Atlantic Estuarine Research Society

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AERS

April 4 - 6, 2019

Potomac Environmental Research and Education Center
Woodbridge, VA

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Table of Contents

Venue Information

Potomac Environmental Research and Education Center

The Potomac Science Center is a destination for environmental science research along the Chesapeake Bay watershed.

Located along Belmont Bay near the mouth of the Occoquan River, this 50,000 square-foot research facility houses laboratories for teaching and research, lecture rooms, event space, outdoor trails, and a library/resource center. The facility meets LEED Silver certification standards.

The Potomac Science Center supports educational outreach to local schools and opportunities for collaboration with government agencies and private industry.

Location: 50 Mason Ferry Avenue, Woodbridge VA 22191

Harbour Grille

Come for a night of socializing with students and colleagues of AERS and Harbour Grille! Harbour Grille is Northern Virginia's newest waterfront dining. We will be out on the deck for appetizers and drinks.

Location: 13188 Marina Way, Woodbridge, VA 22191

Schedule at a Glance

Thursday April 4th

8:00 - 5:00pm Workshops- Margaret A Davison Coastal Career Development Program

The Coastal Society (TCS) is co-sponsoring with AERS a full-day workshop designed to provide valuable skills and information to the next generation of early- to mid-career coastal professionals. There is a seperate registration fee for this event. Register at https://new.thecoastalsociety.org/

Location: Gallery at the Potomac Science Center, George Mason University, Woodbridge, VA

3:00 - 6:00 pm AERS Board meeting

6:00 - 9:00 pm Welcome Social at Harbour Grille (partial cash bar)

Friday April 5th

8:00 Registration and coffee (Gallery and Multi- purpose Room Potomac Science Center)

8:45 Welcome

9:00 - **Keynote Speaker - Dr. Mary Fabrizio**

9:45 - 10:45 Session 1- Wetlands

10:45 Break

11:00 - 11:30 Session 1 Continued

11:30- 11:37 Session 1 Ignite

11:37 Lunch on your own - Food Trucks Available

1:00 - **Keynote Speaker- Dr. Courtney Harris**

1:45 - 2:45 Session 2- Clams & Crabs

2:45 Break

3:00 - 3:30 Session 3- Algae, Plankton & Diatoms

3:30 -3:45 Session 3 Ignite

3:45 - 4:10 Session 4- Other

4:10-4:40 Session 4 Ignite

4:40 **Business meeting (Multi-purpose Room)**

5:40 - 7:40 **Poster Session**

7:50 **Banquet Harbour Grille**

Saturday April 7th

8:00 -Registration (Gallery and Multi- purpose Room Potomac Science Center)

8:45 - Welcome

9:00 -9:30 Session 5- Seagrass

9:30 - 10:00 Session 6- Water Quality

10:00 - 10:10 Session 6 Ignite

10:10 - 10:55 Session 7- Fish

10:55 - Break

11:15 - 11:45 Session 7 continued

11:45 - 12:30 **Keynote Speaker Christian Jones**

12:30 **Student Awards**

1:00 **Closing remarks**

2:00 - 4:00 pm Field Trips

Field Trip 1: Miss River Shore Cruise ($20)

Field Trip 3: Canoe/Kayak Tour of Occoquan Bay National Wildlife Refuge ($0)

2:30 - 5:00ish pm Field Trips

Field Trip 2: Hiking trip and tour in Occoquan Bay national Wildlife Refute ($3 parking)

Field Trips and Workshops

Miss River Shore Cruise

Additional fee of $20 (payable to boat captain)

Time: Saturday April 7th - 2 PM (Approx. 2 hours)

Meeting Place: Leesylvania Park (2001 Daniel K Ludwig Dr, Woodbridge, VA 22191

Step aboard the Miss Rivershore, a 50-foot commercial cruising vessel for a 2 hour guided tour down the Potomac and Occoquan Rivers. Captain Mark Perry gets our patrons close to the action during our relaxing bald eagle and wildlife spotting cruises, while pointing out areas of historical interest along the way. Beverages (alcoholic and other) may be purchased on the boat.

Hiking trip and tour in Occoquan Bay National Wildlife Refuge

Time: Saturday, April 7 - 2:30 PM (approximately 2-3 hours)

Meeting Place: Parking lot at Occoquan Bay National Wildlife Refuge (13950 Dawson Beach Rd, Woodbridge, VA, https://www.fws.gov/refuge/Occoquan_Bay/, parking will be $3)

Occoquan Bay National Wildlife Refuge's diverse grasslands and marshes attract songbirds, raptors, waterfowl and butterflies that depend on meadows and open water for their food, nesting sites, and a place to rest. Visitors share this feeling of respite as they hike trails and watch wildlife drawn to the one-square mile refuge, a sanctuary in an urban setting. Occoquan Bay NWR is a key refuge in the National Wildlife Refuge System. The grassland and wetland habitats are important to the Nations' wildlife in this highly urbanized area. Furthermore, the variety of habitat types accessible to refuge visitors and the refuge's proximity to the Nation's capitol provide unparalleled opportunities to demonstrate the role of national wildlife refuges, particularly the benefits of habitat management for wildlife.

Limit - 20 participants

Canoe/Kayak trip and tour in Occoquan Bay National Wildlife Refuge

Time: Saturday, April 7 - 2 PM (approximately 2 hours)

Meeting Place: Leaving from Potomac Environmental Research and Education Center

Kayak along the Occoquan River and see a wonderful array of wildlife. There are frequently bald eagles and osprey flying overhead.

Limit - 20 participants

Detailed Schedule of Events

Thursday April 4th

8:00- 5:00 Workshop- Margaret A. Davidson Coastal Career Develpment Program, Gallery at the Potomac Science Center, George Mason University

3:00 - 6:00 Board Meeting

6:00 - 9:00 Social at Harbour Grille

Friday April 5th

8:00 **Registration and Coffee**

8:45 **Welcome**

9:00 **Keynote Speaker: Dr. Mary Fabrizio**
Putting the Genie Back in the Bottle: A Case Study of an Invasive Freshwater Fish in the Chesapeake Bay Region

9:45 Session 1-Wetlands

Study of Carbon Sequestration in Barrier Island Salt Marshes According to Age
Ryan Brett (Undergraduate student)

10:00 The Impact of Saltwater Intrusion on the Rates of Methanogenesis and Methanotrophy in Freshwater Wetlands
Miranda Cento (Masters student)

10:15 The Effect of Salt Marsh Geomorphologic Classification on Rates of Transgression
Jessica Flesher (Masters student)

10:30 Legacy Pesticides in Riverine Marsh Sediment Cores From the Tidal Freshwater, Oligohaline, and Mesohaline Zones of the Potomac River
Elizabeth Lang (PhD student)

10:45 BREAK

11:00 Ability of Salt Marsh Mallow to Retain Nitrogen and Increase Carbon in Soil Organic Matter in Farm-Field Buffer Strips
E. Victoria Long (PhD student)

