Southeastern Estuarine Research Society

Semi-annual Meeting

April 17 – 19, 2013

Fort Johnson Marine Resources Center
Charleston, SC

PROGRAM & ABSTRACTS

SEERS

The Southeastern Estuarine Research Society (SEERS) is a 501(c)(3) non-profit educational organization dedicated to the informal exchange of interdisciplinary information related to estuaries of the southeastern United States. SEERS promotes discussion of estuarine research, science, and management; promotes discussion of current research projects and management issues; and encourages participation of student colleagues. SEERS membership is largely, but not exclusively, from the states of NC, SC, GA and FL. SEERS typically meets twice per year, including the biennial Coastal and Estuarine Research Federation Conference. SEERS is an affiliate society of the Coastal and Estuarine Research Federation (CERF). SEERS website: www.SEERS.org

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SEERS would like to thank the following for their contributions to this meeting:

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Our Local Hosts:
Marie DeLorenzo, NOAA, National Ocean Service
Denise Sanger, SCDNR

Session Chairs
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The Program Chair would like to thank Kate Doyle and Sugeiry Rivera of Savannah State University for their assistance with the program, as well as Brigette Brinton, Keya Jackson, and Jenn Gut

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Donald Hoss (Honorary)	2007
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Chair of Student Promotions Committee (Travel Awards):
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SEERS Congratulates our Student Travel Award Winners:

Full Award

Charles Best, Georgia Regents University
Breanna Korsman, University of North Florida
Natalie McLenaghan, University of Georgia
Ben Toscano, University of South Carolina
Chanel Young, Georgia Regents University

Partial Award

Melissa Gieseking, Georgia Regents University
Zach Hedley, University of South Carolina, Beaufort
Sierra Mannix, Georgia Regents University
Loren Mathews, University of Florida
Michelle Zimberlin, University of South Carolina

Student Representative Travel Awards

Mary Grace Lemon, University of North Carolina Wilmington
Sylvia Schaefer, University of Georgia

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SEERS T-shirts and stainless steel water bottles with the new SEERS logo will be available for purchase during all registration times, lunch and breaks. They make great Birthday gifts!

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SOUTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES


NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

Southeastern Estuarine Research Society
April 17 – 19, 2013
Fort Johnson Marine Resources Center, Charleston, SC

PROGRAM

All events are in Fort Johnson Marine Resources Center (see map at end of program).

Schedule at a Glance

Wednesday, April 17

9:15 a.m. – 10:15 a.m.	YSI Workshop (everyone welcome; free) DNR/MRRI Indoor Classroom
10:30 a.m. – 12:30 p.m.	Hach Hydromet/Sea-Bird Scientific Workshop (everyone welcome; free) DNR/MRRI Indoor Classroom
1:30 p.m. – 4:30 p.m.	Workshop on Green Infrastructure (full, previous sign up was required) CCEHBR Auditorium
4:30 p.m. – 5:30 p.m.	Registration and poster setup
5:30 p.m. – 7:30 p.m.	Poster session and social with snacks and beverages Front lobby of DNR/MRRI building

Thursday, April 18

8:00 a.m. – 4:15 p.m.	All day oral presentation sessions in MRRI Auditorium
11:30 a.m. – 1:00 p.m.	Lunch will be provided in DNR Outdoor Classroom (*Poster Presenters: Please stand by your poster from 12:15-12:45 p.m.*)
4:15 p.m. – 5:15 p.m.	SEERS Business Meeting in MRRI Auditorium
5:30 p.m. – 8:00 p.m.	Evening Banquet in DNR Outdoor Classroom

Friday, April 19

8:15 a.m. – noon	Half-day oral session at DNR/MRRI Auditorium Student Award winners announced at 11:45!

PLATFORM PRESENTATIONS

- **Presenting author is underlined**
- **Graduate student authors (*)**
- **Undergraduate student authors (**)**

Thursday 8:00 Welcome: Robert Virnstein – SEERS President, Marie DeLorenzo – Local Host, and Carla Curran – SEERS Program Chair, Robert Van Dolah – MRRI Director

Thursday 8:30 – 10:00 a.m. Session I
Moderators Ashlee Lillis – NCSU and Geno Olmi – NOAA

8:30 Seasonal dissolved inorganic nitrogen and phosphorus budgets for two sub-tropical estuaries in south Florida, USA
C. Buzzelli, Y. Wan, and P. Doering, Coastal Ecosystems Section, South Florida Water Management District; J. N. Boyer, Center for the Environment and Environmental Science and Policy Department, Plymouth State University

8:45 Nitrogen vs. Phosphorus Limitation of Algal Blooms in the Indian River Lagoon, FL: Spatial and Temporal Trends
*Brian Lapointe, Laura Herren, and David Debortoli**, Harbor Branch Oceanographic Institute at Florida Atlantic University*

9:00 Determining factors that influence the molecular quantification of the harmful raphidophyte *Heterosigma akashiwo* using a sandwich hybridization assay (SHA)
Cameron Doll, University of South Carolina; and Dianne I. Greenfield, Belle W. Baruch Institute for Marine and Coastal Science and the Marine Sciences Program, University of South Carolina; South Carolina Department of Natural Resources, Marine Resources Research Institute

9:15 The influence of nitrogen and phosphorus on seasonal phytoplankton biomass and community composition in four coastal South Carolina systems
M. Reed, College of Charleston, Graduate Program in Marine Biology, Charleston, SC; L. Brock and C. Keppler, Marine Resources Research Institute, Department of Natural Resources; S. Kacenas, Belle W. Baruch Institute for Marine and Coastal Sciences and the Marine Sciences Program, University of South Carolina; S. Hogan and D.I. Greenfield, Marine Resources Research Institute, Department of Natural Resources, and Belle W. Baruch Institute for Marine and Coastal Sciences and the Marine Sciences Program, University of South Carolina*

9:30 Primary productivity and respiration in fresh-to-oligohaline tidal creeks
Lauren Bohrer, Michael A. Mallin, Matthew R. McIver, and Lawerence B. Cahoon, University of North Carolina Wilmington*

9:45 Tidal variation in porewater distributions and sedimentary fluxes of oxygen, nutrients, sulfur and redox-sensitive metals in an urban tidal creek, "Withers Swash", Myrtle Beach, SC
Joshua P. Driscoll, Coastal Carolina University; Leigha E. Peterson*, Brent L. Lewis and Richard N. Peterson*

BREAK 10:00 a.m.-10:30 a.m.
Please take time to check out the SEERS merchandise

Thursday 10:30 a.m. – 11:30 a.m.
Moderator: Marie DeLorenzo – NOAA, National Ocean Service

10:30 Climate change and effects on microbes and HABs
Geoff Scott, NOAA, National Ocean Service

11:00 Is climate change negatively affecting the brown shrimp fishery?
David Whitaker and Larry DeLancey, SCDNR Marine Resources Division

LUNCH 11:30 a.m. – 12:15 p.m. followed by POSTER VIEWING 12:15 p.m. – 1:00 p.m.
Poster Presenters: Please stand by your poster from 12:15 – 12:45 p.m.

Thursday 1:00 – 2:15. Session II
Moderator: Sylvia Schaefer – UGA

1:00 Good Vibrations: Characterizing estuarine soundscapes from a larval settlement perspective
Ashlee Lillis, David B. Eggleston, and DelWayne R. Bohnenstiehl, Department of Marine, Earth & Atmospheric Sciences, North Carolina State University*

1:15 Assemblage structure and seasonality of the ichthyoplankton community ingressing into a northeast Florida estuary
B. Korsman, University of North Florida, M. E. Kimball, University of North Florida and the Guana-Tolomato-Matanzas National Estuarine Research Reserve*

1:30 Comparing bait fish among three barrier islands of the Georgia-Carolina coastal region
*Charles Best**, Bruce Saul, Jessica Reichmuth, Georgia Regents University*

1:45 Do we stay or do we go? A study of site fidelity among three species of marine fishes
*Melissa Gieseking** and Jessica Reichmuth, Georgia Regents University*

2:00 Life history trends of gray triggerfish *Balistes capriscus* in the South Atlantic Bight from 1990-2011
A. Kelly, Graduate Program in Marine Biology, College of Charleston; V. Shervette, University of South Carolina Aiken; M. Reichert and T. Smart, South Carolina Department of Natural Resources; and D. Owens, Graduate Program in Marine Biology, College of Charleston*

BREAK 2:15 p.m. – 2:45 p.m.

Thursday 2:45 – 4:15. Session III
Moderators: Cameron Doll – USC and Dianne Greenfield – USC and SCDNR

2:45 Molecular profiling of zooplankton diet using PNA-PCR and denaturing high performance liquid chromatography (PNA-PCR-DHPLC)
Tina L. Walters and LaGina M. Frazier*, Savannah State University and Skidaway Institute of Oceanography; Gustav A. Paffenhöfer and Marc E. Frischer, Skidaway Institute of Oceanography*

3:00 Microzooplankton grazing experiments from the Indian River Lagoon reveal complex trophic interactions
Nikki Dix and Dennis Hanisak, Harbor Branch Oceanographic Institute at Florida Atlantic University

3:15 Trophic responses to polycyclic aromatic hydrocarbons and copper exposure in tidal flats of North Inlet, South Carolina
Leslie L. Muggelberg and James L. Pinckney, University of South Carolina*

3:30 Mercury bioaccumulation in the longnose gar (*Lepisosteus osseus*): a model species for examining patterns of MeHg uptake
Meredith Smylie, College of Charleston; Virginia Shervette, University of South Carolina Aiken; Christopher McDonough, South Carolina Department of Natural Resources; Lou Ann Reed, National Oceanic and Atmospheric Administration*

3:45 Trait-mediated functional responses: consumer personality and fear mediate prey consumption
Benjamin J. Toscano and Blaine D. Griffen, Department of Biological Sciences and Marine Science Program, University of South Carolina*

4:00 Population genetics of three crab species along the southeastern Atlantic coast

*April Hammack**, Sierra Mannix**, Austin Coleman**, Amy Abdulovic-Cui, and Jessica Reichmuth, Georgia Regents University*

Thursday 4:15 – 5:15 SEERS Business Meeting in MRRI Auditorium

Thursday 5:30 – 8:00 Banquet Dinner in DNR Outdoor Classroom

Friday 8:15 a.m. Welcome: Robert Virnstein – SEERS President, Denise Sanger and Marie DeLorenzo – Local Hosts, and Carla Curran – SEERS Program Chair

Friday 8:30 – 10:00 a.m. Session IV
Moderators: Robert Dunn – NCSU and Bob Virnstein – St. Johns River Institute, Inc.

8:30 Linking harmful algal bloom (HAB) research with public awareness through outreach: The HAB and human health educator initiative
Sarah Hogan, Marine Resources Research Institute; S.C. Department of Natural Resources; Dianne I. Greenfield, Marine Resources Research Institute; S.C. Department of Natural Resources, Belle W. Baruch Institute for Marine and Coastal Sciences, Marine Sciences Program, University of South Carolina; Susan Ferris Hill and Rick DeVoe, South Carolina Sea Grant Consortium

8:45 Modeling phytoplankton productivity to analyze natural and anthropogenic influences on the trophic status of the Caloosahatchee Estuary, Florida, USA
Loren Mathews and Edward Phlips, University of Florida*

9:00 Eastern oyster early-life demographic parameters on alternative reef-building substrate materials
Robert P. Dunn and David B. Eggleston, NC State University Center for Marine Sciences and Technology; and Niels Lindquist, UNC-Institute of Marine Sciences*

9:15 Conservation and management of estuarine-dependent fisheries resources within Akanda and Pongara National Parks, Gabon, West-Central Africa: contributions to ensuring aquatic-resource-based food security within the greater Libreville region
Evan Chipouras, Department of Biology, University of Tampa

9:30 Fish assemblages of the mangrove-dominated Komo River and Mondah Bay Estuaries, Gabon, West-Central Africa
Evan Chipouras and Erich J. Dietterle, Department of Biology, University of Tampa

9:45 Use of simulation modeling for decision support in adaptive management of least tern (*Sternula antillarum*) nesting habitat
William Kanapaux, Pennsylvania Cooperative Fish & Wildlife Research Unit, Pennsylvania State University; Greg Kiker, Department of Agricultural and Biological Engineering, University of Florida.

BREAK 10:00 – 10:30 a.m.

