

# GRICE LOGBOOK

A NEWSLETTER OF THE GRICE MARINE LABORATORY AND THE GRADUATE PROGRAM IN MARINE BIOLOGY, COLLEGE OF CHARLESTON

APRIL 2009, VOLUME 8

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## UNDERGRAD RESEARCH IMPACTS STUDENTS & THE STATE OF SCIENCE

They came to the Grice Marine Laboratory from Texas and Ohio; from Virginia, North and South Carolina. They studied crustaceans, molluscs, fish, algae, cnidaria, and even seabirds. They addressed questions in marine ecology, toxicology, physiology and cell biology, using an extraordinary range of techniques, made possible by the unique partnership of federal and state agencies at Fort Johnson. In Summer 2008, a group of 9 talented undergraduate interns descended upon the Grice Marine Laboratory as part of the NSF-sponsored Fort Johnson Undergraduate Summer Research Program. Now in its seventeenth year, the Program aims to provide promising undergraduates with a real world experience of a career in science. That experience involves the development of collegial relationships with faculty mentors, graduate students and peers with whom the interns live, work and play during the 10-week internship.

Led by the College of Charleston's Grice Marine Laboratory, the 2008 Fort Johnson Undergraduate Summer Research Program



offered a tremendous range of undergraduate research projects involving mentors from two partner federal agencies: NOAA's Center for Coastal Ecosystem Health and

## SEX AND THE SINGLE CELL

Every organism that undergoes sexual reproduction faces an enormous challenge: transforming a tiny, featureless cell into a much larger, complex adult. **Dr. Bob Podolsky** and his students ask ecological and evolutionary questions about this transformation--in particular, how development at early stages is influenced by environmental conditions, and how these stages ultimately respond over evolutionary time.



One group the lab focuses on is gastropod molluscs, many of which deposit clutches of fertilized eggs in capsules or gelatinous masses. Of particular interest are species that oviposit in intertidal habitats, where fluctuation in physical conditions (e.g., temperature, ultraviolet radiation, oxygen) can be rapid and extreme. Podolsky and his students have been studying different risks of these conditions for early development, working in shallow soft-sediment tidal habitats. **Daniel Fernandes**, a Marine Biology grad student, has been using laboratory experiments to partition the effects of different components of tidal temperature fluctuation (e.g. mean, variance, rate of change, and degree of stress) on the development

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## Sea Urchin Research May One Day Lead to Healthier People

Advances in modern science often occur when various fields of research are seamlessly melded together. Here at the College of Charleston, **Dr. Christine Byrum** combines genomic, molecular, and experimental approaches to study cell specification and differentiation in invertebrate models. After graduating from the College of William & Mary, Dr. Byrum studied marine invertebrate morphology in the Zoology Department at Clemson University. She then went on to receive a PhD in Zoology from the University of Texas at Austin studying gastrulation in marine hydrozoans. In 2001, she started postdoctoral work on Wnt signaling in echinoderms at the University of Hawaii at Manoa. Wnt signaling pathways are most well known for their effects on embryogenesis and cancer. This work was continued at Duke University and,



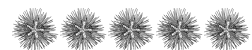
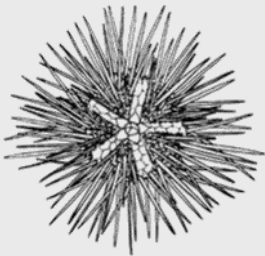
Dr. Christine Byrum

while at Duke, she also became involved in the sea urchin genome project. In the Fall of 2007, Dr. Byrum started her current position as an Assistant Professor in the College's Department of Biology. Currently Dr. Byrum works on cell signaling pathways in the sea urchin, *Lytechinus variegatus*, and the sea anemone, *Nematostella vectensis*. As in most animals, development in the sea urchin produces 3 primary tissue layers: ectoderm (forms skin and the nervous system), endoderm (the gut and associated structures), and mesoderm (skeleton, reproductive organs, coeloms, muscle). The molecular interactions responsible for formation of the early mesoderm have been well documented in sea urchins, however little is known about how embryonic sea urchin muscle forms or which muscle types comprise this organ. To learn more about these molecular pathways, Dr. Byrum is working with three undergraduates (**Mark Hutto**, **Erica Flores**, and **Travis O'Dell**) to identify and isolate

skeletal and smooth muscle markers. In later studies, they plan to use these markers in functional analyses that will test which cell signaling molecules regulate production of muscle in sea urchin development.