11:15	Tidal Marsh Vulnerability to Rising Sea Level Along the Southern Coast of North Carolina: A 30-Year Record of Change Elena Solohin (PhD student)
11:30	Ignite Session 1
	Genetic Diversity of *Spartina alterniflora* in a Large-Scale Marsh Restoration Project in Chesapeake Bay: Effects of Dieback and Age with Comparisons to a Wild Reference Marsh Benjamin Lee
11:37	Lunch on your own-Food Trucks Available
1:00	**Keynote Speaker: Dr. Courtney Harris** Sediment Transport Models in Estuarine Settings and Applications to Interdisciplinary Problems
1:45	Session 2-Clams & Crabs
	Obligate v. Opportunist: The Ecology of the Hard Clam Pathogen, Quahog Parasite Unknown (QPX) Sabrina Geraci-Yee (PhD student)
2:00	Of Crabs and Clams: OA and Salinity on Marine Invertebrate Growth and Armor Katherine Longmire (Masters Student)
2:15	Swimming Characteristics in Blue Crab Larval Broods Joseph Caracappa (PhD student)
2:30	How is the Genetic Variation of a Blue Crab Reovirus Affected by Geography and Host Life History? M Zhao (PhD Student)
2:45	BREAK
3:00	Session 3- Algae, Plankton & Diatoms
	Impacts of Intense Algal Blooms on the Cycling of Dissolved Organic Matter and Benthic Metabolism in the Lower York River Estuary Joshua Sacks (Undergraduate Student)
3:15	Species Distribution Modeling of Proxy-Relevant Planktic Foraminifera Peter Jacobs (PhD student)
3:30	Ignite Session 3
	Ichthyoplankton Assemblage Structures in Gunston Cove, VA - Long-term Trends in a Recovering Tidal Freshwater Embayment Amanda Mueller

3:37 Utilizing an SMZ-18 Zoom Stereomicroscope and Scanning Electron Microscope for Identifying and Calculating Abundance of Diatom Species from Blackbird Creek.
Mohana Gabbe (Masters Student)

3:44 Ignite Session 4- Other

Of Plastic Nurdles and Hungry Dolphins in the Tidal Potomac River
Dann Sklarew

3:51 The Effect of Herbivory and Nutrient Addition on the Dynamics of the Macroalgae, *Dictyota spp.* on Caribbean Coral Reefs in St. Thomas, U.S. Virgin Islands
Tanya Ramseyer

3:58 Modeling the Effects of Temperature on the Phenology of the Chesapeake Bay
Nicole Basenback (Masters Student)

4:10 Session 4- Other

Suppression of Growth Driven by Sea Level Rise in Coastal Mid-Atlantic Forests
LeeAnn Haaf (PhD Student)

4:25 Assessing Heavy Metal Pollution in Estuarine Systems Along the Eastern United States in Relation to Land Use Changes
Kristen Jezycki (Masters Student)

4:40 **Business Meeting**

5:40 **Poster Session**

7:50 **Banquet Harbour Grille**

Saturday April 6th

8:00 **Registration Open**

8:45 Welcome

9:00 Session 5- Seagrass

Investigation of the Structure and Persistence of Temperate and Sub-Tropical Seagrasses Located at the Transition Zone between their Geographic Distributions.
Amy Bartenfelder (Masters Student)

9:15 Ex-seeding Expectations: Quantifying *Zostera marina* Seed Quality Over Time
Avonelle Combs (Masters Student)

9:30	Session 6- Water Quality
	Presence and Sources of Pharmaceutical and Personal Care Products in Water and Sediments in The Tidal Freshwater Potomac River and Its Tributaries Arion Leahigh (PhD Student)
9:45	Seasonal, Inter-annual and Longitudinal Patterns in Estuarine Metabolism Derived from Diel Oxygen Data Spencer Tassone
10:00	Ignite Session 6
	Dissolved Organic Matter Flocculation in Coastal Streams and Its Effects on Water Quality Dina Leech
10:10	Session 7- Fish
	Assessment of Fish Passage Use and Success in Facilitating Movement of Regionally Vulnerable and Invasive Fish Species in Potomac River Tributaries Samantha Alexander (Masters Student)
10:25	Comparing the Feeding Ecology of Native and Invasive Catfishes in a Tidal Inlet of the Potomac River Christopher Bodner (Masters Student)
10:40	An Evaluation of Non-Invasive Sampling Methods in Determining River Herring Run Count Jessie Melton (Masters Student)
10:55	BREAK
11:15	Fish Habitat and Passage Assessment of American Eel (*Anguilla rostrata*) in Chesapeake Bay Tributaries Nicholas Walker (PhD Student)
11:30	Estimates of Lost Ecological Subsidies by Over-Harvesting of Shad and River Herring in Chesapeake Bay Vic Kennedy
11:45	**Keynote Speaker: Chrsitan Jones** From Cyanobacteria Blooms to Clear Water: The Remarkable Story of the Tidal Potomac River Recovery
12:30	**Student Awards**
1:00	**Closing Remarks**

2:00 - 5:00	Field Trips Field Trip 1: Miss River Shore Cruise ($20) Field Trip 3: Canoe/Kayaking in Occoquan Bay National Wildlife Refuge
2:30 - 5:00ish	Field Trip 2: Hiking trip and tour in Occoquan Bay National Wildlife Refuge ($3 parking)

Posters

(Alphabetical by presenter, *Presenting Author)

Changing Paradigms of MarineFfood Webs: What Roles do Zooplankton Play?
Ambler, Julie*

Personality Persistence Post-Exposure to Parasites
Assur, Allison*, Darby Pochtar, Amy E Fowler

Fecundity of Blueback Herring Spawning in Potomac River Tributaries
Bachman, Beverly*, CJ Carroll Schlick, Kim de Mutsert

Ecosystem Restoration and Water Quality Monitoring at Longwood University's Hull Springs Farm, Westmoreland County, VA
Bauer, Kirsten*, Dina M. Leech

Living Shoreline Assessment for Coastal Resiliency in Southeast Pennsylvania
Beal, Irina*, Joshua A. Moody, Sarah A. Bouboulis, Danielle A Kreeger

Effect of Tidal Resuspension with Oyster Biodeposits on the Nutrient and Oxygen Dynamics in an Experimental Ecosystem Study
Blickenstaff, Sara*, Elka T. Porter, Jeff Cornwell, Melanie Jackson

Quantifying Nutrient Sequestration in Chesapeake Bay Submersed Aquatic Vegetation (SAV) Beds
Bolton, Miles*, Cindy Palinkas, Cassie Gurbisz

Water Quality Benefits of a Shellfish-Based Living Shoreline along the Mispillion River, Delaware
Bouboulis, Sarah*, Josua Moody, Kurt Cheng, Irina Beal, Danielle Kreeger

Using High Frequency Sensor Data to Monitor Organic Matter Fluxes to a Coastal Stream
Clift, Troy*, Dina M. Leech

Bioaccumulation of Selected Pharmaceuticals and Personal Care Products Between Primary Producers and Consumers in the Tidal Freshwater Potomac River
Czarnecki, Julia*, Thomas Huff, Greg Foster, Duane Hugget, Amy Fowler

Linear and Non-Linear Trends in Benthic Community Condition in the Chesapeake Bay Over the Past 30 Years
Dauer, Daniel*, Roberto J. Llanso, Michael F. Lane

Impact of Oyster Biodeposit Resuspension on Phytoplankton Community Structure in Estuarine Systems.
Davis, Sarah*, Elka Porter, Eric Robbins, Richard Lacouture, Marcia Olson

