It has been a wonderful way to reach out to the public.

Middle school students job shadow at GML's Molecular Core Facility

GPMB Degrees

Elizabeth Broyles–Diamondback terrapins (*Malaclemys terrapin*) of Charleston SC: population estimate, sex ratios and distribution. (Advisor David Owens)

Jason Ferrante–Discovery of blood protein biomarkers of domoic acid toxicosis in California sea lions, *Zalophus californianus*. (Advisor Mike Janech)

Jennifer Fountain–Assessment of multiple stocking strategies of striped bass in the Ashley River, South Carolina using multiplexed microsatellite panels. (Advisor Mike Denson)

Joy Gerhard–Recruitment of stocked juvenile red drum (*Sciaenops ocellatus*) to the adult population in South Carolina. (Advisor Mike Denson)

Melanie Hedgespeth–An assessment of the presence and fate of pharmaceuticals and personal care products (PPCPs) found in treated wastewater discharges into Charleston Harbor, South Carolina. (Advisor Ed Wirth)

Kevin Huther–An examination of bottlenose dolphin (*Tursiops truncatus*) abundances in relation to environmental factors and risks. (Advisor Geoff Scott)

Christopher Johns–Genetic and environmental contributions to gene expression variations in the eastern oyster (*Crassostrea virginica*) from three locations in Mississippi. (Advisor Bob Chapman)

Megan Kent–Isolating the contribution of microbial biofloc to *Litopenaeus vannamei* growth: How do heterotrophic floc and microbial classes representative of photoautotrophic floc affect growth when provided as dietary supplements? (Advisor John Leffler)

Allison Kreutzer–The role of crab traps in oyster restoration. (Advisor Virginia Shervette)

Amanda McLenon–Effects of increased temperature and CO_2 on Dimethylsulfoniopropionate (DMSP) concentration in *Symbiodinium microadriaticum* and associated changes in methionine synthase activity. (Advisor Jack DiTullio)

Lindsey Parent–Effects of a synthetic pyrethroid pesticide on two estuarine fish species. (Advisor Marie DeLorenzo)

Joseph Pollock–Phylogeography of the coral pathogen *Vibrio corallilyticus* and the development of a QPCR-based diagnostic assay for its detection. (Advisor Pam Morris)

Jared Ragland–Persistent organic pollutants in blood plasma of adult male Loggerhead sea turtles (*Caretta caretta*). (Advisor Jennifer Keller)

Nora Sturgeon–Bottlenose dolphins and the Atlantic blue crab fishery: A study of coincidence and interaction in Charleston Harbor, SC. (Advisor David Owens)

Jacquelyn Wilkie–Characterization of the surf zone macrofauna at Folly Beach, South Carolina. (Advisor Tony Harold)

Tucker Williamson–Molecular ecology of the barnacle *Megabalanus coccopoma* over its introduced range in the southeastern U.S. (Advisor John Zardus)

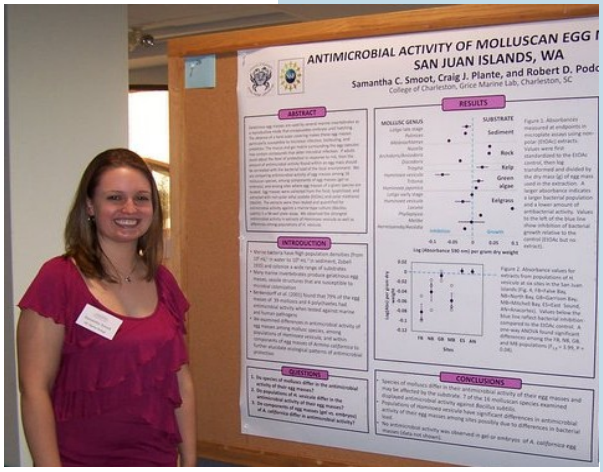
Student Awards

Jenn Bennett–Student travel award, American Society of Limnology and Oceanography

Leah Fisher–McLeod-Frampton Scholarship; student travel award, International Sea Turtle Society

Nat Johnson–Graduate Student Assoc. Research Grant

David Shiffman–CofC 5th Annual Graduate Student Poster Session Best Mar. Biol. Poster