Friday 10:30 – 11:45 a.m. Session V

Moderators: Brigette Brinton – SSU and Dave Eggleston – NCSU

10:30 The interplay of climate drivers affecting freshwater delivery to the Altamaha River estuary: watershed scale and regional context
Joan E. Sheldon and Adrian B. Burd, University of Georgia

10:45 Aquatic nutrient monitoring on process time scales
Charlotte Clark and Ian Walsh, WET Labs

11:00 Addressing the Changing Face of Coastal South Carolina: The Sea Grant Perspective
M. Richard DeVoe, S.C. Sea Grant Consortium

11:15 Biotic, physical and meteorological factors maximizing N loss in a constructed wetland
Michael A. Mallin, Bongkeun Song, Andrew Long, and Matthew McIver, UNC Wilmington*

11:30 Potential for estuarine habitat restoration by closing an obsolete navigation cut: Noyes Cut, Satilla River estuary, southeastern Georgia
Clay L. Montague, University of Florida; and Fred Voigt, Jr., Dover Bluff Hunting and Fishing Club

11:45 Closing Remarks and Award Presentations

POSTER PRESENTATIONS (in order by number)

- **Presenting author is underlined**
- **Graduate student authors (*)**
- **Undergraduate student authors (**)**

1. Interpretation of biological activity using an Acoustic Backscatter Sensor (ABS)
*Courtney Elliton*** and Ansley Wren, Coastal Carolina University*

2. Quantifying bivalve veligers in plankton collections: comparing the effectiveness of different mesh sizes
*Stephanie Krug**, Coastal Carolina University; Juliana M. Harding, Coastal Carolina University; and Dennis M. Allen, Baruch Marine Field Laboratory/University of SC*

3. Identification of osmoregulatory ion transporters from gills of the Carribean spiny lobster using degenerated oligonucleotides designed on evolutionary conserved protein domains
Giuliana Gusmaroli and Stephen A. Borgianini, University of South Carolina Beaufort

4. Sandwich hybridization assay (SHA) as a novel genetic approach for rapid identification and quantification of red drum (*Sciaenops ocellatus*) eggs.
Rebecca Mortensen, College of Charleston; Steve Arnott, Marine Resources Research Institute, South Carolina Department of Natural Resources; William J. Jones, Arnold School of Public Health, Marine Sciences Program, University of South Carolina; Dianne I. Greenfield, Belle W. Baruch Institute for Marine and Coastal Sciences, Marine Sciences Program, University of South Carolina, Marine Resources Research Institute, South Carolina Department of Natural Resources*

5. Genetic population structure of black drum (*Pogonias cromis*) in US waters
Jacqueline Leidig, College of Charleston-GPMB; Virginia Shervette, University of South Carolina Aiken; Tanya Darden, SCDNR-MRRI; and Chris McDonough, SCDNR-MRRI*

6. Changes in sediment properties of the Savannah River estuary corresponding with precipitation in the Savannah River drainage basin, 2012
*Meghan Maylone**, Faith Palmer**, and Carol Pride, Savannah State University*

7. Seasonal and annual variations of surface diatom distribution in the Savannah River estuary
Brian Christopher Murry and Carol Pride, Savannah State University*

8. Abiotic versus biotic removal mechanisms of TSS and Chl a over *Crassostrea virginica* reef structure
Mary Grace Lemon, Martin Posey, Michael Mallin, Lynn Leonard, and Troy Alphin, UNCW Center for Marine Science*

9. Nutrient limitation of bioluminescent dinoflagellates in Mangrove Lagoon, Salt River Bay, St. Croix, USVI
Michelle E. Zimberlin and James L. Pinckney, University of South Carolina*

10. Modeling the effects of freshwater runoff on estuarine pelagic primary production
*Zachariah Hedley**, Aaron Palmieri**, Gloria Welch**, Kasia A. Pawelek, and Stephen A. Borgianini, University of South Carolina Beaufort*

11. Shoreline armoring in coastal Georgia: Do landscape characteristics matter?
Natalie McLenaghan, Merryl Alber, and Jeff Hepinstall-Cymerman, University of Georgia; and Clark Alexander, Skidaway Institute of Oceanography*

12. Coastal urban greenways as a stopover point for migrating birds
Sarah Diaz and Paul Nolan, The Citadel*

13. Avian community response to seasonal and successional changes along the Cooper River, SC
Pamela Corwin, Dept. of Biology, The Citadel and SC Dept. of Natural Resources—Dennis Wildlife Center; and Paul M. Nolan, Dept. of Biology, The Citadel*

14. Oyster demographic rates in fished areas: recruitment, growth, and mortality
Jason W. Peters and David B. Eggleston; North Carolina State University*

15. Early life history of two oyster reef fishes in North Inlet, SC
Rachel M. Tremont, and Juliana M. Harding, Coastal Carolina University; and Dennis M. Allen, Baruch Marine Field Laboratory/University of South Carolina*

16. Current Status of the Ctenophore (*Mnemiopsis leidyi*) in Upper Barnegat Bay, New Jersey
John A. Tiedemann, Monmouth University; Nicole Wisniewski, College of Charleston; and Keith P. Leonard, Monmouth University*

17. Salt marsh fish assemblages along an urbanization gradient in Barnegat Bay.
*Gina Clementi**, University of Miami; Kenneth Able and Thomas Grothues, Rutgers University*

18. Variation in fish assemblages between estuarine and coastal sites near the mouth of the Savannah River, Georgia
Jennifer A. Gut, Savannah State University; Jessica M. Reichmuth, Georgia Regents University; and Mary Carla Curran, Savannah State University*

19. Residency and movement patterns of three species of elasmobranchs in Georgia during the off season
Charles Cotton and Mary Carla Curran, Savannah State University

20. Site fidelity, home range, and population demographics of two grass shrimp species in North Inlet, SC
*Karla Stroud**, Coastal Carolina University; Juliana M. Harding, Coastal Carolina University; and Dennis M. Allen, Baruch Marine Field Laboratory/University of South Carolina*

21. A snail's pace: density, movement, and food choice of the marsh periwinkle
*Chanel J. Young**, Georgia Regents University*

22. Selection of an omnivorous diet by the mangrove tree crab *Aratus pisonii* in laboratory experiments
Amy A. Erickson, Louisiana State University Shreveport; Ilka C. Feller, Smithsonian Environmental Research Center; Valerie J. Paul, Lisa M. Kwiatkowski and Woody Lee, Smithsonian Marine Station

23. The parasitic effects of *Probopyrus pandalicola* on the behavior of *Palaemonetes pugio* and the predation preferences of *Fundulus heteroclitus*
Brigette A. Brinton, Joe LaBarre**, and Mary Carla Curran, Marine Sciences Program, Savannah State University*

24. Do swimming performance tests explain ecological differences between estuarine *Fundulus heteroclitus* and *F. majalis* fishes?
*Kelsey Yetsko** and Gorka Sancho, College of Charleston*

ABSTRACTS (in order of presentation)

ORAL PRESENTATIONS

Thursday 8:30 – 10:00 a.m. Session I

Seasonal dissolved inorganic nitrogen and phosphorus budgets for two sub-tropical estuaries in south Florida, USA

C. Buzzelli, Y. Wan, and P. Doering, Coastal Ecosystems Section, South Florida Water Management District; and J. N. Boyer, Center for the Environment and Environmental Science and Policy Department, Plymouth State University

Interactions among climate, nutrient loading, hydrodynamics, and biogeochemistry modulate estuarine responses to introduced nutrients. The goal of this study was to develop seasonal dissolved inorganic nitrogen (DIN) and phosphorus (DIP) budgets for the two estuaries in south Florida, the Caloosahatchee River Estuary (CRE) and the St. Lucie Estuary (SLE) from 2002-2008. The Land Ocean Interactions in the Coastal Zone (LOICZ) Biogeochemical Model was used to generate water, salt, and DIN and DIP budgets. Increased internal production of DIN for the CRE was associated with increased external DIN loading. Water column DIN concentrations decreased and stabilized in both estuaries as flushing time increased to >10 d. The CRE approached balanced metabolism across all seasonal budgets. Although the SLE was also sensitive to DIN loading, system autotrophy increased with DIP loading to this estuary. This included large DIP consumption and bloom of a cyanobacterium (*Microcystis aeruginosa*) following hurricane-induced discharge in 2005. Additionally, while denitrification offered a loss pathway for inorganic nitrogen in the CRE, this potential was not evident for the smaller and more anthropogenically altered St. Lucie Estuary. Disparities between total and inorganic loading ratios suggested that management actions should examine the role of dissolved organic nitrogen (DON) in attempts to reduce both nutrient inputs to the SLE. Establishment of quantitative loading limits for anthropogenically impacted estuaries requires an understanding of the inter-seasonal and inter-annual relationships for both N and P, circulation and flushing, variability in plankton community composition, and the dynamics of DON.

Nitrogen vs. Phosphorus Limitation of Algal Blooms in the Indian River Lagoon, FL: Spatial and Temporal Trends

*Brian Lapointe, Laura Herren, and David Debortoli**, Harbor Branch Oceanographic Institute at FAU*

The classic view that marine waters are nitrogen-limited does not apply to Florida's Indian River Lagoon (IRL). Results from an IRL-wide study in 2011 and 2012 indicated that mean dissolved TDN and TDN:TDP ratios and macroalgal N:P and C:P ratios all increased from south to north in both the wet and dry seasons. This suggests a shift from N-limitation in the southern IRL to strong P-limitation in the northern IRL. TDN pools in the northern IRL were dominated by DON, which is known to support brown tides similar to the 2012 diatom bloom in the Mosquito Lagoon. Chlorophyll a was higher in the northern IRL, with the highest concentrations (> 100 µg/l) reflecting the 2011 "super bloom". Mean ^{15}N in macroalgae was consistently higher in all IRL segments in the wet season (+6.8 o/oo) compared to the dry season (+5.9 ± 1.9 o/oo), suggesting stormwater-driven wastewater inputs following heavy rains.

Determining factors that influence the molecular quantification of the harmful raphidophyte *Heterosigma akashiwo* using a sandwich hybridization assay (SHA)

Cameron Doll, University of South Carolina and Dianne I. Greenfield, Belle W. Baruch Institute for Marine & Coastal Sciences and the Marine Sciences Program, University of South Carolina; Marine Resources Research Institute

Molecular techniques for detecting and quantifying harmful algal bloom (HAB) species have become central to research, monitoring and management to expedite sample processing. Sandwich hybridization assay (SHA) is one such example that provides rapid (~1-2 hours) results that enable organism identification and quantification through direct detection of species or taxa-specific large subunit rRNA sequences. Assay results can then be used to approximate organism abundance. However, cellular rRNA content may be affected by several factors that may influence SHA results. We assessed SHA results for geographically distinct HAB isolates, sample preservation using Lugol's iodine, culture growth phase, range/limit of detection and nutrient limitation and found that some of these factors do influence SHA results. The raphidophyte *Heterosigma akashiwo* was chosen as the test species because it occurs globally, produces ichthyotoxic

blooms and SHA has previously been validated for it. The *H. akashiwo* strain used primarily in this study was isolated in South Carolina, providing local relevance. This work is part of a foundation that will assess the application of SHA in a monitoring and management program, and directly compare it to another commonly used molecular approach, quantitative PCR (qPCR). This program entails a rigorous methods comparison of SHA and qPCR using criteria such as cost, accuracy, sample throughput, range/limit of detection, speed and others for HAB research and monitoring.

The influence of nitrogen and phosphorus on seasonal phytoplankton biomass and community composition in four coastal South Carolina systems

M. Reed, College of Charleston, Graduate Program in Marine Biology, Charleston, SC; L. Brock and C. Keppler, Marine Resources Research Institute, Department of Natural Resources, Charleston, SC; S. Kacenas, Belle W. Baruch Institute for Marine and Coastal Sciences and the Marine Sciences Program, University of South Carolina, Columbia, SC; S. Hogan, Marine Resources Research Institute, Department of Natural Resources, Charleston, SC; and D.I. Greenfield, Marine Resources Research Institute, Department of Natural Resources, Charleston, SC, Belle W. Baruch Institute for Marine and Coastal Sciences and the Marine Sciences Program, University of South Carolina, Columbia, SC*

Human population density, and related urbanization, is predicted to continue to increase along South Carolina's (SC) coast over upcoming decades, and this may affect estuarine nitrogen (N) and phosphorus (P) levels. In preparation, regulators are considering numeric criteria for nutrient levels along the coastal zone. In order to make informed decisions, biological responses to various N and P forms should be considered. This study examines how macronutrient, particularly N, form influences phytoplankton biomass and community composition among four coastal SC habitats: a forested tidal creek in Winyah Bay, an urbanized tributary to the Ashley River, a salt marsh in the Combahee River, and a stormwater detention pond on Kiawah Island. Phytoplankton biological responses to N and P are being assessed via seasonal field sampling and nutrient addition bioassays over two years (2011-2013). Fluorometric analyses of chlorophyll *a* (chl *a*) are used to calculate phytoplankton biomass, and high performance liquid chromatography (HPLC) is used to quantify photopigments. CHEMTAX will be used to determine the relative contribution of different algal taxa to total chl *a*. Preliminary results suggest that N-form, particularly organic N, likely influences phytoplankton growth in sites considered here. Further, land use patterns may affect nutrient (especially N) source and therefore phytoplankton dynamics in these systems. Dissolved organic carbon (DOC) is naturally elevated by terrigenous matter in southeastern blackwater streams, such as systems considered here, however, phytoplankton produce DOC and therefore contribute to the overall pool. Since DOC fuels microbial respiration, levels of bacteria and DOC will be assessed.

