Southeastern Estuarine Research Society
Est. 1974

Semi-annual Meeting

November 6 – 8, 2014

Celebrating 40 years of estuarine and coastal research and management in the southeast

Courtyard by Marriott
Carolina Beach, North Carolina

PROGRAM & ABSTRACTS

This program has been provided courtesy of the University of North Carolina Wilmington Department of Biology & Marine Biology

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

SEERS Officers

President
Eugene (Geno) Olmi, PhD
Coordinator, NOAA Southeast and Caribbean Regional Team
2234 South Hobson Avenue
Charleston, SC 29405
Tel: 843-740-1230
email: geno.olmi@noaa.gov

Past President
Robert Virnstein, PhD
Seagrass Ecosystems Analysts
142 Elgin Road
East Palatka, FL 32131
Tel: 386-546-0204
email: seagrass3@gmail.com

President-Elect
Erik Smith, PhD
Research Coordinator, North Inlet-Winyah Bay National Estuarine Research Reserve
Research Assistant Professor
USC Baruch Institute for Marine & Coastal Sciences
Baruch Marine Field Laboratory
PO Box 1630
Georgetown, SC 29422
Tel: 843-904-9035
email: erik@belle.baruch.sc.edu

Secretary
Virginia Shervette, PhD
Assistant Professor of Biology
Department of Biology and Geology
University of South Carolina Aiken
471 University Parkway
Aiken, SC 29801
Tel: 803-641-3605
email: shervette@gmail.com

Treasurer
Amanda Kahn Dickens, PhD
Department of Biology and Marine Biology
University of North Carolina Wilmington
601 South College Road
Wilmington, NC 28403
Tel: 910-962-3472
email: dickensa@uncw.edu

Program Chair
Loren Mathews, PhD
Visiting Assistant Professor
Department of Biology
Georgia Southern University
PO Box 8042
Statesboro, GA 30458
Tel: 912-478-4732
email: lorensmathews@yahoo.com

Student Representative
Mary Grace Lemon
Department of Renewable Natural Resources
Louisiana State University
Renewable Natural Resources Building
Baton Rouge, LA 70803
Tel: 337-515-2711
email: mlemon7@tigers.lsu.edu

Member-at-Large
Nikki Dix, PhD
Research Director
Guana Tolomato Matanzas
National Estuarine Research Reserve
505 Guana River Road
Ponte Vedra Beach, FL 32082
Tel: 904-823-4519
email: Nikki.Dix@dep.state.fl.us

Southeastern Estuarine Research Society

November 6, 2014

Welcome to Carolina Beach! I am so glad that you came out to the North Carolina coast for this meeting. Even though autumn is in the air, I hope you can enjoy a sunrise over the ocean, stroll along the sandy beach, or visit to the revitalized boardwalk along the dunes.

Located just south of Wilmington, this area is known to the locals as Pleasure Island, a barrier island separating the Cape Fear River from the Atlantic Ocean. The area has beautiful beaches and marshes and a vibrant past. Towards the southern end of the island is Ft. Fisher. Built mostly of sand and earth during the Civil War, this fort served to protect the port of Wilmington for blockade-runners supplying goods to Confederate armies inland. In 1865, the fort fell after a Federal amphibious assault. Today there is ~10% of the fort still standing and the park also serves as the North Carolina State Underwater Archaeology headquarters. Just south of the state historic site is the North Carolina Aquarium at Ft. Fisher. The exhibits there represent the local ecosystems from the freshwater river, through the estuaries, and into the ocean.

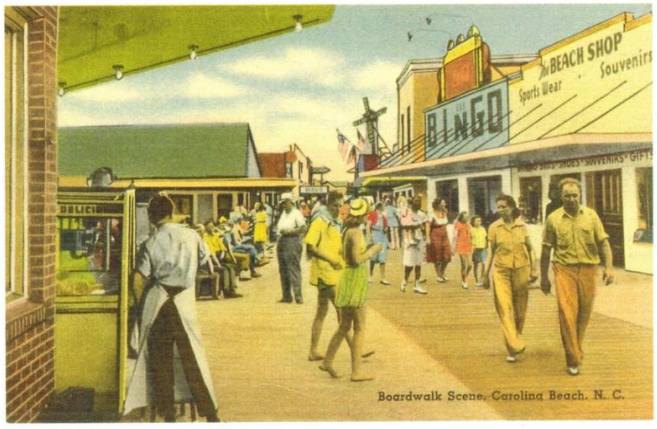
A few miles north over the bridge is the UNCW Center for Marine Science at the CREST Research Park. This facility is located on the Intracoastal Waterway and houses labs, equipment, boats, and other resources that facilitate interdisciplinary collaborative research along our coasts.

I hope y'all enjoy your time here! Let me know if you have any questions or if there is anything I can do to help make your stay more enjoyable.

Regards,

Amanda

Amanda Kahn Dickens
University of North Carolina Wilmington
Fall 2014 Meeting Local Host



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

Our Sponsors:

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Additional Contributors:

University of North Carolina Wilmington, Department of Biology and Marine Biology
(for printing of the program book)
University of North Carolina Wilmington, Honors College
(for providing poster display boards and easels)

Our Local Host:

Amanda Dickens, University of North Carolina Wilmington

Our Student Volunteers:

Ruthie Barbas, University of North Florida
Samantha Bobbitt, University of North Carolina Wilmington
Amanda Cole, University of North Carolina Wilmington
Christian Commander, University of North Carolina Wilmington
Erin Cummings, University of North Carolina Wilmington
Caitlin Phelps, University of North Carolina Wilmington
Amanda Tritinger, University of North Florida

Session Chairs and Anonymous Judges

Chair of Student Promotions Committee (Travel Awards):

Erik Smith, University of South Carolina, Baruch Institute for Marine & Coastal Sciences, North Inlet-Winyah Bay National Estuarine Research Reserve

SEERS Congratulates our Student Travel Award Winners:

Jamie Alfieri, Georgia Southern University
Thomas Dornhoffer, University of Georgia
John Paul Everhart, University of South Carolina
Jonathan Ledoux, University of Georgia
Marie Tarnowski, Florida Atlantic University

YSI Incorporated, a subsidiary of Xylem Analytics, designs and manufactures innovative water quality, water velocity, water level, and flow measurement sensors, instrumentation and monitoring systems for sampling and long term monitoring applications in the field and laboratory

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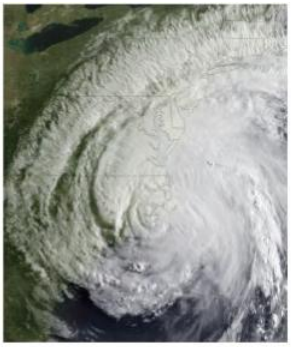
Department of Environmental Studies

&

University of North Carolina Wilmington,
Department of Biology and Marine Biology

&

University of North Carolina Wilmington
Honors College

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Be sure to stop by the sponsor exhibition tables and say thank you to all our sponsors for their support of the Fall 2014 Meeting!

Southeastern Estuarine Research Society
November 6-8, 2014
Courtyard by Marriott
100 Charlotte Avenue, Carolina Beach, NC 28428

Schedule at a Glance

Thursday, November 6

4:00 p.m. – 5:30 p.m.	Registration check-in and poster set-up
5:00 p.m. – 5:15 p.m.	Sponsor Demo – HACH / Hydromet
5:15 p.m. – 5:30 p.m.	Sponsor Demo – YSI, a Xylem brand
5:30 p.m. – 8:30 p.m.	Poster Session and Social (Presenters should stand by their posters between 6:00 and 8:00 p.m. – Student posters will be judged during this time)

Friday, November 7

7:30 a.m. – 8:45 a.m.	Breakfast
8:00 a.m. – 8:45 a.m.	Registration check-in
8:45 a.m. – 9:00 a.m.	Welcome and Announcements
9:00 a.m. – 10:15 a.m.	Session I – Water Quality / Pollutants
10:15 a.m. – 10:45 a.m.	Break
10:45 a.m. – 11:30 a.m.	Session II – Sediment / Nutrient Cycling
11:30 a.m. – 1:00 p.m.	Lunch
1:00 p.m. – 1:45 p.m.	Session III – Marsh Elevation / Sea Level Rise
1:45 p.m. – 2:30 p.m.	Session IV – Social Side of Science
2:30 p.m. – 3:00 p.m.	Break
3:00 p.m. – 4:00 p.m.	Session V – Special Session
4:00 p.m. – 5:00 p.m.	Business Meeting & Student Travel Award Presentation
7:00 p.m. – 10:00 p.m.	Dinner Social at Seawitch Café and Tiki Bar 227 Carolina Beach Ave N, Carolina Beach, NC 28428

Saturday, November 8

7:30 a.m. – 8:45 a.m.	Breakfast
8:45 a.m. – 9:00 a.m.	Welcome and Announcements
9:00 a.m. – 10:15 a.m.	Session VI – Marine Vertebrates / Fish
10:15 a.m. – 10:45 a.m.	Break
10:45 a.m. – 11:30 a.m.	Session VII – Primary Producers
11:30 a.m. – 12:00 p.m.	Student Presentation Awards & Closing Remarks

During registration times, breaks, and lunch,
Please be sure to check out the SEERS merchandise table!

SEERS T-shirts and stainless steel water bottles will be available for purchase! Special 40th anniversary T-shirts are also available!

They make great holiday gifts!

Sales help to support student travel awards!

PLATFORM PRESENTATIONS

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

Friday, November 7

8:45 Welcome
Geno Olmi, SEERS President; Amanda Dickens, Local Host; Loren Mathews, SEERS Program Chair

9:00 a.m. – 10:15 a.m. Session I: Water Quality / Pollutants
Moderator: Brigette Brinton, Savannah State University

9:00 Quantifying submarine groundwater discharge from St. Catherine's Island, Georgia
*Jacque L. Kelly, Georgia Southern University; Kirk Mobley**, Georgia Southern University; and James S. Reichard, Georgia Southern University*

9:15 The impacts of urban and suburban stormwater runoff on selected metabolic processes in a southeastern North Carolina tidal creek
Anna R. Robuck, UNCW Center for Marine Science; Michael A. Mallin, UNCW Center for Marine Science; Matthew R. McIver, UNCW Center for Marine Science; Lawrence B. Cahoon, UNCW Department of Biology and Marine Biology; Joanne Halls, UNCW Department of Geography and Geology*

9:30 The effects of on-site sewage treatment and disposal systems on urbanized canals and the St. Sebastian River in Indian River County, FL
Marie Tarnowski, FAU Harbor Branch Oceanographic Institute; Laura Herren, FAU Harbor Branch Oceanographic Institute; Brian Lapointe, FAU Harbor Branch Oceanographic Institute*

9:45 Differences in mercury concentrations of mummichogs (*Fundulus heteroclitus*) and Atlantic silversides (*Menidia menidia*) from a South Carolina salt marsh
Daniel P Ferons, Coastal Carolina University Department of Marine Science; Jane L Guentzel, Coastal Carolina University Department of Marine Science; Andrew Heyes, University of Maryland Center for Environmental Science; Veronica L Lance**, Coastal Carolina University Department of Marine Science*

10:00 Total and methyl mercury in surface water, sediments, and aquatic plants from differing ecoregions of South Carolina
Jane L. Guentzel, Coastal Carolina University Department of Marine Science

10:15 a.m. – 10:45 a.m. BREAK

Friday, November 7

10:45 a.m. – 11:30 a.m. Session II: Sediments / Nutrient Cycling

Moderator: Marie Tarnowski, FAU Harbor Branch Oceanographic Institute

10:45 The role of benthic fauna in enhancing nitrogen removal in coastal ecosystems

T.M. Dornhoffer, University of Georgia; G.G. Waldbusser, Oregon State University; C. Meile, University of Georgia*

11:00 Shifts in control: How seawater intrusion may alter the estuarine nitrogen cycle

David E Hines, University of North Carolina Wilmington; Pawandeep Singh*, Visva-Bharati University, Santiniketan, India*

11:15 Floating material is an alternative sediment source for salt marshes: Novel measurement methods and comparisons with suspended sediment

Scott Ensign, Aquatic Analysis and Consulting, LLC; Carolyn Currin, NOAA

11:30 a.m. – 1:00 p.m. LUNCH

1:00 p.m. – 1:45 p.m. Session III: Marsh Elevation / Sea Level Rise

Moderator: Ruthie Barbas, University of North Florida

1:00 Effect of morphological changes on tidal range within a tidal creek

Brittany L. Hoffnagle, Coastal Carolina University; Erin E. Hackett, Coastal Carolina University; Richard N. Peterson, Coastal Carolina University; Michael P. Slattery, South Carolina Sea Grant; Richard F. Viso, Coastal Carolina University*

1:15 Use of remote sensing data for evaluating elevation and plant distributions in Georgia tidal marshes

Christine Hladik, Georgia Southern University

1:30 Insights from merging ecological indicators with sea-level rise scenarios to develop a spatial prioritization for the South Atlantic coast

Bradley A. Pickens, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Applied Ecology, North Carolina State University; Rua Mordecai, South Atlantic Landscape Conservation Cooperative; Ashton Drew, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Applied Ecology, North Carolina State University; Louise Alexander-Vaughn, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Applied Ecology, North Carolina State University; Amy Keister, South Atlantic Landscape Conservation Cooperative; Jaime A. Collazo, U.S. Geological Survey, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Applied Ecology, North Carolina State University

1:45 p.m. – 2:30 p.m. Session IV: Social Side of Science

Moderator: Christian Commander, University of North Carolina Wilmington

1:45 Albemarle Sound demonstration study of the National Monitoring Network for U.S. coastal waters and their tributaries

Michelle Moorman, USGS; Sharon Fitzgerald, USGS; Keith Loftin, USGS; Elizabeth Fensin, NC DWR

2:00 Indian River Lagoon observatory: Real-time water quality data network for research, education, and outreach

M. Dennis Hanisak, Kristen S. Davis, Ben Metzger, Harbor Branch Oceanographic Institute at Florida Atlantic University

2:15 Modeling suitability to enhance North Carolina shellfish aquaculture

Keith B. Walls, University of North Carolina Wilmington Center for Marine Science; Martin H. Posey, University of North Carolina Wilmington Department of Biology & Marine Biology; Eman M. Ghoneim, University of North Carolina Wilmington Department of Geography and Geology; Troy D. Alphin, University of North Carolina Wilmington Department of Biology & Marine Biology*

2:30 p.m. – 3:00 p.m. BREAK

3:00 p.m. – 3:30 p.m. Session V: Special Session

Moderator: Loren Mathews, Georgia Southern University

3:00 Session Overview

Loren Mathews, SEERS Program Chair

3:15 Fish parasites as bioindicators of human disturbance in Georgia salt marshes

Jamie M. Alfieri, Georgia Southern University; Tavis K. Anderson, Georgia Southern University*

3:30 Numerical modeling and analysis of tidal variance, flow through vegetation, and marsh accretion and evolution in the Guana Tolomato Matanzas National Estuarine Research Reserve, Florida

Amanda Tritinger, University of North Florida*

3:45 Is seagrass recovery recruitment limited in the Indian River Lagoon?