Sammi Smoot's poster presentation

Sammi Smoot–2011 Richard & Megumi Strathmann Fellowship

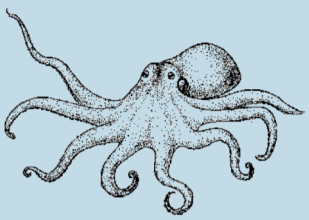
Mark Stratton-Graduate Student Assoc. Research Grant

Jena Wirth–Joanna Deep Water Foundation Fellowship

GPMB students gave presentations at research conferences:

Poster Presentation: Jenn Bennett, Walter Blair, Casey Darling, Cameron Doll, Anna Manyak, David Shiffman, Sammi Smoot, Mark Stratton, Kristin Stover, Jena Wirth

Oral Presentation: Leah Fisher, Nat Johnson, Anna Manyak, Weatherly Meadors, David Shiffman, Chuck Tucker



Faculty Notes

Burnett Lab: In January 2011 the Burnett lab made a big showing at the annual meeting of the Society of Integrative and Comparative Biology in Salt Lake City. Graduate students Nat Johnson, Kris Stover and Casey Darling presented their research, as did postdoc Kristin Hardy. Kristin is now headed for a faculty position at Cal Poly San Luis Obispo. Postdoc Natasha Sharp will also be departing the lab in 2011 for a job at Guild Associates in Charleston. Congratulations to them both! The lab is also excited about a new acquisition – a treadmill and cameras designed for capturing high-speed video from aquatic animals during walking. The new treadmill has already proven useful for analyzing details of locomotion in the blue crab. The new, more flexible design can accommodate other aquatic crustaceans, such as American and Caribbean lobsters.

GPMB students dig getting muddy for Ecology class

Alumni, please let us know what you are up to!

marine@cofc.edu

DiTullio Lab: In February 2011, the lab was awarded a 3 year NSF-OCE grant entitled "Lipid lubrication of oceanic carbon and sulfur biogeochemistry via a host-virus chemical arms race." The project entails determining the cellular and biogeochemical effects of viral infection on the marine coccolithophorid *Emiliania huxleyi*. In collaboration with researchers from Rutgers (Dr. Kay Bidle) and WHOI (Drs. Ben Van Mooy, Marco Coolen and Assaf Vardi), a research cruise is planned to Icelandic waters in the Northeast Atlantic in June 2012. Graduate student Jacob Kendrick is currently performing thesis research on the project. In January 2011, the lab was pleased to welcome a new postdoctoral investigator, Dr. Jenny Davis. Seven peer-reviewed articles were published (or in-press) in the 2010-11 academic year including one by research associate, Dr. Peter Lee (Advances in Oceanography and Limnology). During spring 2011, the new ocean-going laboratory van was delivered and will house a state-of-the-art high speed flow cytometer. During February 2011, Jack DiTullio and graduate students Bobbie Lyon (Ph.D. candidate, MUSC) and Jenn Bennett (GPMB) presented data at the ASLO meeting in Puerto Rico.

Harold Lab: There are several research projects concerning systematics, evolution, and ecology of fishes currently in progress in Tony Harold's lab. Michelle D'Aguillo (first year GPMB graduate student) is joining the lab and will be studying trophic biology and aspects of distribution of estuarine gobies. She is also working as a research assistant on a project dealing with the systematics of the Neotropical freshwater fish genus *Pseudochalceus*. Two undergraduate students have been involved in research in the lab this year: Dan Zurlo is working with Tony on a dietary study of the Naked Goby, *Gobiosoma bosc*, and Beth Ahern is working with Norma Salcedo (Visiting Assistant Professor) on the systematics of atherinopsid species *Menidia menidia* and *M. beryllina*. Iris Kemp, who did her Bachelor's Essay in the lab last year on marine hatchetfishes continues her graduate studies at the University of Washington.

Plante Lab: A predominately microbial ecology lab, recent efforts have focused on the interactive effects of biological and physical disturbances on the ecology of benthic microalgae. This research provided a MIMES summer internship opportunity for Lauren Daniels (Savannah State University undergrad) and aspects of the project were presented at the 40th Benthic Ecology Meeting in Mobile, AL. In related research, lab technician Tricia Roth and Jessica Lewis (CofC undergrad) are developing molecular methods to eliminate false "live" signals from microalgae in order to accurately characterize these communities. Concurrently, the lab is also focusing on the bacterial production of antimicrobials. Graduate student Whitney Hook (GPMB) is examining antagonistic interactions among sedimentary bacteria for her thesis research, while Sammi Smoot (GPMB), a student with Bob

