ATLANTIC ESTUARINE RESEARCH SOCIETY

FALL MEETING 2016

Back to Basics:

Estuarine Fauna, Flora and Relationships

17-19 November, 2016

Community College of Baltimore County
Catonsville Campus
Catonsville, MD

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Welcome to the AERS Fall 2016 meeting!

We are excited to bring together scientists, students, managers, and educators to discuss estuarine and coastal environments. AERS welcomes presentations from ALL areas of estuarine and coastal science.

Estuarine science and management is becoming increasingly complex as we strive to adapt to myriad challenges. New technologies, approaches and sub-fields are emerging, which makes this an exciting time to be a member of AERS, CERF and the larger environmental community. But to address new challenges and respond to new opportunities, it's important to maintain a solid understanding of estuarine fundamentals. As AERS approaches its 70th anniversary in 2018, it's a fitting time to reflect on our roots and refresh our knowledge regarding fauna, flora and interrelationships that underpin estuarine ecology.

Keynote speakers include ***Dr. Bill Boicourt*** (University of Maryland Center for Environmental Science, Horn Point Laboratory), ***Dr. Joe Luczkovich*** (East Carolina University), ***Dr. Linda Blum*** (University of Virginia), ***Dr. Cindy Palinkas*** (University of Maryland Center for Environmental Science, Horn Point Laboratory), and ***Dr. Wolf Pecher*** (University of Baltimore). These experts will present and discuss current state of our knowledge about estuarine fundamentals. Don't miss out on the Thursday evening activities! In addition to the traditional registration and social, there will be a *workshop on social media for the coastal and estuarine sciences*, and a ***welcoming keynote address*** *by Dr. Bill Boicourt.* **Please stay for the business meeting** following our discussion on Friday. If you are not a member, consider joining today! A **lively poster session** will follow. Afterwards, we will dine at the **Olive Grove**, 705 N Hammonds Ferry Road, Linthicum Heights, MD 21090. Don't miss out on the crab cakes! Please stay with us on Saturday for a ***finale keynote address*** *by Dr. Wolf Pecher*, and a **special field trip to Jones Falls** after the meeting (2:30pm). As always, we conclude our meeting with student awards. Winners receive a certificate and one-year membership to the Coastal and Estuarine Research Federation. And did I mention the diverse talks and posters on the latest and greatest work by our fellow AERSians? Help shape your regional CERF affiliate by providing feedback and input to better suit your needs. *Willing to help out? Join one of the standing committees! Please reach out to any of the AERS Governing Board Members!*

TALKS can be loaded directly onto the presentation computer. Please format filenames for talks as: LastName_Day_Time, e.g. Fertig_Fri_1330. Preview your presentation. Once approved, files cannot be changed. Friday AM talks can be loaded either Thursday or before Friday 8:00 am. Friday PM talks MUST be loaded by the end of the first break. Saturday talks MUST be loaded by the end of last break on Friday. POSTERS can be set up in the MASH hallway adjacent to the lobby starting at 5:00pm on Thursday until end of lunch on Friday. Tacks, poster board, and easels will be available.

A hearty round of thanks to Local Hosts **David O'Neill** (Community College of Baltimore County), **Elka Porter** (University of Baltimore), **Ben Fertig** (University of Maryland, College Park), and **Anna Davis** (University of Maryland, College Park) for putting together a fantastic meeting! Much thanks also to President **Danielle Kreeger**, and Treasurer **Jessie Jarvis** for their tireless work behind the scenes and jobs well done!

We hope you have a fun-filled and intellectually stimulating meeting!

Ben Fertig and Angela Padeletti, *AERS Program Committee*

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VENUE INFORMATION

The venue is the Community College of Baltimore County, Catonsville campus, which has a pleasing mix of historic and modern structures. It's located WSW of Baltimore near the Beltway I-695.

CCBC
The Community College of Baltimore County

For those looking for nearby activities, CCBC is within close proximity to Patapsco Valley State Park (3 miles), Baltimore's Inner Harbor (10 miles), and Annapolis, Maryland's historic capital (30 miles).

The street address is:

800 South Rolling Road
Baltimore, MD 21228-5317

Ample parking is available.

Right: The MASH building as seen from the parking lot.

Left: The SSRV Building as seen from the parking lot.

Below: MASH Lobby. Hallway for posters is to photographer's right.

NEARBY RESTAURANTS

Atwater's
http://www.atwaters.biz/shops/catonsville/

815 Frederick Rd.
Café serving breakfast and lunch everyday, and brunch all day on Saturday and Sunday. Sit-down or take-out.
Mon-Fri: 7a-6p
Sat-Sun: 8a-5p

Catonsville Gourmet
https://www.catonsvillegourmet.com

829 Frederick Rd.
Seafood restaurant serving lunch, dinner, and Sunday brunch. Note: this restaurant is BYOB.
Mon-Thurs: 11:30a-9p
Fri & Sat: 11:30a-10p
Sun: 9a-9p

Chef Paolino Café
http://chefpaolinoscafe.com/catonsville/

726 Frederick Rd.
Italian fare restaurant with great pizza. Serving lunch and dinner. Sit-down or take-out.
Mon-Thurs: 11a-10p
Fri & Sat: 11a-11p
Sun: 12-9p

Duesenberg's American Café
http://www.duesenbergscafeandgrill.com

10 Mellor Ave.
American diner serving breakfast and lunch. Sit-down or take-out.
Mon-Sat: 6a-3p
Closed Sunday

Franco's Italian Bistro
http://www.francosofcatonsville.com

803 Frederick Rd.
Italian bistro with great wood-fired pizzas and a nice bar. Serving lunch and dinner.
Sun-Thurs: 11a-9p
Fri-Sat: 11a-10p

Indian Delight
http://tajrestaurant.com

622 Frederick Rd.
Indian restaurant in the heart of Catonsville. Serving lunch and dinner. Note: this restaurant is BYOB.
Open 12a-3p and 5p-9:30p everyday. Check website for specific times.

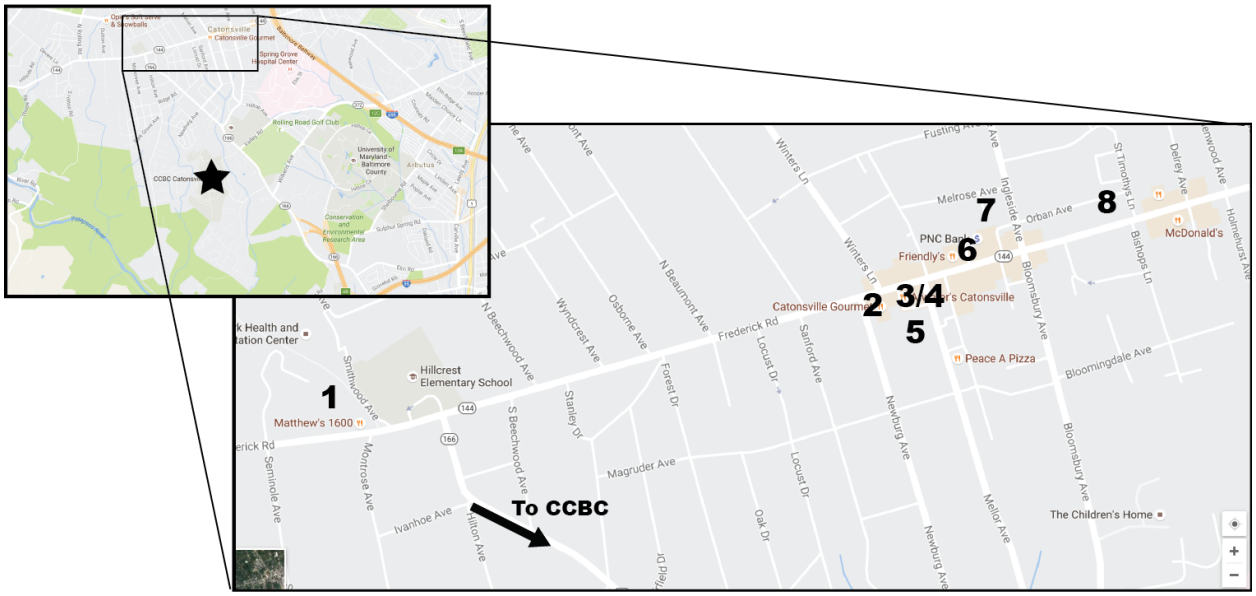
Matthews 1600
http://www.matthews1600.net

1600 Frederick Rd.
Classic American fare restaurant with a great bar. Serving lunch, dinner, and Sunday brunch.
Mon-Sat: 11:30a-12a
Sun: 11a-12a

Umami Global Bistro
http://www.umamibistro.com

712 Frederick Rd.
Mediterranean fusion cuisine. Gluten-free and vegan options available. Serving lunch and dinner. Sit-down or take-out.
Tues-Thurs: 11a-9p
Fri-Sat: 11a-10p
Sun: 11a-3p

NEARBY RESTAURANTS

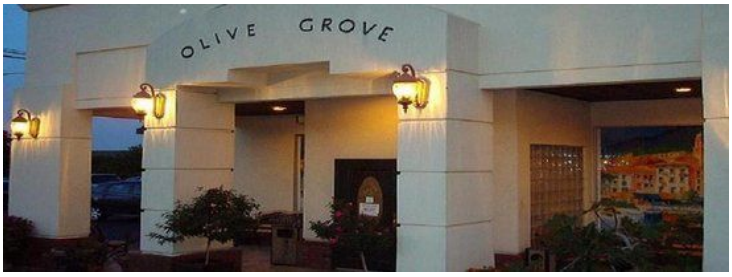


1 - Matthew's 1600
2 - Catonsville Gourmet
3 - Atwater's Catonsville
4 - Franco's Italian Bistro
5 - Duesenberg's American Cafe and Grill
6 - Umami Global Bistro
7 - Chef Paolino Cafe
8 - Indian Delight