Although sea urchins may seem to be obscure organisms to investigate, the reasons they are excellent models for molecular developmental research range from the public availability of the sea urchin genome in 2006 to their ability to simplify complex, human molecular interactions. Recently a "systems biology" approach, a subdivision of genomics that attempts to link the appearance of an organism to the molecular processes responsible for creating this appearance, has been established within the sea urchin research community. The Byrum laboratory hopes that their studies will help further our understanding of the formation of muscle mesoderm. Also, because the cell signaling pathways being investigated are crucial in cell specification and differentiation and because many of these pathways are conserved in humans, these studies are quite likely to be relevant to research in human embryonic development, stem cells, muscle disorders, cancer, regeneration, and recovery after injury.

Another organism that Dr. Byrum is investigating is the sea anemone *Nematostella vectensis*. Like the sea urchin, the genome of this animal has also been sequenced. Because *Nematostella* belongs to an evolutionarily basal group (the phylum Cnidaria), it should prove to be a key species for understanding the evolution of cell signaling pathways. Byrum's laboratory is currently working with undergraduate, **Brandon Finch**, to improve culture techniques in *Nematostella*. She is also involved with **Francis (Drew) Wham**, Dr. Phil Dustan's Marine Genomics graduate student, comparing bacteria isolated from different coral habitats to learn more about the nature of symbiotic interactions in corals. Lastly, in collaboration with Dr. Beth Meyer-Bernstein's lab, Dr. Byrum has also started a preliminary project investigating circadian behavior in *Nematostella*.



## GPMB DEGREES

**Tom Baird** – Descriptive and Mechanistic Toxicity of Conazole Fungicides Using the Model Test Alga *Dunaliella tertiolecta*. (Advisor: Marie DeLorenzo)

**Claudia Friess** – Life History and Population Structure of *Beryx decadactylus* in the Western North Atlantic. (Advisor: George Sedberry)

**Anna Greene** – Invertebrate Endofauna Associated with Sponge and Octocoral Epifauna at Gray's Reef National Marine Sanctuary off the Coast of Georgia. (Advisor: Jeff Hyland)

**Claire Hanson** – The Effect of Temperature on the Vertical Movement and Swimming Behavior of Larval Southern Flounder and Implications for Inshore Migration. (Advisor: Marcel Reichert)

**Sara Jones** – Effects of Urbanization on Nekton Abundance and Food Web Structures in Southeastern Tidal Creeks. (Advisor: Guy DiDonato)

**Luis Leandro** – Trophic Transfer of the Marine Algal Biotoxin Domoic Acid to the North Atlantic Right Whale. (Advisor: Greg Doucette)

**Ammon Leshner** – An Analysis of Larval Dispersal and Retention within the South Atlantic Bight Using Satellite-Tracked Drifters Released on Reef Fish Spawning Grounds. (Advisor: George Sedberry)

**Amanda McCarty** – Regional Variation in Feeding Preferences of the Marine Herbivore *Ampithoe longimana*. (Advisor: Erik Sotka)

**Artur Veloso** – Viral Infection and the Transcriptome of the Pacific Whiteleg Shrimp: The Effect of Taura Syndrome Virus and Yellow Head Virus in Two Strains of *Litopenaeus vannamei* Different In Their Resistance to TSV. (Advisor: Bob Chapman)

**Travis Washburn** – The Macrobenthic Communities of the Southeastern United States: Effects of Land Use on the Macrobenthic Communities and the Spatial Variability of Dominant Macrobenthic Organisms within Creek Systems. (Advisor: Denise Sanger)

**Kim Wieber** – Habitat Associations of Demersal Fishes on the Charleston Bump and Adjacent Blake Plateau. (Advisor: George Sedberry)



## STUDENT AWARDS

**Jonathan Craft** was awarded a predoctoral fellowship to conduct research under Valerie Paul at the Smithsonian Marine Station in 2008. The work targeted elucidation of marine herbivore tolerance for macroalgal chemical defenses.