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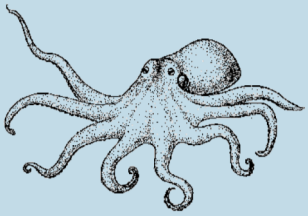


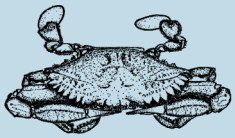
Research Colloquium 2010

The 14th annual Marine Biology Student Research Colloquium was held on September 25 and 26, 2010. The keynote speaker was Dr. Win Watson, a Professor of Zoology at the University of New Hampshire. Dr. Watson's research focuses on the behavior of lobsters, horseshoe crabs, fish and nudibranchs in the Gulf of Maine and Puget Sound. He gave two addresses titled "Rhythms in the Sea: From Neurons to Nature" and "The Secret Life of Lobsters." His research on the behavior of lobsters around traps has received considerable attention in publications such as The Boston Globe and The Christian Science Monitor. As a result, he has appeared on National Public Radio, Canadian Public Radio and the Canadian Discovery Channel.

David Shiffman won Best Oral Presentation Award

Fourteen students participated in oral presentations this year. The oral presentations were evaluated by a panel of six judges on the basis of: 1) scientific content including introduction of the problem, hypothesis testing, methodologies, and analyses; 2) presentation of the material including delivery, organization, and graphics; and 3) functional understanding of the science as demonstrated in the question and answer period. Peer reviews were also conducted by audience members to facilitate the presenters' oratory development. David Shiffman received the best oral presentation award for his talk "Detection of an ontogenetic shift in the diet of a heavily exploited shark species (*Carcharhinus plumbeus*, Nardo 1827) using minimally invasive $\delta^{13}C$ and $\delta^{15}N$ stable isotope analysis." Shiffman's work focuses on the diet and trophic level of the sandbar shark, *Carcharhinus plumbeus,* a common and economically important species in the western North Atlantic. Additional diet and trophic level information would facilitate the creation of an ecosystem-based management plan to protect the species. Studies like Shiffman's have historically used a technique where the stomach is cut open and analyzed, which involves sacrificing many sharks. In stable isotope analysis, a tiny muscle sample is taken from sharks and their suspected prey species, a minimally invasive technique. The samples are then analyzed using mass spectrometry to compare isotope levels between prey and predator samples. Differences in total occupied niche area and $\delta^{15}N$ range indicated that young-of-year sharks have more diverse diets than juveniles. Upon completion, David's data will be important to natural resource managers who are trying to protect this important South Carolina species.

The colloquium concluded with an award presentation ceremony held in the outdoor classroom at the Marshland's House with a cookout complete with Lowcountry Boil.



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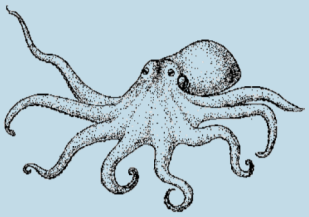

McElroy Lab Gets Fishy

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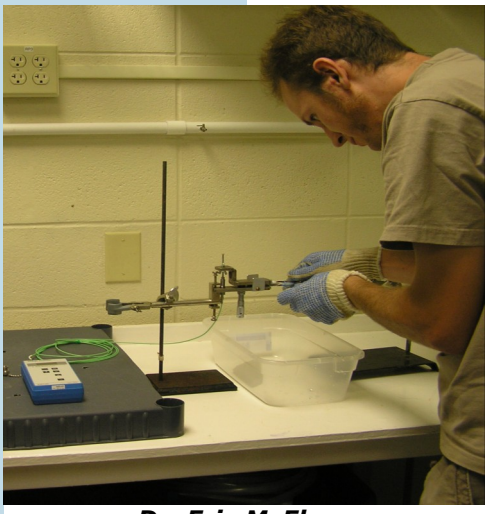
southern flounder. Dr. Isaure de Buron (CofC) and Bill Roumillat (South Carolina Department of Natural Resources) had previously identified that the dorsal and anal fin musculature of the southern flounder *Paralichthys lethostigma* is commonly infected and degraded by a philometric worm *Philometroides paralichthydis*. Using high speed video and a specially constructed aquatic racetrack, Carrie tested the hypothesis that individuals infected by this parasite would exhibit reduced swimming speed, acceleration, and burying ability compared to non-infected individuals. This hypothesis was partially supported; parasitized fish swam slower but showed no difference in the ability to bury in sand. Carrie is presenting these findings at the April 2011 meeting of the Southeastern Society of Parasitologists. This work has spawned a number of new collaborative projects looking at the relationship between fish parasites, swimming performance and physiology, and fish ecology and behavior.