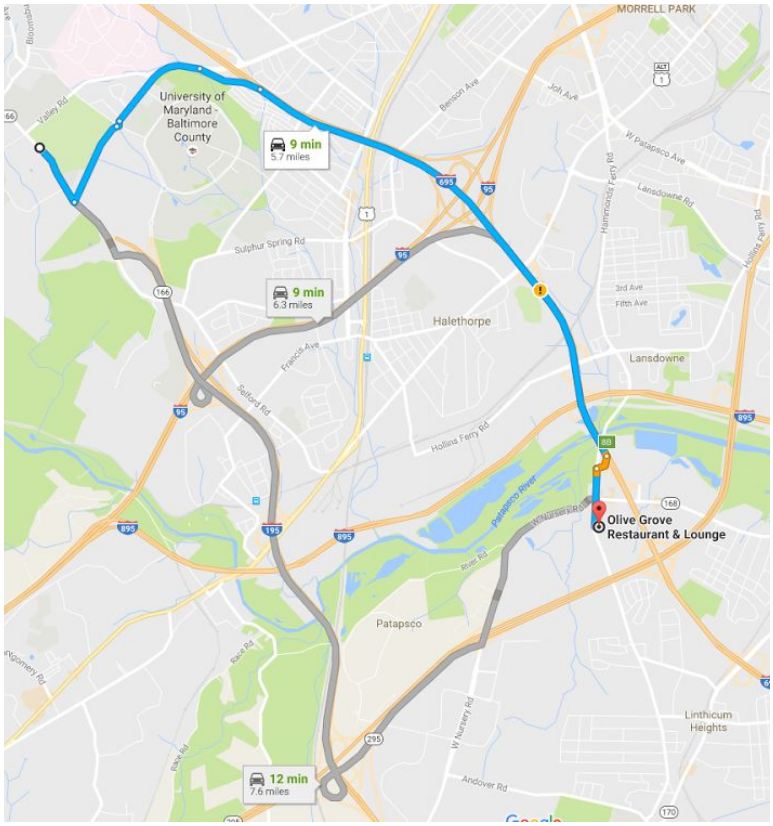
BANQUET INFORMATION

Friday November 18, 8:00 pm

Olive Grove Restaurant and Lounge
http://www.oliveg.com
705 North Hammonds Ferry Road
Linthicum, Maryland 21090



Directions from CCBC:
Turn right onto S Rolling Rd
Turn left onto Wilkens Ave
At the traffic circle, take the 1st exit
Continue onto Wilkens Ave
Merge onto I-695 toward Glen Burnie
Take exit 8B for Hammonds Ferry Rd
toward MD-169/Nursery Rd
Turn left onto N Hammonds Ferry Rd
Destination will be on the left

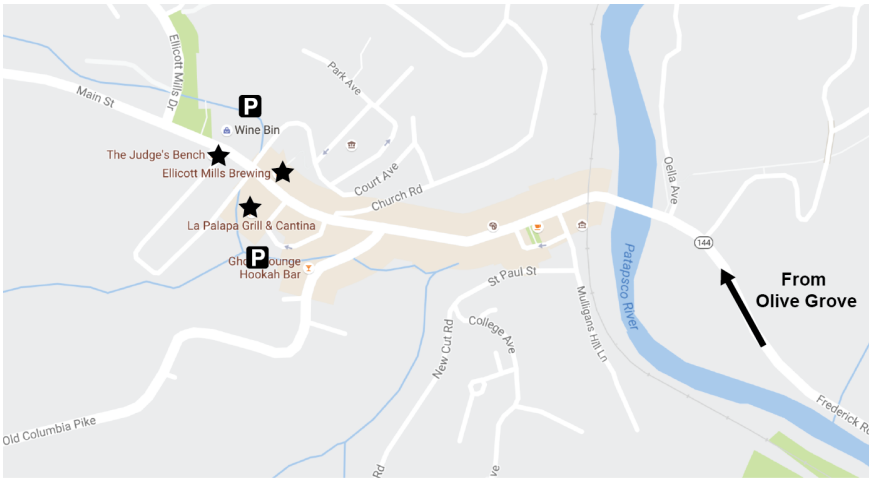


POST BANQUET

Join us for a bar crawl in Old Ellicott City!

Old Ellicott City is a historic riverside mill town founded in 1772. On July 30th, Ellicott City experienced a historic flood that caused millions of dollars in damage and took the lives of two people. The restaurants and businesses in the downtown area are all locally-owned, and they have endured significant financial hardships. We invite you to join us after the banquet for a small bar crawl to help support some of the local businesses that have been able to reopen since the flood! We'll begin the crawl at La Palapa Grill and Cantina (see map below).

Directions from Olive Grove:
Head north on N Hammond Ferry Rd toward Nursery Rd
Turn left onto W Nursery Rd
Turn right to merge onto MD-295 S
Take the exit onto I-195 W toward Catonsville
Continue onto MD-166
Take the exit toward Catonsville
Merge onto S Rolling Rd
Turn left onto Frederick Rd (Rt. 144)
Continue onto Main St



SCHEDULE AT A GLANCE

Thursday , 17 Nov 2016

3:30 - 5:00	AERS Board Meeting	MASH 2nd floor Room 213
5:00 - 8:00	Poster Setup	MASH Bldg Hallway
5:00 - 8:00	Registration open	SSRV Bldg
5:00 - 6:00	Social Media Workshop	SSRV Bldg
6:00 - 7:00	Reception Social & Keynote: Bill Boicourt	SSRV Bldg

Friday, 18 November 2016

07:45 - 08:30	Continental Breakfast	SSRV Bldg
07:45 - 08:30	Registration open	SSRV Bldg
08:30 - 9:15	Keynote: Joe Luczkovitch	SSRV Bldg
09:15 - 10:00	Session 1	SSRV Bldg
10:00 - 10:15	Break	SSRV Bldg
10:15 - 11:15	Session 2	SSRV Bldg
11:15 - 12:00	Keynote: Linda Blum	SSRV Bldg
12:00 - 1:15	Box Lunch	SSRV Bldg
12:00 - 1:15	Student Lunch with Keynote Speakers	SSRV Bldg
1:15 - 3:15	Session 3	SSRV Bldg
3:15 - 3:30	Break	SSRV Bldg
3:30 - 4:15	Keynote: Cindy Palinkas	SSRV Bldg
4:15 - 5:00	Discussion	SSRV Bldg
5:00 - 5:45	AERS Business Meeting	SSRV Bldg
5:45 - 7:45	Poster Session	MASH Bldg Hallway
8:00	Dinner	Olive Grove Restaurant

SCHEDULE AT A GLANCE

Saturday, 19 November 2016

08:00 - 09:00	Continental Breakfast	SSRV Bldg
08:00 - 09:00	Registration open	SSRV Bldg
09:00 - 09:45	Keynote: Wolf Pecher	SSRV Bldg
09:45 - 10:00	Break	SSRV Bldg
10:00 - 11:30	Session 4	SSRV Bldg
11:30 - 11:45	Student awards	SSRV Bldg
11:45 - 12:00	Closing remarks	SSRV Bldg
12:00	Adjourn	
12:00	Lunch on your own	
2:30-4:30	Jones Falls Field Trip	Jones Falls

FIELD TRIP

Take a closer look at Baltimore's central urban waterway: the Jones Falls

Time: Saturday 2:30 pm
Meeting Place: Gordon Plaza at University of Baltimore (NE corner of Maryland Ave. and Mt. Royal Ave.)
Bring: Comfortable walking shoes, clothes suitable for a hike

Join Stan Kemp and Wolf Pecher from University of Baltimore for a walking tour of the lower Jones Falls, the main freshwater tributary to the Inner Harbor. Central to the early development of the city and its industry and transportation, the Jones Falls has been an urban waterway for centuries. We will discuss the impacts from the urban landscape and stormwater/ sewer infrastructure on the Jones Falls ecosystem and beyond as we walk along the Jones Falls trail up to Round Falls. Highlights of this infrastructure include the Jones Falls Conduit, stormwater outfalls, and buried streams. We also will talk about the striking resiliency of an urban ecosystem that was long ago forgotten and in some cases buried underground. The hike will be about 3 miles roundtrip. Parking is available in the Fitzgerald garage on Oliver Street.

WORKSHOPS

Social Media / Employment Workshop

In today's world social media is changing how we interact socially and professionally. Many have tried to ignore social media as it applies professionally, but this could be hurting your employment opportunities. This workshop will cover the importance of social media for increasing your professional reputation and increase the exposure of your work, as well as provide tips on job hunting skills. This workshop is tailored to students and early career scientists, but later career scientists are encouraged to attend to provide their insight and to pass this information onto their students. I will provide many resources for individuals interested in places to search for career opportunities.

STUDENT TRAVEL AWARDS

AERS thanks all contributors to the Student Travel Award Fund including Maryland Sea Grant, Virginia Sea Grant and the Powel Student Fund. The fund enhances the AERS Endowment and provides additional support for student travel for this and future meetings. In so doing it aims to sustain student participation at AERS and CERF meetings.

Ann Colville Powel

Teacher, Student and Environmental Advocate

Ann grew up in Chevy Chase, Maryland and obtained a BA from Wellesley College and a master's degree in education from George Washington University. She taught briefly in DC schools and then moved to the Fairfax County Public Schools where she taught third to fifth grade for 20 years.

Toward the end of this period she became fascinated with marine biology and attended the summer program at Duke Marine Lab as part of obtaining a BA in Biology at George Mason University. It was during this time that she met her future husband, Chris Jones. Ann went on to complete an MS in Environmental Biology and then worked as a transportation and environmental advocate for over a decade in the metropolitan DC area, with particular interest in transit and air quality issues.

She participated in numerous AERS and ERF meetings during this time and never lost her keen interest in marine and freshwater ecology. For the decade preceding her passing in 2013, she became active again in an avocation from earlier years, painting, and participated in numerous classes and shows in the DC area and in Rochester, NY during a sabbatical there.