Primary productivity and respiration in fresh-to-oligohaline tidal creeks

Lauren Bohrer, Michael A. Mallin, Matthew R. McIver, and Lawerence B. Cahoon, UNCW*

Three freshwater-to-oligohaline tidal creeks, one urban, one suburban, and one rural, were sampled approximately monthly in 2011 and 2012 to determine seasonal phytoplankton productivity and respiration. Preliminary ex-situ light-dark bottle productivity experiments were conducted in a controlled environment by placing sample water in BOD bottles in a flow-through pond at the UNCW Center for Marine Science for 4-5 hr periods centered at mid-day. Experiments were subsequently moved into a field situation, and seasonal productivity and respiration data are currently being obtained contemporaneously at Burnt Mill, Smith, and rural Harrison's Creeks, respectively. Water quality data was collected along with in-situ light-dark bottle experiments in order to assess environmental factors influencing primary productivity and respiration. Results to date have shown that in preliminary experiments, respiration and primary productivity were higher in Burnt Mill Creek in comparison with the other two preliminary tidal creeks. Within in-situ experiments completed thus far, Burnt Mill Creek (36% watershed impervious coverage) experienced the highest rates of respiration and net primary productivity (mg of O2/L/day) in May and June, Smith Creek (28% impervious coverage) experienced the highest rates of R and NPP in July, and Harrison Creek (<10% impervious surface coverage) experienced the highest R and NPP in June and July. Net and gross primary production were both positively correlated with water temperature, and gross primary production was also positively correlated with chlorophyll a. At the completion of data collection, percent watershed development and percent impervious surface coverage will also be tested for influence on productivity and respiration.

Tidal variation in porewater distributions and sedimentary fluxes of oxygen, nutrients, sulfur and redox-sensitive metals in an urban tidal creek, "Withers Swash", Myrtle Beach, SC

Joshua P. Driscoll, Leigha E. Peterson*, Brent L. Lewis, and Richard N. Peterson, Coastal Carolina University*

Long Bay, SC, (Cape Fear to Cape Romain, including the "Grand Strand") experiences episodic hypoxia in nearshore waters during summer and early fall. The mechanism for onset of hypoxia appears to be restricted cross-shelf mixing in response to upwelling-favorable winds, with increased nutrient levels and respiration rates. A major contributing factor is thought to be input of nutrients to the bay via storm water runoff and submarine groundwater discharge (SGD). Included are fluxes of water from a number of tidal creeks or swashes. In addition to surface runoff, tidally-variable groundwater inputs via SGD have been documented (ref). Estimates of SGD via the Rn-222 method indicate highest SGD rates at low tide. Here we will report initial results from Withers Swash, which receives stormwater runoff from Myrtle Beach. We will discuss temporal variations in porewater profiles and sedimentary fluxes of oxygen, nutrients, sulfide and redox-sensitive metals over a tidal cycle.

Thursday 1:00 – 2:15 p.m. Session II

Good Vibrations: Characterizing estuarine soundscapes from a larval settlement perspective

Ashlee Lillis, David B. Eggleston, and DelWayne R. Bohnenstiehl, Department of Marine, Earth & Atmospheric Sciences, North Carolina State University*

The underwater soundscape has emerged as a potentially rich source of sensory information for a range of marine fish and invertebrates, but spatial and temporal variability of habitat-related sounds remains largely uncharacterized. Auditory reception may be especially useful during larval settlement and habitat selection, as sound is transmitted large distances compared to other cues, is independent of currents, and reflects the bio-physical characteristics of source habitats. Oyster reef soundscapes are of particular interest because reefs are patchily distributed, productive habitats that harbour many sound-producing organisms (e.g. sciaenid fish, snapping shrimp). To examine the spatiotemporal variability in acoustic characteristics of these estuarine habitats, we used short-term stationary and drifting hydrophone-recording surveys at sub-tidal oyster reserves and soft-bottoms throughout Pamlico Sound, NC, and conducted a year-long recording time-series at a single reef site. Data show that reefs consistently produce distinct acoustic spectra and generally higher sound levels compared to adjacent soft-bottom habitats, and that reef sound has daily, lunar and seasonal patterns. This study indicates that oyster reef sound could be a useful cue for settling reef-builders and residents, and also provides acoustic data needed to better investigate the role of soundscapes in recruitment processes.

Assemblage structure and seasonality of the ichthyoplankton community ingressing into a northeast Florida estuary

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Estuaries are widely recognized as important habitats for the early life history stages of commercially and recreationally important marine fish species. The estuaries of northeast Florida are understudied, and there is a need to investigate the potential nursery role of these habitats, and to characterize the ichthyoplankton community at an important faunal boundary between temperate and tropical marine zones. In order to determine community structure and temporal patterns in the distribution and abundance of larval fish ingressing in to the Guana-Tolomato-Matanzas (GTM) estuary through its two inlets (St. Augustine, Matanzas), ichthyoplankton were sampled bi-weekly at both inlets during nighttime spring flood tides beginning in March 2012. Samples were collected with a 1m diameter plankton net with 1mm mesh, suspended 1 m below the surface in the water column. Over 30,000 were collected, representing 72 taxa. Four families made up 90% of the total number of fish collected: Gobiidae (35.7%), Sciaenidae (25.1%), Engraulidae (19.7%), and Gerreidae (9.6%). Seasonal trends in the taxa collected, the number of species collected per sampling event, and the density of ichthyoplankton were apparent. Species richness and larval density correlated positively with increasing water temperature. Spring and summer pulses in recruitment were evident in species that spawn year-round (e.g., Gobiids and Engraulids), and seasonal peaks in recruitment were evident in marine spawned species (e.g., Sciaenids, Sparids, Haemulids, Lutjanids). Seasonal pulses and species assemblages observed in the GTM estuary were similar to those observed for ichthyoplankton communities in other temperate estuaries along the southeast US Atlantic coast.

Comparing bait fish among three barrier islands of the Georgia-Carolina coastal region
*Charles Best**, Bruce Saul, and Jessica Reichmuth, Georgia Regents University*

Current research suggests that estuaries are subject to anthropogenic degradation affecting many of the fish species that live in these important ecosystems. The comparison of estuaries with varying human environmental influence can provide insight into their overall health. Bait fish are economically and ecologically important because they provide food for sport fish and they are ecological indicators for pollution. The length and abundance of two vitally important bait fishes, *Menidia menidia* (Atlantic silverside) and *Engraulis eurystole* (bay anchovy), were compared among three barrier islands with varying human impacts within the Georgia-Carolina coastal region. Hunting Island (SC) and Tybee Island (GA) are accessible by vehicle and open to the public. St. Catherine's Island (GA) is only accessible by boat and is closed to the public. Sampling occurred on Hunting and Tybee islands and that data was compared to existing historical data from ongoing research at St. Catherine's Island. Fish near each island were sampled on a monthly basis using two types of beach seines. Preliminary findings show some size and count differences among the three islands, suggesting that anthropogenic influence may be at play.

Do we stay or do we go? A study of site fidelity among three species of marine fishes
*Melissa Gieseking** and Jessica Reichmuth, Georgia Regents University*

Diversity studies among three barrier islands, Hunting Island, SC, Cockspur Island, GA, Tybee Island, GA, showed that three fish species, *Trachinotus carolinus*, *Mugil curema* and *Mugil cephalus*, are consistently present in coastal waters. The current investigation looks to determine whether these ecologically and economically important fish species stay in one area or migrate in and out of a region during different stages of their development (juvenile or adult). Current literature for the three genera suggests seasonal site fidelity for all three species, but not much has been studied on either *Mugil* species and little is known about *Trachinotus*, Using monofilament and cotton mesh bag seines, a fish measuring board, and T-Bar anchor tags, fish were caught using a quarter haul technique, measured with the fish board to nearest cm, identified, tagged and released. Tagging occurred subcutaneously behind the first dorsal fin on *T. carolinus* that were at least 8.0 cm, and *Mugil* spp. at least 7.0 cm. Fish were tagged at a range of sizes in hopes to tag a wide variety of age classes to determine their site fidelity. To date 3 Striped Mullet, 28 Pompano, and 54 White Mullet have been tagged on Tybee; 1 Striped Mullet and 9 White Mullet have been tagged on Cockspur; and 26 Striped Mullet, 16 Pompano, and 39 White Mullet have been tagged on Hunting. Only one fish has been recaptured. This study was funded by Augusta State's Center of Undergraduate Research & Scholarship and Pamplin Student Research Funds.

Life history trends of gray triggerfish *Balistes capriscus* in the South Atlantic Bight from 1990-2011
A. Kelly, GPMB-College of Charleston; V. Shervette, University of South Carolina Aiken; M. Reichert, SCDNR; T. Smart, SCDNR; and D. Owens, GPMB-College of Charleston*

Estuaries and coastal environments are essential to influencing adjacent habitats such as the continental shelf. Consequently, they impact fish species that inhabit continental shelf reef ecosystems. Gray triggerfish *Balistes capriscus* is a commercially- and recreationally-valued reef fish species. Over the past five years, average annual landings approached 700,000 lbs in U.S. Atlantic waters. Gray triggerfish are managed as part of the South Atlantic snapper-grouper complex fishery. Many of the other species in the snapper-grouper complex, including red snapper and gag grouper, are considered overfished and are being regulated tightly, which has led to increased fishing pressure on alternative species including gray triggerfish. Despite the economic importance of this species, no published information exists concerning age, growth, and reproductive biology in Atlantic waters of the U.S. Fortunately, the Marine Resources Monitoring, Assessment, and Prediction (MARMAP) Program at the South Carolina Department of Natural Resources has been collecting life history data for this species as part of its reef-fish monitoring program over the past several decades. The current study utilizes these MARMAP samples to address the following objectives for gray triggerfish life history in the South Atlantic Bight population: 1. Determine growth rate and population age structure and 2. Determine reproductive seasonality, size- and age-at-maturity, and sex ratios. This information will be utilized in ongoing gray triggerfish stock assessment efforts by the South Atlantic Fisheries Management Council and the NOAA Fisheries.

Thursday 2:45 – 4:15 p.m. Session III

Molecular profiling of zooplankton diet using PNA-PCR and denaturing high performance liquid chromatography (PNA-PCR-DHPLC)

Tina L. Walters and LaGina M. Frazier*, Savannah State University and Skidaway Institute of Oceanography; Gustav-A. Paffenhöfer and Marc E. Frischer, Skidaway Institute of Oceanography*

The ability to investigate trophic interactions for zooplankton species is vital for understanding processes that structure marine ecosystems. Since it is difficult to assess gut content, little is known about the *in situ* diets of most zooplankton species. This is particularly true for the pelagic tunicate *Dolioletta gegenbauri* which forms large swarms in subtropical shelf environments. We hypothesized that while large *D. gegenbauri* gonozooids likely derive a fraction of their nutrition from large diatom species typical of intrusion waters, smaller gonozooids would not. In this study we presented nutrient-rich intrusion water collected from the mid-shelf of the South Atlantic Bight to large- (5-7 mm in length) and small-sized *D. gegenbauri* gonozooids (1-4 mm in length) and identified their diet *in situ* using a PNA-PCR-DHPLC molecular-based gut content profiling assay. Sequences were compared to clone libraries generated from pooled *D. gegenbauri* gonozooids and also to the planktonic prey community in the intrusion water. Results from the clone libraries support the general observations from DHPLC profiles, that >50 % of *D. gegenbauri* gut was dominated by small heterotrophic organisms relative to diatoms for both size classes. The presence of heterotrophs in the doliolid gut appeared to be independent of the status of the intrusion water suggesting their importance in the nutrition of *D. gegenbauri*.

Microzooplankton grazing experiments from the Indian River Lagoon reveal complex trophic interactions

Nikki Dix and Dennis Hanisak, Harbor Branch Oceanographic Institute at FAU

Microzooplankton (20 – 200 µm) are thought to consume the majority of pelagic primary production in marine ecosystems. To better understand the role of microzooplankton in the Indian River Lagoon, an estuary of national significance, grazing experiments were conducted once per month with water from two sites January – December 2012. Unexpectedly, positive grazing rates were observed in most experiments suggesting that microzooplankton actually had a net stimulatory effect on phytoplankton growth. Several hypotheses explaining this phenomenon were developed and some were tested by comparing plankton community structure before and after two experiments. Results suggest that predation within the microzooplankton community may have released small phytoplankton from grazing pressure. These findings highlight the importance of top-down forces in structuring plankton communities in the Indian River Lagoon, an ecosystem that has experienced two major harmful algal blooms in the past two years.