**Daniel Fernandes** was awarded the Alan Kohn Fellowship from the University of Washington at the Friday Laboratories for the Summer of 2009.

**Jen Fountain** was awarded a Research Presentation Grant from the College of Charleston to attend the annual American Fisheries Society meeting in Ottawa, Canada in August 2008.

**Megan Kent** won the Sigma Xi award for best oral presentation at the 2009 Graduate Research Colloquium.

**Joe Pollock** was awarded a Fulbright Fellowship to study coral disease in Australia.

**Jared Ragland** was awarded first place for his poster presentation during the spring 2009 SETAC meeting.

**Nora Sturgeon** was awarded the Joanna Deepwater Fellowship for summer 2009.

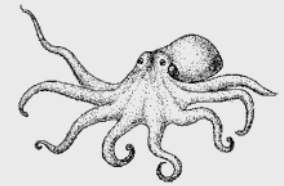
**Steven O'Connell** and **Allie Kreutzer** won awards at the 2009 Graduate Student Research Poster Session in the Science and Math category.

**Kolo Rathburn** won the Leo Higdon Presidential Legacy Award for Leadership. This is a College of Charleston ExCEL Award.



## OCTOCLAUS

We participated in the 2009 Folly Beach Christmas Parade. The RV Chamberlain was decorated with a large stuffed octopus dubbed "OCTOCLAUS." Graduate students dressed up as various sea creatures and threw candy canes to the delighted kids lining Folly Road. "Octoclaus" won 2<sup>nd</sup> place in the parade!



### Grice Staff

**Lou Burnett**  
GML Director &  
Professor of Biology

**Craig Plante**  
GPMB Director &  
Professor of Biology

**Shelly Brew**  
Administrative Assistant

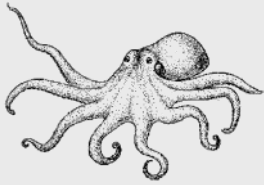
**Sarah Prior**  
Laboratory Manager

**Peter Meier**  
Marine Operations  
Manager

**Dawn Malone**  
Administrative Specialist

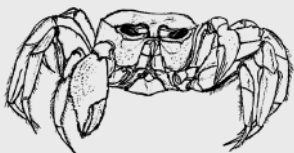
**Melannie Richmond**  
Laboratory Assistant

**Tricia Roth**  
Molecular Core Facility  
Manager



*“Alumni, please let us know what you are up to!”*  
[marine@cofc.edu](mailto:marine@cofc.edu)

*“Grice Logbook is available on-line at [www.cofc.edu/grice](http://www.cofc.edu/grice)”*



## Alumni Notes

**Jane (Davis) Settle (1981):** After receiving her MS, Jane taught Freshman Biology at the College of Charleston for 2 years as a Visiting Instructor, during the latter part of which she was offered a position with the Environmental Evaluations Section (EES) of the Marine Resources Division of SCDNR at Fort Johnson. Jane accepted this position and held it for 13 years. She was responsible for dealing with a variety of environmental issues, primarily related to water quality and potential impacts to resources. During her work with SCDNR, she continued to keep her SC Teachers' Certification current, feeling that teaching was her other career desire. In 1996, Jane accepted a position teaching 5th and 6th grade science at Porter-Gaud School in Charleston. Since 2005, she has been teaching only 6<sup>th</sup> grade Life Science, infusing as much marine science as she can into her curriculum. Jane's daughter, Legare (21) is a junior at Furman and her daughter, Rebecca (18) is a senior (and Student Body President) at Porter-Gaud. Rebecca and Jane live at 12 Sheridan Road in South Windermere subdivision in Charleston with their 2 dogs and 3 cats. Jane's snakes, turtles, lizards and hedgehog live in her classroom!