Use of Stable Isotopes of C and N to Evaluate Spatial and Temporal Variations in the Diets of Copepods in the Maryland Coastal Bays
Edje, Blessing*, Paulinus Chigbu

Nutrient Spiraling among Urban and Non-Urban Streams and the Implications for Stream Restoration
Famularo, Joseph*, Dr. Paul Bukaveckas

Field Surveys and Comparative Parasitology of Freshwater Native and Invasive Snails in Virginia
Fowler, Amy*, April MH Blakeslee

Diamondback Terrapin Nesting Habitat and Projected Sea Level Rise
Funkhouser, Holly*, R.E. Isdell, R.M. Chambers

Effects of Substrate Protection and Type on Ribbed Mussel Recruitment for Living Shoreline Applications
Gentry, Matthew*, Joshua A. Moody, Sarah A. Bouboulis, Danielle A. Kreeger

Accrual of Nutrients in Living Shorelines in Relation to Natural Fringing Tidal Marshes
Gorsky, Adrianna*, Donna Bilkovic, Randy Chambers

Changes in Submerged Aquatic Vegetation (SAV) in North Carolina's Estuaries
Gwynn, Noah*, Joseph Luczkovich

LC-MS/MS Analysis of UV-Filter and Paraben Micropollutants in Sediments Obtained From the Tidal Freshwater Potomac River
Haji, Tovga*, Thomas B. Huff, Gregory D. Foster

Carbon Balance of Seagrass and its Effect on Ecosystem Health
Heit, Evan*, Jessie C. Jarvis,

Controls on Nitrous Oxide Distribution and Air-Sea Flux in Estuarine Waters
Hobbs, Edward*, Jeremy Testa, Laura Lapham, Lora Harris

Presence and Risk of Pharmaceuticals and Personal Care Products in Surface Water and Benthic Sediment of the Tidal Freshwater Potomac River
King, Tabitha*, Lisa McAnulty, Thomas B. Huff, Gregory D. Foster

Relationship of Benthic Community Condition Measures with Flow and Hypoxia in Chesapeake Bay
Llanso, Roberto*, Daniel M. Dauer, Michael F. Lane

Characterizing Water Quality and Hydrologic Parameters of Urban Streams in Central Virginia
Lucas, Rikki*, Paul Bukaveckas

We are the Robots: Studying Coastal Ecosystems a Using Remote Control Robot
Luczkovich, Joseph*, Roger A. Rulifson, Mark W. Sprague, JP Walsh, Ramone Lopez

Plenty of Fish: Connecting Social and Ecological Systems in Small-Scale Fisheries in the Philippines
Marriott, Sara*,

Implications of Biochar Addition on Plant-Microbial Interactions and Soil Respiration
Mitra, Siddhartha*, Ariane Peralta, Andrew Zimmerman, Chad Lane, Andrew Wozniak

Introduction to a Site-Based Wetland Decision Tool for Guiding Salt Marsh Restoration in New Jersey
Moody, Joshua*, LeeAnn Haaf, Metthea Yepsen, Danielle Kreeger, Elizabeth Semple

Do Non-Native Seaweeds Harbor Non-Native Invertebrates on the US West Coast?
Mott, Alexander*, Stacy A Krueger-Hadfield, Amy E Fowler

Forecasting Future Estuarine Hypoxia using a Wavelet Based Neural Network Model
Muller, Andrew*, Diana L. Muller

Heterotrophic Spatial Patterns in *Thalassia testudinum* in Ambergris Caye Lagoon, Belize
Murphy, Theresa*, Ryan J. Woodland, Danielle Quill, Paul Billeter, Cameron Allen

Interannual Variability of Marsh Area in Three Locations of the Chesapeake Bay
Newton, Kajsa*, Dr. Cassie Gurbisz

Food Web Effects of Water Quality Improvement and Invasive Species (*Ictalurus furcatus*) Introduction in a Freshwater Tidal Embayment, Gunston Cove, Virginia, USA
Pehrson, Casey*, Kim de Mutsert

Do No Harm: Noninvasive Analyses of Wetland Plants in a Maryland Estuary
Powell, Dylan*

Preliminary Analysis of Mysid Habitat Preference in the Chesapeake Bay
Quill, Dani*, Ryan Woodland

Long Term Monitoring of Restoration Projects is Crucial for Recognizing Successes, Identifying and Fixing Problems, and Tracking Continuing Threats.
Reilly, Erin*, Lora Harris

Is the Genie Out of the Bottle? The Spread of the Introduced Species, *Hermundura americana* (Polychaeta:Pilargidae), Throughout the Chesapeake Bay
Rodi, Anthony*, Daniel M. Dauer, Roberto Llanso, Suzanne Arcuri

Genetic Diversity of Eastern Oysters from Wild and Restored Reefs in the Chesapeake Bay
Ryan, Dana*, Laura Eierman

Influence of Sea Level Rise on Saline Marsh Retreat and Succession
Sacatelli, Rachael*

Varying Maturity Schedules of River Herring Spawning in Tributaries of the Chesapeake Bay
Schlick, Catherine (CJ)*, Matthew B. Ogburn, Keira Heggie, Kim de Mutsert

Investigation of Tidal Marsh Drowning
Scott, Tyler*

Nekton Monitoring to Assess Beneficial Reuse of Dredged Material in Salt Marsh Restoration
Szczepanski, Jack*, Robert George, Thomas Hopper

Stream Geochemistry and Land Use in Northern Virginia
To, Holly*, Gregory Foster

Using Acoustic Indicators to Assess Habitat Quality of Oyster Mariculture and Wild Reefs
Webster, Nicole*, Elizabeth S. Darrow

Assessing Changes to Rainwater Nitrogen Delivery in Sussex County, Delaware
Wozniak, Andrew*, Jessica I. Czarnecki, Joseph R. Scudlark

Upgoers Style Posters

(Alphabetical by presenter, *Presenting Author)

Things People Take to Not Be Sad and Where They End Up in the Water
McAnulty, Lisa*, Thomas B. Huff, Gregory D. Foster

Keynote Speakers

(Alphabetical by presenter)

Dr. Mary Fabrizio

Friday 9:00am

Dr. Mary C. Fabrizio is a Professor of Marine Science and Chair of the Department of Fisheries Science at The Virginia Institute of Marine Science. She received a Ph.D. from the University of Rhode Island and a B.S. degree from Fordham University. Her research interests include fish population dynamics, habitat, fish movement, fish ecology and fishery-independent surveys. She currently focuses her research on understanding the production of fish populations in the Chesapeake Bay region, designing effective surveys for estimating abundance of fish, and unraveling the ecological effects of climate change on key species such as striped bass, summer flounder, and Atlantic croaker. She is a Past President of the American Fisheries Society as well as a lifetime member.