Trophic responses to polycyclic aromatic hydrocarbons and copper exposure in tidal flats of North Inlet, South Carolina

Leslie L. Muggelberg and James L. Pinckney, University of South Carolina*

The trophic link between benthic microalgae (BMA) and fiddler crabs is critical for the ecosystem functioning of estuaries and alterations in this linkage by anthropogenic activities could have cascading impacts on food webs. Singular and interactive effects of two common pollutants in aquatic ecosystems, polycyclic aromatic hydrocarbons (PAHs) and copper (Cu), were investigated by exposing field collected sediment communities to the contaminants and measuring changes in BMA biomass and community composition. The consequential impacts on the food web were explored by examining the effects of PAHs and Cu on food preference and feeding rates of sand fiddler crabs (*Uca pugilator*). No significant difference in BMA biomass was observed between treatments, though there were significant differences within all contaminant treatments over time, suggesting a complex sediment community response. The fucoxanthin to zeaxanthin ratio increased significantly in Cu and PAHs + Cu treatments compared to controls, indicating an even greater diatom dominance after copper exposure, possibly due to cyanobacterial sensitivity. It was also shown that fiddler crabs grazed on sediments contaminated with PAHs + Cu significantly less than they did upon controls when given a choice, and the feeding rates of crabs exposed to Cu only, PAHs only and to PAHs + Cu were significantly lower than those of controls when no alternative food choice was provided. Because fiddler crabs play an important role as bioturbators, a reduction in feeding, and therefore sediment processing, could have significant impacts on ecosystem functioning.

Mercury bioaccumulation in the longnose gar (*Lepisosteus osseus*): a model species for examining patterns of MeHg uptake

Meredith Smylie, College of Charleston; Virginia Shervette, University of South Carolina Aiken; Christopher McDonough, South Carolina Department of Natural Resources; and Lou Ann Reed, National Oceanic and Atmospheric Association*

Though mercury (Hg) occurs naturally, anthropogenic emissions have increased atmospheric Hg levels by an estimated factor of three since the Industrial Revolution. This increase has caused corresponding increases in Hg levels in terrestrial and aquatic ecosystems. Wetlands contain anaerobic sulfur-reducing bacteria which contribute to transformation of elemental mercury into its most toxic form, methylmercury (MeHg). As a result, wetlands serve as a pathway for MeHg from freshwater to the marine environment, along which it is taken up by organisms. Effects of this neurotoxin vary based on a species susceptibility and degree of exposure, while concentrations in fishes depend on ambient conditions. Biological factors affecting bioaccumulation and biomagnification include diet, age, physiology, and size. Environmental factors include pH, salinity, dissolved organic carbon, rate of Hg addition, and temperature. Longnose gar (*Lepisosteus osseus*) are an excellent model species to study MeHg uptake due to their extensive range, high abundance, top predator status, and tolerance for a range of salinities. The present study examines patterns of MeHg accumulation along a salinity and temporal gradient within muscle tissue of longnose gar in the Ashley River and Winyah Bay, South Carolina. We examined variation in MeHg with regard to size, sex, age, and reproductive stage. Preliminary results show an increase in MeHg concentration with increasing fish size, decreasing salinity, and MeHg fluctuations throughout the year. A better understanding of MeHg uptake and retention patterns in fishes will aid managers in making decisions regarding consumption advisories of commercial fishes in light of potential human health risks.

Trait-mediated functional responses: consumer personality and fear mediate prey consumption

Benjamin J. Toscano and Blaine D. Griffen, Department of Biological Sciences and Marine Science Program, University of South Carolina*

The functional response (an individual predator's consumption rate as a function of prey density) is central to the stability of predator-prey dynamics. This response is behavioral, depending on the rate of attack and time it takes to handle prey. Consistent behavioral differences between individuals, termed animal personality, are a widespread feature of predator populations but the effects of personality on the functional response have not been examined. We tested the effects of crab (*Panopeus herbstii*) personality, specifically their refuge use behavior, on the crab functional response to mussel (*Brachidontes exustus*) prey. We further measured how these effects are mediated by the presence of risk cues from a higher predator (oyster toadfish, *Opsanus tau*). The effects of crab personality and predation risk on the functional response were dependent on crab size. Small crabs (< 25 mm) that were bold (used the refuge less) consumed more mussel prey both in the absence and presence of predation risk than small crabs that were shy. Individual refuge use had a lesser effect on the consumption rate of large crabs. Small crabs also reduced their consumption rate in the presence of toadfish predation risk more so than large crabs. These results indicate that animal personality can have substantial effects on predator-prey dynamics through modification of the functional response.

Population genetics of three crab species along the southeastern Atlantic Coast

*April Hammack**, Sierra Mannix**, Austin Coleman**, Amy Abdulovic-Cui, and Jessica Reichmuth, Georgia Regents University*

The blue crab (*Callinectes sapidus*) is both economically and ecologically important in estuarine communities and is commonly found along with other ecologically important species, including the lesser blue crab (*Callinectes similis*) and the speckled crab (*Arenaeus cribrarius*). The aim of our research is to determine the genetic diversity by sequencing several mitochondrial loci from each crab species using data gained from published blue crab DNA sequences. To collect crabs, we used two different seines at Hunting Island State Park, SC, and Tybee Island, GA. Crab limbs were extracted in the field, stored in ethanol, and extracted following standard molecular methods. If a lack of genetic diversity in the three species is found this could indicate an unhealthy ecosystem, and could suggest alleles are becoming fixed due to removal. The lack of genetic diversity may be caused by the natural removal of genes from predation, or it could indicate that the species' genes are becoming fixed by overfishing.

Friday 8:30 – 10:00 a.m. Session IV

Linking harmful algal bloom (HAB) research with public awareness through outreach: The HAB and human health educator initiative

Sarah Hogan, Marine Resources Research Institute; S.C. Department of Natural Resources, Charleston, SC; Dianne I. Greenfield, Marine Resources Research Institute; S.C. Department of Natural Resources, Charleston, SC, Belle W. Baruch Institute for Marine and Coastal Sciences, Marine Sciences Program; University of South Carolina, Charleston, SC; Susan Ferris Hill, South Carolina Sea Grant Consortium; and Rick DeVoe, South Carolina Sea Grant Consortium

Persistent harmful algal blooms (HABs) are common events along the South Carolina (S.C.) coastal zone, particularly in stormwater detention ponds associated with residential developments. HABs in S.C. pose a number of environmental and public health threats including toxin production, wildlife mortalities, fish kills, and others. As examples, between 2001 - 2012, 26% of the fish kills assessed by the S.C. Algal Ecology Laboratory were associated with algal blooms (both toxic and non-toxic), and toxic cyanobacteria blooms are frequently observed during routine sampling. Despite the success in monitoring and fish kill response efforts, documented HAB-related human health effects in S.C. are minimal and could be underreported. One possible explanation is a disconnect between HAB research and public awareness. To overcome this obstacle, the S.C. Task Group on Harmful Algae established a new outreach project wherein a HABs and Human Health Educator (HHE) directly interacts with the public to educate homeowners and residents about how to recognize and report a HAB or potential HAB-related health effect. Specifically, the HHE visits home owners associations, educational groups, and government institutions and delivers a short (~15 min.) presentation followed by a question and answer session. Work presented here summarizes outreach and education efforts to date, as well as describes preliminary plans for a spring 2013 workshop about HABs and stormwater ponds intended for a broad audience of researchers, pond and property managers, and the general public.

Modeling phytoplankton productivity to analyze natural and anthropogenic influences on the trophic status of the Caloosahatchee Estuary, Florida, USA

Loren Mathews and Edward Phlips, University of Florida*

Urban and agricultural development in and around the Caloosahatchee Estuary on the southwest coast of Florida, USA, has altered the flow and quality of water in the system since the late-1800s. Increasing algal blooms have brought attention to water quality and processes affecting phytoplankton production and biomass accumulation there. The primary objectives of this project were to (1) measure phytoplankton productivity in order to test the applicability of a previously developed empirical model that is based on simple measures of phytoplankton biomass and light availability in the photic zone and (2) apply the adapted phytoplankton productivity model to analyze long-term changes in the estuary's trophic status. Primary production rates, in terms of oxygen evolution, were measured monthly between February and August 2009 (excluding March) using simulated in situ light:dark bottle incubations in a flow-through raceway. Pooling the estimates across four sites yielded a strong linear relationship between GPPd and the light-biomass model predictor ($R2 = 0.84$, $p<0.001$). Model deviations indicated the secondary control of species composition, nutrients, and light quality on the photosynthetic efficiency of the phytoplankton community. Long-term changes in the system's trophic status given both natural and anthropogenic influences were then examined using a discontinuous twenty-five year water quality data set. Estimates of annual gross primary productivity (GPPy) varied spatially and temporally from oligotrophic (less than 100 g C m^{-2} yr^{-1}) to hypertrophic levels (greater than 500 g C m^{-2} yr^{-1}) given the role of climate/weather, water temperature, salinity, nutrients, and light availability as potential environmental drivers of phytoplankton productivity in the Caloosahatchee Estuary.

Eastern oyster early-life demographic parameters on alternative reef-building substrate materials

Robert P. Dunn and David B. Eggleston, NC State University Center for Marine Sciences and Technology; and Niels Lindquist, UNC-Institute of Marine Sciences*

Restored oyster reefs in high-salinity areas of Pamlico Sound have recently experienced population crashes, potentially brought on by Clionid boring sponge infestation of oyster shells and the limestone reef substrate. The composition and porosity of limestone marl, the material commonly used to construct artificial reefs, may make it particularly vulnerable to bioerosion by sponges. To address this problem, alternative substrates (oyster shell, limestone marl, granite, and concrete) were assessed for use in future oyster reef building efforts via laboratory settlement trials and field-based experimental reef building. In a laboratory settlement experiment, larval oyster settlement was highest onto calcium carbonate-based materials (oyster

shell and marl), followed by concrete, and lowest onto granite with few settlers. There were no differences in spat settlement onto oyster shells with varying degrees of *Cliona* boring sponge infestation. In the field, sites in high salinity areas had much higher recruit density than all other locations, although there were no differences in oyster recruit density between substrate types. Early-life growth rates of oysters were assessed on hatchery-reared larvae out-planted to the field and on natural recruits on experimental reefs, with few differences seen between valve lengths of individual oysters on different substrate types in either setting. These results support continued use of calcium carbonate substrates for oyster reef restoration, but could also support the use of non-carbonate materials in high salinity areas where *Cliona* boring sponge is abundant.

Conservation and management of estuarine-dependent fisheries resources within Akanda and Pongara National Parks, Gabon, West-Central Africa: contributions to ensuring aquatic-resource-based food security within the greater Libreville region.

Evan Chipouras, Department of Biology, University of Tampa, Tampa, FL

The Komo River and Mondah Bay Estuaries are mangrove-dominated systems located on the northwest coast of Gabon, West-Central Africa. In many tropical developing countries, threats to mangroves are viewed as potential threats to regional food security, particularly since these societies generally lack the types of vessels and gear necessary to exploit offshore resources. The small-scale fisheries operating within these estuaries are diffuse (i.e., having many different landing sites utilized by different fishers). Determinations of CPUEs for artisanal and subsistence-level fisheries can be problematic due to greater variation in technique utilized by different fishers, quality of the reported data, etc. Effectively regulating activities such as fishing in restricted areas, use of destructive gear, etc. is also difficult. Current fishing regulations within these estuaries are strictly spatially-based (i.e., tied to existing National Park and buffer-zone boundaries) and were developed without regard to seasonal differences in habitat conditions or correlated differences fish assemblages. Historical regional fisheries practices figured minimally into their formulation. In order to inform constructive revisions to existing regulatory policy, the following efforts are underway: 1) Determining which estuarine-dependent fin- and shell-fish species rely on the mangrove habitats within these two National Parks for all or some fraction of their life histories, 2) Determining the subset of these species that are components of the region's artisanal fisheries and some quantification of their field abundances and proportional contributions to local or export markets and 3) providing more detailed information regarding the physical and other biological characteristics of these two estuaries.