Robert Virnstein, SEA; M. Dennis Hanisak, Harbor Branch; Lori Morris, SJRWMD; Robert Chamberlain, SJRWMD; John Hart, Harbor Branch

4:00 p.m. – 5:00 p.m. BUSINESS MEETING & AWARD PRESENTATION

7:00 p.m. – 10:00 p.m. DINNER SOCIAL AT SEAWITCH CAFÉ & TIKI BAR

Saturday, November 8

8:45 Welcome
Geno Olmi, SEERS President; Amanda Dickens, Local Host; Loren Mathews, SEERS Program Chair

9:00 a.m. – 10:15 a.m. Session VI: Marine Vertebrates / Fish
Moderator: Jamie Alfieri, Georgia Southern University

9:00 Tests of reproductive isolation between *Fundulus heteroclitus* and *F. grandis*
Ruthie Barbas*, University of North Florida; Matthew R. Gilg, University of North Florida

9:15 Multi-decadal patterns and trends for larval fish assemblages in North Inlet estuary, SC; indications of climate-related changes?
Tyler Swanson, Baruch Marine Field Lab, University of South Carolina; Dennis M. Allen, Baruch Marine Field Lab, University of South Carolina

9:30 Seasonal residency and distribution patterns of the Atlantic Stingray *Dasyatis sabina* in two tidal creeks near Savannah, Georgia
Sarah Ramsden, Department of Marine and Environmental Sciences, Savannah State University; Mary Carla Curran, Department of Marine and Environmental Sciences, Savannah State University*

9:45 Movement patterns of the Atlantic Stingray *Dasyatis sabina* in tidal creeks near Savannah, Georgia
Cameron Brinton, Savannah State University; Mary Carla Curran, Savannah State University*

10:00 Spatial and temporal patterns of habitat use and mortality of the Florida manatee (*Trichechus manatus latirostris*) in the Mid-Atlantic States of North Carolina and Virginia from 1991 to 2012
Erin W. Cummings, University of North Carolina Wilmington; D. Ann Pabst, University of North Carolina Wilmington; James E. Blum, University of North Carolina Wilmington; Susan G. Barco, Virginia Aquarium & Marine Science Center; Shannon J. Davis, Virginia Aquarium & Marine Science Center; Victoria G. Thayer, North Carolina Division of Marine Fisheries; Nicole Adimey, U.S. Fish and Wildlife Service; William A. McLellan, University of North Carolina Wilmington*

10:15 a.m. – 10:45 a.m. BREAK

10:45 a.m. – 11:30 a.m. Session VII: Primary Producers

Moderator: Amanda Tritinger, University of North Florida

10:45 Impact of silver nanoparticles on the growth rates of an estuarine dinoflagellate, *Prorocentrum minimum*

Shelby V. Butz, SmartState Center for Environmental Nanoscience, Arnold School of Environmental and Public Health, University of South Carolina; R.C. Merrifield, SmartState Center for Environmental Nanoscience, Arnold School of Environmental and Public Health, University of South Carolina; Tammi L. Richardson, School of the Earth, Ocean and Environment, Department of Marine Science, University of South Carolina; James L. Pinckney, School of the Earth, Ocean and Environment, Department of Marine Science, University of South Carolina; Jamie R. Lead, SmartState Center for Environmental Nanoscience, Arnold School of Environmental and Public Health, University of South Carolina*

11:00 Density-dependent impacts of an invasive foundation species on multiple functions in a coastal ecosystem

Aaron P. Ramus, Department of Biology and Marine Biology, University of North Carolina Wilmington; Zachary T. Long, Department of Biology and Marine Biology, University of North Carolina Wilmington; Brian R. Silliman, Division of Marine Science and Conservation, Nicholas School of the Environment, Duke University, Beaufort*

11:15 Spatial patterns in nutrient limitation of macroalgal blooms in South Florida's coastal waters

Brian Lapointe, Harbor Branch Oceanographic Institute at Florida Atlantic University; Laura Herren, Harbor Branch Oceanographic Institute at Florida Atlantic University

11:30 a.m. – 12:00 p.m. CLOSING REMARKS & AWARD PRESENTATION

POSTER PRESENTATIONS (in alphabetical order by number)

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

POSTER PRESENTATIONS (by poster number)

1 Ingested plastics as a transport medium for marine toxicants to the gastrointestinal fluids of loggerhead sea turtles (*Caretta caretta*)
Misty Mangiacapre, University of North Carolina Wilmington, Department of Chemistry and Biochemistry; Samantha Athey**, University of North Carolina Wilmington, Department of Chemistry and Biochemistry; Bonnie Monteleone, University of North Carolina Wilmington, Department of Chemistry and Biochemistry; Dr. Pamela Seaton, University of North Carolina Wilmington, Department of Chemistry and Biochemistry; Dr. Ralph Mead, University of North Carolina Wilmington, Department of Chemistry and Biochemistry*

2 Quantification of fecal bacteria removal by micro-zooplankton grazing in stormwater BMPs
Jade M. Burtchett, Center for Marine Science, University of North Carolina Wilmington; Michael Mallin, Center for Marine Science, University of North Carolina Wilmington; Matthew McIver, Center for Marine Science, University of North Carolina Wilmington; Lawrence Cahoon Department of Biology and Marine Biology, University of North Carolina Wilmington*

3 Tracing vehicle ethanol emissions and subsequent deposition to roadside ecosystems
John C. Cala, University of North Carolina Wilmington; J.D. Felix, University of North Carolina Wilmington, G. B. Avery Jr., University of North Carolina Wilmington; R. Mead, University of North Carolina Wilmington; J. D. Willey, University of North Carolina Wilmington; R. J. Kieber, University of North Carolina Wilmington*

4 Controls on the photorelease of microcystin in resuspended sediments
Coleman T. Corzine, University of North Carolina Wilmington; G. Brooks Avery Jr., University of North Carolina Wilmington; Stephen A. Skrabal, University of North Carolina Wilmington; J. David Felix, University of North Carolina Wilmington; Ralph N. Mead, University of North Carolina Wilmington; Robert J. Kieber, University of North Carolina Wilmington*

5 Multiple stressors over multiple generations: assessing the combined impact of climate change and endocrine disruptors
Bethany M. DeCourten, University of North Carolina Wilmington; Richard E. Connon, University of California Davis; Susanne M. Brander, University of North Carolina Wilmington*

6 **Jellyfish Database Initiative (JeDI): Improving estimates of gelatinous zooplankton biomass in the ocean**
*Aimee Dexter**, UNCW; Robert H. Condon, UNCW; Amanda S. Williard, UNCW; Vincent S. Saba, NOAA Federal; Jonathan D.R. Houghton, Queen's University Belfast; Jeanne Boylan, SEAMAP; Chris Bonzek, VIMS Fisheries*

7 **Ethanol's impacts on the composition and optical properties of chromophoric dissolved organic matter in rainwater in Wilmington, North Carolina**
Erin C Dingess*, *University of North Carolina Wilmington; Robert J. Kieber, University of North Carolina Wilmington; Joan D. Willey, University of North Carolina Wilmington; J. David Felix, University of North Carolina Wilmington, Ralph N. Mead, University of North Carolina Wilmington; G. Brooks Avery Jr., University of North Carolina Wilmington*

8 **Effect of sediment biogeochemical setting on PBTX-2, -3 and MLR photochemical behavior**
Brent Dober UNCW; Dave Felix, UNCW; G. Brooks Avery Jr., UNCW; Steve Skrabal, UNCW; Robert Kieber, UNCW; Ralph Mead, UNCW*

9 **North Carolina Sentinel Site Cooperative: Leveraging resources to ensure resilient coastal communities and ecosystems**
Carolyn Currin, NOAA, NCCOS, Center for Coastal Fisheries and Habitat Research; Jennifer Dorton, NC Sentinel Sites Cooperative and University of North Carolina Wilmington; Rebecca Ellin, N.C. Division of Coastal Management/N.C. Coastal Reserve and National Estuarine Research Reserve; Whitney Jenkins, N.C. Division of Coastal Management/N.C. Coastal Reserve and National Estuarine Research Reserve; Brandon Puckett, N.C. Division of Coastal Management/N.C. Coastal Reserve and National Estuarine Research Reserve

10 **3D visualization of the GPR stratigraphy of DeBordieu Island, SC.**
Aaron Duecaster**, Marine Science, Coastal Carolina University;
Eric Wright, Marine Science, Coastal Carolina University

11 **Suspended sediment concentrations and sediment deposition rates along elevation gradients in a South Carolina salt marsh**
*John Paul Everhart**, University of South Carolina; Tracy Buck, USC Marine Field Lab Baruch Institute; Erik Smith, USC Marine Field Lab Baruch Institute*

12 **Ecotoxicology of bromoacetic acid on estuarine phytoplankton**
Ana Gordon, University of South Carolina; James Pinckney, University of South Carolina*

13 Photoproduction of dissolved vanadium from resuspended sediments
Shannon Hammaker, University of North Carolina Wilmington; Gene Avery, University of North Carolina Wilmington; Stephen, Skrabal, University of North Carolina Wilmington; David Felix, University of North Carolina Wilmington; Ralph Mead, University of North Carolina Wilmington; Robert Kieber, University of North Carolina Wilmington; Joan Willey, University of North Carolina Wilmington*

14 The impact of photopollution on nesting *Caretta caretta* along developed and undeveloped coastline regions in Long Bay, South Carolina
Ryan Bonner, Coastal Carolina University, Coastal Marine and Wetland Studies Program; Ashton Galarno**, Coastal Carolina University, Marine Science Program; Katina Foley**, Coastal Carolina University, Marine Science Program; Eric Koepfler, Coastal Carolina University, Marine Science Department; Louis Keiner, Coastal Carolina University, Chemistry and Physics Department*

15 Delineating groundwater flow along a marsh transect at a back barrier island on the coast of Georgia
Jonathan Ledoux, University of Georgia Department of Marine Sciences; Clark Alexander, Skidaway/University of Georgia Department of Marine Sciences; Christof Meil, University of Georgia Department of Marine Sciences*

16 Adsorption of brevetoxin onto model sediments
Jason W. Lindt, UNCW; G. Brooks Avery Jr, UNCW; Stephen A. Skrabal, UNCW; J. David Felix, UNCW; Ralph N. Mead, UNCW; Robert J. Kieber, UNCW*

17 Effects of macroalgal identity and richness on secondary production in benthic marine communities
Zachary T. Long, Department of Biology and Marine Biology, University of North Carolina Wilmington; Aaron P. Ramus, Department of Biology and Marine Biology University of North Carolina Wilmington*

18 Survey of the Bull River, Savannah, GA: Mapping groundwater discharge using RadonÂ-222
*Cody Mahaffey**, Georgia Southern University; Jacque L. Kelly, Georgia Southern University*

19 Sediment metals and toxins contamination in Wilmington tidal creeks and an urban lake
Michael A. Mallin, Matthew R. McIver and Anna R. Robuck, University of North Carolina Wilmington, Center for Marine Sciences*

20 Phototransformation of polycyclic aromatic hydrocarbons in crude oil amended marine sediment upon resuspension into the photic zone
Misty D. Mangiacapre, UNCW; G. Brooks Avery Jr., UNCW; Stephen A. Skrabal, UNCW; J. David Felix, UNCW; Ralph N. Mead, UNCW; Robert J. Kieber, UNCW*

21 Photo-transformations of sedimentary bound brevetoxin (PbTx-2) upon resuspension
Wesley K. Mickler, Ralph N. Mead, Robert J. Kieber, G. Brooks Avery Jr., Stephen A. Skrabal, J. David Felix; Department of Chemistry and Biochemistry, University of North Carolina at Wilmington*

22 Photochemical release of chromophoric and bioavailable dissolved organic carbon
Hugh D. Rainey, UNCW; G. Brooks Avery, Jr, UNCW; Stephen A. Skrabal, UNCW; J. David Felix, UNCW; Ralph N. Mead, UNCW; Robert J. Kieber, UNCW*

23 Water residence times and circulation of the Savannah River using short-lived radium isotopes
*Frank Russo-Alesi**, Georgia Southern University; Jacque L. Kelly, Georgia Southern University*

24 Mercury bioaccumulation in Southern Kingfish from coastal South Carolina
*Taylor Cannon, Environmental Health Sciences, University of South Carolina; Alexis Harvin**, BIO/GEO, University of South Carolina Aiken; Virginia Shervette, BIO/GEO, University of South Carolina Aiken*

25 Age, growth, and reproduction in two coastal populations of Longnose Gar *Lepisosteus osseus*
Meredith Smylie, Grice Marine Laboratory, College of Charleston; Virginia Shervette, University of South Carolina Aiken; Christopher McDonough, Marine Resources Division, South Carolina Department of Natural Resources

26 Source-sink dynamics of terrestrial dissolved organic matter (TDOM) in the Cape Fear River estuary
*Danielle Siegert**, UNCW; Robert Condon, UNCW; Michael Durako, UNCW; Robert Whitehead, UNCW*

27 Developing a stable isotopic composition approach to source apportionment of ethanol
Rachel Thomas, UNCW; J.D. Felix, UNCW; G. B. Avery Jr., UNCW; R. Mead, UNCW; J.D. Willey, UNCW; R.J Kieber, UNCW*

28 **The Terrapin Tally: A pilot project to engage volunteers in citizen science to inspire action, increase understanding, and protect estuaries**
Hope Sutton, University of North Carolina Wilmington; Jeff Brown, University of North Carolina Wilmington; Sarah Finn, University of North Carolina Wilmington; Marie Davis, University of North Carolina Wilmington; Heather Wells, University of North Carolina Wilmington; Byron Toothman*, University of North Carolina Wilmington*

29 **Improved seagrass classification using linear spectral unmixing**
Amy V. Uhrin, NOAA & University of Wisconsin Madison*

30 **Assimilation rates of dissolved organic carbon by photomixotrophs in North Inlet**
Elise Van Meerssche, University of South Carolina; James L. Pinckney, University of South Carolina*

31 **Temporal changes in total iron in rainwater**
*Kelsey Wilenta**, Department of Chemistry and Biochemistry, University of North Carolina Wilmington; Stephen Skrabal, Department of Chemistry and Biochemistry, University of North Carolina Wilmington; Joan Willey, Department of Chemistry and Biochemistry, University of North Carolina Wilmington; Mark Hopwood, Ocean and Earth Science, University of Southampton, National Oceanographic Centre Southampton*

32 **Defining subsurface architecture of spit growth from GPR imagery**
Eric Wright, Marine Science, Coastal Carolina University; Sarah Kruse, Department of Geology Department (SCA 528), University of South Florida

ABSTRACTS
(in alphabetical order by presenting author's last name)

Fish parasites as bioindicators of human disturbance in Georgia salt marshes
Jamie M. Alfieri, Georgia Southern University; Tavis K. Anderson, Georgia Southern University*
Salt marshes provide critical ecosystem services such as nursery habitat for fishes and can act as physical buffer against storm surges. Despite functions such as this, marshes in Georgia are currently under threat of development as the human population expands along the coast. This process of urban development may affect ecosystem services as the local landscape is homogenized. A particularly fruitful approach to understanding the effects of this urbanization, and a potential "canary in a coal mine" for ecosystem degradation, is the presence and diversity of complex life cycle parasites. Parasites have the potential to be excellent indicators of environmental quality because of their ubiquity, propensity to concentrate heavy metals, and most importantly they have a dependence on a diverse suite of free-living organisms to complete their life cycle. In this study, we will use the metazoan parasites of the mummichog*, Fundulus heteroclitus*, as indicators of ecosystem quality. Six sites reflecting a gradient in disturbance have been selected: disturbance proxies such as heavy metal concentration, turbidity, dissolved oxygen, and acidity are being collected. Mummichogs will be collected from each site every three months for the next year and following dissection, we will calculate parasite species richness, diversity indices, ecto- vs. endoparasite ratios, and abundance of heteroxenous parasites. We predict that heavily disturbed salt marshes will have a lower diversity of complex life cycle parasites and a higher abundance of directly transmitted parasites: the presence of this pattern would indicate a reduction in free-living species diversity and stressful environmental conditions.