Title: Putting the Genie Back in the Bottle: A Case Study of an Invasive Freshwater Fish in the Chesapeake Bay Region

Abstract: The introduction of non-native blue catfish *Ictalurus furcatus* in tributaries of the Chesapeake Bay resulted in the intended establishment of a recreational fishery, and in the inadvertent expansion of populations into brackish habitats. Having spread from stocked tributaries to new systems, blue catfish are considered an invasive species in the region, and management is hampered by competing objectives, namely, supporting trophy fisheries and limiting the ecological impacts on native communities. In 2014, the Invasive Catfishes Task Force recommended a number of management approaches to control the spread of invasive blue catfish, however, a comprehensive management plan for this species has not yet been developed. In this presentation, I will discuss results from recent studies of population size, movement ecology, trophic ecology, and salinity tolerance of blue catfish. The large population size that we observed in the James River sub-estuary (1.6 million fish in a 12-km section of the river) was unexpected for a freshwater fish in tidal habitats, and estimated densities exceeded those reported for other invasive species such as lionfish, snakehead, and round goby. Furthermore, the blue catfish that we tagged represented size classes that are likely to exhibit piscivory and to colonize estuarine habitats (salinity > 10 psu). Coupled with results from our salinity tolerance experiment, and in light of the wet year we experienced in 2018, such findings highlight the need to identify effective management measures for this species.

Dr. Courtney Harris

Friday 1:00pm

Dr. Courtney K. Harris is a Professor of Marine Science in the Department of Physical Sciences at The Virginia Institute of Marine Science. She received M.S. degrees at The University of California, Berkeley and The University of Virginia, and B.S. and Ph.D. degrees from the University of Virginia. Her research focuses on improving the ability to quantify and predict sediment transport on continental shelves over a variety of temporal and spatial scales, using numerical modelling. Current research projects include evaluating the role that cohesive sediment dynamics play in determining spatial and temporal patterns of turbidity within the York River Estuary, developing and using numerical models for the northern Gulf of Mexico to quantify sediment processes and their interactions with biogeochemistry, and identifying the oceanographic transport processes that impact sediment transport off shore of the Ayeyarwady Delta, Myanmar. She actively collaborates with a group of oceanographers and geologists who are working to develop a community sediment transport model, by developing and testing numerical models that account for sediment transport and oceanographic circulation.

Title: Sediment Transport Models in Estuarine Settings and Applications to Interdisciplinary Problems

Abstract: Sediment transport impacts many issues of water quality and biogeochemical cycling in coastal waters; via light attenuation, transport of particle-bound constituents, and exchanges between the sediment bed and water column. Though numerical models have become widely used in marine sciences, few models directly account for both the sediment transport and biogeochemical processes, however. Community ocean models, such as the Regional Ocean Modeling System (ROMS) provide modular, open source code capable of solving the momentum and transport equations for coastal environments. The sediment transport routines developed for ROMS have been applied to calculate suspended sediment concentrations, erosion, and deposition for an expansive set of both idealized and regional studies. These sediment modules build on ROMS' available routines that provide estimates of turbulence and bed stress levels, and that solve the transport equation; augmenting these with a non-cohesive sediment erosion formula and a routine for sediment settling. Recently, however, ROMS' sediment transport model has been modified to also account for cohesive sediment processes including bed consolidation and flocculation; which should make the model more useful for muddy sediments. Coupling the sediment transport routines with one of ROMS' available biogeochemical modules furthermore provides a means of addressing the role that sediment transport and burial play in biogeochemical cycles in coastal environments. Applications of these capabilities has enabled us to develop numerical models that explore the role of sediment transport on biological productivity and nutrient cycling within estuaries such as the York River, and Chesapeake Bay. Results highlight the role that flocculation processes play in Estuarine Turbidity Maxima (ETM). Within the Chesapeake Bay, results from the coupled model show that light attenuation in the ETM reduces productivity there, and that resuspension of particulate organic matter impacts patterns of oxygen consumption. Acknowledgements: This talk will draw on work done by current and former students who worked with Dr. Harris, including Dr. Julia Moriarty (now at the US Geological Survey), and Danielle Tarpley (VIMS).

Dr. Christian Jones

Saturdy11:45am

Dr. R. Chris Jones was the founding Chair of the Department of Environmental Science and Policy and the Founder and current Director of the Potomac Environmental Research and Education Center (PEREC) at George Mason University. He earned a Ph.D. from University of Wisconsin-Madison. He is a freshwater ecologist whose research foci include tidal freshwater ecosystems (emphasizing plankton, periphyton, and macrophytes), stream ecology (emphasizing benthic macroinvertebrates), and watershed management. His current research projects include an Ecological Study of Gunston Cove (continuous since 1984), an Ecological Study of Hunting Creek (continuous since 2013) and Fairfax City Nonpoint Source Water Quality Monitoring (continuous since 2009).

Title: From Cyanobacteria Blooms to Clear Water: The Remarkable Story of the Tidal Potomac River Recovery

Abstract: The tidal Potomac River suffered major degradation during most of the 20th century due to excessive discharges of partially treated sewage containing high levels of phosphorus and nitrogen. These nutrient elements resulted in massive blooms of cyanobacteria which rendered the water column opaque to light and resulted in the demise of underwater plants which provided critical habitat for invertebrates and fish. With the increased awareness of the importance of environmental protection and the political will fostered by Earth Day, the "Nation's River" became a target for a major environmental cleanup. Over the decade of the 1970's and into the early 1980's, sewage treatment plants were upgraded and nutrient discharges reduced by over 95% even as total sewage volumes continued to rise. One of the locations suffering major blooms was the Gunston Cove embayment in Fairfax County. Since 1984 we have conducted a consistent biweekly monitoring program which has documented the response of the river to nutrient reductions. This embayment did not respond quickly to nutrient controls and major recovery was not evident until after 2000. The system has now made a clear transition from the "turbid-water", phytoplankton-dominated condition to a "clear-water" state dominated by submersed aquatic vegetation. Further recovery is hoped for but uncertain. Our studies demonstrate important concepts in ecosystem restoration including multiple stable states, lags in system response and hysteresis which need to be understood by managers and the public as we seek to better manage ecosystems.

Poster and Presentation Abstracts

(Alphabetical by presenter)

Assessment of Fish Passage Use and Success in Facilitating Movement of Regionally Vulnerable and Invasive Fish Species in Potomac River Tributaries

Alexander, Samantha[1], Kim de Mutsert[2]

1. George Mason University 2. Potomac Environmental Research and Education Center

The purpose of this study is to assess the usage and success of 12 fish passages. These passages occur below road crossings and act as facilitators of the movement of two species of concern (*Alosa aestivalis* and *Alosa pseudoharengus*), hereafter termed river herring, and two invasive species (*Channa argus* and *Ictalurus furcatus*) in northern Virginia tributaries to the Potomac River. River herring rely on stream connectivity to support annual spawning runs from the Atlantic Ocean into the tributaries of the Potomac River. Invasive species rely on stream connectivity to facilitate colonization to new areas with better available resources. Both groups rely on streams to be unobstructed by human development in order to persist, but little is known surrounding the implications of reopened fish passages at road crossings. Environmental DNA samples were collected above and below the passages at the beginning, middle, and end of the 2018 river herring spawning season to determine if any of the targeted species were present. DNA from the water samples were filtered, extracted, and amplified using quantitative PCR. Preliminary analysis indicates that river herring were present at at least five of the locations and were able to cross above the passage at at least two locations. Determining which species utilize each passage will help guide management strategies, so that resources go into improving locations that will maximize the benefits for species of concern and minimize the spread of invasive species.