Fish assemblages of the mangrove-dominated Komo River and Mondah Bay Estuaries, Gabon, West-Central Africa

Evan Chipouras and Erich J. Dietterle, Department of Biology, University of Tampa, Tampa, FL

The Komo River and Mondah Bay Estuaries are mangrove-dominated systems that are located on the northwest coast of Gabon, West-Central Africa. Each estuary is subsumed in large part by one of Gabon's coastal National Parks, Pongara and Akanda, respectively. Aquatic resources within both of these estuaries are exploited by artisanal fishers. Between mid-October and early-November 2012, the habitat characteristics of both estuaries were examined. Direct field observations were also made of the fishes being targeted by artisanal fishers, as well as observations of larger samples that were aggregated at local fish landings. The dominant gear-types being employed were both natural-fiber and monofilament gill nets. Gill-netting efforts were supplemented by seining on shallower flats and fishing with hand-lines. Both field-capture and market assemblages were dominated by fishes from four families: 1) Ariidae (sea catfishes), notably *Arius latiscutatus*, 2) Sciaenidae (drums), notably *Pseudotolithus elongatus*, 3) Mugilidae (mullets), several species, and Polynemidae (threadfins), notably *Polydactylus quadrafilis*. Field samples included an assortment of fishes from other families in lower numbers (e.g., tounguesoles, Family Cynoglossidae; barracudas, family Sphyraenidae; jacks, family Carangidae, mojarras, family Gerreidae, etc.) Of particular concern were captured juvenile charcharinid bullsharks, *Charcharhinus leucas*, and fins from others whose corpses had been discarded. Observations likely reflect a combination of temporal, spatial, and gear-specific biases. Market assemblages contained a greater diversity of fishes than those observed in the field, in particular, cichlids and other types of catfishes likely captured in areas of lower salinity relative to where direct field observations were made.

Use of simulation modeling for decision support in adaptive management of least tern (*Sternula antillarum*) nesting habitat

William Kanapaux, Pennsylvania Cooperative Fish & Wildlife Research Unit, Pennsylvania State University, and Greg Kiker, Department of Agricultural and Biological Engineering, University of Florida

Botany Bay Plantation Wildlife Management Area is one of only four known natural nesting sites for least terns (*Sternula antillarum*) on the South Carolina coast, and more than 20,000 people visit the 3-mile stretch of beach each nesting season since it opened to the public in 2008. We developed a simulation model for the adaptive management of human disturbance on least tern nesting habitat. The simulation uses the Questions and Decisions (QnD) system framework, an object-oriented modeling approach that emphasizes interactions among key ecological and social components. The model is designed to explore the potential results of management actions and identify key indicators for future monitoring. Initial model parameters were developed from existing literature, expert opinion and on-site ecological observations as few baseline data were available. Substantial uncertainty exists on the nesting behavior of least terns related to productivity levels, responses to human disturbance, and effects of overwash tides. In order to test model assumptions and performance, parameters are assigned stochastic probability distributions made explicit to wildlife managers and can be easily updated as additional monitoring data become available. Initial simulation results suggest that Botany Bay colonies are at significant risk of collapse, as simulated productivity falls well below the minimum productivity threshold needed for site fidelity. A sensitivity analysis identifies three variables to monitor for reducing uncertainty in simulation results. The model is intended to initiate an ongoing adaptive monitoring program for improving colony productivity, and continued monitoring is being used to improve model design and performance.

Friday 10:30 – 11:45 a.m. Session V

The interplay of climate drivers affecting freshwater delivery to the Altamaha River estuary: watershed scale and regional context

Joan E. Sheldon and Adrian B. Burd, University of Georgia

Variability in watershed precipitation and streamflow to the Altamaha River estuary (GA) was examined in relation to indices for eight climate signals. Empirical orthogonal function (EOF) analysis showed that precipitation can be largely described by a temporal signal that is uniform across the watershed (EOF 1), modulated by spatial patterns along (EOF 2) and across (EOF 3) the long axis of the watershed. These patterns agree broadly with regional-scale analyses but are likely to be different from those outside the region. At this scale, even differences with neighboring states emerge. Each of these aspects of precipitation was best correlated with a different climate signal, and the dominance of climate signals changed throughout the year: EOF 1 with the Bermuda High Index in summer-fall; EOF 2 with El Niño/Southern Oscillation and El Niño Modoki in winter; and EOF 3 with the Atlantic Multidecadal Oscillation in December and June. These signals all propagated to river discharge entering the estuary 0-1 month later. Other climate signals examined (North Atlantic Oscillation, Pacific Decadal Oscillation, Pacific-North America Pattern, and North Pacific Oscillation) had few and inconsistent correlations with precipitation and streamflow. Changes in global- and regional-scale climate signals have the potential to affect the amount, seasonality, and quality of freshwater entering the estuary, influencing estuarine salinity, mixing time scales, and nutrient status. Differential propagation of climate signals through ecosystems, as e.g., a phenomenon that disproportionately affects the growing season of a keystone species, is possible with such a complex interplay of climate drivers affecting freshwater delivery.

Aquatic nutrient monitoring on process time scales

Charlotte Clark and Ian Walsh, WET Labs

Nutrient dynamics in aquatic systems are driven by a range of natural and anthropogenic forcing functions. Because nutrient dynamics broadly affect issues related to public health, ecosystem status and resource sustainability there are increasing needs to monitor nutrient loading and variability. Monitoring and modeling ecosystem dynamics and predicting changes in normal variability due to potentially adverse impacts requires sustained and accurate information on nutrient loads on the appropriate time scales. On site sampling is often resource limited which results in sparse data sets with low temporal and spatial density. For nutrient dynamics, sparse data sets will bias analyses because critical time scales for the relevant biogeochemical processes are often far shorter and spatially limited than sampling regimes. Recent technological

developments have brought the ability to sample and remotely deliver data on the time scales that the forcing functions operate. These technological improvements, while still nascent, have delivered new understanding of process variability from the physiological to event to seasonal scales.

Addressing the changing face of Coastal South Carolina: The Sea Grant perspective
M. Richard DeVoe, Executive Director, S.C. Sea Grant Consortium

The coastal biogeography of South Carolina is highly diverse and dynamic, and has been and continues to be instrumental in shaping the history, culture, and social fabric of the region. Changes, both natural and anthropogenic, to this fabric manifest themselves in many ways and present challenges to all who attempt to direct, manage, and influence human behavior. The generation and application of science-based information is a critical requirement if we are to be successful in understanding natural systems, our influence upon them, and their value to the economic, environmental, and social value that they support. The purpose of this paper is to present a brief overview of the coastal South Carolina landscape (economy, demographics, natural systems) to set the stage for a brief presentation of several key coastal issues that will require our attention over the next few decades, including population growth and land use change, environmental quality, weather and climate, and emerging coastal ocean interests. The role of the S.C. Sea Grant Consortium in contributing to an improved understanding of and more informed decision-making regarding these issues will then be summarized.

Biotic, physical and meteorological factors maximizing N Loss in a constructed wetland
Michael A. Mallin, Bongkeun Song, Andrew Long, and Matthew McIver, UNC Wilmington*

Estuarine waters such as tidal creeks are highly subject to microbial, nutrient, and chemical pollution from watershed sources. Constructed stormwater wetlands are an important tool in the arsenal to reduce non-point source pollution, but the actual wetland processes that reduce pollutant loads need continuing elucidation to refine construction efforts. In particular, microbial processes including denitrification and anammox, involved in N removal, have not been fully examined in constructed wetlands. The efficiency and factors influencing microbial nitrogen removal from stormwater was examined from the constructed JEL Wade wetland in Wilmington, NC in 2011. Water quality parameters were analyzed from surface water samples, while the abundance and activity of sediment anammox and denitrifying communities were measured using quantitative PCR and 15N tracer incubation experiments, respectively. Denitrification was found to be the dominant N removal pathway of this system, contributing up to 71% of the N2 production in bare sediments and 78% in plant rhizospheres. The activity and abundance of both anammox and denitrification were found to be higher in the rhizosphere compared to the bare sediment. Increased water temperature stimulated denitrification in macrophyte rhizospheres, but had no effect on rhizosphere anammox, while in sediment samples both denitrification and anammox were negatively correlated with water temperature. Pickerelweed *Pontederia* had overall highest denitrification, with alligatorweed *Alternanthera* second. *Pontederia*, cattail *Typha*, giant cutgrass *Zizaniopsis*, and bur-reed *Sparganium* had highest anammox. Parrott feather *Myriophyllum* had poorest N removal for both processes. These results indicate wetland plants play a species-specific role in enhancing sedimentary N removal processes.

Potential for estuarine habitat restoration by closing an obsolete navigation cut: Noyes Cut, Satilla River estuary, southeastern Georgia
Clay L. Montague, University of Florida and Fred Voigt, Jr., Dover Bluff Hunting and Fishing Club
In the early twentieth century, a kilometer long navigation channel was cut through tidal marsh between the Satilla River estuary and navigable water near the headwaters of a small network of tidal creeks running parallel to the river. Noyes Cut thus provided an alternate storm route and a way for timber to be barged to market for a time. The creek system evolved over the 80 years after the cut was made. Sediment filled creeks to near blockage at low tide, and the salinity gradient has been disrupted. Based on the sedimentation issue and presumed damage to habitat for diadromous fishes and other migratory estuarine animals, the Georgia Water Coalition identified Noyes Cut as #8 in its Dirty Dozen list of state issues. A resolution to close Noyes Cut was introduced into the Georgia legislature. A rare occurrence is the simultaneous support of politicians, adjacent land owners, navigation interests, and environmental groups. Closure of Noyes Cut seems to have such support. A relatively simple blockage may restore a regular salinity gradient in the creek network, and slowly produce deeper channels for more effective migrations by fishes as well as for better navigation by local boaters that live along the banks. The next step will be to assess the hydraulic changes, sediment movements, and salinity gradients that would result, and translate those into an evaluation of habitat

improvement. Noyes Cut is probably not unique. Other potentially beneficial closures of obsolete navigation cuts may occur throughout the southeast.

POSTER PRESENTATIONS (By Poster Number)

1. Interpretation of biological activity using an Acoustic Backscatter Sensor (ABS)
*Courtney Elliton*** and Ansley Wren, Coastal Carolina University*

A series of hydrodynamic deployments took place on a hard bottom habitat 850 meters off the coast of Myrtle Beach, SC, between 2008 - 2009 as a part of a Sea Grant-funded project. Acoustic instrumentation collected current velocity, suspended sediment concentration, and grain size of the suspended sediments within the bottom 1.5 meters of the water column at approximately 7 m depth. Analysis of the data revealed an anomaly in the acoustic backscatter intensity profiles collected from the Acoustic Backscatter Sensor (ABS). In November 2008 and November 2009 a daily cycle of high backscatter intensities appeared in the acoustic signal, between 7:00 PM to 7:00 AM. The signal did not rise from the seafloor as if sediment had been re-suspended, but was mostly concentrated approximately 20-80 cm above the seabed. Hydrodynamic data indicated that the threshold for sediment suspension had not been met during times when the anomaly was observed. Wind velocities were less than 8 m/s, bottom wave orbital velocities were less than 20 cm/s and wave heights were less than 1 m. The signal was observed predominately in the 1 MHz transducer which indicates suspended particle sizes were at least 1.5 mm within the bottom 1 meter of the water column. This study suggests that zooplankton capable of active movement could be causing this diel migration pattern. Behaviors of different species that are present on the hard bottom reef habitats have been investigated are presented in the study as a possible cause for this anomaly.

2. Quantifying bivalve veligers in plankton collections: comparing the effectiveness of different mesh sizes
*Stephanie Krug**, Coastal Carolina University; Juliana M. Harding, Coastal Carolina University; and Dennis M. Allen, Baruch Marine Field Laboratory, University of South Carolina*

Bivalve veligers occur in samples collected in a long-term zooplankton monitoring program in North Inlet, SC, but retention of these small larvae in 153 micron plankton nets has not been evaluated. Not all veligers may be retained on this mesh size. To evaluate retention, we made simultaneous collections using 80 micron and 153 micron mesh nets in Clambank Creek, North Inlet estuary during summer 2012. By making collections under a variety of tidal current conditions, we also evaluated consistency in the relationship between abundances of veligers in the two nets. In addition, we tested the variability associated with subsampling the larger mesh net collections by enumerating veligers using 2 methods. Counts made using the standard BMFL processing protocol (2 ml aliquot, Stemple pipette) were compared with counts collected by examining the entire sample. Then, all veligers in the 80 micron sample from the same date were counted. Counts were adjusted by the volume of water filtered to obtain the samples yielding bivalve and oyster veliger density estimates for both mesh sizes. The results should enable us to more accurately estimate densities of oyster veligers present when the 153 micron samples were collected over the past 31 years.