DETAILED SCHEDULE OF EVENTS

*All activities occur at the SSRV building unless noted

Thursday November 17th, 2016

3:30 - 5:00	**AERS Board Meeting- MASH Building, 2nd Floor Room 213**
5:00 - 8:00	**Registration Open**
5:00 - 8:00	**Poster Setup- MASH Building**
5:00 - 6:00	**Social Media Workshop**
6:00 - 7:00	**Reception Social & Keynote Address: Bill Boicourt**

Friday November 18th, 2016

7:45-8:30	**Continental Breakfast**
7:45-8:30	**Registration Open**
8:30-9:15	***Keynote : Joe Luczkovitch*** Modeling the estuarine food web: the impact of climate change and seafood harvests on whole system metrics
9:15-9:30	Adult blue crabs in the Sedge Island Marine Conservation Zone: Evidence of reduced fishing effects? *Paul Jivoff*
9:30-9:45	Can a crab build or break a marsh? The role of ecological interactions in salt marsh geomorphic processes *Bethany Williams (Masters Student)*
9:45-10:00	Aquatic underdogs: can freshwater mussel conservation and restoration help promote estuarine water quality? *Danielle Kreeger*

Friday November 18th, 2016 (continued)

10:00-10:15 Break

10:15-10:30 Tipping points in coastal fisheries: An investigation in Barataria Bay, Louisiana, USA
Kristy A. Lewis

10:30-10:45 Diet selectivity in juvenile river herring in Gunston Cove, Virginia, USA
CJ Schlick

10:45-11:00 Identification of estuarine and coastal copepod species and their ecological roles
Julie Ambler

11:00-11:15 The Effects of Temperature on Microcystin-LR Toxicity to Bosmina longirostris: Food Wed Implications in the Chowan River, North Carolina
Madison Jupitz (Masters Student)

11:15-12:00 ***Keynote : Linda Blum***
Back to Basics: Reflections on salt marsh responses to sea-level rise in the Virginia Coastal Bays

12:00-1:15 **Boxed Lunch**

12:00-1:15 **Student Lunch with Keynote Speakers**

1:15-1:30 Biotransport of Algal Toxins to Riparian Food Webs
Spencer Tassone (Masters Student)

1:30-1:45 Seasonal- and decadal-scale sediment-vegetation interactions on the subaqueous Susquehanna River Delta, upper Chesapeake Bay
Emily Russ (Doctoral Candidate)

1:45-2:00 Correctly interpreting the functional role of pools in tidal marshes is critical for assessing marsh condition and setting restoration priorities
Joseph smith

2:00-2:15 Carbon and sediment exchange between tidal marshes and estuarine waters
Nat Weston

2:15-2:30 Carbon and Sediment Dynamics in Salt Marshes of Plum Island Sound Estuary, Massachusetts
Mary Zawatski (Masters Student)

Friday November 18th, 2016 (continued)

2:30-2:45 Chesapeake Bay dual nutrient control evolving from a primarily phosphorus-limited towards a nitrogen-limited system
Richard Tian

2:45-3:00 Agricultural intensification drives decreased importance of upwelling as a nutrient source in a California coastal lagoon
Elizabeth Watson

3:00-3:15 The effects of extreme events on the development of Chesapeake Bay summer hypoxia
Wenfei Ni (Doctoral Candidate)

3:15-3:30 **Break**

3:30-4:15 ***Keynote : Cindy Palinkas***
The sediment detective: investigating environmental "mysteries" with sediment cores

4:15-5:00 Discussion

5:00-5:45 **AERS Business Meeting**

5:45-7:45 **Poster Session- MASH Building Hallway**

8:00 **Banquet at Olive Grove Restaurant-** 705 North Hammonds Ferry Road
Linthicum, Maryland 21090

Saturday November 19th, 2016

8:00-9:00 **Continental Breakfast**

8:00-9:00 **Registration Open**

9:00-9:45 ***Keynote : Wolf Pecher***
Molecular microbial source tracking as a tool to assist remediation of fecal contamination

9:45-10:00 **Break**

Saturday November 19th, 2016 (continued)

10:00-10:15 Microbial iron reduction rates along a salinity gradient in Gulf-Coast, Mid-Atlantic, and Northeastern wetland ecosystems
Brian Donnelly

10:15-10:30 Eastern oyster, Crassostrea virginica, valve gape behavior under diel-cycling hypoxia
Elka Porter

10:30-10:45 Water storage expands the duration of the Hurricane Sandy Storm surge in Maryland Coastal tidal marshes
Dot Lundberg (Doctoral Candidate)

10:45-11:00 Impacts of episodic storms on processes in an urban freshwater tidal wetland
Kirk Raper

11:00-11:15 Submersed Aquatic Vegetation in a Hudson River Watershed: The Great Swamp of New York
David Yozzo

11:15-11:30 Microinvertebrate and vertebrate communities within drift macroalgae blooms at two sites in Barnegat Bay, New Jersey
Elizabeth Lacey

11:30-11:45 **Student Awards**

11:45-12:00 **Closing Remarks and Adjourn**

12:00-2:30 **Lunch on your own**

2:30 **Field Trip Jones Falls**

LIST OF CONTRIBUTED POSTERS

Alphabetical by presenter * Presenting author

Avian Use of a salt marsh island following a trial beneficial reuse of dredged material project
Anholt, A.R*, L. Ferguson, J. Jahn, M. Yepsen, and D. Golden

Does chronic nutrient enrichment alter plant phenology in *Spartina alterniflora*?
Bauer, C.E.*, L.A. Deegan, J.A. Langley, M.K. McCormick, and T.J. Mozdzer
Masters Student

Seasonal Invertebrate Diversity on an Urban Oyster Reef
Bojorquez, C.*, N. Angelucci, J. Acosta, J. Breton, C. Hotchkin, C. Kanchan, and A. Fitzgerald
Undergraduate

Monitoring of a Living Shoreline along the Lewes and Rehoboth Canal, Lewes, DE: 2014-2016
Moody, J., A. Padeletti, S. Bouboulis* and D. Kreeger

Corroboration of NVDI Landsat Imagery Analysis with Long Term Monitoring of Vegetation in the New Jersey Salt Marshes
Haaf, L.*, A. Padeletti, and D. Kreeger
Doctoral Candidate

Respiration and Potential Denitrification in Tidal Marsh Soils
Lampasona, D.*
Undergraduate Student

Sessile invertebrate diversity in Raritan Bay, NJ
Naysha A.*, C. Bojorquez, J. Breton, S. Kanchan, J. Acosta, and A. Fitzgerald
Undergraduate

Denitrification Rates, Potential, and Limitation in a Newly-Created Wetland
Roose, J.J.*
Masters Student

Effect of Vertical Positioning on 3-Dimensional Oyster Reefs on Growth Rates and Body
Sawyer, G.T.*, C. E. Tanner, and M. Power
Undergraduate

Performance of Selected Rain Gardens in Rhode Island
Sharif, R.*
Doctoral Candidate

Fishes of a Temperate Estuary: Temporal and Subhabitat Influences on Species Composition and Abundance
Valenti, J.L.*, T. Grothues, and K.W. Able
Doctoral Candidate

The effect of iron sulfide formation on particulate phosphorus bioavailability in sediments deposited in Chesapeake Bay
Vulgaropulos, Z.L.*, J.C. Cornwell, and M.S. Owens
Masters Student

Comparing performance and economics of feeding methods for oyster larvae using different micro-algal diets.
Waby, S.J., R.J. Borgert, K.L. Clark*, and A.M. DeMarr

Effects of Bio-Remediation on Zooplankton in South Bethany (DE) Canals
Williams A.*, H.L. Glos, T.G. Yeghissian, and J.H. Cohen
Undergraduate Student

Inherit Resilience in Seagrass: Quantifying Genetic and Kin Structure Variation Between Life History Strategies
Willeboordse, P.L.*, J.C. Jarvis, S. Kamel, and D.O. Eulie
Undergraduate Student

Temperature and Body Size Relationships in Delaware Bay Copepods from Historical and Modern Perspectives
Yeghissian, T.G.*, H.L. Glos, and J.H. Cohen
Masters Student

KEYNOTE SPEAKERS

Thursday 6pm - William Boicourt

Bill Boicourt is a Professor of Oceanography at the University of Maryland Center for Environmental Science Horn Point Laboratory. His chief research interests are the circulation of continental shelves and estuaries, addressing particular questions on how these motions are driven by winds and by freshwater flowing off the land. Many of his physical investigations of these waters have been motivated by biological questions such as the role of water motion and water structure in the success of early life stages of fish, how eggs and larvae are transported from spawning to nursery grounds, and how physical processes contribute to the formation of "dead zones" in the estuary and on the continental shelf. Instrumentation and observing systems have been a long-term interest, not only for resolving the small time and space scales of the coastal ocean, but also for monitoring and predicting long-term changes in the coastal ecosystem.

After receiving his degree at the Johns Hopkins University, Boicourt continued his research at the Chesapeake Bay Institute to study the circulation of the Bay and the adjacent continental shelf. In 1981, he was a Visiting Scientist at the Woods Hole Oceanographic Institution. Soon thereafter, he joined the University of Maryland at Horn Point Laboratory. In 1989, he was the recipient of the B.H. Ketchum Award from Woods Hole for his work on shelf-estuary interactions.

Where the River Meets the Sea: Flow and Turbulence

Descriptions of estuarine circulation have evolved into the third dimension, with increasing temporal and spatial detail. Early formulations conveyed a sense of steady flow, despite an awareness of variability driven by tide and wind. The advent of reliable recording instruments enabled researchers to discover marked departures from steadiness, giving rise to a perception that the old circulation ideas were to be overthrown. The crux of the circulation problem remains in our attempts to describe the turbulent mixing that drives the estuarine flow. Recent work has provided insight into some dramatic wind-driven and hydraulically modulated mixing processes. The emerging circulation picture is more a pulsed response and relaxation process than a steady flow, yet the classic two-layer circulation always emerges in temporal averages. Progress has been made assuming superposed processes, but nonlinearities suggest that this approach has limits. Further interactive modeling/observational approaches will be required to integrate episodic and steady processes into a unified whole.

KEYNOTE SPEAKERS

Friday 8 am - Joe Luczkovich

Dr. Joe Luczkovich is Professor of Biology and Senior Scientist in the Institute for Coastal Science and Policy at East Carolina University. He graduated with a B.S. Biology from Lehigh University, an M.S. in Ecology from Rutgers University, and a Ph.D. in Biological Sciences from The Florida State University. Specific research topics include network models of estuarine ecosystems, in which fish dietary patterns were investigated and related to the other species that feed on the fishes and on which the fishes fed, fish bioacoustics and reproductive ecology studies, and fish habitat studies.

Modeling the estuarine food web: the impact of climate change and seafood harvests on whole system metrics.

One of the basic ways to understand estuaries energy flow and species interactions is to analyze the food web structure of the ecosystem. I will review common species interactions in a food web model of Core Sound, North Carolina. My research group has used direct measurements of benthic biomass of various species, the published literature, and NC Division of Marine Fisheries harvest data to construct ecosystem network models for this estuary, for management areas open and closed to trawling, to determine if differences occurred after the end of the shrimp trawling season. We compared among trawling management areas: 1) log-biomass measurements of key bycatch species and benthic groups in open and closed trawling areas; 2) effective trophic levels, 3) stable isotopes, 4) net primary production, 5) total system respiration, 6) total system throughput and 7) flows to detritus using Ecopath. Net primary production was greater in open trawling areas before and after the shrimping season; this was largely due to higher planktonic primary production. Simulations of climate change scenarios indicate that loss of benthic production by seagrasses will occur, resulting in declines of key fishery species such as blue crabs, southern flounder, red drum and increases in jellyfish.