Masters Student; Oral

Changing paradigms of marine food webs: what roles do zooplankton play?

Ambler, Julie

1. Millersville University

In classical food chain models, zooplankton are the food chain link between phytoplankton and fish, but food webs are much more complex than this. Zooplankton include several feeding types besides their classical role as herbivores. Some are bacterivores, predators, or omnivores, or they can even be both omnivorous and photosynthetic. The size of phytoplankton ranges over several powers of ten, from very small bacteria to cells that are almost 1mm, the size of the tip of your pencil. Some types of zooplankton, gelatinous bag types, can eat bacteria and small phytoplankton as well as large phytoplankton. Other shrimplike zooplankton can only eat large phytoplankton but they also can eat small zooplankton. Examples of zooplankton feeding types in Mid-Atlantic shelf waters during summer are described, and their relationship to other organisms in a current food web model is explained. Current food web models help us understand the abundance of zooplankton groups. For example, blooms of large-sized phytoplankton benefit some zooplankton more than others, and seasonal abundance of shrimplike zooplankton food benefits predators such as fish and whales.

Poster

Identification of sex-specific candidate genes in the protandric eastern oyster (*Crassostrea virginica*)

Apuzza, Brittany, Laura Eierman
1. SUNY Cortland

The eastern oyster (*Crassostrea virginica*) is a keystone species that builds reef habitat in estuarine ecosystems. As protandric hermaphrodites, they are able to change sex during gametogenesis each year. Increasing plastic pollution is exposing the oysters to leaching xenoestrogens that have the potential to alter sex differentiation patterns. Unfortunately, little is known about the process of sex differentiation or the patterns of gene expression that regulate differentiation in the eastern oyster. Our objective was to measure gene expression in 14 candidate genes that are homologous to genes underlying gametogenesis in the Pacific oyster (*Crassostrea gigas*), a related species with a published genome. We extracted RNA from gonadal tissue of immature, mature male, and mature female oysters, synthesized cDNA, and measured gene expression from RT-qPCR using newly designed species-specific primers. We then tested whether the expression patterns in immature, male, and female oysters matched predictions from expression patterns in *C. gigas*. Future studies will use these candidate genes to test the effects of xenoestrogens leaching from plastics.

Undergraduate Student; Poster

Personality Persistence Post-Exposure to Parasites

Assur, Allison, Darby Pochtar, Amy E Fowler
1. George Mason University

Parasites can effect behavioral changes in their hosts to facilitate the parasites survival or reproductive success. Among those parasites is *Loxothylacus panopaei*, an invasive rhizocephalan barnacle from the Gulf of Mexico that afflicts the estuarine mud crab *Rhithropanopeus harrisii*. The parasite alters the host physiology, prevents the host from molting, and appropriates the hosts reproductive system. To determine whether the parasite also causes its host to behave in a shyer manner to ensure its own survival, 75 uninfected *R. harrisii* of both sexes (3.9 to 9.7 mm carapace width) were subjected to three iterations of behavioral trials that resulted in an individual score on a shy-to-bold scale of 100. Behavioral trials consisted of a habitat arena where crabs were given the option of hiding under a shelter or actively moving in exposed areas. The crabs were randomly assigned to one of two treatment groups, with the first being exposed to *L. panopaei* cyprids, and the other serving as an uninfected control. The crabs were exposed to *L. panopaei* cyprids immediately post-molt, with the second round of behavior trials commencing one day after molting for both groups and being repeated at set intervals for two weeks for a total of five post-molt trials. The score averages of the second round of trials were compared to the results of the pre-infection trials to yield a percent change in behavior for each group. The expected results are that the exposed or infected crabs will behave in a shyer manner than the unexposed *R. harrisii* to perpetuate the parasites survival.

Undergraduate Student; Poster

Fecundity of Blueback Herring Spawning in Potomac River Tributaries

Bachman, Beverly, Carroll Schlick, Kim de Mutsert
1. George Mason University

Anadromous river herring were once recreationally and commercially important species that return to Potomac River tributaries in the spring to spawn. The stock status of river herring in Potomac River tributaries is currently listed as unknown and fecundity has not been estimated for blueback herring *Alosa aestivalis* in Potomac River tributaries since the early 1900s. This study estimates batch size and fecundity of blueback herring in Potomac River tributaries using digital imaging. Fecundity estimates range widely based on the length and weight of the females, geographic location, and environmental conditions during egg recruitment. An equation to estimate fecundity based on a parameter, such as length or weight, that can be obtained without the death of the individual is highly beneficial to stock assessment and modeling strategies. By counting ripe oocytes in blueback herring returning to Potomac River tributaries to spawn, this study aims to determine if a correlation between length and fecundity exists and whether an equation can be determined for management purposes. Preliminary analyses reveal fecundity of blueback herring ranged from 34,000 (SL=190) to 133,000 eggs (SL=241) within the Potomac River population, which was less variable than the fecundity estimated from previous studies (45,000 to 400,000 eggs).

Poster

Investigation of the Structure and Persistence of Temperate and Sub-Tropical Seagrasses Located at the Transition Zone between their Geographic Distributions.

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1. Department of Biology and Marine Biology, University of North Carolina Wilmington 2. North Carolina National Estuarine Research Reserve

Seagrasses provide critical ecosystem services to coastal areas, including nursery habitat for fisheries species, a food source for grazers, improvement of local water quality conditions, and sediment stabilization. North Carolina is located at the transition zone where *Zostera marina*, a temperate seagrass, is at its southern boundary and *Halodule wrightii*, a tropical seagrass, is at its northern limit. Climate change can alter the abundance and distribution of seagrasses, often favoring those more stress-tolerant and opportunistic. A shift towards these species in North Carolina could result in a dominance shift towards sub-tropical/eurythermal species. The number of days that water temperature exceeds the thermal tolerance of *Z. marina* has increased by 50 days since 2008. This thermal stress likely will cause a decline in the distribution, density, and biomass of *Z. marina*, while *Halodule wrightii* and *Ruppia maritima* may increase. A temporal decline in *Z. marina* cover as already been observed, with meadows that were persistent (found all 12 months) in 1978, losing their *Z. marina* cover by September in 2017 and 2018. The research described here will quantify the current status of NC seagrass meadows in order to compare the current status to historical data from the 1980s to identify dominance shifts.

Masters Student; Oral

Modeling the Effects of Temperature on the Phenology of the Chesapeake Bay

Basenback, Nicole, Jeremy M Testa
1. University of Maryland Center for Environmental Science Chesapeake Biological Lab

The Chesapeake Bay is a eutrophic estuarine ecosystem, with well-described features of compromised water quality and related ecosystem impacts. Eutrophication processes are moderated by climatic variability associated with changes in river flow, temperature, and wind forcing, but there is a lack of quantitative insight into the consequences of this variability on seasonal patterns of estuarine processes. Climate change may alter the phenology of key biogeochemical processes by influencing water temperature, which is a key driver of many biogeochemical rates. Various analyses of observational data over the past several decades, provides evidence for increasing surface water temperatures within the Chesapeake Bay mainstem, with the largest deviations occurring in summer. The objective of this study was to use a coupled hydrologic-biogeochemical model (ROMS-RCA) to investigate the spatial and temporal effects of idealized, 1.5°C, increases in summer water temperatures within the Chesapeake Bay. Estuarine responses to elevated temperature were evaluated in terms of phytoplankton production, nutrient cycling, and hypoxia. Our results indicate that elevated temperatures cause an increase in hypoxia in the first half of the year at the expense of late-summer hypoxic volumes. This suggests that water temperature effects on hypoxia may be realized as seasonal shifts in the regular annual cycle.