3. Identification of osmoregulatory ion transporters from gills of the Carribean spiny lobster using degenerated oligonucleotides designed on evolutionary conserved protein domains
Giuliana Gusmaroli and Stephen A. Borgianini, University of South Carolina Beaufort

One of the ultimate questions in ecology is what limits the distribution of species on the planet. Exceeding optimal salinity range leads to physiological stresses which may limit species survivorship and distribution. Some decapod crustaceans are capable of osmoregulating in virtually all salinity conditions. Most, however, are much less tolerant of freshwater. In addition, many decapods experience osmoregulatory stress leading to differential expression of osmoregulatory capacity. This occurs naturally during limb regeneration and ecdysis or as a consequence of human-mediated disruption of coastal hydro-geological cycles, resulting in reduced fecundity and survivorship. The broad range of osmoregulatory capabilities of decapod crustaceans is ripe for experimentation that would identify specific genetic components. We have previously identified several osmoregulatory genes in the euryhaline crab , which strives in a wide spectrum of salinity conditions. Here we are presenting the cloning of Na+K+ATPase and Na+/H+Exchanger, while the identification of 5 others ion transporters is still underway. , the Caribbean spiny lobster is not very salinity tolerant, being preferentially found on reefs and in mangrove swamps in the western Atlantic Ocean where salinities range from 34 – 36 ppt. The comparison of the molecular mechanisms implicated in osmoregulation in species that show very dissimilar ability to tolerate salinity changes (e.g. versus) will broaden our understanding of the evolutionary processes involved in the transition of estuarine species to freshwater habitat and will help us in

predicting species adaptability to anthropogenic activities interfering with the geochemical cycles in coastal ecosystems.

4. Sandwich hybridization assay (SHA) as a novel genetic approach for rapid identification and quantification of red drum (*Sciaenops ocellatus*) eggs.

Rebecca Mortensen, College of Charleston; Steve Arnott, Marine Resources Research Institute, South Carolina Department of Natural Resources; William J. Jones, Arnold School of Public Health, Marine Sciences Program, University of South Carolina; Dianne I. Greenfield, Belle W. Baruch Institute for Marine and Coastal Sciences, Marine Sciences Program, University of South Carolina, Marine Resources Research Institute, South Carolina Department of Natural Resources*

There has been a recent shift from microscopy to molecular approaches for identifying and quantifying marine plankton. This has been driven by a need to expedite sample processing for research and management purposes while increasing detection sensitivity and accuracy. One such method is sandwich hybridization assay (SHA), which uses DNA probes to directly detect unpurified and unamplified large sub-unit (LSU) ribosomal RNA (rRNA) of a target organism. The resulting colorimetric response can be used to infer organism abundance. To date, SHA applications have focused on harmful algae, bacteria, zooplankton and invertebrate larvae. Here, we present a novel application of SHA for detecting finfish eggs using the red drum, *Sciaenops ocellatus*, as our test species. *S. ocellatus* is an important recreational gamefish throughout the southeastern Unites States. Managers would benefit from egg production studies because they can be used to identify spawning locations, study spawning behavior, and calculate indices of abundance. However traditional ichthyoplankton methods are time-consuming and eggs cannot be reliably identified under a microscope. Sequencing of LSU rRNA for *S. ocellatus* and closely-related Sciaenids indicated low genetic divergence, and probe design used the more variable internally transcribed spacer (ITS) region. Probe validation studies, including standard curves and cross-reactivity tests, are planned. To determine the effect of developmental stage, eggs sampled over a 24 hour period from spawning to hatching will be evaluated. Finally, the probes will be used to validate *S. ocellatus* egg production over an annual cycle using field samples.

5. Genetic population structure of black drum (*Pogonias cromis*) in US waters

Jacqueline Leidig, College of Charleston-GPMB; Virginia Shervette, University of South Carolina Aiken; Tanya Darden, SCDNR-MRRI; and Chris McDonough, SCDNR-MRRI*

Black drum is an estuarine-dependent saltwater fish that supports recreational and commercial fisheries along the US Atlantic and Gulf of Mexico coasts. A previous study examining genetic population structure of black drum, using mitochondrial DNA and limited samples from the Atlantic, reported distinct Gulf of Mexico and Atlantic stocks. The current study is using nuclear microsatellite markers to examine genetic variation of black drum along the Gulf of Mexico and US east coast. We will test the hypothesis of the existence of only one population of black drum in US coastal waters, and evaluate genetic population structure along the US east coast. No microsatellite primers have been developed for black drum, but studies have shown that often primers will amplify confamilial species. Spotted seatrout and red drum microsatellite primers were screened for polymorphism and reliable amplification of black drum DNA. Eight polymorphic loci have been identified that will be used to determine genetic population structure. Data from the present study will prove useful for management and conservation of black drum, including accurate definition of geographic boundaries to determine useful management units.

6. Changes in sediment properties of the Savannah River estuary corresponding with precipitation in the Savannah River drainage basin, 2012

*Meghan Maylone**, Faith Palmer**, and Carol Pride, Savannah State University*

Sediment deposition in an estuary is influenced by river discharge. During a drought, river discharge is reduced, the turbidity maximum zone and associated sedimentation shifts upstream, and sediment transport is decreased. During heavy rainfall, river discharge increases and results in erosion and the rush of accumulated fluvial sediments downstream. Sediment samples collected from sixteen locations were used to analyze deposition characteristics in the Savannah River estuary during drought conditions in February and the beginning of the wet season in June, 2012. Sediment samples were collected using a Van Veen grab sampler aboard the *R/V Savannah*. Grain size distributions were determined by wet sieving and loss-on-ignition was used to estimate organic content. The silt/clay fraction of the inner estuary sediments decreased from 93% in February to 37% in June, but increased 35% in the outer estuary over the same time period. The

middle estuary exhibited little change in grain size distribution. Organic content in the inner estuary decreased from 11% to 3%, while that of the outer estuary increased from <1% to 6% between February and June; corresponding with the distribution of fine grain sediments. The distribution trend exhibited a seaward transport of fine grain fluvial sediments that had accumulated in the inner estuary turbidity maximum zone during the drought. This is likely due to increased discharge resulting from substantial rain events. The distribution of fine grained sediments is of concern due to their ability to trap contaminants.

7. Seasonal and annual variations of surface diatom distribution in the Savannah River estuary

Brian Christopher Murry and Carol Pride, Savannah State University*

The purpose of this study was to determine seasonal and interannual variability in diatom community composition and standing stocks in the Savannah River estuary. Bi-monthly cruises were conducted along the Savannah River estuary from August 2009 to August 2012 aboard the *R/V Savannah*. Samples were taken at salinities ranging from >32 to <3 PSU. Near-surface water samples were filtered with a 20 micron mesh net, preserved, and examined microscopically. Surface water chlorophyll concentrations were measured with a fluorometer. Overall, diatom and chlorophyll concentrations were highest in the summer and lower in the winter. However, diatom diversity was lower in the summer than in the winter. Superimposed on this seasonal cycle was an apparent decrease in diatom and chlorophyll concentrations over the period of study. The maximum diatom stock was 18,092 cells/L in June 2010 and subsequent summer maxima were lower than this. Chlorophyll concentrations were highest in June 2010 (17.84 micrograms/L) and October 2009 (19.50 micrograms/L). In August, *Skeletonema* dominated the diatom communities along much of the estuary with greater diversity typically near the river mouth. *Skeletonema* only dominated in 2011 among the three years of December data. The results show interannual differences among diatom abundances, and that diversity was lower when standing stocks were higher. Further work will investigate the influence of nutrients, light intensity, and tides on the diatom community. The results improve our understanding of temporal and spatial influences on estuarine diatom distribution, trophic state of the estuary, and baseline conditions prior to the planned harbor deepening.

8. Abiotic versus biotic removal mechanisms of TSS and Chl *a* over *Crassostrea virginica* reef structure

Mary Grace Lemon, Martin Posey, Michael Mallin, Lynn Leonard, and Troy Alphin, UNCW Center for Marine Science*

Over the last two decades the eastern oyster (*Crassostrea virginica*) has received increased attention due to declining abundances and the recognition of the ecosystem services they provide, including filtration, nutrient cycling, substrate stabilization and habitat. A number of field studies have evaluated filtration as the removal of suspended solids (TSS) and phytoplankton (Chl *a*) by *C. virginica*. Generally it seems that there is more material being removed from the water column than would be predicted by oyster filtration rates, indicating loss, settlement, or sequestration due to oyster structure. The main objective of this study is to quantify removal by both abiotic and biotic processes across the oyster reef. Sampling will be performed on four medium oyster reefs located in Hewletts Creek near Wilmington, North Carolina. Total removal will be determined by comparison of vertical profiles of upsteam/downstream measurements during target tidal stages. All measurements of TSS and Chl *a* will be correlated with flow velocity. Removal will be parsed between biotic and abiotic factors by quantifying the amount of pseudofeces and feces released by the oysters versus the amount of sediment deposited on settlement tiles and traps during target time periods. In addition to the observational study an experimental manipulation will evaluate removal before and after oyster defaunation. This data will be used as an aid in quantifying abiotic and biotic removal observed over natural reefs. This study will lead to a better understanding of the filtration and hydrodynamic factors interacting to remove particulates.

9. Nutrient limitation of bioluminescent dinoflagellates in Mangrove Lagoon, Salt River Bay, St. Croix, USVI

Michelle E. Zimberlin and James L. Pinckney, University of South Carolina*

Bioluminescent bays resulting from dense concentrations of bioluminescent dinoflagellates are rare with only 14 documented systems worldwide. One of these bays, Mangrove Lagoon, is located in Salt River Bay National Park in St. Croix, USVI. Very little is known about the environmental factors responsible for maintaining the high dinoflagellate densities in this lagoon. In order to assess the dynamics of the dinoflagellates, in situ bioassays nutrient addition bioassays will be conducted to determine which nutrients

regulate the phytoplankton community including the bioluminescent dinoflagellate *Pyrodinium bahamense*. Bioassays will be conducted in two different seasons, Jan 2013 and May 2013 to examine seasonal responses to nutrient additions. The proposed research will provide insights into the primary nutrients regulating phytoplankton community structure including dinoflagellate abundance and will satisfy the need for baseline data prior to planned changes in the immediate watershed. The two hypotheses that will be addressed in this project are (1) the phytoplankton community is phosphorus-limited and (2); mangrove leachate stimulates the growth of dinoflagellates relative to the other phytoplankton. Photopigment biomarkers will be used to assess community composition and biomass in the bioassays as well as ambient waters. This proposed research will provide insights into the role of nutrients and mangrove leachate as regulators of bioluminescent dinoflagellate biomass in Mangrove Lagoon.

10. Modeling the effects of freshwater runoff on estuarine pelagic primary production

*Zachariah Hedley**, Aaron Palmieri**, Gloria Welch**, Kasia A. Pawelek, and Stephen A. Borgianini, University of South Carolina Beaufort*

This modeling framework is part of a larger project assessing the effects of freshwater runoff on phytoplankton distribution, community dynamics and productivity across spatial and temporal scales in the May River, a high salinity estuary in southeastern South Carolina. The ecological impact of phytoplankton assemblages and their role in primary production in high salinity estuaries are indisputable, yet very little has been published on the effects of human-mediated freshwater/ stormwater input into these uniquely sensitive environments. We considered surface water monitoring data collected in the May River by the Town of Bluffton between 2007-2008 including temperature, salinity, and chlorophyll a. Local tide data and daily precipitation data were also considered to estimate the timing, intensity and duration of freshwater input. We developed a model to study the effects of freshwater input and tide changes on the dynamics of salinity of the May River. This ongoing study provides a quantitative understanding of the abiotic factors that can explain the rapid changes in the salinity of the river. The ultimate function of the model will be to assist in the development of a spatially and temporally appropriate sampling strategy designed to assess the biological effects of freshwater input into this high salinity estuary.

11. Shoreline armoring in coastal Georgia: Do landscape characteristics matter?

Natalie McLenaghan, Merryl Alber, and Jeff Hepinstall-Cymerman, University of Georgia; and Clark Alexander, Skidaway Institute of Oceanography*

As coastal regions are modified to support development, armored structures are installed to stabilize the land-sea interface and protect property. Shoreline hardening is expected to increase in coming decades, as projected growth elevates the demand for engineered solutions to an encroaching sea. As such, it is critical to understand how armoring is linked with land-use change and how these structures might impede the flow of energy, nutrients, and biota across coastal landscapes. We investigated the distribution of hardened structures along the Georgia coastline, capturing an urban-to-rural gradient. Relationships between land cover and shoreline armoring were examined at county and catchment scales, and we also evaluated the proportion of modified cover in highly localized buffer zones extending inland from hardened features. At the county scale, impervious cover was very closely linked with total armoring ($r = 0.98$). In contrast, land cover was completely unrelated to armoring length at the HUC-8 catchment scale ($r = 0.01$). As sub-basins were further divided into smaller units (HUC-10 and -12), correlations increased from $r = 0.52$ to 0.74, respectively. Armored structures were in close proximity to fringing coastal development, and the extent of modified cover decreased logistically with increasing distance from the hardened shoreline. In the rural counties, upland in the immediate vicinity of armored shores was four-to five-fold more modified (by %) than the surrounding county-wide cover. Further research will explore cumulative ecological impacts of armoring at a range of spatial scales, as well as potentially confounding effects of land-use change.