KEYNOTE SPEAKERS

Friday 11am - Linda Blum

Linda Blum received her Ph.D. from Cornell University in 1980. Four years later she accepted a position at the University of Virginia in the Department of Environmental where she has been ever since. Her research focuses on understanding the fate of organic matter in salt marshes and soil development as it impacts marsh persistence in an environment of rising sea levels. How much organic matter is produced? Is the source production above- or belowground? How much organic material is mineralized and how much is buried in marsh sediments? How do organic matter dynamics impact marsh topography and trangression or progradation? Is organic matter exported to the estuarine water column? Of course, the answer is that some portion of salt marsh organic material will be mineralized, transferred, buried, and exported; but, how much organic carbon realizes each fate and how does each of these fates contribute to the sustainability of marshes in the face of rising sea-level and anthropogenic alterations of the coastal zone?

Back to Basics: Reflections on salt marsh responses to sea-level rise in the Virginia Coastal Bays
Tidal marshes occupy the narrowest range of elevation of estuarine ecosystem types. Marshes are bracketed by subtidal mud and sand flats at lower elevations and by upland forest vegetation at higher elevations. In 1995, we presented a conceptual model of mainland marsh transition during sea-level rise that focused on the dominant plant species and soil characteristics. Since then, we have conducted studies examining the internal marsh processes leading to replacement of upland by high marsh and high marsh by low marsh. Our focus is on understanding the above- and below-ground processes generating change in vertical and horizontal position to allow for better prediction of marsh responses to accelerating relative sea-level rise through field experiments and long-term observations. Marsh plant communities are self-maintaining and resist change by building vertically at rates equal to, or greater than, sea-level rise. The combination of doubled flooding frequency and disturbance associated with wrack deposition facilitates the replacement of high-marsh plant species with low-marsh species. Similarly, storm surge likely converts uplands to high marsh through osmotic shock. Both elevation change and landward horizontal movement are critical to maintenance of the spatial extent of salt marshes as the climate warms and sea rises.

KEYNOTE SPEAKERS

Friday 3:15pm - Cindy Palinkas

Cindy Palinkas received her BA from Johns Hopkins University, majoring in Earth and Planetary Sciences. She then went on to receive her MS and PhD in Geological Oceanography from the University of Washington. She arrived at UMCES Horn Point Lab in 2005 as an Assistant Professor and was promoted to Associate Professor in 2013. Her research focuses on sediment transport and deposition in intertidal, fluvial and estuarine environments, especially with regard to feedbacks between sediment and vegetation dynamics.

The sediment detective: investigating environmental "mysteries" with sediment cores

Like detectives, sedimentologists gather clues to investigate environmental questions. This talk focuses on the impacts of natural and human activities on the benthic environment, using 3 case studies: 1) marsh response to environmental change (increased rates of sea-level rise; changing fluvial sediment supplies); 2) translation of land-use changes to sediment and nutrient loads to creeks; and 3) impact of coastal structures on adjacent benthic environments. Clues are provided by sediment cores, which preserve the record of past sedimentary environments. Specifically, down-core changes in sediment character (grain size, organic content, nutrient concentrations) and accumulation rates can be linked to natural- and/or human-caused perturbations. Decoding the impacts of past perturbations provides valuable insight for present and future resource management.

KEYNOTE SPEAKERS

Saturday 8:30am - Wolf T. Pecher

Dr. Wolf Pecher is an Assistant Professor at the University of Baltimore and faculty of the Environmental Sustainability and Human Ecology Major. He holds a Ph.D. in Marine Estuarine Environmental Sciences from the University of Maryland, College Park. His research interests focus on the biology and ecology of parasites and the microbial ecology of extreme and urban environments. Over the past few years, he has been working on tracking and identifying the sources of fecal contamination in the Baltimore Harbor watershed by using molecular based assays as well as DNA fingerprinting approaches and 16S metagenomics. Furthermore, he has been exploring the use of microbes as indicators of road salt pollution, and the effect of salt on microbial communities.

Molecular microbial source tracking as a tool to assist remediation of fecal contamination
Chesapeake Bay and its tributaries are listed as impaired for nutrients and solids. Urban runoff is a significant source for these pollutant, which is exasperated by an aging sanitary infrastructure. In Baltimore City, for example, leaks and breaks in sewage pipes resulting in raw sewage to be flushed into its streams are not uncommon. Baltimore is located near the Patapsco, a tributary of Chesapeake Bay. Two of its urban streams, the Jones Falls and Gwynns Falls, join the Patapsco, conveying nutrients, pathogenic microorganisms, and trash to Chesapeake Bay. Despite repairs of the sanitary sewer infrastructure bacterial loads remain high that have been explained by the uncertainty of the source of fecal matter. Molecular based methods (referred to as molecular microbial source tracking (mMST)) to identify specific sources of fecal contamination have been developed. Using these tools we identified and quantified human and canine sources of fecal contamination in Baltimore' streams. Our studies confirmed that traditional methods are not sufficient to characterize and thus remedy fecal contamination, and demonstrate the potential of mMST to assist municipalities in prioritizing repairs and implementing other appropriate measures to reduce fecal contamination, and consequently to contribute to efforts to improve the health of surface waters.

ORAL PRESENTATION ABSTRACTS

Listed alphabetically * Presenting author

Identification of estuarine and coastal copepod species and their ecological roles

Ambler, J.W.*
Millersville University of Pennsylvania
julie.ambler@millersville.edu

Copepods are usually the most abundant animals collected in plankton nets in estuaries and coastal areas, but are represented by only a few species. A photographic zooplankton key www.natureatlas.org/zooplankton/midatlantic is being updated to include a simplified copepod key which includes several dominant genera (*Acartia*, *Eurytemora*, *Temora*, *Oithona*, *Centropages*), and will eventually include all species of dominant genera for the Mid-Atlantic region. In this talk, the key will be demonstrated by identifying a few copepod species and their distributions. Distributions of copepod species are generally predictable and can provide supporting evidence for identifications. Broad spatial distributions of copepod species are determined by salinity ranges caused by estuarine and coastal circulation patterns. Temporal distributions of copepods can be caused by abiotic seasonal factors such as temperature, day length, rainfall patterns, hurricane surges and macronutrient input from watersheds. Food web interactions also determine spatial and temporal patterns by the presence of predators (ctenophores, jellyfish, fish larvae, menhaden), prey species (phytoplankton, harmful algal species, microzooplankton), competitors (microzooplankton, appendicularians, bivalves), and detritus. As our understanding of microbial ecology, gelatinous zooplankton feeding ecology, pelagic-benthic interactions, and watershed nutrient contributions has increased, our conceptual models of copepod food web interactions have become more complex.

Microbial iron reduction rates along a salinity gradient in Gulf-Coast, Mid-Atlantic, and Northeastern wetland ecosystems

Donnelly, B.R.*, and N.B. Weston
Villanova University
brian.r.donnelly@villanova.edu

Coastal wetlands and the ecosystem services they provide are disappearing at an alarming rate. Iron reduction by anaerobic microbes in marsh soils is an important respiration pathway that may be influenced by environmental parameters and about which we know relatively little. By examining rates of iron reduction and the effects of salinity, depth, and below-ground biomass in marsh soils, we can better predict future impacts of wetland loss. In this study, we examined iron reduction rates along salinity gradients of coastal wetlands in Barataria Bay, LA, Plum Island, MA, and the Delaware River, NJ. We determined that as latitude increased, iron reduction rates decreased. We concluded iron reduction declined with both increased salinity and depth in the Gulf Coast wetlands, but the story was not as clear in the other two sites. Iron reduction rates were also controlled by soil characteristics such as water content and organic carbon content. There was no statistically significant link between iron reduction and below ground biomass, suggesting environmental parameters other than organic matter production control iron reduction. If freshwater wetlands salinize due to salt-water intrusion that accompanies sea-level rise, iron reduction rates may decline, altering pathways of organic matter decomposition in coastal wetlands.

Adult blue crabs in the Sedge Island Marine Conservation Zone: Evidence of reduced fishing effects?

Jivoff, P.R.*, L. Moritzen, A. Barton, J. Kels, J. McCarthy, A. Young, P. Ferdinando, F. Pandolfo, and C. Tighe
Rider University
pjivoff@rider.edu

Conservation zones are important for maintaining the sustainability of ecosystems and populations of economically important species. Commercial and some recreational fishing activities are limited in the Sedge Island Marine Conservation Zone (SIMCZ) in Barnegat Bay but little work has examined the potential impact of the SIMCZ. We compared aspects OF adult blue crab population structure in the SIMCZ with other SAV-dominated areas, as well as other habitats (creek mouths, open bay areas) commonly used by blue crabs in Barnegat Bay. Abundance, size and sex ratio of adult blue crabs were assessed using commercial-style blue crab traps deployed daily for one week in each month May-August, 2012-2013. Compared to other SAV-dominated areas in the Bay, the SIMCZ contained: (1) more adults of both sexes, (2) more ovigerous females than areas adjacent to the SIMCZ, (3) relatively more legal-sized (>120mm) male crabs and (4) more males than physically similar open bay habitats. Taken together, these results suggest that both sexes of blue crabs benefit from the SIMCZ: adult females use the SIMCZ as a spawning habitat and adult males may find refuge from fishing pressure outside the conservation zone.

The Effects of Temperature on Microcystin-LR Toxicity to *Bosmina longirostris*: Food Wed

Jupitz, M.C.*, D.G. Kimmel, and E.K. Field
East Carolina University
jupitzm15@students.ecu.edu
Masters Student

In the Chowan River, North Carolina, the frequency of *Microcystis aeruginosa* blooms has increased over recent years with an average 2.6°C rise in July/August water temperatures since 1975. Zooplankton are an important trophic link for toxins to move up the food web, but most cannot survive exposure. *Bosmina longirostris*, dominant in the Chowan River, resists microcystins and consumes toxic cells. This study aimed to understand how microcystin-LR, produced from *M. aeruginosa*, affects *B. longirostris* mortality under increasing temperatures. *B. longirostris* was highly resistant to microcystin-LR, demonstrating an LC50 of 23.3 μg/L. Therefore, *B. longirostris* can survive current microcystin concentrations ranging 0.26 to 2.0 μg/L. As temperatures were increased 25°C-27°C, total mortality increased approximately 30%, demonstrating microcystin was more toxic with increasing temperatures. Above 27°C, mortality also increased, but this was due to the effect of temperature rather than increased toxicity of microcystin. This signifies that during spring, when temperatures are below 27°C and B. longirostris is most abundant, microcystin is most toxic and has the greatest influence on the Chowan River food web. Under climate change conditions microcystin may eliminate resistant zooplankton from the food web, putting pressure on fisheries.