**Michelle Lee (2003):** Michelle is in her fourth year of teaching biology at James Island Charter High School where she has made some big accomplishments thus far. She involves her biology students in service learning projects to help the local environment by collaborating with Stacey Crocker (GPMB Alum, '07) and Lowcountry Earth Force. Last year, students wrote and received a grant for \$10,000 to plant a native butterfly garden on the school's campus. This year, students built “cigarette butt cannons” and installed them on Folly Beach with Charleston Surfrider Foundation. They also made recycling commercials that will be distributed to every school in Charleston County. Michelle was voted James Island's Teacher of the Year by her colleagues and is currently in the Top Ten Semi-Finalists for the whole county!

**Stephanie Rexing (2006):** Stephanie is earning her Juris Doctorate Degree with a specialization in Environmental Law at Golden Gate University in San Francisco. She worked a summer internship

with the California Coastal Commission in 2008. The mission of the Coastal Commission is to: protect, conserve, restore, and enhance environmental and human-based resources of the California coast and ocean for environmentally sustainable and prudent use by current and future generations. Stephanie's tasks included participating in legal brief writing, discovery and procedural aspects of the Commission's causes of action. Stephanie is currently completing her second year of law school and has been certified by the State Bar of California as a Certified Practicing Law Student with the Environmental Law and Justice Clinic at Golden Gate University. She is participating in causes of action that deal with environmental blights in traditionally underprivileged and minority neighborhoods of the Bay Area. Stephanie will graduate in May of 2010.

## Faculty Notes

**Burnett Lab.** Heidi Williams and Lindy Thibodeaux received their masters' degree. Heidi now works for Analytical Biological Services, Inc. and Lindy teaches Human Anatomy & Physiology at Roanoke College in Virginia. Natasha Sharp is a new post-doc in the lab coming from the University of Southern Mississippi. Research continues on the mechanisms of disease in marine organisms and how environmental variables influence disease resistance.

**Harold Lab.** Current projects include Neotropical freshwater fish systematics and ecology (undergrad Jen Tschaikevsky; MES grad student Paul Haywood), marine fish systematics (undergrad Iris Kemp; GPMB grad student Ray Simpson), and community ecology of inshore macrofauna (Jackie Wilkie, GPMB). Rachel Worthen (MES) is working as a curatorial assistant in the collection and is working on a research project involving deep-sea hatchetfishes. Publications from the last year include a description of a new species of characid from the Andes of Peru (with co-author Norma Salcedo, Visiting Assistant Professor in Biology) and two chapters on deep-sea fishes in the 2008 Fishes of Australia's Southern Coast.

**Owens Lab.** This past year included a busy field season with Dave Owens and Gaëlle Blanvillain (Research Technician &

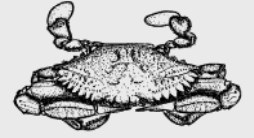


# RESEARCH COLLOQUIUM 2009

The 12<sup>th</sup> annual Marine Biology Student Research Colloquium was held on February 6<sup>th</sup> and 7<sup>th</sup>, 2009. The keynote speaker, **Dr. Stephen Palumbi**, is a professor at Stanford University and he directs the Hopkins Marine Station in Pacific Grove, California. His research group engages in the study of the genetics, evolution, conservation, population biology and systematics of a diverse array of marine organisms including sea urchins, whales, cone snails, corals, sharks, shrimps, bryozoans, and butterflyfishes. A primary focus is the use of molecular genetic techniques in conservation. Current conservation work centers on the genetics of marine reserves designed for conservation and fisheries enhancement, with projects in the Philippines, Bahamas and western US coast. In addition, basic work on the molecular evolution of reproductive isolation and its influence on patterns of speciation employs marine model systems such as sea urchins. Dr. Palumbi kicked off the event with his keynote address "Local Adaptation in Marine Species: The Balance of Selection and Dispersal and Implications for the Impact of Global Climate Change." A poster session and social followed.