Multi-decadal patterns and trends for larval fish assemblages in North Inlet estuary, SC; indications of climate-related changes?
Tyler Swanson, Baruch Marine Field Lab, University of South Carolina; Dennis M. Allen, Baruch Marine Field Lab, University of South Carolina
Knowledge about the temporal dynamics of larval fishes and environmental factors which influence their abundance, timing of occurrence, and demographics is essential for the development of fisheries management plans. We report on the results of a 32 year study of ichthyoplankton in a high salinity, salt marsh estuary. Biweekly collections made with an epibenthic sled in a shallow subtidal channel yielded over 220,000 individuals representing 66 fish taxa. A decreasing trend in densities of total larval fishes was observed over the time series. Two distinct seasonal assemblages occurred each year. Late stage larvae arrived in the estuary from ocean spawning areas between mid-November and mid-April. A more abundant and diverse group of larvae occurred from mid- April to mid-November as resident estuarine and nearshore ocean fish spawned with warming inshore waters. The largest declines in abundance were observed for resident fish species which reached peak densities during the spring and early summer. Species richness increased over the period, but no major changes in the taxonomic composition of either assemblage were evident. Changes in abundance and composition occurred during periods of drought and El Nino events. Shifts in the timing of the onset of larval production by some but not all summer, local-spawning species may be related to a significant increase in water temperature. This long-term dataset should provide fish stock assessment modelers and resource managers with a useful set of metrics that can be used to develop better fisheries and ecosystem management plans.

Ingested plastics as a transport medium for marine toxicants to the gastrointestinal fluids of loggerhead sea turtles (*Caretta caretta*)
Misty Mangiacapre, University of North Carolina Wilmington, Department of Chemistry and Biochemistry; Samantha Athey**, University of North Carolina Wilmington, Department of Chemistry and Biochemistry; Bonnie Monteleone, University of North Carolina Wilmington, Department of Chemistry and Biochemistry; Dr. Pamela Seaton, University of North Carolina Wilmington, Department of Chemistry and Biochemistry; Dr. Ralph Mead, University of North Carolina Wilmington, Department of Chemistry and Biochemistry*
Plastic in the marine environment is becoming an increasingly more important problem for the conservation of marine species. Plastics pose a serious threat to marine life because of entanglement and ingestion. From previous studies it has been found that polycyclic aromatic hydrocarbons (PAHs), many of which are known carcinogens, are adsorbed and leached from plastics into the gastrointestinal

fluids of loggerhead sea turtles (*Caretta caretta*). This could have important conservation implications for these already endangered species. This study investigated how 4 different PAHs are absorbed and desorbed from polyethylene and polypropylene pellets into the gastrointestinal fluids of a loggerhead sea turtle. Pre-production pellets were spiked with chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, and anthracene of approximately the same concentration found on environmental plastics collected from the Sargasso Sea, North Atlantic. These spiked pellets were then placed in stomach, large intestinal and small intestinal fluid recovered during a necropsy of a stranded loggerhead turtle. These plastics were incubated in the fluids for 48 hours at 27.5°C to simulate a loggerhead's natural digestion process. After the removal of plastic pellets and extraction of digestive juices, PAHs that leached from the plastics were examined and quantified using gas chromatography/mass spectrometry (GC/MS).

Tests of reproductive isolation between *Fundulus heteroclitus* and *F. grandis*
Ruthie Barbas*, University of North Florida; Matthew R. Gilg, University of North Florida
The goal of this study is to elucidate the speciation of salt marsh fishes by investigating barriers to reproduction between similar species. This work is a breeding study that involves the spawning, hatching, and rearing of the fishes *Fundulus heteroclitus* and *F. grandis* to determine the viability of the next generation. Barriers to reproduction between *F. heteroclitus* and *F. grandis* are being investigated by analyzing the prevalence or lack of hybridization in a variety of laboratory experiments. The study focuses on two questions: 1) How strong is pre-zygotic isolation (barriers to the formation of hybrid zygotes) between and their hybrids under conditions when individuals do and do not have the opportunity to choose between conspecific and non-conspecific mates? 2) How strong is post-zygotic isolation (barriers to survival and reproduction of hybrid offspring) among *F. heteroclitus* and *F. grandis* and their hybrids? Preliminary results of no-choice breeding trials have revealed a slight pre-zygotic barrier and stronger post-zygotic barrier between the two species. These results have revealed a decrease in heterospecific mating success relative to the mating success of conspecifics. The data also show a decrease in fertilization success among heterospecific crosses compared to that of conspecific crosses. In general, hatching success of heterospecific embryos was lower than that of conspecifics. However, post-zygotic barriers appeared to be stronger in one of the two heterospecific crosses, revealing an asymmetry in post-zygotic barriers between *F. heteroclitus* and *F. grandis*.

Movement patterns of the Atlantic Stingray *Dasyatis sabina* in tidal creeks near Savannah, Georgia
Cameron Brinton, Savannah State University; Mary Carla Curran, Savannah State University*
Stingray behavior can be affected by external cues in the environment such as time of day and tide. The purpose of this study was to determine how these two variables affected the movement patterns of the Atlantic Stingray *Dasyatis sabina* in the Herb River system near Savannah, GA. Seven stingrays were tagged internally with Vemco continuous, depth-sensing acoustic transmitters. Stingray movement was tracked using a Vemco VR100-acoustic receiver with a directional hydrophone for a cumulative total of ~22-70 h per stingray. A 95% kernel density estimation was used to determine the activity area of each ray. There appeared to be more of an effect of tidal stage than time of day on stingray movements. The activity area of each stingray overlapped less between high and low tide (~0-50%) than between ebb and flood tides (~80-95%). Most stingrays had similarly sized night and day activity areas that overlapped by ~70-90%. Stingrays typically occupied the channel of smaller tributaries at high tide but the edges of deeper branches at low tide. Stingrays may have altered their movement patterns based on changes in access afforded by the higher tidal stage. Further research will be conducted to determine if there is a relationship between stingray movements and small-scale habitat features that may be linked to food resources.

Quantification of fecal bacteria removal by micro-zooplankton grazing in stormwater BMPs
Jade M. Burtchett, Center for Marine Science, University of North Carolina Wilmington; Michael K. Mallin, Center for Marine Science, University of North Carolina Wilmington; Matthew McIver, Center for Marine Science, University of North Carolina Wilmington; Lawrence Cahoon Department of Biology and Marine Biology, University of North Carolina Wilmington*
Stormwater runoff has a number of negative impacts on aquatic resources, and best management practices (BMPs) are needed to help control the issue. Stormwater runoff contains high loads of fecal bacteria and other contaminants that cause health issues for many organisms, including humans.

Different BMPs need to be analyzed to determine the best fit for varying situations, such as smaller vs. larger drainage areas, specific land uses, and primary pollutants. To gain an understanding of what controls fecal bacteria loss in BMPs, we performed several experiments examining the effect of grazing by micro-zooplankton (protozoans, copepod nauplii and rotifers) on fecal bacteria removal within two different BMPs, a standard wet detention pond with little vegetation and a vegetation-rich constructed wetland in Wilmington, North Carolina, during summer 2014. Samples were taken during dry and active rain periods for both sites. The experiments were conducted in 500mL flasks on a shaker table in the dark. Both 3-day grazing experiments and 24hr dilution assays were used. The wet detention pond is surrounded by retail stores and impervious parking lots, with geese living in close proximity. The JEL Wade wetland was constructed in 2007 and is 11.5 acres including open water, wetlands, and uplands. Micro-zooplankton grazing impacts on fecal bacteria were often statistically significant in both the wet detention pond and constructed wetland. Upcoming studies will examine the role of individual macrophyte vegetation species in stimulating micro-zooplankton grazing as a fecal bacteria removal process.

Impact of silver nanoparticles on the growth rates of an estuarine dinoflagellate, *Prorocentrum minimum*

Shelby V. Butz, SmartState Center for Environmental Nanoscience, Arnold School of Environmental and Public Health, University of South Carolina; R.C. Merrifield, SmartState Center for Environmental Nanoscience, Arnold School of Environmental and Public Health, University of South Carolina; Tammi L. Richardson, School of the Earth, Ocean and Environment, Department of Marine Science, University of South Carolina; James L. Pinckney, School of the Earth, Ocean and Environment, Department of Marine Science, University of South Carolina; Jamie R. Lead, SmartState Center for Environmental Nanoscience, Arnold School of Environmental and Public Health, University of South Carolina*

Nanoscale materials, defined as being within the 1-100 nm size range are currently used in multiple commercial applications and are therefore being discharged into the environment. In this study, we examined the effect of a range of concentrations (1-100 ppb) of two different silver nanoparticles (AgNPs) on the growth rates of the estuarine dinoflagellate, *Prorocentrum minimum*. The primary hypothesis was that there would be a significant reduction in growth rate due to exposure to AgNPs. Our results showed exposure to the high concentrations of polyvinylpyrrolidone (PVP)-coated AgNPs and citrate-coated AgNPs decreased cellular growth rates. LC50 values were seen at 24 hours in the 100 ppb exposure for citrate-AgNPs and in the 70-100 ppb exposures for PVP- AgNPs, At 48 hours LC50 was in the 40-100 ppb exposures for citrate- AgNPs. The results of this study demonstrate significant low concentration impacts of AgNP toxicity and inhibition of phytoplankton growth rates. Examining AgNP toxicity on the level of a primary producer such as the photosynthetic dinoflagellate *P. minimum* may have implications for biomagnification and trophic transfer of AgNPs within an ecosystem.

Tracing vehicle ethanol emissions and subsequent deposition to roadside ecosystems

J.C.Cala, University of North Carolina Wilmington; J.D. Felix, University of North Carolina Wilmington, G. B. Avery Jr., University of North Carolina Wilmington; R. Mead, University of North Carolina Wilmington; J. D. Willey, University of North Carolina Wilmington; R. J. Kieber, University of North Carolina Wilmington*

Recent increases in fuel ethanol usage has led to a direct influx of uncombusted ethanol concentrations in the atmosphere and thus a higher rate of dry and wet ethanol deposition in roadside areas. To quantify this increased deposition, condensates were collected on four separate occasions between April and June of 2014, using Teflon condensate collection units placed at 0, 75, 150, and 300 meters from a heavily trafficked roadway. Time of day, humidity, and temperature were recorded during each condensate sampling session, and combined with measured condensate ethanol concentrations to derive an atmospheric ethanol concentration. Results from the transect sampling showed average condensate concentrations of 11, 15, and 16 ppbv ethanol at 75, 150, and 300 m, respectively. Compared to the average concentration of 28 ppbv at roadside (0 m), it became apparent that the roadway represented a significant source of ethanol. Additional sampling was performed at shorter interval distances from the roadway and resulted in similar data: 40ppbv (0m); 18ppbv (3m); 14ppbv (6m); 17ppbv (10m). This increase in tropospheric ethanol concentrations has fundamental implications regarding both atmospheric and estuarine carbon cycles. In gaseous state ethanol can limit the oxidizing potential of the atmosphere and increase the concentration of acetaldehyde-a U.S. EPA-classified pollutant. In its aqueous form ethanol contributes to the dissolved organic carbon (DOC) concentration which promotes bacterial growth

and can lead to drastic changes of estuarine ecosystems. Environments in close proximity to roadways are particularly affected by these ethanol emissions, and will have accordingly higher DOC concentrations.

Controls on the photorelease of microcystin in resuspended sediments

Coleman T. Corzine, University of North Carolina Wilmington; G. Brooks Avery Jr., University of North Carolina Wilmington; Stephen A. Skrabal, University of North Carolina Wilmington; J. David Felix, University of North Carolina Wilmington; Ralph N. Mead, University of North Carolina Wilmington; Robert J. Kieber, University of North Carolina Wilmington*

The algal toxin, microcystin-LR (MLR), can adsorb to surface sediments in fresh bodies of water which can be resuspended back into the water column when exposed to light. Surface sediments containing MLR were sampled from five different freshwater sites throughout the United States. All sample sites showed a release of MLR when exposed to simulated light relative to dark controls ranging from 31.76 pg mg^{-1} in Lake Winnebago, WI sediment to 3215.20 pg mg^{-1} in Porter's Neck, NC sediment with an average release of 694.72 pg mg-1. Carbon Preference Index (CPI) and Terrestrial Aquatic Ratio (TARHC) were used to try and determine what parameters are most important in controlling the release of MLR. CPI values ranged from a diagenetically altered 2.71 to a relatively unaltered 11.11 and TARHC values from a marine dominated 0.07 to a more terrestrial influenced 8.04. Percent organic carbon (%OC) values ranged from 3-30%. Preliminary data suggests that more terrestrially influenced sediment produced a greater photorelease of MLR. However, no correlation has been found between CPI, %OC and MLR release. Results of this project will provide a better understanding of how photorelease occurs, as well as the biogeochemistry that influences it.