Aquatic underdogs: can freshwater mussel conservation and restoration help promote estuarine water quality?

Kreeger, D.A.*
Partnership for the Delaware Estuary
dkreeger@delawareestuary.org

Freshwater mussels are the most imperiled of all plants and animals in North America. Little is known about whether and how mussel declines may contribute to degraded health of streams, rivers and tidal freshwater estuaries. Similar to other suspension-feeding bivalves, freshwater mussels can live in dense beds having upwards of 50 animals per square meter. They filter seston indiscriminately, optimizing nutritional balance through complex sorting and digestive adaptations. Clearance rates, filtration rates, and absorption efficiencies were assessed for 7 representative mussel species of North America. Clearance rates were generally comparable among mussel species during the growing season, averaging between 0.3-1.1 L hr-1 [g DTW]-1. The water quality effects of mussel grazing mainly varied with temperature and seston composition. Absorption efficiencies were positively correlated with seston quality. Extrapolation of physiologically based models of ecosystem services to typical mussel beds suggests that 10 metric tons of total suspended solids can be filtered per hectare per year at tidal freshwater study sites on the Delaware River. Options for mussel restoration will be discussed, including the potential consequences for water quality management in the Chesapeake Bay and Delaware Estuary.

Microinvertebrate and vertebrate communities within drift macroalgae blooms at two sites in Barnegat Bay, New Jersey

Lacey, E.A.*
Stockton University.
elizabeth.lacey@stockton.edu

Many commercially and recreationally important invertebrates and fish rely on complex habitats for growth, reproduction and survival yet seagrass beds, which have traditionally provided this habitat, are in decline. Macroalgae has been found to provide nursery habitat and increased growth rates for many species, in some instances more than native eelgrass habitats, yet studies on the extent of this ecosystem service are lacking. During the summers of 2014 and 2015, drift macroalgae microinvertebrate and vertebrate communities were collected in Barnegat Bay, New Jersey. Fauna that was attached or incorporated into the macroalgae were enumerated and identified. Seasonal blooms varied spatially whereas the less anthropogenically impacted site (Barrel Island) had significantly greater drift algae canopies than the more impacted site (Seaside Heights). While drift macroalgae presence also varied annually and seasonally, drift algae was found to be habitat for amphipods, isopods, shellfish larvae, juvenile fish and blue crabs at combined densities over 250 individuals per m2. Further research on the relative contribution of drift macroalgae as habitat is necessary in order to predict the impact of future blooms on commercially and recreationally important invertebrates and fish as well as seagrass ecosystems in Barnegat Bay.

Tipping points in coastal fisheries: An investigation in Barataria Bay, Louisiana, USA

Lewis, K.A.*, A. Sills, K. De Mutsert, and J.H. Cowan, Jr.
St. Mary's College of Maryland
kalewis3@smcm.edu

In Louisiana, previous studies hypothesized that a tipping point (i.e. fisheries collapse) could be reached if marsh degradation continued, thus eroding nursery function for many estuarine-dependent species. Here, we use historical GIS data to determine if increases in the linear distance of marsh edge during marsh degradation could temporarily mask the negative impacts of marsh loss. Then using fisheries monitoring data, we created single-species regression trees and applied a series multivariate community analyses to determine if a tipping point for coastal fisheries has been reached in Barataria, Bay, Louisiana. We found that the maximum value of marsh edge was in 1985 and has been decreasing ever since. Commercially fished species, like brown and white shrimp (*Farfantepenaeus aztecu*s, *Litopenaeus setiferus*), appear unaffected by the rise and subsequent decline of edge distance, however this finding is complicated by the fact that overall edge distances after 1985 are generally higher than distances before. The multivariate analyses, rather, aggregated nekton communities in two distinct groups, before and after 1985, best explained by a subset of environmental variables: turbidity and marsh edge. So, while individual species appear to be unaffected by the loss of marsh edge, community composition within the estuary is changing.

Water storage expands the duration of the Hurricane Sandy storm surge in Maryland Coastal tidal marshes

Lundberg D.*, K. Prestegaard, and B. Needelman
University of Maryland
dotlundberg@gmail.com
Doctoral Candidate

Coastal marshes have the potential to reduce the magnitude of storm surges through several mechanisms, including vegetative drag, water absorption and displacement/dampening, and the sheltering of surface winds. About 90% of marshes from Maine to Virginia are ditched. In this study we report data collected during Hurricane Sandy (2012) to evaluate storm surge attenuation and subsequence hydrological response in both ditched and unditched coastal marshes. A year prior to Sandy, we instrumented two pairs of ditched and unditched marshes located on the Bay and Atlantic side of the Delmarva Peninsula with groundwater wells, tide gauges, and weather stations. Hurricane Sandy was the highest rainfall event during the project period from 2011-2015 with wind speeds of 88.5 km/hr. Water level measurements indicated that both ditched and unditched had similar hydrological responses to Sandy. Marsh water levels were sustained at high levels for three days after Sandy. After the storm surge, marsh water levels declined to a new, higher, baseline then slowly declined until reset higher by another major storm. Time series indicate that major changes in marsh hydrology occurred as consequences to major storms; these event-based changes in marsh hydrology were more significant than lunar cycles or seasonal hydrological responses.

Biotransport of Algal Toxins to Riparian Food Webs

Moy N.J., J. Dodson, S.J. Tassone*, P.A. Bukaveckas, and L.P. Bulluck
Virginia Commonwealth University
tassones@mymail.vcu.edu
Masters Student

The occurrence of harmful algal blooms has resulted in growing world-wide concern about threats to aquatic life and human health. Microcystin (MC), a cyanotoxin, is the most widely reported algal toxin in freshwaters. Prior studies have documented its presence in aquatic food webs including commercially important fish and shellfish. In this paper we present the first evidence that algal toxins propagate into riparian food webs. We show that MC is present in emerging aquatic insects (Hexagenia Mayfly) from the James River Estuary and their consumers (Tetragnathidae Spider, Prothonotary Warbler; *Protonotaria citrea*). MC levels in Prothonotary Warblers varied by age class, with nestlings having the highest levels. At the site where nestlings received a higher proportion of aquatic prey (i.e., mayflies) in their diet, we observed higher MC concentrations in liver tissue and fecal matter. Warbler body condition and growth rate were not related to liver MC levels suggesting that aquatic prey may provide dietary benefits which offset potential deleterious effects of the toxin. This study provides evidence that threats posed by algal toxins extend beyond the aquatic environments in which blooms occur.

The effects of extreme events on the development of Chesapeake Bay summer hypoxia

Ni, W.*, and M. Li
University of Maryland
wni@umces.edu
Doctoral Candidate

Chesapeake Bay is the largest estuary in the United State which is also a high dynamic system. During summer, the bottom water in the Bay suffered from persistent oxygen depletion since 1950's, jeopardizing the health of the estuarine ecosystem. Chesapeake Bay region is also under the threat of extreme events as storms which are most frequent in late summer and fall. To study the effects of storms on the development of Chesapeake Bay summer hypoxia, a coupled hydrodynamic -biogeochemical numerical model (ROMS-RCA) was applied to investigate two sequential storms in the late summer of 2011 (Hurricane Irene and Tropical Storm Lee). The results indicated that the strong wind (>20m/s) during Hurricane Irene could mediate the late summer hypoxia substantially. The record flood from Susquehanna River by Tropical Storm Lee led to a temporal recovery of hypoxia by the enhanced stratification and allochthonous POC input with flood.

Eastern oyster, *Crassostrea virginica*, valve gape behavior under diel-cycling hypoxia

Porter, E.T.*, and D.L. Breitburg
University of Baltimore
eporter@ubalt.edu

Hypoxia and anoxia in many estuaries worldwide can cause a wide range of negative effects on animals that are directly exposed or indirectly influenced by food-web interactions. Typically, experimental studies focus on animal behavior as a function of continuous exposure to low dissolved oxygen (DO) conditions rather than short-term fluctuations. Dissolved oxygen concentrations [DO] can, however, vary throughout the day, and water can become hypoxic for minutes to hours, often during the late night/early morning hours in the summer. Valve gape of 1-year old eastern oysters, *Crassostrea virginica*, from Maryland, USA, was continuously measured while exposed to diel-cycling DO in aquaria during normoxic, hypoxic and supersaturated phases of the cycle over several 2-d periods (July–August 2012). Severe hypoxia (0.6 mg DO L-1) induced oysters to close for significantly longer times than normoxic (7.3 mg DO L-1) conditions. Oysters exposed to mild hypoxia (1.7 mg DO L-1) closed for a similar amount of time as oysters held at normoxia and severe hypoxia. At severe hypoxia, more than one third of the oysters closed simultaneously and closed immediately when they encountered severe hypoxia while oysters at mild hypoxia often closed later in the low oxygen phase of the cycles. When normoxia was reintroduced after severe hypoxia, most oysters opened immediately and gaped throughout the period. The results indicate that while one-year old oysters responded negatively to diel-cycling low [DO], especially to severe hypoxia, they rapidly opened during the normoxic period that followed, potentially reducing any negative effects of a fluctuating environment.

Impacts of episodic storms on processes in an urban freshwater tidal wetland

Raper, K.L.*, E.B. Watson, J.V. Mead, and D.J. Velinsky
Drexel University
klr323@drexel.edu

Climate model simulations corresponding to IPCC emissions scenarios suggest that by 2100, increases in precipitation intensity, the number of heavy precipitation events, and the intensity of the wettest events are all expected to increase. Concurrently, one to three month droughts could occur as frequently as once per summer in the U.S. Northeast. We predict that changes in storm frequency and intensity could have effects on marsh survival, as well as ecosystem services like sediment and nutrient retention. Here, we report on event-based field monitoring regarding impacts of changing precipitation patterns on sediment deposition in an urban freshwater tidal wetland. Storm events accumulated greater deposition than base flow events, and our sediment deposition data suggests that episodic storms account for much of the sediment deposited in freshwater tidal wetlands. In fact, we found that often the tides only flooded the upper marsh to significant depths (>15cm) during storm events. Using empirical data to parameterize a process-based marsh elevation simulation model, we found that increased storm frequency will likely increase the probability of marsh survival with sea level rise significantly. These results suggest that changes to storm events could significantly impact coastal wetland function and persistence.