Masters Student; Ignite Talk

Ecosystem Restoration and Water Quality Monitoring at Longwood University's Hull Springs Farm, Westmoreland County, VA

Bauer, Kirsten, Dina M. Leech
1. Longwood University

Hull Springs Farm is located in Westmoreland County, Virginia between two tidal tributaries of the Potomac River, near the confluence with the Chesapeake Bay. The 662-acre property was cultivated for hundreds of years to produce corn, soybeans, timber and other crops. In 1999, Hull Springs was bequeathed to Longwood University, and now its mission is to serve as a model of conservation and environmental stewardship. The site offers 8,400 feet of shoreline, including an award-winning Living Shoreline project, 457 acres of established forest, 152 acres in wetland and nutrient bank development, and 7,466 linear feet of stream restoration. Given its location within the Chesapeake Bay Watershed, Longwood undergraduates and faculty have been actively monitoring water quality in the local tidal creeks. These data are needed as many of these creeks have been on the Virginia Impaired Waters List for 10+ years, leading to the closure of the shellfish fishery. Dissolved oxygen levels are often low while *E. coli* and algal biomass are high. We hope that our ecosystem restoration efforts will improve future conditions and are actively encouraging our neighbors to follow suit. If you are interested in potential research or educational collaborations at Longwoods Hull Springs Farm, please ask!

Undergraduate Student; Poster

Living Shoreline Assessment for Coastal Resiliency in Southeast Pennsylvania

Beal, Irina, Josua A. Moody Sarah A. Bouboulis, Danielle A. Kreeger
1. Partnership for the Delaware Estuary

Freshwater tidal wetlands of the Delaware Estuary are a valuable buffer to rising seas. Unfortunately, only 16% of the coastal marshes in southeast Pennsylvania remain from colonial times. Living shorelines represent an innovative measure to protect further wetland loss and to help restore vital habitats. This study identified locations that were amenable to living shoreline implementation within the coastal zone of southeast Pennsylvania, and prepared initial conceptual designs for a subset of candidate living shoreline sites. Locations for conceptual designs were selected based on feasibility of implementation and adaptive management, as well as pre-existing physical and biological conditions.

This study developed a two-tiered rapid assessment methodology to assess existing conditions at potential living shoreline locations. GIS analysis identified thirteen candidate sites that were both public land and had emergent tidal wetlands. An in situ assessment was performed to capture current conditions. A non-technical rapid assessment methodology integrated GIS and field data to score sites using multiple criteria. Model outputs identified sites most responsive to living shoreline tactics to address various management goals. This study begins the process of standardizing site assessment methods used to screen and prioritize candidate living shoreline sites in Pennsylvania's coastal zone.

Poster

Effect of Tidal Resuspension with Oyster Biodeposits on the Nutrient and Oxygen Dynamics in an Experimental Ecosystem Study

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1. University of Baltimore 2. Horn Point Labratory, University of Maryland

To test the effect of biodeposit resuspension on the nutrient and oxygen dynamics we performed a 4-wk experiment in three 1000 L shear turbulence resuspension mesocosm (STURM) tanks (R) and three 1000 L non-resuspension tanks (NR). All tanks contained defaunated muddy sediment and brackish estuarine water, received daily additions of oyster biodeposits, and had similar water column RMS turbulent verlocities (~ 1 cm s-1) , energy dissipation rates (~0.08 cm2 s-3), and tidal cycles (4h mixing-on and 2h mixing off). However, while bottom shear stress was low in the NR tanks, high instantaneous bottom shear produced sediment and biodeposit resuspension in the R tanks during the mixing-on cycles.

Resuspension and biodeposit addition resulted in a complex nutrient and oxygen dynamics as well as altered seabed fluxes. In the NR tanks sediment dissolved oxygen uptake and ammonium effluxes were higher than in the R tanks and were mediated by microphytobenthos abundance and biodeposit deposition. Dissolved oxygen concentrations in the water column were significantly lower in the R tanks than in the NR tanks. Concentrations of nitrite+nitrate were significantly higher in the water column of the R tanks, suggesting nitrification. Seabed and bottom boundary-layer biogeochemical processes affected the nutrient and oxygen dynamics.

Undergraduate Student; Poster

Comparing the Feeding Ecology of Native and Invasive Catfishes in a Tidal Inlet of the Potomac River

Bodner, Christopher, Kim de Mutsert
1. George Mason University

One of the major ecological challenges facing the Chesapeake Bay and its tributaries is the spread of aquatic invasive species. Since blue catfish Ictalurus furcatus were purposefully introduced to several Chesapeake drainages in the 1970s, they experienced a population explosion and now occur in all major tributaries of the Bay. Their trophic role as a generalist omnivore places blue catfish in the center of the food web, enabling them to thrive in the many degraded habitats of the Bay while tying them to numerous other resident organisms. This study aims to determine the extent of diet overlap between this invasive species and two native catfishes, *Ameiurus catus* and *Ameiurus nebulosus*. Five individuals of each species were subsampled from otter trawl collections captured between May and August 2018 in Gunston Cove, an inlet of the Potomac River. Their stomachs were excised, and prey items were visually identified, counted, and weighed. Several diet indices were calculated and a multivariate analysis was performed to determine the extent of diet overlap. Comparing the diets of native and nonnative fishes can help to understand the competitive pressures invasive species impose on resident ecosystems, thus providing useful insights to drive informed watershed management decisions.

Masters Student; Oral

Quantifying Nutrient Sequestration in Chesapeake Bay Submersed Aquatic Vegetation (SAV) Beds

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Excess sediment and nutrient loads play a key role in the degradation of estuarine habitats. In upper Chesapeake Bay, most of these loads come from the Susquehanna River, which enters the Bay just upstream of a large, dense bed of submersed aquatic vegetation (SAV) known as the Susquehanna Flats. Loads are especially high during flooding from heavy rainfall events, such as following Tropical Storm Lee in 2011 and more recently in July 2018. While the Flats ultimately proved resilient to TS Lee, much remains unknown about their response to large events, especially their potential to capture inputs otherwise bound for the Bay. Thus, this study examines sediment and nutrient trapping within SAV beds of the Flats through sediment cores collected after the July 2018 floods. Sedimentation rates (calculated via 7Be (half-life: 53.3 days), a tracer of recently eroded watershed sediment), nutrient (nitrogen and phosphorous) and organic content, and grain size are compared between paired sites inside and outside SAV beds, as well as previous observations during non-flood periods. Results from this study address key modeling needs and inform future management efforts.

Masters Student; Poster

Water Quality Benefits of a Shellfish-Based Living Shoreline along the Mispillion River, Delaware

Bouboulis, Sarah, Joshua Moody, Kurt Cheng, Irina Beal, Danielle Kreeger
1. Partnership for the Delaware Estuary

In 2013 PDE installed a hybrid living shoreline in Milford, Delaware, which included oyster breakwaters and erosion control structures along the eroding marsh. The primary goal was to provide water quality uplift via an increase in shellfish filtration capacity. Oyster demographics were tracked between 2014 and 2018 and ribbed mussels between 2016 and 2018. Changes in population biomass were then integrated with seasonal measurements of seston filtration to develop allometrically scaled physiological-based filtration models as the living shoreline matured.