Spatial and temporal patterns of habitat use and mortality of the Florida manatee (*Trichechus manatus latirostris*) in the Mid-Atlantic States of North Carolina and Virginia from 1991 to 2012

Erin W. Cummings, University of North Carolina Wilmington; D. Ann Pabst, University of North Carolina Wilmington; James E. Blum, University of North Carolina Wilmington; Susan G. Barco, Virginia Aquarium & Marine Science Center; Shannon J. Davis, Virginia Aquarium & Marine Science Center; Victoria G. Thayer, North Carolina Division of Marine Fisheries; Nicole Adimey, U.S. Fish and Wildlife Service; William A. McLellan, University of North Carolina Wilmington*

Florida manatees (*Trichechus manatus latirostris*) are known to range north into the U.S. mid-Atlantic during warmer summer and fall months. However, rapid cooling of water temperatures in the fall can be detrimental to their survival in this region. This study reports upon all known manatee sightings (n=211) and strandings (n=9) from 1991 to 2012 in North Carolina and Virginia. The goals were to describe spatial and temporal patterns of manatee habitat use and mortality and relate those patterns to seasonal water temperatures, and to develop a finer scale understanding of environmental temperatures across the region by deploying temperature data loggers at multiple sites throughout inland and coastal waterways. Although sightings were opportunistically gathered and, thus, not corrected for effort, they reveal a consistent picture of manatee presence in the mid-Atlantic. In both states, sightings were most common from June-October when water temperatures were above 20°C. Sightings in North Carolina were most common in the Intracoastal Waterway (27%), and in rivers and creeks (46%) in Virginia. Fine scale temperature data collected throughout the region demonstrated highly variable, declining water temperatures in late fall, with temperatures dropping by as much as 1.35°C/day. Manatee sightings decreased precipitously with water temperature in November while strandings increased. The results of this study demonstrate that manatees are predictably found in North Carolina and Virginia throughout the late spring, summer and fall. These data can be used to plan future education and outreach, monitoring, regulatory actions, and habitat protection measures for this endangered species in this region.

Multiple stressors over multiple generations: assessing the combined impact of climate change and endocrine disruptors

Bethany M. DeCourten, University of North Carolina Wilmington; Richard E. Connon, University of California Davis; Susanne M. Brander, University of North Carolina Wilmington*

Understanding the impacts of climate change and pollution on aquatic ecosystems is essential for preserving biodiversity and maintaining suitable water quality. As human populations increase it is likely that these impacts will become increasingly prevalent. The pesticide bifenthrin is a known endocrine disrupting compound (EDC) found in urban runoff. Little is known about how elevated temperatures

associated with climate change may affect the estrogenic activity of bifenthrin. This study investigates the combined effects of temperature and bifenthrin exposure on reproductive output in *Menidia beryllina*, an estuarine fish native to the Atlantic coast. Fish were exposed to bifenthrin, ethinylestradiol (positive control) and a solvent control at 22°C and 28°C for 14 days prior to 24 hour spawning trials. Eggs were removed and counted to determine reproductive output and fertilization rates. We hypothesized that the reproductive output would decrease following bifenthrin exposure, with higher temperatures showing the strongest effect. This study will continue for multiple generations to determine if *M. beryllina* are able to adapt to these stressors. Bifenthrin will likely have different effects on sexual development depending on experimental temperatures in organisms with TSD, ultimately skewing the populations' sex ratio. We expect that a skewed sex ration will result in further alteration of reproductive output and fertilization rates. In addition, data will be collected from each generation to assess gene expression, growth and survival. Findings from this study can be used to assess the impacts of EDCs in estuarine habitats susceptible to temperature increases and pesticide exposure.

Jellyfish Database Initiative (JeDI): Improving estimates of gelatinous zooplankton biomass in the ocean

*Aimee Dexter**, UNCW; Robert H. Condon, UNCW; Amanda S. Williard, UNCW; Vincent S. Saba, NOAA Federal; Jonathan D.R. Houghton, Queen's University Belfast; Jeanne Boylan, SEAMAP; Chris Bonzek, VIMS Fisheries*

Jellyfish blooms are perceived as a symptom of a degraded ocean but recent evidence suggests that jellyfish populations naturally fluctuate over multidecadal time scales around a stationary baseline. While the driving mechanisms for these cycles are unclear, interpretation of shifts in the long-term baseline is restricted by a lack of spatiotemporal information where jellyfish proliferate. Here, we collate and analyze data on medusae and ctenophore biomass and abundances from coastal waters of eastern USA, including three unpublished data sets associated with fisheries and ecological monitoring programs (SEAMAP, NEAMAP and Long Island Sound), for inclusion in the Jellyfish Database Initiative. Consistently high seasonal biomasses of jellyfish were distributed along southern and mid-Atlantic regions, with several biomass hot spots closer to shore. Long-term trends in jellyfish showed no significant increase but periodicity around species-specific baselines. The data have possible implications for fisheries management and leatherback turtle conservation, including predictability of migration patterns.

Ethanol's impacts on the composition and optical properties of chromophoric dissolved organic matter in rainwater in Wilmington, North Carolina

Erin C Dingess*, *University of North Carolina Wilmington; Robert J. Kieber, University of North Carolina Wilmington; Joan D. Willey, University of North Carolina Wilmington; J. David Felix, University of North Carolina Wilmington, Ralph N. Mead, University of North Carolina Wilmington; G. Brooks Avery Jr., University of North Carolina Wilmington*

A series of rainwater samples were collected in Wilmington, North Carolina from July 15, 2014 to September 24, 2014. The absorbance at 300 nm of six rain events significantly increased ($p < 0.05$) upon addition of environmentally relevant ethanol concentrations (1 µM). Unlike absorbance the response of fluorescence to ethanol addition was variable. Storms with a terrestrial origin increased in the total integrated fluorescence when ethanol is added. Whereas, storms with a more oceanic origin significantly decreased in the total integrated fluorescence upon ethanol additions. This suggests that a storm's air mass back trajectory plays a key role in the molecular compounds responsible for changes in optical properties upon the presence of ethanol. The increase in optical properties upon ethanol addition was mirrored by production of a suite of relatively higher molecular weight compounds as determined by LC-MS analysis of the precipitation samples. Results of this study are important because they suggest that shifting ethanol concentrations have a significant influence on the optical properties of atmospheric water which has ramifications on the spectral attenuation of solar radiation reach the earth's surface.

Effect of sediment biogeochemical setting on PBTX-2, -3 and MLR photochemical behavior

Brent Dober UNCW; Dave Felix, UNCW; G. Brooks Avery Jr., UNCW; Steve Skrabal, UNCW; Robert Kieber, UNCW; Ralph Mead, UNCW*

A series of irradiation experiments were conducted using diverse sediments collected from southeastern North Carolina spiked with 0.25 µg microcystin-LR (MLR). The biogeochemical setting of these sediments

were manipulated in way that half were sulfate reducing and half were methanogenic. Following irradiation of two size-fractionated (<10-20 Î¼m) sediments, there was a net photorelease of 1.7 – 3.5 ng g^{-1} into the dissolved phase during irradiation of sulfate reducing sediments. There was photodegradation of 1.0 – 2.2 ng g^{-1} in the dissolved phase with methanogenic sediments during irradiation for the same sites. Other sites experienced a photodegradation of MLR during irradiation ranging from 1.4 – 1.6 ng g^{-1} for sulfate reducing and 1.1 – 2.2 ng g^{-1} for methanogenic. Manipulating the sediments mode of remineralization also changed the amount of organic carbon in the sediment. A sample from the lower Cape Fear River (Wilmington, NC) had 40% less organic carbon under sulfate reduction when compared to the same sediment exposed to methanogenisis. This reduction in organic carbon was paired with the largest photorelease observed during irradiation experiments suggesting %OC plays a direct role in the photorelease of MLR. Results from this study demonstrate that the biogeochemical setting of sediments can have significant impacts on the photochemistry of MLR when these sediments are resuspended back into the water column.

The role of benthic fauna in enhancing nitrogen removal in coastal ecosystems

T.M. Dornhoffer, University of Georgia; G.G. Waldbusser, Oregon State University; C. Meile, University of Georgia*

The extent and severity of oxygen depletion in coastal environments has been steadily increasing, driven in part by excess inputs of nitrogen from terrestrial environments. Estuaries and coastal wetlands act as natural filters, processing nitrogenous compounds and resulting in a net removal of nitrogen from a system. One of the main drivers of this natural filter is the benthic community, so understanding the effect that benthic infauna have on nitrogen cycling is critical for understanding the ongoing development of hypoxia. We examine the effects of arenicolid polychaete behavior on sediment nitrogen cycling using a reaction-transport model parameterized with literature and laboratory data. Our findings show that faunally mediated nitrogen removal is strongly dependent on irrigation intensities: intense burrow irrigation stimulates denitrification and coupled nitrification-denitrification. Furthermore, burrow depth is an important factor in some environments, and shallow burrows can lead to decreases in nitrogen removal relative to deep burrows. These results suggest that a community of mature, deep-burrowing organisms enhances the removal of bioavailable nitrogen, counteracting eutrophication in N limited systems.

North Carolina Sentinel Site Cooperative: Leveraging resources to ensure resilient coastal communities and ecosystems

Carolyn Currin, NOAA, NCCOS, Center for Coastal Fisheries and Habitat Research; Jennifer Dorton, NC Sentinel Sites Cooperative and University of North Carolina Wilmington; Rebecca Ellin, N.C. Division of Coastal Management/N.C. Coastal Reserve and National Estuarine Research Reserve; Whitney Jenkins, N.C. Division of Coastal Management/N.C. Coastal Reserve and National Estuarine Research Reserve; Brandon Puckett, N.C. Division of Coastal Management/N.C. Coastal Reserve and National Estuarine Research Reserve

The National Oceanic and Atmospheric Administration's (NOAA) Sentinel Site Program (SSP) leverages existing research and monitoring to provide coastal resource managers with solutions to support coastal resiliency of coastal ecosystems and communities, with an initial focus on impacts of sea level rise (SLR). The SSP accomplishes this through regional "Cooperatives," which include North Carolina, Chesapeake Bay, Northern Gulf of Mexico, San Francisco Bay, and the Hawaiian Islands. The North Carolina Sentinel Site Cooperative (NCSSC), established in 2012, utilizes the SSP approach to enable resource managers and communities to address the challenges of SLR in a more holistic and efficient manner. The geographic focus for the NCSSC includes the central coastal region of NC, encompassing all of Carteret County and portions of Craven and Onslow Counties. The NCSSC has: facilitated collaborative workshops to identify and prioritize monitoring and research gaps related to SLR; inventoried marsh Surface Elevation Tables within the Cooperative boundaries to assess the impacts of SLR; planted marsh grass at shoreline stabilization demonstration projects; and, collaborated with NCSSC members to extend research on the impacts of bulkheads on shoreline habitats. The NCSSC is also sharing information through the NCSSC quarterly newsletters and improving access to projects and reports through the Coastal Atlas Clearinghouse. The NCSSC partners include N.C. Sea Grant, N.C. Division of Coastal Management, N.C. National Estuarine Research Reserve, NOAA Center for Coastal Fisheries and Habitat Research, NOAA National Marine Fisheries Service, NOAA National Weather Service, NOAA National Climatic Data Center, UNC Wilmington, and East Carolina University.

3D visualization of the GPR stratigraphy of DeBordieu Island, SC.
Aaron Duecaster**, Marine Science, Coastal Carolina University;
Eric Wright, Marine Science, Coastal Carolina University
This study generated a 3D fence diagram of ground penetrating radar (GPR) data to better visualize the stratigraphy of Debordieu Island, a barrier spit that formed seaward of the North Inlet marsh system of northeastern South Carolina. GPR data were collected using a GSSI-SIR-20 system with a 200 MHz antenna. These data were processed in RADAN 6x software with elevation values extracted from LIDAR data and imported into IVS FLEDERMAUS software to produce the fence diagram. In the attached northern section of the island, the modern beach overlays a higher amplitude surface of humate sand. Cut and fills, formed by a swash that drains the landward wetlands, have intersected this surface. In the developed central section, a previously unrecognized cut and fill was identified in the northern end of this section while a potential cut and fill was located towards the southern end. Along the landward side of the previously-studied undeveloped southern section, higher amplitude reflector reveals a buried marsh system and dipping reflectors show extension of a northward ridge. Along the seaward side of this section, dipping reflectors to the northeast indicate progradation of an extensive ridge and beach system. The 3-D view of the GPR radiograms provided for easier stratigraphic correlation of the subsurface architecture and allowed for a better understanding of the geologic development of DeBordieu Island.

Floating material is an alternative sediment source for salt marshes: Novel measurement methods and comparisons with suspended sediment
Scott Ensign, Aquatic Analysis and Consulting, LLC; Carolyn Currin, NOAA
Previous research on salt marsh sediment transport has focused on suspended sediment in the water column, although a significant quantity of material is held in surface tension at the water surface (surface microlayer). We studied the source of material within the surface microlayer, characterized its composition, and compared this with the material in suspension throughout a 6 hour portion of the tidal cycle at two locations in Freeman Creek, North Carolina, on two occasions. Surface skimmers were designed to capture the surface microlayer generated from a known surface area of marsh, and glass plates were used to sample the surface microlayer from tidal water flowing over the marsh. During the initial phase of marsh inundation, when flow velocity and subsequent sediment flux are highest, the surface microlayer accounted for an average of 20% of the total sediment in transport (including suspended material). The mass of surface microlayer material generated from the marsh averaged 0.666 grams per square meter, and the average mass of material in the surface microlayer across a lateral transect of marsh was 0.501 grams per square meter during the initial period of marsh inundation. Chlorophyll a was significantly greater in the surface microlayer than material in suspension, although differences in particle size were not apparent between floating and suspended material. These results indicate that sediment delivery to salt marshes is significantly influenced by a transport mechanism (flotation) that is not currently accounted for in models of salt marsh dynamics, and we suggest that predictions of salt marsh response to sea level rise may require revision to account for this additional mechanism of delivery.