Seasonal- and decadal-scale sediment-vegetation interactions on the subaqueous Susquehanna River Delta, upper Chesapeake Bay

Russ, E.*, C. Palinkas, and C. Gurbisz
University of Maryland
eruss@umces.edu
Doctoral Student

Submersed aquatic vegetation (SAV) historically have been a prominent feature on the shallow, subaqueous delta of the Susquehanna River (SR), referred to as the Susquehanna Flats; however, SAV were absent from the Flats between 1972 and the early 2000s. Although it is well established that SAV promote sediment and nutrient retention, the timing and magnitude of trapping on the Flats is unclear. This study evaluates sediment trapping over seasonal to decadal time scales, using naturally occurring radioisotopes (7Be, 210Pb), within the context of fluvial sediment supply and plant biomass. Results show that, while average river discharge and suspended-sediment concentration (SSC) were lowest during the summer (plants present), sedimentation rates and mud content were highest, especially in the middle of the plant bed. In contrast, recent sedimentation was observed only at sites farthest downstream of the SR mouth during the spring (plants absent), when average discharge and SSC were highest. Decadal-scale sediment accumulation was also influenced by plant biomass, with higher accumulation rates occurring during years when plants were present than when they were absent. Therefore, the seasonally vegetated Flats are an important sink for sediment and nutrients in the upper Bay.

Diet selectivity in juvenile river herring in Gunston Cove, Virginia, USA

Schlick, C.J.C.*, C. Pehrson, K. Lewis, and K. de Mutsert
George Mason University
cjcschlick@gmail.com

Juvenile alewife *Alosa pseudoharengus* and blueback herring *A. aestivalis* (collectively termed river herring) use Gunston Cove, Virginia, USA as a nursery habitat from May to September and feed on similar prey items. To investigate possible interspecies competition and ontogenetic shifts in diets, juvenile river herring diets were compared between the two species and between months within each species using non-parametric multivariate analyses. Additionally, to determine if river herring were selectively feeding, the Chesson selectivity index was used to compare the relative abundance of prey in each species diet to the relative abundance of the prey in the environment. Juvenile river herring consumed many of the same prey taxa, but alewife consumed a wider variety, resulting in statistically different diets between species throughout the summer ($p = 0.001$). Both species selectively fed on cladocerans in June and transitioned to large benthic insects by September. Other prey taxa were opportunistically fed upon throughout the entire summer, thus reducing interspecies competition. The results from this study provide not only baseline dietary data for juvenile river herring, but also provide insight on niche partitioning in a shallow embayment.

Correctly interpreting the functional role of pools in tidal marshes is critical for assessing marsh
Smith, J.*
smithjam@gmail.com
Pools in tidal marshes are often misinterpreted as a symptom of degradation. Recent research demonstrates that pools in unditched marshes instead represent a fundamental cyclical geomorphic process of pool formation, expansion, tidal breaching and vegetation recovery. Given the importance of each pool successional stage as wildlife habitat, pool dynamics are a key driver of habitat diversity. Pool dynamics may be altered by accelerated sea level rise, with consequences for both wildlife and marsh resilience. We test the prediction that pools in unditched Atlantic Coast marshes in Southern New Jersey are in dynamic equilibrium by (1) comparing the relative coverage of different pool stages and vegetated marsh during 1970 and present and (2) by tracking individual pool dynamics across an 86 year time series of aerial imagery to determine whether the rate of pool tidal breaching has remained stable over time. Conservation practitioners must incorporate a nuanced understanding of marsh pools when assessing marsh condition and setting restoration priorities. Without this understanding, restoration projects may fail by either taking restoration actions where they are not warranted or by selecting restoration strategies that treat symptoms of degradation rather than its causes.

Chesapeake Bay dual nutrient control evolving from a primarily phosphorus-limited towards a nitrogen-limited system
Tian, R.*, P. Wang, and L. Linker
rchrdtian@gmail.com
The U.S. Environmental Protection Agency, together with the jurisdictions on the watershed, support an unprecedented restoration effort on Chesapeake Bay based on implementation to achieve living resource based water quality standards. A key metric is the reduction of nutrient loads from the watershed to the Bay. Nutrient limitation of phytoplankton growth and biomass is altered by these measures. Based on historical nutrient data collected by the Bay Program from 1984 to the present, trend analyses were conducted on nitrogen and phosphorus limitation based on standard Michaelis-Menten principles. It was found that there is a general increasing trend of nitrogen limitation and a decreasing trend of phosphorus limitation. Similar trends were found in the nutrient loading, with a decreasing trend of nitrogen versus phosphorus ratios. Spatial and seasonal variability will be presented as well.

Agricultural intensification drives decreased importance of upwelling as a nutrient source in a California coastal lagoon

Watson, E.B.*, F.I. Rahman, P.M. Zelanko, and K. Wasson
Drexel University
elizabeth.b.watson@drexel.edu

In the arid and semi-arid environments of coastal California and Baja California, upwelling can overwhelm infrequent freshwater inflows as a dominant source of nutrients to coastal estuaries. However, changes in coastal land use can shift the direction of nutrient transport, and many estuaries have extreme eutrophication resulting from a combination of physical modifications, poor flushing and dense coastal development or heavily fertilized row crop agriculture. Here, we use bulk sediment stable nitrogen isotopes preserved in dated wetland sediment cores to reconstruct spatial patterns and temporal changes in nitrogen processing at Elkhorn Slough, a lagoon located in central California in an intensely agricultural watershed. We find strong contrasts between current sediment stable isotope signatures and those from the recent past (1900), suggesting that much higher DIN concentrations are found today than existed previously. In addition, spatial patterns suggest that in 1900 marine nitrate – largely upwelling derived- was the main nutrient source to the Slough. However, this pattern has shifted, and instead high levels of nitrate are found adjacent to agricultural sources. Examination of historic land use, population, and fertilizer application data suggests that a change in fertilization regime – rather than extent of agricultural lands – is chiefly responsible for these shifts..

Carbon and sediment exchange between tidal marshes and estuarine waters

Weston, N.*
Villanova University
nathaniel.weston@villanova.edu

The response of salt-marshes to sea-level rise depends on rates of marsh vertical accretion which is regulated by the trapping of sediments during marsh flooding and the accumulation of plant organic matter in marsh soils. The goal of this study is to evaluate the import and export of carbon and sediments at the creek-shed scale in tidal creek systems that drain marshes of varying elevations and plant communities. We measured sediment and dissolved inorganic carbon (DIC) exchange through a full tidal cycle (low-high-low) at creek sites that drain high-elevation and low-elevation marsh areas on five dates from May through October 2016. The vertical exchange of carbon between the marsh and atmosphere is measured at these same sites using chambers and eddy flux towers, allowing us to determine the complete carbon budget. Our results to date indicate that, surprisingly, there is little net DIC exchange in the tidal creek systems. All marsh types retained sediment throughout the summer. In the autumn, the high-elevation marshes continued to trap sediment while the low-elevation marshes exported sediment to the estuary. While tidal exchange of sediments plays a critical role in marsh accretion, it appears that tidal exchange of carbon is of minor importance.

Can a crab build or break a marsh? The role of ecological interactions in salt marsh geomorphic processes

Williams, B.L.*, and D.S. Johnson
Virginia Institute of Marine Science
bwilliams@vims.edu
Masters Student

Accelerated sea-level rise threatens coastal habitats along the northeast Atlantic coast of the United States, where sea-level rise is 3-4 times greater than the global average. Salt marshes are critical intertidal ecosystems, providing a host of services such as storm protection, food production, and carbon storage. Salt marsh persistence in the face of rising sea levels relies on vertical accretion and landward migration. Current ecogeomorphic models of emphasize the importance of cordgrass *Spartina alterniflora* production in vertical accretion via aboveground sediment trapping by stems. Thus, changes in cordgrass production leads to changes in accretion rates. However, these models do not consider the effects of animal-mediated changes in cordgrass production on accretion. These changes, occurring via facilitation or herbivory, may affect sediment deposition and ultimately vertical accretion. This study aims to understand how two crustacean species, *Uca pugnax* and *Sesarma reticulatum*, indirectly affect sediment deposition via their contrasting effects on *Spartina* production, through field measurements of primary production and sedimentation in areas heavily affected by these species. This study builds on current ecogeomorphic models, by determining the role of ecological interactions, such as herbivory and facilitation, and ultimately provides a clearer understanding of salt marsh responses to accelerated sea-level rise.

Submersed Aquatic Vegetation in a Hudson River Watershed: The Great Swamp of New York

Yozzo, D.J.*, and C. Cotroneo
Purchase College
glenfordenviro@gmail.com

A multi-season submersed aquatic vegetation (SAV) study was conducted in the Patterson Great Swamp, along the East Branch of the Croton River, in Putnam County, NY (Hudson River Watershed). Twelve locations were sampled bi-weekly from May through October 2016. Percent cover was estimated for individual SAV species along three transects at each location. A total of 770 SAV samples were collected, and five SAV species alternately dominated the assemblage over time: curly leaf pondweed, small pondweed, Illinois pondweed, coontail, and Canadian waterweed. The use of SAV habitat by fish and macrocrustaceans was evaluated monthly to determine whether or not habitat utilization changed along with observed seasonal variation in SAV species dominance. Both passive (fyke nets, minnow pots) and active (seine, throw trap) methods were used to sample within SAV stands. A total of 1,015 individuals were collected, among sixteen species. The assemblage was dominated by bluegill sunfish, representing 57% of the total collection. Additional species associated with SAV included golden shiner, rusty crayfish, pumpkinseed, yellow bullhead, yellow perch, redbreast sunfish, redfin pickerel, ringed crayfish and white river crayfish.

Carbon and Sediment Dynamics in Salt Marshes of Plum Island Sound Estuary, Massachusetts

Zawatski M.H.*, and N.B. Weston
Villanova University
mzawatsk@villanova.edu
Masters Student

Salt marshes are located at the critical boundary between land and ocean and are therefore especially vulnerable to sea level rise (SLR). Resilience of the marsh to SLR depends on the accretion of both organic and inorganic material in the marsh. Our goal is to evaluate controls on carbon cycling to understand marsh vulnerability and potential changes to ecosystem services, such as carbon sequestration, in response to climate change. We are measuring carbon cycling and sediment deposition over the course of one year in Plum Island, Massachusetts at twelve locations throughout the marsh to model spatial and temporal patterns. Carbon dioxide fluxes are measured at each location using a chamber under four different light levels to determine rates of respiration and gross ecosystem production (GEP). We measure accretion rates using feldspar marker horizons. Above- and below-ground biomass, soil salinity, and other environmental parameters are also measured. Preliminary data provided insight into the influence of multiple factors including flooding, temperature, plant type, elevation, and light. Our data shows that while light accelerates GEP and respiration increases with temperature, flooding suppresses both processes. Marsh elevation and plant community appear to be driving factors in marsh carbon cycling.