Shellfish recruitment increased annually. Due to non-linear population growth rates, the community filtration capacity was minimal until 2016 when a dramatic increase in biomass was measured. The estimated removal of total suspended solids and nitrogen filtration by oysters increased slowly between 2014 and 2016, and then increased markedly in 2018. Ribbed mussel filtration of TSS followed a similar pattern between 2016 & 2018. These results indicate that shellfish-based living shorelines can positively contribute to water quality, but at least 3 years are needed for these benefits to materially develop. Water quality managers should consider the value of protecting established, demographically diverse, shellfish populations while also enhancing bivalve populations where appropriate.

Poster

Study of Carbon Sequestration in Barrier Island Salt Marshes According to Age

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1. Albright College 2. Rochester Institute of Technology

Coastal marshes are effective carbon sinks, however, there is uncertainty in their long-term carbon burial capacity especially as related to marsh age. We examined a marsh chronosequence on Hog Island, Virginia, where *Spartina alterniflora* re-established following 1962 storm sand deposits and newer marsh was added in 2011. Triplicate culms and 30cm soil cores were harvested from six transects from both the marsh plain and tidal creeks from marsh plain of each age group. We predicted that aboveground production by *S. alterniflora* peaks at intermediate ages before declining from stress-induced nitrogen limitation as belowground carbon continues to increase; intermediate-aged marshes should sequester the most carbon in their total biomass. Results indicated that aboveground biomass was higher in younger marshes and belowground biomass higher in older marshes. Porewater salinity and redox potential do not explain relationships between site age and biomass along the chronosequence. However, the oldest site and tidal creek sites were significantly different from all other sites with respect to these two soil parameters. Salinity and redox are potentially dependent upon flooding frequency and duration as well as substrate composition. Additionally, within-site elevational heterogeneity of marsh plain, by changing flooding regime, is likely responsible for variability that transcends age-linked characteristics.

Undergraduate Student; Oral

Swimming Characteristics in Blue Crab Larval Broods

Caracappa, Joseph, Daphne Munroe
1. Haskin Shellfish Lab - Rutgers

Blue crabs (*Callinectes sapidus*) are an economically and ecologically important species in Delaware Bay that experience inter-annual fluctuations in their populations, partially due to changes in larval recruitment. Blue crab larvae (zoeae) must constantly swim to maintain their position in surface waters over their long development in order to survive development and successfully disperse. A zoea's ability to swim is related to its morphology, and recent work has shown that blue crab larval morphology differs among different mothers offspring. The goal of this study was to determine whether zoeae from different broods varied in their swimming behavior and to whether larval morphology was correlated to swimming ability. The offspring of 9 individual crabs were hatched in the laboratory. Zoeae were placed in small aquaria, video was taken of their swimming behavior under controlled conditions, and their morphology was measured. Zoea's swimming behavior varied substantially both within and between broods. Zoeae swam with multiple modes of behavior, and these modes were expressed within individual broods. Morphology partially explains swimming behavior, but there are likely other causes. Overall differences in swimming ability may have further impacts on zoeae's energy expenditure, survival, and dispersal.

PhD Student; Oral

The Impact of Saltwater Intrusion on the Rates of Methanogenesis and Methanotrophy in Freshwater Wetlands

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1. Villanova University

Saltwater intrusion alters the chemistry of freshwater wetlands through the introduction of sulfate into the ecosystem. This creates competition between two types of bacteria for the utilization of organic matter: sulfate reducers (carbon dioxide-producing bacteria) and methanogens (methane-producing bacteria). Increasing saltwater concentration impacts methane production. However, there is opposing evidence regarding the influence of sulfate on methane production in freshwater wetlands. Previous research on this topic focuses on methanogenesis, the process that creates methane in the system. Little is understood of methanotrophy, the process that breaks down methane in the system. There is also little research on the role that soil organic matter plays in the processes of methanogenesis and methanotrophy. In this study, the rates of methanogenesis and methanotrophy were measured in soil cores with varying levels of organic matter from Rancocas Creek, NJ that were subjected to one of three saltwater concentrations:1ppt, 5ppt, or 10ppt.

Masters Student; Oral

Using High Frequency Sensor Data to Monitor Organic Matter Fluxes to a Coastal Stream

Clift, Troy, Dina M. Leech
1. Longwood University

Dead zones, or regions of low dissolved oxygen, in the Chesapeake Bay are often attributed to excessive nutrient runoff, but recent studies suggest that inputs of terrestrially-derived dissolved organic matter (DOM) also contribute to oxygen depletion by stimulating bacterial growth. This is a concern given that DOM inputs to coastal waters have increased in the last several decades, a phenomenon referred to as "browning". We used high frequency data collected by a YSI multiparameter sonde, coupled with local weather station data, to better understand the relationship between organic matter inputs and water quality in Aimes Creek, a brackish tributary of the Potomac River, adjacent to Longwood University's Hull Springs Farm, Westmoreland County, VA. Parameters measured include water temperature, dissolved oxygen, salinity, pH, turbidity, and DOM in addition to air temperature and precipitation. Preliminary analyses of the dataset indicate an inverse relationship between precipitation, salinity, and DOM, with increasing precipitation leading to lower salinity, and increased DOM. We are now examining connections to DOM loading with dissolved oxygen, pH, and algal production. Long-term, high frequency data enables us to investigate potential mechanisms that would be obscured by more infrequent sampling.

Undergraduate Student; Poster

Ex-seeding Expectations: Quantifying *Zostera marina* Seed Quality Over Time

Combs, Avonelle, Jessie Jarvis, Judson Kenworthy
1. University of North Carolina Wilmington

As anthropogenically driven climate change continues to occur, warming ocean temperatures call into question natural resilience provided by seed banks of temperate seagrass *Zostera marina.* Temperature related stress events have resulted in large scale die-offs of *Z. marina* near to the species southernmost limits along the North American east coast. Recovery was initiated from seed germination from the sediment seed bank. To understand the natural variability in seed quality (e.g. viability) in *Z. marina* meadows and the impacts of that variation on seed bank function and meadow resilience, seeds were collected from three seagrass meadows near Hampstead NC. Seeds were collected during the flowering season (March-May) to categorize seed size (length (mm), width (mm), weight (mg)) and composition (protein (%), starch (mg/L)) Additional seeds were collected during the period of maximum flowering in May and examined for lipid concentration based on seed size. Finally, seeds were kept in controlled conditions to measure change in viability over time to quantify impacts of time on seed persistence. Information on basic seed physiology collected as part of this research on resilience provided by seed banks, will help coastal policy makers make more effective decisions concerning seagrass conservation and management.