Suspended sediment concentrations and sediment deposition rates along elevation gradients in a South Carolina salt marsh
*John Paul Everhart**, University of South Carolina; Tracy Buck, USC Marine Field Lab Baruch Institute; Erik Smith, USC Marine Field Lab Baruch Institute*
A key uncertainty in the current understanding of tidal salt marsh dynamics, and their ability to keep pace with rising sea level, is the supply and delivery of suspended sediment onto the marsh platform. The present study was conducted as part of a larger, national effort to develop a standardize, cost-effective protocol for sampling suspended sediments within vegetated marshes to better inform model of salt marsh accretion and related management options for effective tidal marsh conservation. The present study deployed a series of novel 'siphon samplers' on the marsh platform of the North Inlet estuary to examine temporal and spatial patterns in suspended sediment concentrations within the vegetated marsh platform. Specific study objectives were to compare suspended sediment concentration within the marsh platform to those of the adjacent tidal creek and to quantify fine-scale patterns in suspended sediment concentrations and their relationship to short-term sediment deposition rates (as mass accumulation on surface tiles) along marsh platform elevation gradients and distance from adjacent tidal creek. Study results indicated general relationships between suspended sediment concentrations and duration of tidal

inundation, as well as suspended sediment concentrations and sediment deposition rates. The occurrence of higher concentrations of suspended sediments on the marsh platform, relative to adjacent creek waters, suggests sampling bottles were in part capturing suspended sediments resulting from the re-suspension and mobilization of sediments from the marsh platform itself.

Differences in mercury concentrations of mummichogs (*Fundulus heteroclitus*) and Atlantic silversides (*Menidia menidia*) from a South Carolina salt marsh

Daniel P Ferons, Coastal Carolina University Department of Marine Science; Jane L Guentzel, Coastal Carolina University Department of Marine Science; Andrew Heyes, University of Maryland Center for Environmental Science; Veronica L Lance**, Coastal Carolina University Department of Marine Science*

Scientific studies of mercury cycling in fish populations have primarily occurred in freshwater and open ocean environments. Relatively few studies have focused on mercury cycling within estuaries and the majority of these studies were conducted using laboratory conditions. Estuaries are unique environment because they serve as an interface between freshwater systems and the open ocean. Additionally, they are a nursery for commercial fishes such as summer flounder (*Paralichthys dentatus*), and bluefish (*Pomatomus saltatrix*). Mummichogs (*Fundulus heteroclitus*) and Atlantic silversides (*Menidia menidia*) are abundant forage fish species that live year round in South Carolina salt marshes. Both species are tertiary consumers that have different food web interactions. Mummichogs are omnivores that feed during high tide within *Spartina alterniflora*. Prey is captured from the water column, within sediments and off of *Spartina*. Atlantic silversides are planktivores that feed on zooplankton suspended above oyster reefs and mud flats during high tide. Preliminary data indicates that these fish have differing gut contents. Silversides contain higher percentages of copepods than mummichogs, while mummichogs contain a higher percentage of teleost bones and detritus. Relative to mummichogs, silversides have higher concentrations of total and methyl mercury, however the percentages of methylmercury relative to the total are similar in both fish. The differences in mercury concentrations in these two fish may impact the bioaccumulation of mercury in higher trophic level organisms. Summer flounder that feed on mummichogs have lower mercury concentrations than bluefish that feed on silversides.

Ecotoxicology of bromoacetic acid on estuarine phytoplankton

Ana Gordon, University of South Carolina; James Pinckney, University of South Carolina*

The toxicology of chlorinated disinfection by-products has been widely studied in freshwater ecosystems; however, their toxicology in coastal marine environments is not fully understood. The objective of this research was to quantify the effects of brominated haloacetic acids in estuaries using phytoplankton as a proxy species for estuarine health and productivity. To quantify phytoplankton response to bromoacetic acid, three in situ acute bioassays were completed at Belle W. Baruch Institute for Marine and Coastal Science in Georgetown, SC in May, June and July of 2014. Water samples were spiked with bromoacetic acid (ranging from 5 to 524 mg l^{-1}) and incubated for 36 hours. Phytoplankton responses were determined by quantifying changes in community composition by HPLC. Growth inhibition was calculated as the change in pigment concentration (chl *a* for the bulk response or individual pigments for phytoplankton group response) relative to the controls. Data were plotted and fit with sigmoidal dose-response curves from which the half-maximum effective concentrations (EC50) were derived. We found that the EC50 for total chl *a* was 80 mg l^{-1}. Individual phytoplankton group responses varied, with EC50 values ranging from 22 to 156 mg l^{-1} for dinoflagellates and haptophytes, respectively. Diatom response closely agreed with the total phytoplankton response, likely caused in part because diatoms were the largest contributor to the community composition. The remaining groups (cryptophytes, euglenophytes and prasinophytes) had EC50 values similar to the dinoflagellates, suggesting that the diatoms and the haptophytes have the lowest sensitivity to bromoacetic acid.

Total and methyl mercury in surface water, sediments, and aquatic plants from differing ecoregions of South Carolina

Jane L. Guentzel, Coastal Carolina University Department of Marine Science

Mercury (Hg) exists in several different physical and chemical forms in the environment and it is the interconversions between these species that mediate its distribution patterns and biogeochemical cycling. The most widely known conversion is the biological transformation of inorganic Hg (II) to methyl Hg and its subsequent biomagnification in piscivorous fish, which poses a risk to higher trophic level organisms and humans who consume these fish. The discovery of elevated levels of Hg (>0.25 ppm) in fish from

water bodies in South Carolina (SC) has resulted in the issuance of many fish consumption advisories throughout the state. The highest fish tissue concentrations have been found in unregulated blackwater rivers in the Middle Atlantic Coastal Plain ecoregion, with lower fish Hg concentrations found in the Southern Coastal Plain, and Piedmont ecoregions. This presentation will discuss the levels of total and methyl Hg in aquatic plants from a SC coastal plain river and the levels of total and methyl Hg in water and sediments from sites 21 throughout South Carolina. Sites within differing ecoregions were chosen to identify potential factors governing the spatial variability of Hg levels in water and sediment throughout the state and how they may relate to the concentration of Hg in fish tissue.

Photoproduction of dissolved vanadium from resuspended sediments

Shannon Hammaker, University of North Carolina Wilmington; G. Brooks Avery Jr., University of North Carolina Wilmington; Stephen, Skrabal, University of North Carolina Wilmington; David Felix, University of North Carolina Wilmington; Ralph Mead, University of North Carolina Wilmington; Robert Kieber, University of North Carolina Wilmington; Joan Willey, University of North Carolina Wilmington*

Photoproduction of dissolved vanadium represents an additional, previously unrecognized source of this trace element into estuarine environments where sediments are frequently exposed to sunlight through resuspension. Estuarine sediments, with varying levels of anthropogenic influence, were suspended in 0.2 µm- filtered seawater and exposed to simulated sunlight for six hours. Dissolved vanadium, in both sunlight-exposed samples and dark controls, was quantified using cathodic stripping voltammetry. Resuspended Bradley Creek sediments showed an increase in dissolved vanadium concentrations, ranging from 8.81 nM to 14.3 nM, following exposure to simulated sunlight. Resuspensions with lower total suspended solids (TSS) showed a greater release of dissolved vanadium relative to resuspensions with a higher TSS value. This shows uncertainty of competitive reactions between sediments or another process controlling the release of dissolved vanadium from sediments. Sediment resuspensions containing Macondo oil are in progress. As this study continues, a better understanding of the release of dissolved vanadium from oil contaminated sediments will be achieved through experiments exploring the role of sunlight exposure time, the impact on metal release by weathered oil, and particulate concentrations of these metals in the sediments.

Indian River Lagoon observatory: Real-time water quality data network for research, education, and outreach

M. Dennis Hanisak, Kristen S. Davis, Ben Metzger, Harbor Branch Oceanographic Institute at Florida Atlantic University

The Indian River Lagoon Observatory (IRLO) was initiated to investigate ecological relationships in the Indian River Lagoon (IRL) and how they are impacted by natural and human-induced stressors. An important component of IRLO is the development of a network of advanced observing stations in the Lagoon. We are deploying a network of Land/Ocean Biogeochemical Observatories (LOBOs) to provide real-time, high-accuracy and high-resolution water quality data through an interactive website. We have been operating two LOBO units for 18 months in the IRL and over the coming year will instrument 10 sites in the IRL and St. Lucie Estuary. These sites are ecologically important because of the dynamic interface between freshwater inputs from river and canal discharges and oceanic water from the inlets. Continuous, high-resolution measurements are being made for: temperature, conductivity, depth, turbidity, current speed and direction, chromophoric dissolved organic matter, nitrate, phosphate, dissolved oxygen, pH, and chlorophyll a. These reliable, continuous observatory data will enable better quantification and modeling of relationships between environmental factors and biological processes in the IRL. This LOBO network will enable scientists, managers, educators, students, and the public to enhance observations to follow long-term ecosystem changes and those driven by events such as freshwater discharges, algal blooms, storms, and droughts.

Mercury bioaccumulation in Southern Kingfish from coastal South Carolina

*Taylor Cannon, Environmental Health Sciences, University of South Carolina; Alexis Harvin**, BIO/GEO, University of South Carolina Aiken; Virginia Shervette, BIO/GEO, University of South Carolina Aiken*

Fishes are an integral part of diets around the world, with approximately one billion people relying on fish for their main source of protein. There are many nutritional benefits to fish consumption, however the emerging concern of mercury exposure from the consumption of fish has led to much controversy concerning the risks versus the benefits. For this reason, studies measuring the mercury concentrations

in commonly caught and consumed fish by recreational fishers are an important part in relaying useful information to the public. Whiting (also known as southern kingfish) *Menticirrhus americanus* is a demersal fish that occurs in shallow waters along the Atlantic coast of the U.S. and the Gulf of Mexico. It is a benthic feeding species in the drum family that primarily consumes invertebrates. Whiting typically spawn in nearshore coastal waters during spring-summer time and utilize tides and currents to carry larvae into estuarine habitats where they thrive and grow. Whiting are common inhabitants of South Carolina estuaries. It is absent in coldest months of the year, which may indicate that they move south or slightly offshore to warmer, deeper waters. In South Carolina, whiting is not directly fished for commercially, but is often targeted by pier and surf fishers throughout the state because of their high quality meat. The purpose of this study is to quantify mercury concentration in this local marine fish species targeted and consumed by South Carolinians and to examine the relationships between Hg concentration with age and size of the fish.

Shifts in control: How seawater intrusion may alter the estuarine nitrogen cycle

David E Hines, University of North Carolina Wilmington; Pawandeep Singh*, Visva-Bharati University, Santiniketan, India*

Ecologists and ecosystem managers often seek to identify which components of an ecosystem are most important to its functioning. To address this challenge, ecologists have developed Ecosystem Network Analyses (ENA). Control analysis, one type of ENA, identifies which ecosystem members regulate the organization and distribution of energy matter once it enters the ecosystem. We applied ENA control analysis to two nitrogen cycling models in the Cape Fear River Estuary, NC, USA. These models were constructed at sites with similar characteristics, but different salinity regimes: one freshwater (oligohaline) and one saltwater (polyhaline). We compared the ENA control analysis results for these two models to infer how seawater intrusion from sea level rise and dredging might change the control relationships in the sedimentary nitrogen cycle. At the oligohaline site, the ammonium pool regulated the movement of nitrogen through the nitrate and nitrite pools, while the opposite was observed at the polyhaline site, where the nitrate and nitrite pools regulated the movement of nitrogen through the ammonium pool. This reversal of control relationship suggests that seawater intrusion may alter which ecosystem components regulate the distribution of energy matter for reactive nitrogen species in estuaries. However, relative to all ecosystem components, sedimentary nitrate and nitrite were most important for regulating the distribution of nitrogen at both sites, highlighting the central role of nitrate and nitrite in estuarine nitrogen cycling. This work helps to inform management decisions by predicting the effects of seawater intrusion on which ecosystem components regulate the flow of nitrogen in estuaries.

Use of remote sensing data for evaluating elevation and plant distributions in Georgia tidal marshes

Christine Hladik, Georgia Southern University

Elevation is an important determinant of the frequency and duration of tidal flooding, which in turn affects species patterns in marshes. Light Detection and Ranging (LIDAR) can provide synoptic elevation information in many environments, but its accuracy in tidal marshes is limited by a combination of sensor resolution, instrument errors, and poor laser penetration in dense vegetation. In a previous study, we found that LIDAR-derived DEM mean error varied with vegetation cover in saltmarshes. However, overall mean error could be reduced to -0.003 m by applying cover-class-specific correction factors. This approach has been tested in salt marshes on a site-specific basis, but has yet to be applied to brackish and tidal fresh marshes where vegetation is taller and denser. In this study, we quantified LIDAR-derived DEM errors for salt, brackish, and tidal marshes near the Altamaha River, Georgia to produce a corrected DEM and evaluated accuracy with elevations collected using real time kinematic (RTK) GPS. We found that DEM mean vertical errors varied by marsh type, with the largest offsets for brackish marshes (0.31 m). When correction factors were used to modify the LIDAR-derived DEM, overall mean error was reduced from 0.22 to 0.02 m and root mean squared error from 0.30 to 0.22 m in the modified DEM. Our results suggest that these types of corrections can greatly improve the accuracy of LIDAR-derived DEMs for the three tidal marsh types and further emphasize the importance of accuracy assessments before DEM data are used.

Effect of morphological changes on tidal range within a tidal creek

Brittany L. Hoffnagle, Coastal Carolina University; Erin E. Hackett, Coastal Carolina University; Richard N. Peterson, Coastal Carolina University; Michael P. Slattery, South Carolina Sea Grant; Richard F. Viso, Coastal Carolina University*

Singleton Swash is a small tidal creek inlet located in Myrtle Beach, South Carolina. Like other tidal inlets, Singleton Swash facilitates water exchange between the ocean and the surrounding landscape. The stability of Singleton Swash depends on the coastal processes at work, particularly the relationship between longshore current, sedimentation processes and the tidal prism within the creek. Currently, the mouth of Singleton Swash naturally shifts through time to the south as sediment is deposited in the channel mouth. Over time, the elevation in the channel increases altering the water level within the tidal creek. Increased channel elevation results in restricted water flushing and may promote water column stratification and decreased dissolved oxygen levels indicating poor ecosystem health. This study aims to monitor the morphological change of Singleton Swash and the resulting effect on water level and quality by coupling the use of highly accurate GPS technology and a suite of water quality parameters. Through the comparison of topographic grids, created using ArcGIS, the highest elevations of the creek channel were identified and compared to tidal level amplitudes on a monthly time scale. Between April and July, 2014, sediment elevations within the creek channel increased and tidal amplitude within the swash basin was greatly reduced indicating a more restricted water flow within Singleton Swash.