POSTER PRESENTATION ABSTRACTS

* Presenting author

Avian Use of a salt marsh island following a trial beneficial reuse of dredged material project
Anholt, A.R.*, L. Ferguson, J. Jahn, M. Yepsen, and D. Golden
Wetlands Institute
aanholt@wetlandsinstitute.org
In response to degraded conditions, a multi-partner restoration project was initiated in August 2014 to restore a coastal salt marsh in southern New Jersey with locally dredged material. Two thin-layer placement plots, 0.2 hectares each, were raised 12-22 cm. A higher elevation nesting habitat plot (1.6 m x .77 ha) was also created. Following material placement we employed two monitoring approaches in order to better understand use of the marsh system by nesting and migratory birds: point count surveys measuring avian usage, and intensive breeding monitoring. In total, 65,756 birds were counted, representing 67 species and 8 guilds. Overall, species richness was greatest during the spring and fall seasons near the constructed plots. Reproductive monitoring of placement and control plots demonstrated use by at-risk species of birds and other taxa. The elevated habitat proved beneficial for nesting species. Continued post-construction monitoring will allow us to assess how metrics of bird use change over time at this significant salt marsh island and, more broadly, in response to salt marsh restoration projects. As more restoration projects are initiated for coastal wetlands in response to rising sea levels, it is critical that avian use be incorporated into planning, construction, and post-construction stages.

Does chronic nutrient enrichment alter plant phenology in Spartina alterniflora?
Bauer, C.E.*, L.A. Deegan, J.A. Langley, M.K. McCormick, and T.J. Mozdzer
Villanova University
cebauer94@gmail.com
Masters Student
There is a great deal of uncertainty as to how tidal wetland ecosystems will respond to chronic nutrient enrichment. Plot-level studies have demonstrated that ecosystem productivity typically increases with nitrogen (N) enrichment, however, a 13-year landscape-level study has produced contrasting results. Specifically, chronic nutrient enrichment applied in a realistic manner decreased belowground productivity of the foundation species *Spartina alterniflora*, leading to creek bank instability and ecosystem collapse. We hypothesized that chronic nutrient enrichment has fundamentally altered foundation species genetic identity. To evaluate if the phenotypic traits we observed (altered leaf/stem ratio, earlier phenology) are due to genetically inherited traits or phenotypic plasticity, we conducted a common garden reciprocal transplant experiment using marsh organs during the 2016 field season at two long-term study sites within the PIE-LTER. Specifically, we reciprocally transplanted *S. alterniflora* from 13-year enriched and 13-year reference creeks for one field season. Preliminary analysis demonstrates consistent differences in flowering phenology in plants from the long-term fertilized creeks only, which suggests that early flowering, and perhaps other traits may have been inadvertently selected for by nutrient enrichment. How this selection of unique plant traits feeds back on ecosystem stability merits future research.

Seasonal Invertebrate Diversity on an Urban Oyster Reef

Bojorquez, C.*, N. Angelucci, J. Acosta, J. Breton, C. Hotchkin, C. Kanchan, and A. Fitzgerald
New Jersey City University
cbperez5@gmail.com
Undergraduate

The Hudson Raritan Estuary was previously home to an abundance of oysters. However, due to unsustainable harvesting and mistreatment of aquatic ecosystems, they are now considered "ecologically extinct" in the estuary. Efforts have been made to help the wild oyster population flourish, including creating artificial reefs, which would increase all invertebrate diversity. By studying how seasonal changes affect invertebrate diversity on and around the oyster reef, we can gain a better understanding of the effectiveness of cultivating artificial oyster reefs. We hypothesized that invertebrate diversity will fluctuate as seasonal changes occur on an urban estuarine oyster reef. Over the course of two years, we found that invertebrate diversity fluctuated as seasonal changes occurred on an urban estuarine oyster reef. Species richness and Simpson's diversity index changed throughout the seasons and years as different species competed better and grew more abundant. Oysters were observed to have changed condition index and spawned during the summer months and oyster size increased over time. The results of this study are part of a long-running oyster restoration project at the site, and will be used to inform management decisions and future research projects

Corroboration of NVDI Landsat Imagery Analysis with Long Term Monitoring of Vegetation in the New Jersey Salt Marshes

Haaf, L.*, A. Padeletti, and D. Kreeger
Partnership for the Delaware Estuary
lhaaf@delawareestuary.org
Doctoral Candidate

Since 2011, the Partnership for the Delaware Estuary has collected long-term monitoring data in coastal marshes of New Jersey. Annually, nine permanent plots (3 sets of triplicates) are revisited at each station and data on vegetation percent cover and blade heights are collected. For the Dividing Creek and Maurice River stations, Landsat 7 imagery from August 2011 and August 2016 were obtained from USGS and analyzed for NDVI (Normalized Difference Vegetation Index, i.e. "greenness") using ArcMap (v10.4) Image Analysis. Changes between 2011/16 NDVI were qualitatively compared to plant metric changes from plots to ground-truth satellite observations. Also, 1975-2000 NDVI maps, furnished through ESRI from USGS/NASA imagery, were used to reflect on historical vegetation dynamics. Patterns of increases/decreases in greenness among triplicates were similar for recent and historical NDVI, suggesting that at certain locations vegetation trends can be consistent through time. At Dividing Creek, one location's blade heights increased by ~7.8 cm/yr, corroborating decreases in NDVI greenness. The finding that recent changes in Landsat-derived vegetation robustness reflect concomitant field-derived data merits the continued examination of these relationships to better interpret, over a larger space-time continuum, satellite based vegetation data in the context of marsh vulnerability.

Respiration and Potential Denitrification in Tidal Marsh Soils

Lampasona, D.*
Villanova University
dlampaso@villanova.edu
Undergraduate Student

Denitrification, an anaerobic microbial respiration process, plays an important role in the removal of reactive nitrogen in wetlands. Our goal was to investigate how rates of denitrification and total soil respiration varied spatially and temporally in tidal marshes of Plum Island, Massachusetts, to better understand how this denitrification may respond to increased flooding due to sea-level rise. We hypothesized that differences in the plant community and the soil oxidation state in low-elevation marshes would limit denitrification compared with high-elevation marshes. We established transects from the creek-bank to the marsh-interior at two high-elevation and low-elevation sites, obtained soil cores on three dates, and measured rates of potential denitrification and total soil respiration. Denitrification ranged from 0.05 to 0.60 nmol cm-3 hr-1. Rates of total soil respiration ranged from 5 to 100 nmol cm-3 hr-1, indicating that denitrification was a small fraction (~1%) of total respiration. Total respiration was significantly related to belowground plant biomass, suggesting that belowground production and soil respiration were closely linked. Denitrification did not appear to differ between high- and low-elevation marshes. Increased flooding and a transition from high-elevation marshes to a system dominated by low-elevation marshes may not directly influence denitrification as an ecosystem service.

Monitoring of a Living Shoreline along the Lewes and Rehoboth Canal, Lewes, DE: 2014-2016

Moody, J., A. Padeletti, S. Bouboulis*, and D. Kreeger
Partnership for the Delaware Estuary
sbouboulis@delawareestuary.org

Living shorelines represent a promising approach to stabilize eroding shorelines, enhance ecological health, and promote water quality along coastal areas. Despite interest in living shorelines within the Delaware Estuary, few projects have been installed and there are insufficient studies concerning their performance and long-term viability. In 2014, a living shoreline treatment was applied along an eroding stretch along the Lewes and Rehoboth Canal in Delaware. The primary goal of the treatment was to stem the erosion through ecological uplift of the remaining salt marsh. A bio-based tactic was employed utilizing coconut-fiber coir-logs to augment physical characteristics and provide short-term stability. After a period of settlement and sediment capture, the treatment was planted with salvaged and purchased plugs of *S. alternifora*. Metrics relevant to the goals of shoreline stabilization and ecological uplift were selected for monitoring before installation. Metrics included: position of the contiguous vegetated shoreline; elevation profiles; ribbed-mussel density; and vegetation robustness.
Results show that the treated area has been successful in retaining the vegetated shoreline and elevation profiles compared to the control. These data highlight the importance of project monitoring for understanding the benefits of living shoreline projects, and appropriate timescales in which they should be expected to develop.

Sessile invertebrate diversity in Raritan Bay, NJ

Angelucci, N.*, C. Bojorquez, J. Breton, S. Kanchan, J. Acosta, and A. Fitzgerald
New Jersey City University
nayshaangelucci@gmail.com
Undergraduate

Throughout a two-year study, settlement of sessile invertebrate species was observed in Raritan Bay, NJ near an ongoing oyster reef restoration (at NWS Earle). Over the two seasons, environmental parameters (pH, salinity, dissolved oxygen) varied daily and seasonally, leading to a variety of organisms being found. However, succession of a bare surface shows that "weedy" species will colonize first, and be taken over by heartier species later on. It was hypothesized that sessile invertebrate diversity would increase over time despite the changing environmental conditions. To compare the differences of invertebrate diversity from 2015 to 2016 we set out settlement plates out in the water for 10 weeks and removed five plates biweekly. We calculated the percent coverage of sessile organisms, and identified mobile organisms down to the lowest possible taxon or family. Our results show that diversity and species richness increased over time, with the dominant species changing as the plates became more colonized. This data will be used to inform management decisions regarding the care of underwater cages and piers, as well as how the colonization of other species on bare castles can influence oyster restoration.

Denitrification Rates, Potential, and Limitation in a Newly-Created Wetland

Roose, J.J.*
roosejj@gmail.com
Masters Student

The growth of agriculture and urban development in coastal regions has introduced unnatural nutrient loads into streams that have negatively affected estuaries, diminishing habitat, biodiversity, and water quality. Wetland habitat restoration and nutrient management have the potential to mitigate watershed nutrient loading. This study focuses on nitrogen removal in a mature (Bishopville Pond) and recently created (Lizard Hill) wetland along a tributary of the St. Martin River in Eastern Maryland, which has historically experienced severe eutrophication, contributing to poor water quality in the Maryland Coastal Bays system. Flux measurements using intact, incubated cores showed that denitrification rates at Lizard Hill were generally lower than those at Bishopville Pond during the spring but became more similar during the summer. Denitrification rates in cores from both sites increased considerably following nitrate amendment. These increased rates indicate that nitrate limits denitrification at each site, and that plant/algal assimilation may dominate nitrate removal; however, the nitrate amendment experiment shows that the bacterial community is capable of responding to pulses of nitrate delivered via anthropogenic sources and episodic precipitation. Pending microbial analysis will give some indication on how the denitrifying community has developed in the mature and created wetlands.