12. Coastal urban greenways as a stopover point for migrating birds

Sarah Diaz and Paul Nolan, The Citadel*

Given that many birds migrate along the coast and that human cities are increasingly concentrated there, loss of stopover habitat for migrating birds is almost inevitable. Recent decades have seen a movement to develop or restore green spaces within urban boundaries, primarily serving recreational roles for humans but with the potential to provide stopover points for migrating birds. We divided an urban/suburban green space in Charleston, SC into twelve, 300m transects and surveyed all bird species present during the Fall 2011 migration (October to early December) and the Spring 2012 migration (March to early May). We

quantified the vegetation composition of each transect using standard shrub plot and prism plot techniques, plus used densiometer readings to quantify canopy closure. Combining those vegetation data with satellite imagery, we categorized the transects into five different habitat types. Finally, we compared Shannon-Weaver diversity scores of plant and bird diversity using linear regression, and used ANOVA to compare bird diversity and abundance across the habitat categories. In all we identified 75 species, representing 26 families of birds, using the West Ashley Greenway. We found significant variation in the composition of the avian communities present in the Fall vs. the Spring migration periods, and noted a strong pattern of habitat diversity influencing avian diversity. We conclude that urban green spaces may serve a valuable role as stopover points in the absence of more valuable, undisturbed lands.

13. Avian community response to seasonal and successional changes along the Cooper River, SC
Pamela Corwin, Dept. of Biology, The Citadel and SC Dept. of Natural Resources—Dennis Wildlife Center and Paul M. Nolan, Dept. of Biology, The Citadel*

Secondary succession plays a critical role in driving community structure in natural communities. Vertebrate communities should respond to these successional changes on long time scales, but can also be expected to undergo significant seasonal changes differing from those seen on successional time scales. Avian communities in particular may show distinct changes, given the birds' ability to migrate long distances between habitats. I studied seasonal changes in the abundance, diversity, and similarity of avian communities, in abandoned rice fields representing a variety of successional stages on the Cooper River, Berkeley County, South Carolina. I censused three rice fields that differed in successional stage, across all seasons of the year, by sight and sound. I found 106 total species. An ANOVA was used to test for differences in abundance and Shannon-Weaver diversity across seasons and successional stages. Successional stage significantly influenced the diversity of the avian community. Although I detected no seasonal differences in diversity, seasonal variability in the particular species comprising the avian community on these ponds is noteworthy. The resulting figures from the Shannon Index did not give an absolute description of a site's biodiversity therefore I also calculated for differences in the abundance of species using a modified Renkonen's Index. Successional stage proved very diverse with no overlap in similarity and seasonal diversity showed little overlap in similarity. Additionally, my data suggest that such rice fields may vary in their value depending on seasons, making heterogeneity of wetland types important to the overall river ecology. Remnant rice fields play a significant role as habitat for various species, substituting for decreasing natural wetlands. Understanding how the avian community responds to succession is important. More knowledge of this community response will enable us to make better wetland management decisions that benefit threatened or endangered species.

14. Oyster demographic rates in fished areas: recruitment, growth, and mortality
Jason W. Peters and David B. Eggleston, NCSU*

Understanding spatiotemporal variability in population demographic rates is essential to guiding effective restoration of a given species, especially an ecosystem engineer such as oysters. Large-scale restoration of eastern oysters (*Crassostrea virginica*) in Pamlico Sound (PS), North Carolina indicates that this metapopulation within a network of no-take reserves is strongly dependent upon larval subsidies from outside the network. To begin to identify larval sources in fished areas (natural reefs vs. cultch planting sites) that facilitate metapopulation persistence within reserves, we quantified oyster demographic rates (density, recruitment, growth, survival) in 22 sub-tidal fished oyster reefs throughout PS over a six-month period in 2012. Differences between natural reefs and cultch planting sites were striking natural reefs resembled isolated oyster shell hash with no vertical relief, whereas cultch sites, although variable, tended to have relatively high shell cover and quantifiable demographic rates. Oyster density was significantly higher in relatively low salinity sites than high salinity sites, whereas oyster growth and survival generally varied at relatively small scales such as across sampling sites. Recruitment was generally weak in PS throughout the study; however, length-frequency histograms suggest strong recruitment at some sites in early October. This information will help identify the role fished oyster populations play in persistence of no-take reserves.

15. Early life history of two oyster reef fishes in North Inlet, SC

Rachel M. Tremont and Juliana M. Harding, Coastal Carolina University; and Dennis M. Allen, Baruch Marine Field Laboratory/University of South Carolina*

Recruitment success for many marine fishes may be determined during the larval stage. Larval duration and size at settlement are two variables that are associated with recruitment success. Water temperature is one factor that regulates larval physiology and can influence larval duration and settlement size. Planktonic larval duration (days) and size at settlement (mm) were used as metrics to describe the early life history of two common temperate estuarine fishes, the naked goby (*Gobiosoma bosc*) and striped blenny (*Chasmodes bosquianus*) in North Inlet, SC. Fish nests collected from oyster reefs were cultured from hatch through settlement at ambient conditions July 2012 in a running seawater laboratory at Baruch Marine Field Laboratory (BMFL). Gobies settled after 21 days at total lengths ranging from 7.1 to 8.4 mm. The planktonic larval period lasted 14-18 days for striped blennies and size at settlement ranged from 5.0 to 11.8 mm. Average water temperatures during larval fish culture ranged from 29.1 to 30.1 °C. Planktonic larval duration estimates for both species agree with previous studies; however naked goby total lengths at settlement were smaller in this study compared to the 9-12 mm reported in other studies. These data provide first descriptions of the early life histories of the naked goby and striped blenny in North Inlet. Research planned for summer 2013 will describe these metrics for larval fishes cultured during April and August when water temperatures are potentially cooler and warmer, respectively, than in the 2012 study period.

16. Current status of the Ctenophore (*Mnemiopsis leidyi*) in Upper Barnegat Bay, New Jersey

John A. Tiedemann, Monmouth University; Nicole Wisniewski, College of Charleston; and Keith P. Leonard, Monmouth University*

The ctenophore *Mnemiopsis leidyi* is abundant in many mid-Atlantic estuaries during the summer. Historically, *Mnemiopsis* has been reported to occur in Barnegat Bay from late May/early June into the fall with periods of peak abundance recorded in June and August. To date, the results of a macrozooplankton monitoring survey indicate that *Mnemiopsis leidyi* is present in upper Barnegat Bay from May to November. Furthermore, *Mnemiopsis* typically comprises a major component of the summer macrozooplankton community within the study area, reaching maximum densities in June and August. The Barnegat Bay ecosystem has changed considerably over the past several decades. Threats to its ecological integrity include nutrient enrichment, algal blooms, alteration of freshwater inputs, and extensive development around its watershed. Continued monitoring of the status of *Mnemiopsis* populations in Barnegat Bay, coupled with water quality monitoring, may serve as an indicator of trends taking place within living resources of the bay in relationship to changing environmental conditions. If changes in seasonal patterns of *Mnemiopsis* abundance or bloom conditions occur, this could have an impact on other populations of the bay since *Mnemiopsis* is a voracious predator that feeds on a diversity of holoplankton and meroplankton including ichthyoplankton and bivalve larvae.

17.Salt marsh fish assemblages along an urbanization gradient in Barnegat Bay

*Gina Clementi**, University of Miami; Kenneth Able and Thomas Grothues, Rutgers University*

Salt marshes face increased construction, contamination, physical degradation, and undetermined ecological and economical effects due to urbanization in Barnegat Bay, New Jersey. These habitats located within the estuary provide a suitable environment for many resident and transient species of marine and freshwater organisms, and serve as protection for many larval and juvenile fishes that are able to tolerate the abrupt changes in salinity, temperature, and dissolved oxygen levels. Our purpose was to determine possible ichthyofaunal variability, in regard to species abundance, richness, and composition, of salt marshes relative to the urbanization gradient of Barnegat Bay. We sampled at multiple upper and lower creek sites among five predetermined clusters of different degrees of urbanization along Barnegat Bay. Sampling was done by otter trawl (4.9 m headrope, 6 mm mesh) and repeated three times per site, during the months of February, April, and June 2012. Physical parameters as well as species composition and abundance were then standardized and analyzed using Principal Components Analysis. We determined that fish abundance decreased as urbanization increased, but proximity to inlets appeared to alter physical properties (DO, salinity, temperature) and, thus, fish assemblages. We also found that several species were found in all clusters, but some species had higher site fidelity depending on the degree of urbanization. Therefore, the degree of urbanization of clusters most likely influences the composition of fish species that can tolerate its levels of contamination and pollutants.

18. Variation in fish assemblages between estuarine and coastal sites near the mouth of the Savannah River, Georgia

Jennifer A. Gut, Savannah State University; Jessica M. Reichmuth, Georgia Regents University; and Mary Carla Curran, Savannah State University*

Fish assemblages are indicators of the health of an ecosystem. The purpose of this study was to determine fish biodiversity near the mouth of the Savannah River from the estuarine site of Cockspur Island to the coastal site of Tybee Island, Georgia. Fish were collected by seine from June to December 2012, identified to species, and measured. Half as many individuals were collected at Cockspur Island (n=57) than Tybee Island (n=114). Both sites exhibited high biodiversity, but Cockspur Island had a higher biodiversity (5.16) than Tybee Island (3.50). The greatest species diversity was found within the family Sciaenidae at both sites. However, sciaenids were more abundant at Cockspur Island with 22.8% of the total catch compared to carangids (3.5%). Carangids were more abundant at Tybee Island with 29.5% of the total catch compared to sciaenids (10.7%). My work supports the findings of previous studies in which sciaenids were commonly the most represented group in estuaries on the East Coast of the United States. Carangids are predominantly open-water species, which may account for their greater abundance on the coast at Tybee Island.

19. Residency and movement patterns of three species of elasmobranchs in Georgia during the off season

Charles Cotton and Mary Carla Curran, Savannah State University

The estuaries of coastal Georgia are home to a diverse assemblage of elasmobranchs many of which use these productive habitats as nursery grounds. However, most of these species emigrate during the fall months as water temperatures decline. Very little information exists about year-round resident species or winter elasmobranch fauna in coastal Georgia, specifically with regards to their movement and residency patterns within tidal creeks. We present preliminary telemetry results for three species of elasmobranchs tracked during the late fall, winter and spring months of 2012-2013 in a small creek system in Georgia to establish movement patterns and residency during these months of the year. Bonnethead sharks (*Sphyrna tiburo*), Atlantic stingrays (*Dasyatis sabina*), and a dusky smoothhound (*Mustelus canis*) were outfitted with Vemco ultrasonic transmitters and released into the Romerly Marsh Creek system, which was monitored with a passive array of Vemco ultrasonic datalogging receivers. Initial results of our telemetry and catch data indicate that bonnethead sharks exit the system in early fall, Atlantic stingrays are year-round residents though not within discrete tidal creeks, and dusky smoothhounds are temporary residents during the late fall and winter months. Data will be collected for several more years to fully characterize movement patterns and residency of these species both within coastal Georgia and further along the entire U.S. east coast when our study animals encounter telemetry arrays maintained by collaborators within the Atlantic Cooperative Telemetry (ACT) network.

20. Site fidelity, home range, and population demographics of two grass shrimp species in North Inlet, SC

*Karla Stroud**, Coastal Carolina University; Juliana M. Harding, Coastal Carolina University; and Dennis M. Allen, Baruch Marine Field Laboratory/University of South Carolina*

Habitat segregation has been observed among different estuarine shrimp species. Generally, *Palaemonetes pugio* occupies intertidal areas, whereas *P. vulgaris* resides in subtidal habitats within the same system during most of the tidal cycle. The objective was to determine if either shrimp exhibits site fidelity and to describe its home range size. Both shrimp species were collected from Clambank Creek, North Inlet, SC during June and July 2013. Shrimp were marked with coded microwire tags and released. Beginning 2 d after release and continuing weekly for 53 d, shrimp collections were made from multiple locations including the release site. Approximately 9% of the 2,400 *P. pugio* released were recaptured. 97% of the *P. pugio* recaptured were collected at their release location. Home range size for *P. pugio* ranged from 0 to 95 m. The recapture rate for *P. vulgaris* (16%) was higher than that observed for *P. pugio*. Estimated home range size was less than 1 m for *P. vulgaris*. Carapace widths ranged from 5 - 16 mm and 4 - 15 mm for *P. pugio* (n = 3100) and *P. vulgaris* (n = 620), respectively. Grass shrimps in North Inlet creeks have a smaller home range and display higher site fidelity than other species of estuarine shrimps and fishes. We suggest that the energy expended maintaining positions within small areas of tidal creeks where tidal currents can easily disperse passive shrimps over long distances may be worth the benefits provided by these areas.