Quantifying submarine groundwater discharge from St. Catherine's Island, Georgia

*Jacque L. Kelly, Georgia Southern University; Kirk Mobley**, Georgia Southern University; and James S. Reichard, Georgia Southern University*

St. Catherine's Island is a relatively pristine barrier island located ~80 km south of Savannah, GA. Its coastline is dominated by tidal marsh and wetlands, with some sandy beaches. The island has a locally recharged surficial aquifer that is stratigraphically above the confined Upper Floridan aquifer. The surficial aquifer naturally discharges groundwater to the nearby estuary as submarine groundwater discharge (SGD). SGD has been shown to be an important source of fresh to brackish water and dissolved inorganic nutrients to estuaries worldwide. To better understand the chemistry of this discharging water, we periodically collected water samples from six surficial wells and four Upper Floridan wells located on St. Catherine's Island. We also collected nine samples from active groundwater seeps on the island's sandy beaches. All samples were analyzed for radon-222, a tracer of SGD. The well samples were also analyzed for common ions. Our results suggest that the active groundwater seeps are fed by the surficial aquifer. A preliminary radon-222 survey of the estuary surrounding the northern half of the island indicates that groundwater also diffusely discharges from the surficial aquifer. Our future research plans are to characterize the major ion and dissolved inorganic nutrient chemistry of the groundwater seeps issuing from the beaches. We will also conduct seasonal radon-222 surveys of estuary waters around the entire island to better characterize the locations and fluxes of groundwater discharge and dissolved inorganic nutrients to the nearby estuary.

The impact of photopollution on nesting *Caretta caretta* along developed and undeveloped coastline regions in Long Bay, South Carolina

Ryan Bonner, Coastal Carolina University, Coastal Marine and Wetland Studies Program; Ashton Galarno**, Coastal Carolina University, Marine Science Program; Katina Foley**, Coastal Carolina University, Marine Science Program; Eric Koepfler, Coastal Carolina University, Marine Science Department; Louis Keiner, Coastal Carolina University, Chemistry and Physics Department*

Photopollution associated with heavily developed coastlines are known to demonstrate a negative impact on nesting sea turtle populations, through nesting avoidance. However, the relationship between light intensity and avoidance has not been quantitatively examined. The purpose of this study was to characterize the onshore light gradient along developed and undeveloped areas within a stretch of Long Bay South Carolina and to determine the model of relationship to nesting density of *Caretta caretta* using historical data. Onshore light intensity was measured using a point source light meter (Unihedron SQM-LU), as well as from NOAA VIIRS satellite imagery. Measurements were made from approximately 90 km of coastline including the heavily developed Grand Strand region of Myrtle Beach. Nesting data was acquired from data archives maintained at seaturtle.org. Biases in the data related to moonlight, tourism occupancy rates, and others are discussed. The nesting data relationship and relationship to false crawls

are described for each light source and future investigation of impacts upon hatchling beach orientation are also detailed.

Spatial patterns in nutrient limitation of macroalgal blooms in South Florida's coastal waters
Brian Lapointe, Harbor Branch Oceanographic Institute at Florida Atlantic University; Laura Herren, Harbor Branch Oceanographic Institute at Florida Atlantic University
Coastal waters of South Florida have experienced unprecedented blooms of benthic macroalgae with increasing eutrophication and extreme climatic events during the past several decades. Along Florida's southeast coast, invasive blooms of *Codium isthmocladum* and *Caulerpa* spp. developed on deep reefs between 1990 and 2004. In southwest Florida, massive blooms of red drift macroalgae, including *Gracilaria* spp., *Hypnea* spp., developed between 2003 and 2007 following heavy rainfall associated with record hurricane activity and non-point source nutrient inputs. Long-term monitoring of biologically diverse coral reef communities at Looe Key in the Florida Keys since 1984 shows dramatic decline of hermatypic corals and expansion of benthic algae (crustose coralline algae, algal turfs, and fleshy brown macroalgae) with increasing water column dissolved inorganic nitrogen (DIN) concentrations since the early 1990s. Monitoring for water column nutrients, C:N:P ratios, and alkaline phosphatase activity in macroalgae show the importance of silici-clastic vs. carbonate-rich environments to spatial patterns of N vs. P-limitation in South Florida. In addition, stable N isotopes in macroalgae show broad patterns in N sources, with depleted values (+3 o/oo) reflecting human sewage in urban areas.

Delineating groundwater flow along a marsh transect at a back barrier island on the coast of Georgia
Jonathan Ledoux, University of Georgia Department of Marine Sciences; Clark Alexander, Skidaway/University of Georgia Department of Marine Sciences; Christof Meil, University of Georgia Department of Marine Sciences*
The movement of groundwater in the coastal marsh plays a vital role in nutrient loading to the coastal ocean and in the structuring of marsh vegetation. To quantify the magnitude, distribution and driving forces of groundwater flow, a series of CTD meters were installed in a transect of shallow piezometers behind Blackbeard Island, a back barrier island at the coast of GA. Several methods were developed to assess and quantify individual drivers of flow. The role of subsurface pressure waves was determined using a simple one-dimensional model. Due to the sediment characteristics and distance to the tidal creek, the subsurface pressure waves were found to be of minor importance at our study location. The contribution of density driven flow was estimated from an analysis of co-registered measurements of pore water salinity and pressure, and found to contribute less than 10% to the overall flow velocity. The consistent nature of tidal frequencies allowed tidal components to be removed by filtering the pressure time series using low-pass and band-pass filters. Comparison between the signal with tide removed and time lagged precipitation data demonstrated that precipitation is a critical driver of groundwater flow. Future research will relate residual signals, after tidal influences and precipitation effects have been removed, to atmospheric forcing (e.g. low pressure systems) or aquifer leakage from the impermeable clay layer. Understanding the current drivers of groundwater flow will help constraining the impact of climate change such as sea level rise or land use change on groundwater flow patterns in coastal marshes.

Adsorption of brevetoxin onto model sediments
Jason W. Lindt, UNCW; G. Brooks Avery Jr, UNCW; Stephen A. Skrabal, UNCW; J. David Felix, UNCW; Ralph N. Mead, UNCW; Robert J. Kieber, UNCW*
The adsorption of brevetoxin (PbTx-2) produced from *Karenia brevis* onto model particles was investigated. Suspensions of montmorillonite, kaolinite, and calcium carbonate sediments in Wrightsville Beach seawater with varying amounts of organic material in the aqueous and sediment phases were spiked with 186 nM of PbTx-2 and the resulting adsorption rates and partition coefficients (Kd) were calculated. Adsorption rates and Kd of PbTx-2 onto size fractionated (<10um) montmorillonite sediments increased in suspensions containing organic material in the sediment phase (5 ± 1 min-1 and 77x104 ± 12x104 respectively) and decreased in suspensions containing organic material in the aqueous phase (0.059 ± 0.002 min-1 and 1.9x104 ± 0.5x104 respectively). Adsorption rates and Kd of PbTx-2 onto size fractionated (<10um) kaolinite sediments increased in suspensions containing organic material in the sediment phase (0.010 ± 0.002 min-1 and 20x104 ± 0.03x104 respectively) and decreased in

suspensions lacking organic material in either phase with no observable adsorption occurring. Rates of adsorption and Kd of PbTx-2 onto suspensions of chromatographic grade calcium carbonate increased when organic material was present in both the aqueous and sediment phases (0.0105 ± 0.0001 min-1 and 1.6x104 ± 0.1x104 respectively) and decreased when organic material was present solely in the sediment phase (0.002 ± 0.001 min-1 and 0.25x104 ± 0.05x104 respectively). Results of this study are important because understanding these concepts will open up future opportunities for management of harmful algal blooms and contribute to understanding how brevetoxins interact with sediments in marine environments.

Effects of macroalgal identity and richness on secondary production in benthic marine communities

Zachary T. Long, Department of Biology and Marine Biology, University of North Carolina Wilmington; Aaron P. Ramus, Department of Biology and Marine Biology University of North Carolina Wilmington*

Previous research has demonstrated that biodiversity can influence ecosystem functioning. Recently, the development of new analytical tools has allowed us to mechanistically partition the effects of species diversity and identity on these diversity-functioning relationships. Here, we report the results of a field experiment designed to investigate how macroalgal diversity influences the production of upper trophic levels. We established seven treatments that differed in macroalgal composition. The treatments consisted of monocultures of four species (*Codium fragile*, *Gracilaria tikvahiae*, *Gracilaria vermiculophylla*, *Gymnogongrus griffithsiae*), two different three species mixtures with *Codium*, *Gymnogongrus*, and either the native *Gracilaria tikvahiae* or the invasive *Gracilaria vermiculophylla*, and the complete mixture. We followed the development of invertebrate communities in each treatment for 12 weeks. By the end of the experiment, we found a positive relationship between macroalgal diversity and consumer production. This occurred primarily because of complementarity among macroalgal species; different invertebrates colonized different macroalgal species. Our results suggest that processes that influence diversity at lower trophic levels are linked to the functioning of upper trophic levels. Future work will investigate how the bottom-up effect of macroalgal diversity on consumers demonstrated here interacts with top-down effects known to regulate this system.

Survey of the Bull River, Savannah, GA: Mapping groundwater discharge using RadonÂ-222

*Cody Mahaffey**, Georgia Southern University; Jacque L. Kelly, Georgia Southern University*

The goal of our research was to determine the locations and fluxes of submarine groundwater discharge (SGD) to the Bull River and nearby Oyster Creek and Lazaretto Creek. We surveyed the river from June 10-12th, 2014. We used a commercially available radon detector (RAD7, Durridge, Inc.) and a water quality meter (EXO1, YSI, Inc.) to continuously survey surface water in the estuary via boat. Slow surveying (~2 kph) allowed us to detect radon-222, an indicator of recent SGD, in the estuary. We surveyed the area within three hours of low tide, when groundwater flow to the estuary was maximized. Our radon data was integrated over five minute intervals, giving our data set a spatial resolution of 53--500 m, depending on boat speed. Our groundwater fluxes were variable, ranging from 1-2056 m^3/day along ~50 km of surveyed shoreline. We also quantified groundwater end-members by collecting nine 250 mL samples of groundwater with a peristaltic pump and push-point piezometer from actively flowing discharge areas such as those with wet mud and rivulets in the study area. These samples had radon-Â-222 concentrations that ranged from 213-3824 Bq/m^3. To our knowledge, this is the first study near Savannah, Georgia to quantify SGD to the area's estuaries. Our findings will be useful for understanding how seasonal tidal variations impact groundwater fluxes and how SGD impacts wildlife along Georgia's coasts.

Sediment metals and toxins contamination in Wilmington tidal creeks and an urban lake

Michael A. Mallin, Matthew R. McIver and Anna R. Robuck, University of North Carolina Wilmington, Center for Marine Sciences*

Between 2010 and 2014 we collected 37 sediment samples among 8 tidal creeks and urban Greenfield Lake in Wilmington, North Carolina. Samples were analyzed using standard methods for EPA priority pollutant metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), total nitrogen and total phosphorus. Watersheds draining into each site were assessed using GIS techniques for size and percent impervious surface coverage, and correlation analyses were used to compare pollutant concentrations with demographic attributes. Excessively high PAH concentrations, as well as

high levels of arsenic, copper, mercury, lead and zinc were found in Greenfield Lake (37% impervious coverage), Burnt Mill Creek (34% impervious coverage) and Bradley Creek (28% impervious coverage). Highest TN concentrations occurred in Burnt Mill Creek sediments, and highest TP levels occurred in Greenfield Lake sediments. PCBs were not at problematic concentrations in the sample set. The most common polluting individual PAHs were pyrene, fluoranthene, phenanthrene, chrysene, anthracene, benzo(a)anthracene and benzo(a)pyrene. Watersheds draining residential neighborhoods rarely had elevated metals or PAHs, although TN was rather high in some of these. Watersheds draining commercial areas yielded highest sediment PAH concentrations, while the two marina sites sampled had elevated copper and zinc in the sediments. Correlation analyses found that concentrations of total PAHs, as well as several individual PAHs were strongly correlated with percent watershed impervious surface coverage. Sediment phosphorus levels were correlated with impervious coverage, but sediment TN was not. Watershed area was not a significant predictor of pollution concentrations in this urban area.

Phototransformation of polycyclic aromatic hydrocarbons in crude oil amended marine sediment upon resuspension into the photic zone

Misty D. Mangiacapre, UNCW; G. Brooks Avery, Jr., UNCW; Stephen A. Skrabal, UNCW; J. David Felix, UNCW; Ralph N. Mead, UNCW; Robert J. Kieber, UNCW*

Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous environmental compounds primarily of anthropogenic origin due to their significant contribution to crude oil composition. The objective of this study was to determine the phototransformation of priority pollutant PAHs in resuspended sediments from a heavily impacted region of Bradley Creek watershed in southeastern North Carolina, USA. Additionally, phototransformations of PAHs in sediment amended with Macondo crude oil were observed. Prior to irradiation, Bradley Creek sediment contained measurable levels of petroleum compounds including n-alkanes and PAHs. Sediments were suspended in 0.2 µm filtered seawater, then size-fractionated to obtain particles 10-20 µm in diameter. The sediment-water slurries (with and without crude oil) were irradiated in a solar simulator for six hours along with dark controls. Aqueous phase PAHs were isolated and preconcentrated by solid phase extraction (SPE), then analyzed by gas chromatography/triple quadrupole mass spectrometry (GC-QqQ). Irradiation caused a shift in GC retention time of the unresolved complex mixture, suggesting phototransformation consistent with oxidation of oil-derived components. Irradiation of sediment resulted in an overall photorelease of PAHs (approx. 274 pg Σ'PAH/mg sediment excluding naphthalene) into the aqueous phase, and irradiation of sediments with Macondo crude oil photoreleased (approx. 781 pg Σ'PAH/mg sediment excluding naphthalene) nearly double that of irradiated sediment alone. These effects were most apparent in lower molecular weight PAHs, such as naphthalene, fluorene, and phenanthrene. Quantification of this process will determine the photolytic contribution of PAHs to underlying estuarine concentrations and will initiate more thorough understanding of the impact of oil on coastal ecosystems.