Effect of Vertical Positioning on 3-Dimensional Oyster Reefs on Growth Rates and Body

Sawyer, G.T.*, C.E. Tanner, and M. Power
St. Mary's College of Maryland
Gtsawyer@smcm.edu
Undergraduate

With increased urban development along shorelines, summertime hypoxia is becoming more prolonged and intense. This is specifically detrimental to sessile species, like the eastern oyster, *Crassostrea virginica*, that cannot escape the stressful environment. In the St. Mary's River, I investigated the impact of vertical positioning on 3-dimensional reefs on the growth and development of spat and juvenile eastern oysters during the summer months. I hypothesized that oyster growth rates, survival and body condition would be compromised at the bottom of the oyster reefs where oxygen levels are reduced. Juveniles and spat were deployed onto the reefs constructed in the St. Mary's River in mid-June and retrieved late September 2015. Samples were analyzed at St. Mary's College of Maryland and the Smithsonian Nutritional Ecology Laboratory. I found significantly higher growth rates, percent survival, dry weight, and shell weight of juvenile and oyster spat at the top of the reef. There was no significant difference in percent calcium, nitrogen, fat or gross energy along reef height. Understanding the implications of vertical changes in water quality along 3-dimensional reefs, exacerbated by increasing eutrophication, is important for effective oyster restoration and improved water quality in the Chesapeake Bay.

Performance of Selected Rain Gardens in Rhode Island

Sharif, R.*
University of Maryland, College Park
rahatsharif@gmail.com
Doctoral Candidate

Rain gardens are constructed with the goal of mitigating the detrimental effects of storm water runoff, including eutrophication, sedimentation, and flood damage. In Rhode Island six rain gardens were investigated to look at effectiveness in retaining storm water runoff. This project sought to investigate existing rain gardens to see if they function appropriately to handle the runoff generated in their drainage area. The amount of runoff was calculated by measuring the amount of impervious surface contributing runoff into the garden then multiplied by 1-2" of rain, and 24 - hour storm scenarios. Five out of the six rain gardens studied were found to be oversized for 1-2 inches of runoff, while the one was undersized and other was failing due to vegetation die off. Rain gardens are part of a larger category of infrastructure, called green infrastructure. Green infrastructure has been made highly relevant after the detrimental impact of flooding from Hurricanes Irene and Sandy. The effects of urbanization can compound flooding situations. As structures such as rain gardens are built, they should be monitored over time to confirm they work as intended. Studies such as this one hope to illuminate possible methodologies for monitoring efforts.

Fishes of a Temperate Estuary: Temporal and Subhabitat Influences on Species Composition and Abundance

Valenti, J.L.*, T. Grothues, and K.W. Able
Rutgers University
valenti@marine.rutgers.edu
Doctoral Candidate

An inventory of the fishes inhabiting Barnegat Bay, a lagoonal estuary in New Jersey, was based on a survey of the fish community within the bay using otter trawl sampling which occurred yearly (2012-2014) in April, June, August, and October. We sampled at 49 stations encompassing four different habitats: open bay, submerged aquatic vegetation (SAV), upper marsh creek, and marsh creek mouth. Throughout the sampling duration, 1,731 tows were performed and 33,993 fish comprising 72 species were collected. The fish fauna consisted of both resident (e.g. oyster toadfish, *Opsanus tau*) and transient (e.g. summer flounder, *Paralichthys dentatus*) species. Composition and abundance of the fish fauna varied seasonally with certain species only collected in a particular month (e.g. pollock, *Pollachius virens* in April), whereas others were present within the estuary during all months sampled (e.g. lined seahorse, *Hippocampus erectus*). For many of the species collected, a majority (50% or greater) of their catch was collected in a single habitat (e.g. fourspine stickleback, *Apeltes quadracus* in SAV), whereas others were ubiquitous (e.g. bay anchovy). This data set provides a baseline from which long-term stability, improvement, or decline in the Barnegat Bay fish community can be assessed.

The effect of iron sulfide formation on particulate phosphorus bioavailability in sediments deposited in Chesapeake Bay

Vulgaropulos, Z.L.*, J.C. Cornwell, and M.S. Owens
University of Maryland Center for Environmental Science
zvulgaropulos@umces.edu
Masters Student

Suspended sediment and nutrient loads from the Susquehanna River, the largest tributary to the Chesapeake Bay, have been increasing in recent years due to the infilling of the Lower Susquehanna reservoir system and event-driven scour of sediment from behind the dams. Inorganic particulate phosphorus, the main form of P input, likely remains associated with particles except under sulfate reducing conditions in the mid-Bay, where the formation of iron sulfides releases iron-bound phosphate to the water column. To help estimate what fraction of the scoured particulate P load could become available by this mechanism, reservoir sediment samples were characterized using a series of extractions of iron and phosphorus. In addition, the release of P from deposited sediment was directly simulated by the placement of reservoir material on top of intact mid-Bay sediment cores, which were incubated anaerobically for several weeks to measure P efflux. The results of this experiment as well as the sediment characterization were used to assess the potential reactivity of particulate phosphorus transported to the mid-Bay during a scour event from the Susquehanna River reservoirs.

Comparing performance and economics of feeding methods for oyster larvae using different micro-algal diets.

Waby, S.J., R.J. Borgert, K.L. Clark*, and A.M. DeMarr
Roanoke College
rebekah.borgert@morgan.edu

Culturing micro-algae as feed for larvae in an oyster hatchery can be a difficult and costly process. Many hatcheries have considered concentrated microalgal diets as an alternative to live feed. This study compares the growth and survival of *C. virginica* larvae using the feeding protocol of the FAO Hatchery Operation: feeding and nutrition manual for live algae (Bourne and Helm, 2004), and the Use of Microalgae Concentrates for Rearing Oyster Larvae, *Crassostrea virginica* (Rikard and Walton, 2012). The experiment was repeated twice, with an n=5 in the first trial and n=3 in the second. A significant difference was not observed in survival between the two feeding protocols ($p = 0.1131$ and 0.1524). Size did vary significantly between the two treatments in trial one ($p = < 0.0001$), but not in trial two ($p = 0.2685$). It cost $20.87/million larvae to feed using the concentrate, and $435.16/million larvae to feed using the three live algae species in the FAO manual. Evidence in this study suggest that live micro-algae may be more nutritionally beneficial than the concentrate, but a lack of sufficient data and a significant difference in cost requires a recommendation of the concentrate diet.

Effects of Bio-Remediation on Zooplankton in South Bethany (DE) Canals

Williams, A.*, H.L. Glos, T.G. Yeghissian, and J.H. Cohen
Eastern Mennonite University
amanda.williams@emu.edu
Undergraduate Student

The dead-end canals with developed shorelines along the Delaware inland bays are vulnerable to poor water quality such as low dissolved oxygen and high turbidity. In conjunction, these systems can experience harmful algal blooms and fish kills. Bioremediation projects are seeking to improve dead-end canal water quality. Here, we analyze zooplankton diversity in spring/summer of 2016 as a metric for evaluating the effectiveness of a bioremediation project which in 2015 established oyster cages and floating wetlands in a dead-end canal of South Bethany (DE). For a year prior, and throughout the bioremediation project, water quality parameters were measured in both a remediated canal (York) and an adjacent non-remediated control canal (Carlisle). Water quality data suggested that consistent with positive effects of bioremediation in the treatment canal, turbidity decreased in York canal relative to Carlisle canal when compared monthly. Dissolved oxygen was consistently higher in York canal, but this cannot be attributed to the oysters/wetlands. Zooplankton diversity, however, was the same between canals, suggesting that any improvements to water quality did not influence the zooplankton community. Distinct differences in zooplankton species composition and abundance between canals over this time indicate limited mixing of water.

Inherit Resilience in Seagrass: Quantifying Genetic and Kin Structure Variation Between Life History Strategies

Willeboordse, P.L.*, J.C. Jarvis, S. Kamel, and D.O. Eulie
University of North Carolina
plw4031@uncw.edu
Undergraduate Student

To understand the impacts of life history strategy on *Zostera marina* resilience to disturbance, genetic and kin structures of two meadows expressing different life history strategies were measured. In an ecological context, genetic structure refers to the patterning of species genetic diversity across multiple local populations within a single metapopulation. This structure can have significant effects on interactions between conspecific individuals as well as population level resilience to disturbance. Despite their clonal nature, perennial populations of *Z. marina* show significant genetic structure within populations and across multiple spatial scales. Increased sexual reproduction in mixed-annual and annual populations compared to perennial meadows may result in greater variation in genetic and kin structures, potentially providing a greater resilience to disturbance. However, genetic and kin structures of populations which express the less commonly observed annual life history strategies are unknown. Spatially explicit measurements of genetic and kin structures in one perennial and one mixed-annual meadow were collected near the southern limit of the species distribution along the western Atlantic Ocean. Understanding the effects of life history on both genetic and kin structures within *Z. marina* populations and their impacts on meadow resilience to disturbances is crucial to increase the effectiveness of seagrass conservation.

Temperature and Body Size Relationships in Delaware Bay Copepods from Historical and Modern Perspectives

Yeghissian, T.G.*, H.L. Glos, and J.H. Cohen
University of Delaware
tgyeghis@udel.edu
Masters Student

Copepods are a dominant group of zooplankton in estuaries including Delaware Bay. Like other Arthropods, copepods are marine ectotherms and as a result, the Temperature-Size Rule affects their growth rates. This widely accepted idea states that warmer water can lead to shorter generation time and an overall decrease in body size. Historical zooplankton sampling in Delaware Bay (1929-1933) shows the relationship between copepod body size and water temperature to differ among species, notably between the common species *Acartia tonsa* and *Centropages hamatus*. The goal of the current study is to revisit the analysis of body size and temperature for these species under modern bay water conditions. In both the historical and current study, *A. tonsa* linearly decreases in size with increasing temperature. The absolute body size of *C. hamatus* in both data sets is similar at low and high water temperatures but at intermediate temperatures the modern *C. hamatus* are smaller, and have a different functional relationship to temperature. This mid temperature range is associated with seasonal blooms, and suggests that while spring blooms strongly influenced body size in the historical data, the copepods in current conditions may be more influenced by fall blooms.

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