Sixteen students participated in the oral presentations on Saturday. The oral presentations were evaluated by a panel of judges on the basis of: 1) scientific content including articulation of the problem, soundness of hypothesis testing, methodology, and data 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. **Meggie Kent** received the Best Oral Presentation Award

this year for her talk titled "Relative Contribution of Taxonomic Groups within Microbial Biofloc Communities to the



Growth of *Litopenaeus vannamei* When Provided as Dietary Supplements." It is known that plant-based feeds used in conjunction with photoautotrophic biofloc systems can produce growth equal to fishmeal-based feeds fed to shrimp in superintensive clear water systems. It is unclear which groups of microbes are providing the supplemental nutritional benefit. The goals of Meggie's research, conducted with Dr. John Leffler and others, are to identify the specific biological components within the microbial biofloc that provide supplemental nutrition to Pacific white shrimp. They would also like to identify which nutrients are being contributed by the biofloc.

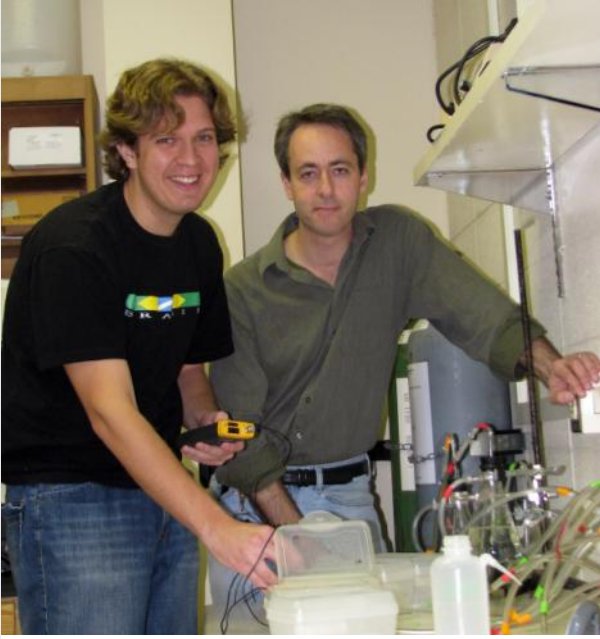
Dr. Palumbi followed the last student presentation with his second talk titled "The Otter, the Mayor and the Billionaire: How They Brought Monterey Bay Back to Life." The day was finalized with a Lowcountry Boil, held in the outdoor classroom at the Marshlands House.



**Dr. Steve Palumbi congratulates Meggie Kent, who won the award for best presentation.**



## Sex and the Single Cell



Grad student Daniel Fernandes (left) sets up an experiment with Dr. Bob Podolsky

rate, hatching success, and size of embryos. **Suzanne Kacenas**, another graduate student, is studying differences in the heat shock response of embryos and in the construction of egg masses across populations from field sites that differ in physical conditions. An undergraduate, **Sylvia Lewis**, examined a different aspect of risk for these egg masses, involving predation on embryos, by testing whether egg masses chemically deter feeding by three types of crab predators.

Another major focus of this research involves problems associated with dissolved gases. For example, when embryos develop in large clutches they can severely deplete available oxygen. **Podolsky** and a collaborator have shown that association with photosynthetic organisms, like diatoms and eelgrass, can substantially increase the oxygen available to embryos. **Kacenas** found that diatom growth is determined in part by where adults deposit egg masses. **Fernandes** has shown that embryos in the presence of eelgrass blades developed significantly

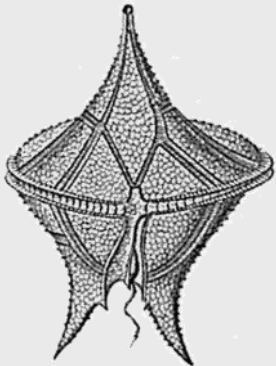
faster, though as expected only under high light conditions. More recently, the lab has become interested in effects of increasing CO<sub>2</sub> in the oceans, which leads to acidification and the loss of structures built from calcium carbonate, like mollusc shells. Studies initiated by an undergraduate, **Haley O'Brien**, and now being continued by **Fernandes** and another undergraduate, **Mary McCumber**, are addressing how future changes in CO<sub>2</sub> could affect shell production by gastropod larvae, and how the weakness of a thinner shell could increase the risk of predation.