Photo-transformations of sedimentary bound brevetoxin (PbTx-2) upon resuspension

Wesley K. Mickler, Ralph N. Mead, Robert J. Kieber, G. Brooks Avery Jr., Stephen A. Skrabal, J. David Felix; Department of Chemistry and Biochemistry, University of North Carolina at Wilmington*

Blooms of *Karenia brevis* occur nearly annually in the Gulf of Mexico releasing a suite of potent neurotoxins, termed brevetoxins, into the water column and benthic sediments. The abiotic fate of sedimentary bound brevetoxins in the natural environment is poorly understood and it is hypothesized that brevetoxins may be released into overlying waters by sediment resuspension and photolysis. Surface sediments impacted by a *K. brevis* bloom were resuspended in Wrightsville Beach seawater and photolyzed to determine if brevetoxins are photoreleased from sediments into the aqueous phase. There was a statistically significant increase in dissolved phase PbTx-2 in light exposed resuspensions compared to dark controls, (6.0 ± 0.8 vs 2.6 ± 0.3 pmol/mL/gram sediment) and (0.11 ± 0.02 vs 0.054 ± 0.003 pmol/mL/gram sediment) for two offshore sites along the Florida Gulf Coast. A photorelease of this magnitude per gram of sediment is comparable to 1-5% of the concentration of extracellular PbTx-2 during a low level *K. brevis* bloom. Photorelease of brevetoxins from resuspended sediments represents a new and unforeseen vector to release PbTx-2 and brevetoxin photoproducts to overlying waters even after a bloom subsided. Photorelease of PbTx-3 was also observed as well as brevetoxin photoproducts of unknown toxicity.

Albemarle Sound demonstration study of the National Monitoring Network for U.S. coastal waters and their tributaries

Michelle Moorman, USGS; Sharon Fitzgerald, USGS; Keith Loftin, USGS; Elizabeth Fensin, NC DWR

The U.S. Geological Survey's (USGS) is implementing a demonstration project in the Albemarle Sound for the National Monitoring Network for U.S. coastal waters and their tributaries. The goal of the National Monitoring Network is to provide information about the health of our oceans and coastal ecosystems and inland influences on coastal waters for improved resource management. The network integrates biological, chemical, and physical features and links uplands to the coastal ocean. The purpose of the Albemarle Sound pilot study is to: 1) Inventory current monitoring programs in the Albemarle Sound, 2) Conduct a gap analysis to determine current monitoring needs, 3) Implement a monitoring program to address data gaps, and 4) Create a web-based map portal of monitoring activities. As part of the project, the USGS worked with stakeholders to inventory current programs and design a monitoring program. Results after 3 years of implementation will be discussed. Value proposition: The National Monitoring Network is an integrated, multidisciplinary, and multi-organizational program using multiple sources of data and information to improve monitoring of coastal waters.

Insights from merging ecological indicators with sea-level rise scenarios to develop a spatial prioritization for the South Atlantic coast

Bradley A. Pickens, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Applied Ecology, North Carolina State University; Rua Mordecai, South Atlantic Landscape Conservation Cooperative; Ashton Drew, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Applied Ecology, North Carolina State University; Louise Alexander-Vaughn, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Applied Ecology, North Carolina State University; Amy Keister, South Atlantic Landscape Conservation Cooperative; Jaime A. Collazo, U.S. Geological Survey, North Carolina Cooperative Fish and Wildlife Research Unit, Department of Applied Ecology, North Carolina State University

The South Atlantic Landscape Conservation Cooperative is charged with developing a shared Conservation Blueprint for the region spanning from southeast Virginia to northern Florida. The Blueprint incorporates a broad, landscape-driven approach to help identify locations where local conservation actions will most benefit the region. This systematic conservation planning approach has the objective of assessing current ecological conditions, and then to incorporate future projections of threats to optimize conservation strategies. In this study, our objectives were to: 1) develop spatially explicit ecological and cultural indicators for beaches and dunes, maritime forest, and estuarine ecosystems; 2) identify "hotspots" of ecological integrity where multiple indicators overlap; and 3) incorporate strategies to deal with projected sea-level rise effects. A total of nine indicators were developed for coastal ecosystems; examples include an index of beach birds, beach alterations, the EPA's Coastal Condition Index, marsh patch size, and open water-vegetation edge. We selected sea-level rise scenarios from NOAA's Sea Level Rise and Coastal Flooding Impacts Viewer to examine the trade-offs of particular conservation strategies. Sea-level rise rates of 0.30, 0.90, and 1.80 m by 2100 were projected to assess the effects at 2050. This included two surface elevation change rates (0 and +4 mm/yr), and the focus was on both marsh migration and vegetation to open water conversion. The results show how the baseline spatial prioritization, based solely on indicators, changes with the incorporation of sea-level rise scenarios. Additionally, we highlight how two distinct prioritization strategies, mitigating or avoiding direct threats, changes conservation priorities.

Photochemical release of chromophoric and bioavailable dissolved organic carbon

Hugh D. Rainey, UNCW; G. Brooks Avery, Jr, UNCW; Stephen A. Skrabal, UNCW; J. David Felix, UNCW; Ralph N. Mead, UNCW; Robert J. Kieber, UNCW*

A series of sediments were collected from the Cape Fear estuary in close proximity to Wilmington, NC. These sediments were resuspended and exposed to simulated sunlight in order to determine if this process releases 1) chromophoric dissolved organic matter (CDOM) and 2) bioavailable dissolved organic carbon (DOC). CDOM was characterized by UV/Vis absorbance and excitation emission (EEM) fluorescence spectroscopy. Time series experiments were utilized to establish rate of release for bioavailable DOC and CDOM. Photochemical release of DOC ranged from19 µmol/g to 1480 µmol/g of resuspended sediment. Increase in absorbance values (300 nm) ranged from 51-202%, while fluorescence increase ranged from 34-260%. One bioavailability experiment showed a 14 µmol/L release

of DOC. Of this release, 94% was consumed by bacteria. CDOM released in this experiment was completely refractory. Although there was an overall photochemical release of DOC and CDOM from size fractionated sediments, there was no correlation between the two, most likely due to the different molecular composition and therefore photoreactivity of the two DOM fractions. This fraction of DOM may represent a previously unrecognized means of fueling secondary productivity in the ocean.

Seasonal residency and distribution patterns of the Atlantic Stingray *Dasyatis sabina* in two tidal creeks near Savannah, Georgia

Sarah Ramsden, Department of Marine and Environmental Sciences, Savannah State University;*
Mary Carla Curran, Department of Marine and Environmental Sciences, Savannah State University

The Atlantic Stingray *Dasyatis sabina* is a demersal predator that is found in freshwater, estuarine, and saltwater habitats along the Atlantic Coast of the United States. There are discrepancies about whether this species is a seasonal or year-round resident of coastal habitats along its entire geographic range. The purpose of this study was to determine the effect of season on the residency and distribution patterns of the Atlantic Stingray in two creek systems near Savannah, Georgia. Forty stingrays were surgically implanted with acoustic transmitters and passively tracked with receivers deployed in Romerly Marsh Creek and the Herb River. Bottom-water temperature was monitored with a stationary logger attached to one receiver in each creek. A monthly residence index was calculated for each stingray for each creek system, and seasonal distribution was determined for each stingray at each receiver location. Monthly residence was positively correlated with average bottom-water temperature in both creek systems. Monthly residence (>70% of days) and bottom-water temperature (>27°C) were highest during summer months and lowest during winter months (<10% and <10°C, respectively). Presence was low at all receiver locations during winter in both Romerly Marsh Creek (0.0-9.2% of days) and the Herb River (0.0-15.7%). Atlantic Stingrays are mostly absent from both creek systems during winter; however, why the rays leave the creek system during this time is still unclear. Atlantic Stingrays are predators of commercially important blue crabs and shrimp, so the drivers of their migratory patterns should be investigated in future studies.

Density-dependent impacts of an invasive foundation species on multiple functions in a coastal ecosystem

Aaron P. Ramus, Department of Biology and Marine Biology, University of North Carolina Wilmington;*
Zachary T. Long, Department of Biology and Marine Biology, University of North Carolina Wilmington;
Brian R. Silliman, Division of Marine Science and Conservation, Nicholas School of the Environment, Duke University, Beaufort

Ecosystem services are maintained by multiple different ecosystem functions that operate simultaneously. Understanding how changes in biodiversity impact ecosystems' ability to deliver these valuable services is crucial to our future well-being. The seaweed *Gracilaria vermiculophylla* has invaded shallow near-shore ecosystems throughout the North Atlantic, including many areas historically devoid of macroscopic primary producers and physical structure. Here *Gracilaria* creates a novel, widespread, complex habitat, rendering it an invasive foundation species with few native analogs. We experimentally manipulated *Gracilaria* cover across six treatments in 5 x 5 m low-intertidal plots and measured seven disparate ecosystem functions (as proxies for ecosystem services) on a quasi-monthly basis for ten months. We calculated the temporal mean and temporal stability of each function over the course of observation and the standardized temporal mean (i.e., multifunctionality) and temporal stability (i.e., multifunctional stability) indices of all seven functions. We found that increasing *Gracilaria* cover increased (1) the temporal mean of dissolution, epifaunal abundance and diversity, nursery habitat abundance and diversity; (2) the temporal stability of epifaunal abundance and diversity and nursery habitat diversity; and (3) the multifunctionality and multifunctional stability indices of all seven functions. Although both were increased, the increase in multifunctionality and multifunctional stability occurred through increases in different suites of functions. Our results suggest that invasion by foundation species which create novel habitats may increase multifunctionality and stability of multifunctionality – and that an increase in invasive foundation species abundance corresponds with an increase in ecosystem services and the stability of services through time.

The impacts of urban and suburban stormwater runoff on selected metabolic processes in a southeastern North Carolina tidal creek

Anna R. Robuck, UNCW Center for Marine Science; Michael A. Mallin, UNCW Center for Marine Science; Matthew R. McIver, UNCW Center for Marine Science; Lawrence B. Cahoon, UNCW Department of Biology and Marine Biology; Joanne Halls, UNCW Department of Geography and Geology*

Growing scientific evidence suggests that stormwater runoff is the most pressing problem impacting coastal waterways. The components of stormwater can negatively impact a range of key parameters in the receiving water body. This study sought to better characterize stormwater runoff from landscapes with variable impervious cover, while assessing the impacts of stormwater inputs on tidal creek processes. Baseline monitoring events were conducted at two sites along Hewlett's Creek to establish an idea of water quality characteristics associated with estuarine waters of variable salinity not impacted by stormwater. Ex-situ manipulations were carried out to assess stormwater impacts on receiving waters. Receiving water was collected from the same two sites along Hewlett's Creek the day prior to an expected rain event. Stormwater was collected from three stormwater flows during significant rain events. Bioassays were conducted using combinations of each type of stormwater and receiving estuarine water to assess stormwater impacts on productivity and respiration. Post rain sampling was conducted at each receiving water sampling site to evaluate in situ stormwater impacts on nutrient content, DOC content, phytoplankton community, and biochemical oxygen demand. Tidal stage of receiving water used in ex-situ assays influenced the responses observed; stormwater significantly impacted chlorophyll a in receiving water collected at low tide, yet this response was not consistent across all assays. DOC and nutrient content were significantly different in situ following a rain event. BOD5 at both receiving water sites was significantly impacted by stormwater inputs. Stormwater characteristics and observed ex-situ/in-situ responses also correlated to derived geospatial characteristics.

Water residence times and circulation of the Savannah River using short-lived radium isotopes

*Frank Russo-Alesi**, Georgia Southern University; Jacque L. Kelly, Georgia Southern University*

Dredging the Savannah Harbor will address the present insufficiencies of marine transportation through the Savannah River. Dredging will likely impact water circulation and residence times in the harbor. The primary goal of our research is to monitor groundwater discharge, groundwater-river water mixing, and water residence times prior to dredging. This will allow us to identify any hydrological changes, such as aquifer breeches that occur as a result of dredging. Short-lived radium isotopes (224Ra, t1/2 = 3.6 d and 223Ra, t1/2 = 11 d) are ideally suited for this research because they decay at rates comparable to these groundwater-river water interaction processes. We conducted our study along a transect of the Savannah River starting at the mouth and ending upstream, near the city of Savannah. We collected surface and bottom water during two cruises (February 2014 and April 2014) onboard the Research Vessel Savannah. Our samples were collected from nine different locations (18 samples from each cruise). The locations were determined by designated salinity intervals from 32 to < 3 practical salinity units. Sample sizes ranged from 19 to 40 liters of water. Radium isotopes were pre-concentrated on fibers that were counted using a Radium Delayed Coincidence Counter (RaDeCC). We found that 224Ra excess was higher than 223Ra during both cruises. Furthermore, both short-lived radium isotopes were higher in April than in February. Results of this study will be compared to a duplicate study of the Savannah Harbor once the dredging is complete.

Age, growth, and reproduction in two coastal populations of Longnose Gar *Lepisosteus osseus*

Meredith Smylie, Grice Marine Laboratory, College of Charleston; Virginia Shervette, University of South Carolina Aiken; Christopher McDonough, Marine Resources Division, South Carolina Department of Natural Resources

Age, growth, and reproduction are excellent tools for disseminating the ecological role and impact of a species within an ecosystem. Longnose gar *Lepisosteus osseus* is a large, ubiquitous top predator in fresh and saline waters of the eastern United States, though basic biology of this species has been largely uncharacterized, especially in brackish and marine waters. Specimens were collected from two estuaries: Winyah Bay and Charleston Harbor, South Carolina, from May 2012 through July 2013 to examine age, growth, and reproduction in tidally influenced systems. This species is fairly long-lived with maximum ages from this study of 17 and 25 for males and females in the present study. The Von Bertalanffly growth model was significantly different for males and females with a higher growth rate in males than females (Males: Lt = 727(1-e-0.17(t+2.18)), Females: Lt = 1125(1-e-0.09(t+3.60)).

Reproductive histology and Gonadosomatic Index (GSI) suggest longnose gar exhibit determinate fecundity and spawn in late spring following a long development period during fall and winter. These life history parameters provide valuable insight into how the longnose gar functions in estuarine environments, though further research on the precise timing and location of spawning movement as well as daily movement patterns of this species would provide a more comprehensive knowledge of its basic biology.

Source-sink dynamics of terrestrial dissolved organic matter (TDOM) in the Cape Fear River estuary

*Danielle Siegert**, UNCW; Robert Condon, UNCW; Michael Durako, UNCW; Robert Whitehead, UNCW*

The metabolic balance between net autotrophy vs. net heterotrophy in marine systems is mediated by source-sink dynamics of allochthonous organic matter. While rivers discharge 0.25 Tg C annually, terrestrial dissolved organic matter (TDOM) is virtually absent in global oceans suggesting biological and photo-chemical sinks within coastal and estuarine systems. We conducted two experiments contrasting microbial and photo-chemical kinetics of TDOM from upper, mid and lower Cape Fear River estuary sites, to test the hypothesis that UV-B (318-320 nm) increases bioavailability and stimulates microbial uptake of TDOM in dystrophic systems. In the absence of UV, microbial uptake of TDOM was minimal after 29 days of incubation. In contrast, DOC and spectral slope analysis suggest short-term (7-14 days) exposure to UV-B enhanced photo-oxidation of TDOM, although it was unclear whether microbial metabolism resulted in TDOM uptake. These results have implications for global carbon cycles and the metabolic balance under future climate scenarios.