Dr. Eric McElroy

The second new area of research is examining the biomechanical and physiological basis of fighting behavior in *Callinectes* crabs. This project was spawned via discussions of fighting behavior and claw performance in fiddler crabs with Candice Bywater (Ph.D candidate, University of Queensland) and Dr. Robbie Wilson (Lecturer, University of Queensland). Candice came to Charleston for three weeks in June 2010 and was able to collect data on pinching force, claw morphology, claw muscle anatomy, claw color (thanks to Dr. Paul Nolan from the Citadel), aggression levels, and relative fighting ability in male *Callinectes sapidus* and *C. similis*. These data are currently being analyzed to help design the next phase of this project.

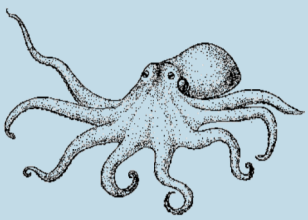
Finally, Eric is working with GPMB student Kristin Stover and Drs. Lou and Karen Burnett to examine the functional and biomechanical underpinnings of locomotor fatigue in *Callinectes sapidus*. This project is starting to uncover some interesting correlates with locomotor fatigue, such as the reduced ability of fatigued males to 'hold' onto objects with their walking legs. This could have important impacts on fitness, as male blue crabs have to 'hold' onto females until they molt so that they successfully fertilize the female.

Eric completed his Ph.D. at Ohio University in 2008 and then joined the Department of Biology at the College of Charleston. He teaches undergraduate courses in Human Physiology, General and Comparative Physiology, and Comparative Biomechanics.

George D. Grice, Jr. Lecture

The fourth annual George D. Grice, Jr. lecture was presented by Dr. Mark Hay of the Georgia Institute of Technology on April 8, 2011. Dr. Hay spoke on "Chemically-Mediated Interactions and the Structure and Function of Marine Communities." Dr. Hay had a roundtable discussion with students over breakfast on various issues associated with being a scientist and some of the big questions in marine biology.

Dr. Mark Hay



Alumni Notes

Carlene Brandon (1980): Even after retiring from a 30 year long career at MUSC, Carlene continues to work as a full-time research specialist in the department of pathology and laboratory medicine for MUSC researching on hearing loss. She is listed as a coauthor on several manuscripts and research presentations. Carlene and her husband recently moved to Goose Creek, South Carolina.

Rachel (Giotta) Kalisperis (1999): Rachel is Curator for the South Carolina Aquarium where she is responsible for the acquisition and care of the living collection. She is involved with the SC Aquarium's exhibit design and research projects.

Courtney Arthur (2009): Courtney is currently employed by I.M. Systems Group, Inc., as the research coordinator for the National Oceanic and Atmospheric Administration (NOAA) Marine Debris Division in Silver Spring, MD. In addition to serving as a technical reviewer for all marine debris research grants, Courtney has oversight over several projects including those that address the glamorous subjects of derelict fishing gear, microplastics, and monitoring of debris in various marine habitats. She ultimately plans to return to graduate school as a Ph.D. candidate in environmental engineering.

First Annual Grice Marine-ival

Faculty Notes

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Podolsky, is investigating the antimicrobial compounds found in gastropod egg masses. Their latest research focus examines the surfactancy of coral mucus and the surfactant- and antibiotic-resistance of associated bacteria. This work, which has benefited from the assistance of Elizabeth Redpath (CofC undergrad), could hold importance for both coral and human health.

Podolsky Lab: The lab is focused on the phenotypic plasticity of invertebrate egg masses and their symbioses with other organisms. Grad student Sammi Smoot is continuing her work on anti-microbial properties of egg masses, including a broad interspecific comparison. Grad student Daniel Fernandes has continued his studies of the effect of photosynthesis on oxygen supply to embryos that are deposited in the surfaces of macrophytes. Bob Podolsky measured pH gradients inside egg masses under light and dark conditions to gauge the contribution of microphytes to reducing CO_2 and acidification. Two undergraduates also carried out major projects in the lab. Gabe Segarra worked on anti-predatory properties of egg masses, asking whether adults exposed to predators produce egg masses that are more resistant to predation. Diego Castro studied the mechanical properties of tethers that hold egg masses in sediment, asking whether adults exposed to higher flow conditions produced egg masses with stronger tethers. Several lab members presented work at the SICB meeting in Salt Lake City, where Diego won honorable mention for his contributed talk in the Division of Invertebrate Zoology.