Given that embryos are “on their own” once deposited in these challenging locations, **Podolsky** has recently turned to understanding the importance of what are known as “maternal effects”—non-genetic benefits that can be transmitted from mother to offspring. For example, he has been testing experimentally whether mothers that are heat-stressed or exposed to ultraviolet light give rise to offspring that are better able to withstand those stresses. Although the benefits themselves—for example, increased packaging of heat shock proteins in the egg—would be non-genetic, the ability to produce and pass them on could be genetic and therefore under selection.

Dr. Podolsky has taught the sophomore level core course in Biodiversity and Ecology as well as Invertebrate Zoology courses at the undergraduate and graduate levels.

## FACULTY NOTES CONT.

(Continued from page 4)



GPMB Alum) doing an intensive green sea turtle sampling protocol in Bermuda, confirming a long-term trend in increased numbers of females. Courtney Arthur (GPMB) did a series of seminars around the country on oceanic debris and the “Garbage Patch” pollution problem as part of her Knauss Fellowship. Similarly, Nora Sturgeon (GPMB) completed her field work on crab traps versus dolphin interactions. Elizabeth Broyles (GPMB) had a good diamondback terrapin tagging season and is using the program MARK to generate estimates of just how many terrapins are out there. Jesse Alder-

son’s (GPMB) thesis project is designed to help understand why so many sea turtles are injured.

**Plante Lab.** The focus of Craig Plante’s Lab continues around the microbial ecology of marine sediments; recent work has examined the role of disturbances in structuring benthic microalgal communities. University of Akron undergrad Emily Frank (REU) worked with Dr. Plante looking at the effects of disturbances caused by sediment-feeding invertebrates and tidal resuspension. A second area of research deals with the production of antimicrobial compounds by benthic bacteria and will characterize the ecological role of antagonistic interactions among bacteria. Much of this work has been performed

(Continued on page 8)



## UNDERGRAD RESEARCH

(Continued from page 1)

Biomolecular Research and the National Institute of Standards and Technology, two state agencies: the Marine Resources Research Institute of the SC Department of Natural Resources, as well as the Marine Biomedical and Environmental Sciences Program of the Medical University of South Carolina. Three interns, Shannon Wright, Madeleine Zaehringer and David Stancyk, examined the blue crab's metabolic response to bacterial infection using different approaches, including a treadmill and oxygen probe, proteomic technology and NMR-based metabolomics, respectively. Emily Frank and Matt Bertucci studied the impacts of two types of physical disturbance, tidal wash and beach renourishment, on marine communities. Three interns addressed the risks associated with toxicants on marine organisms. Elise Dennis improved the precision of organic contaminant measurements in Alaskan seabird eggs. Joshua Hanagriff clarified the mechanism of toxicity of a marine algal toxin, azasipracid, on human cells. Loren Danese provided a vivid demonstration that toxicant effects can intensify with changes in temperature and salinity that may accompany global warming in the near future. Interns presented their data orally at the Student Research Symposium on August 6, 2008, and as written manuscripts that were bound and distributed to all participants, mentors and participating institutions.

The high quality of research produced by interns in the Summer Program is evident from a solid publication record. During 2008, for example, five manuscripts coauthored by the interns were accepted for publication in peer-reviewed science journals. The scientific impact of research in the Summer Program is being enhanced further by a collaborative effort with the University of South Carolina to publish internship manuscripts in the NSF-sponsored undergraduate online journal MarSci. Look for Claire Campbell's soon-to-be-published manuscript on stress responses in the cnidarian *Nematostella*, in MarSci (<http://www.msci.sc.edu/marsci/index.html>).