The effects of on-site sewage treatment and disposal systems on urbanized canals and the St. Sebastian River in Indian River County, FL

Marie Tarnowski, FAU Harbor Branch Oceanographic Institute; Laura Herren, FAU Harbor Branch Oceanographic Institute; Brian Lapointe, FAU Harbor Branch Oceanographic Institute*

Effluent from on-site sewage treatment and disposal systems (OSTDS) is generally known to impact groundwaters and surface waters with nitrogen (N), phosphorus (P) and other contaminants, but little research has quantified this problem along the Indian River Lagoon (IRL). Roughly 300,000 OSTDS are located in the Indian River Lagoon watershed with 36,894 active systems located within Indian River County along the Central Indian River Lagoon (CIRL). This study, conducted during a wet (October 2013) and dry season (March 2014), assessed the effects of OSTDS on contamination of surface and groundwaters along three urbanized canals and the St. Sebastian River (SSR) in Indian River County, which flow into the CIRL. Multiple lines of evidence were used to identify the source of the nutrient loadings, including the novel approach of using sucralose, the artificial sweetener, as an indicator of human sewage impact. All sites were sampled for N (DIN and TDN) and P (SRP and TDP). Stable nitrogen isotopes (δ15N) in macrophytes, surface and groundwaters and sucralose were used as human source indicators. Along with elevated N (DIN and TDN) and P (SRP and TDP) levels in all canals and the SSR, δ15N in macrophyte tissue and water were elevated well above +3‰, indicating sewage contamination. Sucralose levels were highly correlated with elevated δ15N levels ($R^2 = 0.6758$), confirming a human source of N. The results demonstrate that high densities of OSTDS have the potential to be a significant source of nitrogen and contaminant loading to the IRL.

Developing a stable isotopic composition approach to source apportionment of ethanol

Rachel Thomas, UNCW; J.D. Felix, UNCW; G. B. Avery Jr., UNCW; R. Mead, UNCW; J.D. Willey, UNCW; R.J Kieber, UNCW*

Rainwater samples collected in Ribeirão Preto, São Paulo State, Brazil between September 2013 and April 2014 had an average ethanol concentration (2.38 ± 1.1 µM) an order of magnitude higher than in Wilmington rain during the same time period (192 ± 2 nM). Ethanol makes up ~50% of vehicular fuel usage in Brazil compared with 10% in the USA; possibly leading to higher rain ethanol concentrations. Additionally, vegetation emissions originating in the Amazon rainforest may be a significant source of ethanol. Sources of vehicular and vegetative ethanol emissions to rain can be apportioned by investigating the δ13C compound specific isotope ratio of ethanol in rain because fuel ethanol has a different signature than most vegetative ethanol. To characterize these signatures, a solid-phase microextraction gas chromatography-isotope ratio mass spectrometry (SPME-GC-IRMS) method has been developed to determine the δ13C-CH_3CH_2OH values in low ethanol concentrations found in rains.

The method has been effective at concentrations as low as 6 µM. Recent cryofocusing modifications suggest the method will be successful to 500 nM. This lower detection limit will allow measurement of the isotopic composition of ethanol at low concentrations found in surface waters as well as rainwater.

The Terrapin Tally: A pilot project to engage volunteers in citizen science to inspire action, increase understanding, and protect estuaries

Hope Sutton, University of North Carolina Wilmington; Jeff Brown, University of North Carolina Wilmington; Sarah Finn, University of North Carolina Wilmington; Marie Davis, University of North Carolina Wilmington; Heather Wells, University of North Carolina Wilmington; Byron Toothman*, University of North Carolina Wilmington*

The "Terrapin Tally," a pilot citizen science project, utilizes trained volunteers to collect diamondback terrapin population data at the Masonboro Island component of the North Carolina National Estuarine Research Reserve, located adjacent to coastal North Carolina's largest population center. The only exclusively estuarine reptile in North America, *Malaclemys terrapin*, is found in estuarine areas from Massachusetts to Texas. It is listed as a species of special concern in NC, in part due to a lack of comprehensive surveying and population data. The goal of the project is two-fold: collect high quality population data and educate the public about estuaries by drawing attention to the diamondback terrapin. Charismatic species can serve as ambassadors for ecosystems by connecting the public to the importance of specific habitats and by opening a door to exploration of environmental concerns. Much as sea turtles have raised awareness of the issue of plastics pollution in the oceans, diamondback terrapins, the elusive but equally charismatic turtle of the estuary, can lead members of the public to deeper understanding of the importance of estuaries and greater interest in ongoing protection and restoration of estuary areas. Designed in collaboration with the North Carolina Wildlife Resources Commission and the University of North Carolina Wilmington, the Terrapin Tally directly engages participants in field data collection as they paddle pre-defined kayaking routes and enter data via smartphone. As a result of the project, needed data will be collected and public knowledge about estuaries will be increased.

Numerical modeling and analysis of tidal variance, flow through vegetation, and marsh accretion and evolution in the Guana Tolomato Matanzas National Estuarine Research Reserve, Florida

Amanda Tritinger, University of North Florida*

This thesis will demonstrate how the prediction of marsh accretion provides useful information for the planning and mitigation of sea level rise impacts. Another component to this thesis will investigate drag effects on tidal flow due to the salt marsh vegetation. A model will use a set of parameters and conditions to predict tide and storm surge from the open ocean and simulate flow through the salt marsh vegetation of the Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNEER), which will be validated to an acceptable level of accuracy when compared with a custom-made field study designed for the area. Hindcasting, including comparison with water level data from stations located in the GTMNERR will be used to further validate the model for tide simulation. The analysis will then couple the hydrodynamic model results with a marsh equilibrium model to assess year-to-year biomass density and species variation (saltmarsh cordgrass – *Spartina alterniflora*, black needlerush – *Juncus roemerianus* and saltwort – *Batis maritima*) for a three-year period (2012-2014).

Improved seagrass classification using linear spectral unmixing

Amy V. Uhrin, NOAA & University of Wisconsin Madison*

Seagrass beds provide myriad ecosystem services including habitat for many important fishery species. Accurate classification of seagrass is challenging, particularly in NC where seagrass ranges from continuous meadows (extending 10s of kilometers) to aggregations of patchy mounds often no more than a meter across. These patches are frequently undetected when mapping from low resolution (30 meter) multi-spectral imagery. For this reason, manual delineation of seagrass habitat from higher resolution (≤1 meter) aerial photography remains the most widely adopted approach despite frequent inclusion of unvegetated gaps, leading to overestimates of actual seagrass acreage. I developed a linear spectral unmixing technique for seagrass in which representative endmembers (seagrass and sand) were chosen directly from aerial photos and the unmixing process reported the proportion of each endmember present in each image pixel. Seagrass pixel proportions ranging from 0 to 1 were evaluated in 0.1 increments. Overall accuracy increased with increasing pixel proportion (range: 81 – 98%), peaking at a pixel proportion of 0.4. Kappa statistics were consistently high (Khat > 0.980) across all pixel proportions

indicating strong agreement for seagrass "observed" via unmixing versus that "expected" by chance; all pixel proportions were significantly better than random ($p = 0.001$). At peak overall accuracy, seagrass classified via unmixing represented only 6.6% of the manually-delineated polygon. Spectral information from aerial photos is rarely used in seagrass classification. I have shown that linear spectral unmixing can be applied to aerial photographs for classification of shallow seagrass in NC and that manual delineation overestimates actual seagrass acreage.

Assimilation rates of dissolved organic carbon by photomixotrophs in North Inlet
Elise Van Meerssche, University of South Carolina; James L. Pinckney, University of South Carolina*
Photomixotrophs are phytoplankton that are able to uptake carbon in two ways: by photosynthesis and by assimilation of dissolved organic carbon (DOC) present in the water. Although photomixotrophs likely play an important role in the estuarine carbon cycle, few studies have attempted direct measurements of *in situ* carbon assimilation rates by estuarine phytoplankton communities. Photomixotrophs may be able to outcompete autotrophic phytoplankton under low light and nutrient limitation when organic matter is abundant. This pathway of carbon utilization may provide a significant and unmeasured source of nutrition for phytoplankton communities. The purpose of this research was to quantify the assimilation rates of dissolved organic carbon (DOC) by estuarine photomixotrophs by performing bioassays at North Inlet estuary. The focus was on applying a unique radiolabeling method using 14C glucose as the DOC source and analyzing the relative activity of the separated labeled chlorophyll a peak to provide the carbon assimilation rate. In particular we detail here the DOC assimilation rates over three different light conditions (75% irradiance, 25% irradiance and darkness) and DCMU treatment inhibiting photosynthesis. Interestingly, the assimilation rates were higher at 75% irradiance in presence of DCMU whereas the maximum growth occurred at 25% irradiance without DCMU, suggesting that irradiance and the absence of photosynthesis is important for DOC assimilation. The present results, differing from what was expected, give a new insight on the utilization of DOC by estuarine photomixotrophs.

Is seagrass recovery recruitment limited in the Indian River Lagoon?
Robert Virnstein, SEA; M. Dennis Hanisak, Harbor Branch; Lori Morris, SJRWMD; Robert Chamberlain, SJRWMD; John Hart, Harbor Branch
The Indian River Lagoon lost about half (130 km^2) of its seagrass in 2011-2012 following a phytoplankton superbloom. The water in most areas has now cleared up. Some areas are showing no signs of recovery. To test whether recovery is recruitment-limited, we planted large plugs of the seagrass *Halodule wrightii* in these areas. In the absence of grazing, plantings were near 100% successful. There was high variability among sites. After a year, seagrass plantings had spread square meters beyond the original planting at one site. Other sites were grazed to extinction. Based on the qualified success, we can conclude that, yes, restoration is recruitment limited. However, we cannot yet recommend large-scale planting as a restoration strategy.

Modeling suitability to enhance North Carolina shellfish aquaculture
Keith B. Walls, University of North Carolina Wilmington Center for Marine Science; Martin H. Posey, University of North Carolina Wilmington Department of Biology & Marine Biology; Eman M. Ghoneim, University of North Carolina Wilmington Department of Geography and Geology; Troy D. Alphin, University of North Carolina Wilmington Department of Biology & Marine Biology*
One of the fastest growing food-producing sectors, aquaculture contributed 90 million tons to world seafood production in 2012 and is responsible for creating tens of millions of jobs (Aquaculture 2014). North Carolina (NC) enjoys over 4,000 miles of shoreline, 2.5 million acres of marine and estuarine waters, and is consistently ranked in the top-10 seafood producing states; nevertheless, shellfish landings have remained relatively constant over the last several decades (Conrad 2013). Shellfish aquaculture has the potential to break this trend while providing positive benefits to other important fisheries through habitat enhancement, improved water quality, and larval contributions to wild stocks (Coen et al.1999, Ulanowicz & Tuttle 1992, Peterson et al. 2000). However, a significant challenge to potential growers wishing to enter the industry is identifying appropriate lease locations. To assist potential growers and recreational shellfish harvesters, University of North Carolina Wilmington (UNCW) researchers are developing a suitability model to complement the University's existing Aquaculture Siting Tool. This model integrates public datasets, provided by multiple organizations and agencies, to produce a multi-criteria evaluation to rank locations for shellfish production. Results will be displayed on a composite map

and made available to the public as an online interactive decision support tool. Sites will be ranked on a suitability scale from 0-5, allowing for a comparison of values across source layers using a common standard. This model aims to provide information to potential shellfish growers to help focus their site selection efforts toward areas with fewer risks and greater opportunities for success.

Temporal changes in total iron in rainwater

*Kelsey Wilenta**, Department of Chemistry and Biochemistry, University of North Carolina Wilmington; Stephen Skrabal, Department of Chemistry and Biochemistry, University of North Carolina Wilmington; Joan Willey, Department of Chemistry and Biochemistry, University of North Carolina Wilmington; Mark Hopwood, Ocean and Earth Science, University of Southampton, National Oceanographic Centre Southampton*

Total iron is the sum of dissolved plus particulate iron, and it is highly variable in rainwater. Total iron has been determined using the spectrophotometric ferrozine method for 43 coastal rainwaters collected on the UNCW campus from May 2013 through April 2014. The total iron concentration was determined on acidified samples after reduction of Fe(III) to Fe(II) with hydroxylamine hydrochloride and addition of ferrozine using a 1 m liquid wavelength capillary guide cell. Previous research indicates that total iron decreased by approximately half between 1997 and 2008, however high concentrations were observed in the summer of 2013. Based upon analysis of these 43 samples, the current annual volume-weighted average is 478 nM vs 265 nM in 1997-2001 and 121 nM in 2008, which does not supports the idea that total iron concentrations are continuing to decrease in coastal NC rainwater. Dissolved iron has decreased by more than half over this time period because of better emission control from automobiles and power plants, increasing rainwater pH and a greater proportion of rain of marine vs. terrestrial origin, which means that particulate iron in rainwater has increased. Seasonal variations, effect of storm origin and variations in wind intensity will be explored as possible explanations of these changes. Rainwater iron is especially important in coastal rainwater because iron is often a limiting reactant in photosynthesis and rainwater is an important source of iron to marine surface waters.

Defining subsurface architecture of spit growth from GPR imagery

Eric Wright, Marine Science, Coastal Carolina University; Sarah Kruse, Department of Geology Department (SCA 528), University of South Florida

This study uses ground penetrating radar (GPR) data to examine the extension of the southern spit of North Island, which is located at the southern terminus of the Grand Strand system of northeastern South Carolina. For this study, GPR data were collected along a shore-parallel transect and 3 shore-normal transects using a Pusle-Ekko GPR system with a 100 MHz antenna. A shielded GSSI Sir-20 system with a 200 MHz antenna was also used to collect data along the forested shore-normal transects. GPR data were processed for filtering, background removal, trace-to-trace averaging, time-variable gain, "topographic correction" (using a flattened water table), and time-depth conversions (using common mid-point data). Alongshore downdrift dipping foreset reflectors indicate episodic southward growth of the spit platform by channel infill. Beach and dune facies overlay this platform. On newly interpreted shore-normal transects, landward of the southeasterly dipping reflectors of the shoreline, dip direction becomes southerly to slightly southwesterly and suggests formation of a spit core initiating platform advance. Clinoform facies of swash bar welding was rarely observed in GPR data, indicating that downdrift extension by spit drift may be an important process. Providing for an improved understanding of North Island spit, this study adds to recent advances in defining the complex arrangement of environments formed near inlets.

NOTES