Sancho Lab: The fish ecology lab has been busy with multiple research and educational projects. David Shiffman (GPMB) spent the summer collecting tissue samples from sandbar sharks along South Carolina and the fall running stable isotope samples at Skidaway Institute of Oceanography in order to characterize their trophic ecology. David was busy attending various conferences presenting his work, and

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Grice Staff

Lou Burnett
GML Director & Professor of Biology

Craig Plante
GPMB Director & Professor of Biology

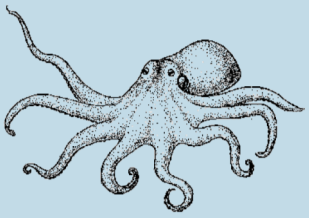
Shelly Brew
Administrative Assistant

Sarah Oakes
Laboratory Manager

Peter Meier
Marine Operations Manager

Melannie Bachman
Administrative Specialist

Tricia Roth
Molecular Core Facility Manager



Faculty Notes

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recently defended his masters thesis. Jessica Miller, a senior undergraduate, continued characterizing fish communities at Lucky Strike hydrothermal vent in the Mid-Atlantic Ridge by analyzing photomosaic images in collaboration with Javier Escartin, from CNRS-Paris. She presented her work at the National Conference for Undergraduate Research. Gorka Sancho was the co-PI along with Leslie Sautter (Dept. of Geology) in a 14 day oceanographic cruise from Charleston to Bermuda with 16 CofC undergraduates on board the *SSV Corwith Cramer*. This cruise was part of the new GUSTO educational program in collaboration with Sea Education Association, funded by the College of Charleston and SC Sea Grant.

Students trawling for Ecology class

Sotka Lab: In 2010, Masters candidate Jonathan Craft started a Research Technician position with the Smithsonian Marine Station in Fort Pierce, Florida. He is on track to defend his thesis this summer on a co-evolutionary arms race between tropical herbivores (urchins) and seaweeds. Masters candidate Anna Manyak started a new project on the evolutionary effects of temperature and predation on the estuarine isopod *Idotea balthica*, and specifically exploring latitudinal clines in body size. Postdoctoral researcher Tina Bell has several ongoing projects focusing on molecular ecology. These include cryptic species in the common tubeworm *Diopatra cuprea*, a molecular phylogeny of diet choice in the herbivorous amphipods of the family Ampithoidae, and the evolution of heat-stress loci in response to warming seas. Erik started his sabbatical in 2010, and flew his family to Sydney, Australia for four months on a Fulbright-funded fellowship. He developed new projects and strengthened existing collaborations with researchers at the Australian Museum, University of New South Wales, and University of Sydney.

GPMB students in Biometry class

Strand Lab: This year a new Masters of Environmental Studies graduate student, Matt Horry, joined the Strand lab. Matt is working on the impact of sea rocket *Cakile edentula* life-history upon fruit dispersal within and among populations. Chris Wiley, a CofC undergraduate, worked in the spring of 2010 identifying digenean parasites of spotted sea trout *Cynoscion nebulosus* using DNA barcoding. Chris has now started graduate work in wildlife management at University of Nebraska. The Strand lab has received funding through several collaborative proposals this year, including NSF and DOE to characterize root biology in terrestrial forest ecosystems and funding through NSF to address the impact of transgenic knockout mutations on plant fitness. Finally, they continue to investigate power analyses associated with population genetic inference; notably this work includes collaborations with Erik Sotka at GML and Tanya Darden and Mike Denson at SCDNR.

Green Teaching Garden

The Marine Biology Graduate Student Association, in partnership with the Grice Marine Lab, will be creating a Green Teaching Garden. This proposed garden will involve many different groups at the College including: Master of Environmental Studies Student Association (MESSA), Alliance for Planet Earth (APE), Biology Club (BC), Urban Agriculture (UA), GML Community Outreach Research and Learning (CORAL) Program, CofC Grounds Department, Clemson Extension and Ashley Cooper Stormwater Education Consortium. Produce collected from the garden will be donated to local food shelters to benefit the community. In addition, the garden will serve as an educational tool for classes and the public.