The Fort Johnson Undergraduate Summer Research Program continues to enjoy en-

thusiastic participation of mentors faculty, strong support from partner institutions, and an ever-increasing applicant pool. The future of research in marine biology looks very bright!

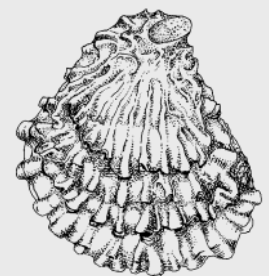
## GRICE WELCOMES NEW STAFF

**M**elannie Richmond joined the Grice Marine Lab in November 2008. She is originally from Michigan where she earned her BS in Zoology from Michigan State University. At MSU, she worked in a neuroscience laboratory researching the effects of neonatal hormone exposure on adult rat behaviors. After graduating, Melannie and her husband Doug moved to Myrtle Beach where she worked as a keeper at Alligator Adventure. In July of 2008, she and her husband moved to Charleston. She became a Charleston Dolphin Abundance and Distribution (CDAD) intern and worked on dolphin photo-identification surveys. She is proud to be a Grice laboratory assistant and hopes to continue improving the quality of the lab. Some of her job duties include chemical and equipment inventories, safety and facility inspections, wetlab and display aquarium maintenance, and working with the Grice Collection. Melannie also assists with the laboratory outreach program and helps other faculty, staff, and students whenever possible. When she is not hard at work, you can find her enjoying the sunny weather at the beach, as well as spending quality time with her black lab mix, Cooper.

We are delighted to announce that Pete Meier is the Marine Operations Manager, serving as the boat captain and the safety officer for the fleet. Pete will also supervise animal care. Dawn Malone is the new Administrative Specialist and will support Shelly Brew and the graduate program with admissions and other office duties.

## GEORGE GRICE, JR. LECTURE

**T**he second annual George Grice, Jr. lecture was given by **Dr. Chuck Derby** of Georgia State University. Dr. Derby spoke on "Chemical Communication in Affiliation, Aggression, and Mating of Decapod Crustaceans."



**FACULTY NOTES CONT.**

*(Continued from page 6)*

by undergrad Amanda Kinney, with the help of Tricia Roth, a technician in the Plante lab and GPMB alum.

**Sancho Lab.** The fish behavioral ecology lab was busy with undergraduate research projects this past fall. Chad Capece and Michael Illig spent the summer tracking from a kayak acoustically tagged spotted seatrout in Grice Cove, and describing their micro-habitat use during different tides. Alison Deary started analyzing oceanographic data collected by Sea Education Association (SEA) sailing vessels in the tropical and equatorial Pacific waters in order to describe the epipelagic environmental variability of the habitat of tropical tuna species. Sancho is presently on sabbatical leave in Spain, preparing a

new summer course on Natural History of Spain and starting a new recreational tagging program of dolphinfish in the eastern Atlantic.

**Sotka Lab.** Erik Sotka was invited to give a symposium talk at the Society of Integrative and Comparative Biology (January 2009 in Boston, MA). GPMB student Jonathan Craft gave a talk about his work with urchins and seaweeds in an associated session of the symposium. For this work, Jonathan spent nearly two months of summer 2008 at the Smithsonian Marine Station in Fort Pierce, Florida. Beth Cushman and Amanda McCarty received their Masters' degree from the Graduate Program in Marine Biology during the past year. Beth was named 'Outstanding Graduate Student' in the GPMB and is now working for the SCDNR on the genetic identification of red drum. In January 2009, Amanda finished a Knauss Fellowship in Washington, DC working with a Senate Committee on Commerce and has taken a position in the Climate Change group at NOAA. On a personal note, Erik welcomed a new daughter into the world (Liv Sotka) in May.



**Grice's CORAL (Community Outreach Research & Learning) Program reaches out to local students.**

**GML Logbook - 8**

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