21. A snail's pace: density, movement, and food choice of the marsh periwinkle

*Chanel J. Young**, Georgia Regents University*

Marsh periwinkles (*Littorina irrorata*) are an important food source for blue crabs and migrant birds, and are important in transfer of energy in the salt marsh food web. The purpose of this study is to measure movement of snails, record their density in the Fort Pulaski National Park and Hunting Island State Park salt marshes, examine the snail's preferred food source, and determine how snails affect the salt marsh. To measure the movement of snails, the mark and recapture technique was used. The density of snails was measured by counting and recording the number of snails along a line transect. An artificial salt marsh microcosm was created in the lab containing labeled snails and two food choices, *Salicornia* spp. and *Spartina alterniflora*, to monitor which plant the snails favor. The effects of snails on the salt marshes were determined by looking for an increase or decrease of *Spartina* found on the salt flats. Recent literature has suggested the periwinkle snails do not move farther than two meters from an origin. However, our data suggest the snails move much farther than the two- meter radius. Our data have also shown that the density of snails seems to be determined by the health and density of the *Spartina* and, furthermore, that *Spartina* is a preferred food choice compared to the *Salicornia*. The effects of the snails on the *Spartina* have yet to be determined.

22. Selection of an omnivorous diet by the mangrove tree crab *Aratus pisonii* in laboratory experiments

Amy A. Erickson, Louisiana State University Shreveport; Ilka C. Feller, Smithsonian Environmental Research Center; Valerie J. Paul, Lisa M. Kwiatkowski, and Woody Lee, Smithsonian Marine Station

Studies on leaf damage, gut content analyses, and crab behavior have demonstrated that like numerous other mangrove and salt-marsh generalists, the mangrove tree crab *Aratus pisonii* feeds on a variety of food resources. This study is the first to experimentally test feeding preferences of *A. pisonii* and test whether chemical composition of food resources is responsible for food selection. Feeding preferences were determined among a variety of plant, algal, and animal resources available in the field in Florida and Belize, using multiple-choice feeding assays, where crabs simultaneously were offered a variety of food items. To test whether chemistry of food resources was responsible for feeding preferences, chemical extracts of food resources were incorporated in agar-based artificial food which was then used in feeding assays. Feeding assays suggested that crabs prefer animal matter anywhere from 2.5 to 13 times more than other available resources, including leaves of the red mangrove *Rhizophora mangle*, which comprise a significant part of their natural diet. Feeding assays with extracts also demonstrated that chemical cues were responsible for selection of animal matter, up to 25 times more than other available resources. Non-polar extracts stimulated feeding the most, suggesting that fatty acids, triglycerides, or sterols may be important for growth, reproduction, or survival. Results for both sexes were similar across most assays. While chemical composition of food resources influences selection, this does not discount the potential of other factors, such as resource availability, competition, predation, or reproductive requirements to influence feeding preferences as well.

23. The parasitic effects of *Probopyrus pandalicola* on the behavior of *Palaemonetes pugio* and the predation preferences of *Fundulus heteroclitus*

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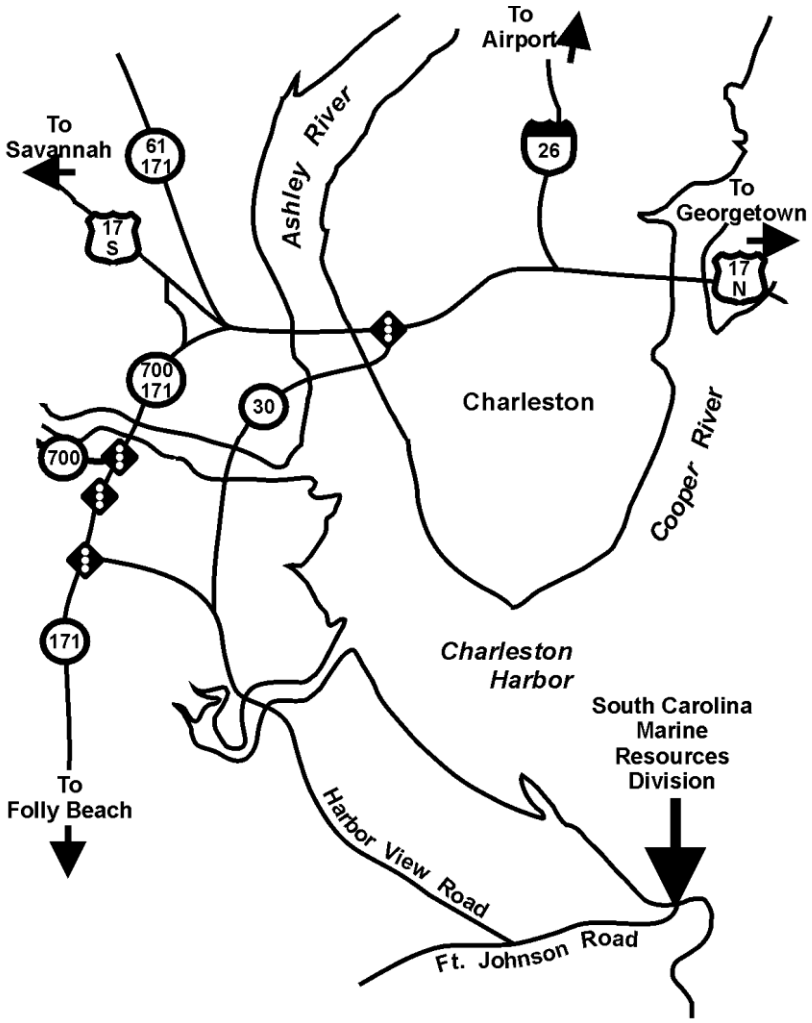
The daggerblade grass shrimp *Palaemonetes pugio* plays a crucial role in estuarine communities on the Atlantic and Gulf coasts. Parasitization by the isopod *Probopyrus pandalicola* affects some aspects of shrimp physiology, but its effect on behavior is unclear. The purpose of this study was to determine how the parasite affected shrimp behavior and the predation preferences of the mummichog *Fundulus heteroclitus*. Each aquarium contained 2 fish along with 1 parasitized and 1 unparasitized shrimp. Prey behavior was recorded immediately prior to predation by *F. heteroclitus*. The 4 types of shrimp behavior in order of perceived activity level were: motionless, walking, swimming, and backward thrusting. Mummichogs preferentially selected shrimp that were swimming (44.7%) and backward thrusting (41.2%), regardless of parasitization. Significantly more parasitized shrimp (51) were selected than unparasitized shrimp (34). Overall, parasitized shrimp were less likely to backward-thrust than unparasitized shrimp. The major findings of this study were that *Probopyrus pandalicola* affected both the behavior of its host and the predation preferences of *Fundulus heteroclitus*. Furthermore, *P. pugio* that were more active were consumed more frequently. An unexpected benefit of parasitization may be a resulting reduction in host activity level, and thus decreased potential visibility to a predator.

24. Do swimming performance tests explain ecological differences between estuarine *Fundulus heteroclitus* and *F. majalis* fishes?

*Kelsey Yetsko*** *and Gorka Sancho, College of Charleston*

Fundulus heteroclitus and *Fundulus majalis*. are fishes physiologically adapted to tolerate wide ranges of salinity that inhabit estuaries. Both species are present in high salinity waters, but *F. majalis* is more abundant beach fronts, while *F. heteroclitus* dominates lower salinity estuarine areas. Swimming performance was used as a measure of relative fitness between the two species. Fishes were acclimated and tested in high salinity (30 ppt) and low salinity (15 ppt) waters. Swimming performance was measured through both endurance and burst speed trials to assess differences in aerobic and anaerobic capabilities. Overall *F. majalis* outperformed *F. heteroclitus* in most swimming trials. For both species, swimming performance did not change significantly with changing salinity. Our swimming performance results explain the ecological dominance of *F. majalis* in high salinity waters, but cannot explain the ecological dominance of *F. heteroclitus* in low salinity estuaries.

MAPS

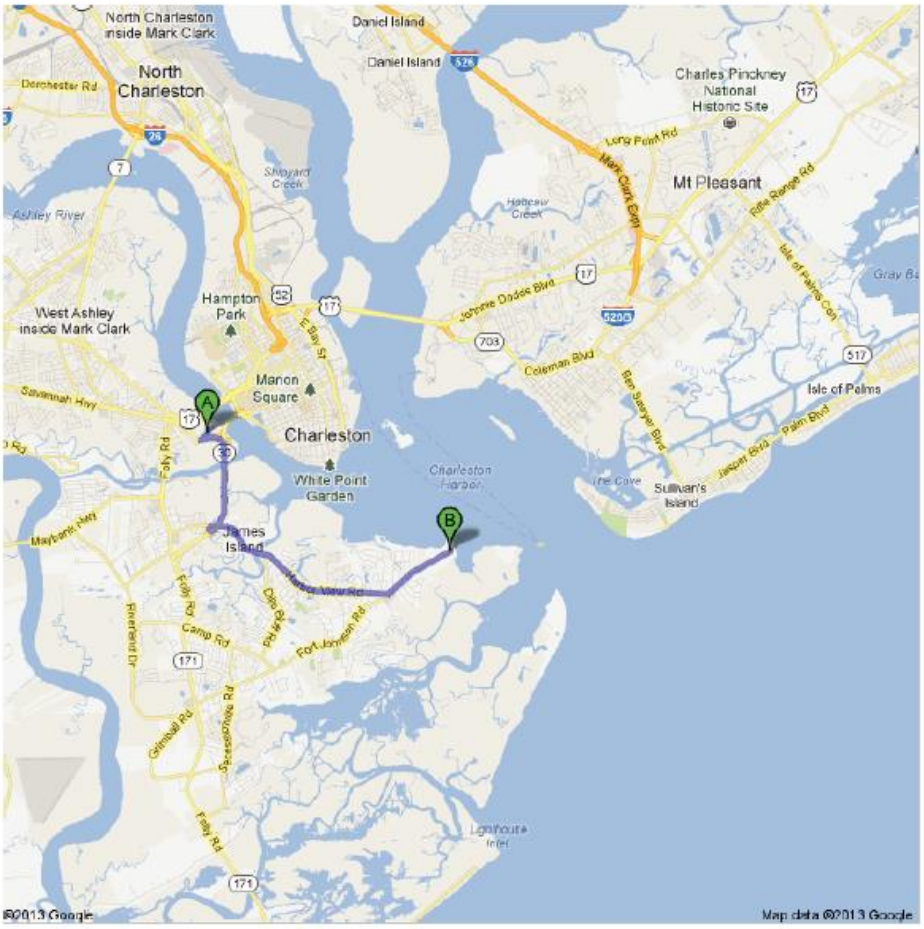


1. From Interstate 26, turn south onto US 17.
2. After fifth traffic light get into center lane. You will soon approach a fork in the road, go straight, not up on to the overpass. Turn left at the next traffic light, onto Lockwood Blvd.; sign should say "North 30 left lane". Go through the next traffic light and proceed up the ramp onto Route 30. Signs will indicate Route 30 to James Island and Folly Beach.
3. Take the second exit off Route 30 at Harbor View Road. Bear to the right. Stay on Harbor View Road until it ends at Fort Johnson Road.
4. Take a left onto Ft. Johnson Road. Continue until you pass through the SC Department Natural Resources gate. Follow the road for approximately 1/4-mile. The main laboratory building is Building 8 and the Administration Building is 10.

Google

Directions to Fort Johnson Rd
6.4 mi – about 13 mins

SC DNR Marine Resources Research Institute and NOAA/National Ocean Service



A La Quinta Inn & Suites Charleston Riverview
11 Ashley Point Dr, Charleston, SC 29407

	1. Head **southwest** on **Ashley Point Dr** toward **S Carolina 61 N**	**go 0.2 mi** total 0.2 mi
61	2. Take the 1st left onto **S Carolina 61 S** About 2 mins	**go 0.3 mi** total 0.4 mi
30	3. Keep right at the fork, follow signs for **S Carolina 30 W/Folly Beach** and merge onto **S Carolina 30 W/James Island Expy** About 2 mins	**go 1.5 mi** total 1.9 mi
↱	4. Take exit **2** for **Harbor View Road**	go 0.1 mi total 2.0 mi
↱	5. Keep right at the fork, follow signs for **Harbor View Rd** and merge onto **Harbor View Rd** About 6 mins	**go 3.2 mi** total 5.2 mi
↰	6. Turn left onto **Fort Johnson Rd** About 3 mins	**go 1.2 mi** total 6.4 mi

B Fort Johnson Rd
go through the front gate, NOAA is first building on right, and SC DNR MRRI is about 0.4 mi on the left


1. South Carolina Dept of Natural Resources Marine Resources Division
2. South Carolina Dept of Natural Resources Admin Offices
3. College of Charleston Grice Lab
4. Medical University of South Carolina
5. Hollings Marine Lab
6. Center for Coastal Environmental Health and Biomolecular Research
Main Gate
150
Meters
N
W
E
S

NOTES