Masters Student; Oral

Bioaccumulation of Selected Pharmaceuticals and Personal Care Products Between Primary Producers and Consumers in the Tidal Freshwater Potomac River

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1. George Mason University 2. EAG Laboratories

Increased concentrations of contaminants flow into our waters ways every year and pose a threat to the aquatic ecosystems. Pharmaceuticals and personal-care products (PPCPs) are amongst these contaminants that enter our lakes, rivers, and streams. Medicines and other constituents found in household products like creams, shampoos, or cleaning products, enter the environment from municipal wastewater, septic systems and runoff. Although there is little knowledge about impacts on the environment, we are aware that PPCPs can lead to sex change in fish and occur in our drinking water. It also results in a health risk to those who continue to consume aquatic species infected with PPCP bioconcentrations. This project will strengthen ecotoxicologists' knowledge to detect and respond effectively to new and existing PPCP concentrations. Specifically, this research will confirm the identities of the toxic PPCP contaminants found in the upper Potomac River and improve our knowledge on current distributions. Outcomes that should be expected from this project include a dataset of the presence and abundance of PPCPs, new and current, in the upper Potomac River, enabling surveyors and scientists to update database record and distribution maps. This includes a broad range of audiences, including statewide fishing organizations, Chesapeake Bay alliances, George Mason science department's current dataset, and USGS records just to name a few. Data and analysis collected will provide transformative, integrated education and communication, and assist policymakers on state or federal levels.

Masters Student; Poster

Linear and Non-Linear Trends in Benthic Community Condition in the Chesapeake Bay Over the Past 30 Years

Dauer, Daniel[1], Roberto J. Llanso[2], Michael F. Lane[1]
1. Old Dominion University 2. Versar, Inc

The Chesapeake Bay is the jewel of North America's estuaries in size, secondary productivity, and effort to protect and promote ecosystem services and functioning. Globally, coastal ecosystems continue to be increasingly stressed by population growth and associated drivers and pressures. Nutrient levels, associated eutrophication, increased levels of hypoxia/anoxia, and increased inputs of toxic materials collectively compromise ecosystem functioning. Benthic community condition is also globally prominent in assessing coastal and transitional ecosystem functioning. We present long-term linear and non-linear trends concerning benthic community condition and inferentially relate such patterns to broad-scale patterns of nutrients and chlorophyll a. Using the accepted paradigm of nutrient reduction, decreased primary production, and improvement in benthic community condition, there are mixed patterns of improvement, degradation and temporal reversals in trends of benthic community condition in the 30plus years of the restoration program for the Chesapeake Bay.

Poster

Impact of Oyster Biodeposit Resuspension on Phytoplankton Community Structure in Estuarine Systems.

Davis, Sarah[1], Elka Porter[2], Eric Robbins[2], Richard Lacouture[3], Marcia Olson[3]
1. Patuxent Environmental & Aquatic Research Laboratory 2. University of Baltimore 3. Patuxent Environmental & Aquatic Research Laboratory, Morgan State University

Anthropogenic disturbances in the Chesapeake Bay have depleted the abundance of the oyster, *Crassostrea virginica*, and have altered the estuary's environment and water quality. To improve these factors, recent mitigation has impelled the addition of oysters into the bay. To study the full impact of the reintroduction of *C. virginica*, the resuspension of the oyster's biodeposits should be analyzed for changes in water quality, and phytoplankton/zooplankton community structure. This work uses a STURM system (Shear Turbulence Resuspension Mesocosm) to compare differences in phytoplankton community structure between mesocosms with biodeposit addition, and those absent of it. The study was performed during the month of July using six resuspension tanks, three with biodeposit addition, three without. The tanks were monitored daily and phytoplankton water samples were taken every three days. Samples were counted using standard phytoplankton counting protocol and data was analyzed in excel. The research revealed that the tanks with biodeposits added had higher zooplankton populations, lower phytoplankton populations, and higher nitrate concentrations, all significantly different than those without biodeposits. This study suggests that oyster biodeposits have the potential to drastically change an ecosystem and that studying their impacts are of increasing importance for oysters to be used for an environments rehabilitation.

Undergraduate Student; Poster

Use of Stable Isotopes of C and N to Evaluate Spatial and Temporal Variations in the Diets of Copepods in the Maryland Coastal Bays

Edje, Blessing, Paulinus Chigbu
1. University of Maryland Eastern Shore

Copepods are omnivores that feed on a variety of food items although diatoms, flagellates and ciliates are the major elements in their diet. Some copepods can actively select their food, whereas others may not. In this study, we assessed the spatial and temporal variations in the diets of copepods in the Maryland Coastal Bays using δ13C and δ15N. Samples were collected from October 2014 to October 2017 at 13 sites in the Bays. Copepod δ13C and δ15N values ranged from -27.78 to -19.40‰ and 2.90 to 12.95‰, respectively compared to those of suspended particulate organic matter (SPOM): -26.85 to -20.33‰ and -0.58 to 10.51‰, respectively. Significant spatial variations (P=0.0075) were observed in the copepod δ13C; the mean value at site 8 (Sinepuxent Bay) close to the Ocean City Inlet was higher (-21.79‰+0.38SE) than the value at site 10 (-24.4‰+0.52SE) located at the mouth of St. Martin River. A similar pattern was observed in the SPOM δ13C; -22.54‰+0.28SE (site 8) and -24.42‰+0.36SE (site 10), suggesting that the copepods at site 10 incorporated more terrestrially derived SPOM than those at site 8. Spatially, there was a positive relationship between the mean values of copepod δ13C and SPOM δ13C (P=00001). Significant temporal variations were observed in the δ13C of copepods and SPOM. Copepod δ13C were more depleted in October 2014, October 2015, and February 2017 than SPOM δ13C, perhaps due to selective feeding by the copepods on a component of the SPOM from terrestrial origin. Copepod δ15N values varied seasonally with the highest value in February 2016 (10.84‰) and the lowest value in October 2016 (7.11‰). Low SPOM δ15N (1.96‰) value observed in February 2016 coincided with a major storm that occurred in the region.

PhD Student; Poster

Nutrient Spiraling among Urban and Non-Urban Streams and the Implications for Stream Restoration

Famularo, Joseph, Paul Bukaveckas
1. Virginia Commonwealth University

Streams provide an important ecosystem service by attenuating the downstream transport of nitrogen (N) and phosphorous (P). This service is particularly important in coastal areas where major urban centers have enhanced the delivery of N and P to sensitive estuarine and marine environments. Urban streams are disproportionately enriched in N relative to P, thus potentially shifting these systems towards N saturation and P limitation. Shifts in nutrient stoichiometry have been shown to change food web structure and function, which effects in-stream nutrient retention. Herein, we have utilized a recently developed method (Tracer Additions for Spiraling Curve Characterization; TASCC) to evaluate nutrient limitation, uptake, and saturation in urban vs. non-urban streams of the Virginia Coastal Plain. This study has examined nutrient spiraling in 3 urban streams of the Richmond Metropolitan area in comparison to 3 forested reference systems located nearby. These 3 urban streams are targeted for watershed and in-stream restoration by the City of Richmond. Results from this study will provide a basis for assessing the success of these restoration efforts and allow for a critique of the current allotment of restoration-based MS4 nutrient reduction credits.

Masters Student; Poster

The Effect of Salt Marsh Geomorphologic Classification on Rates of Transgression

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1. University of Virginia 2. Anheuser-Busch Coastal Research Center

Transgression was measured in nine Virginia sea-side, mainland salt marshes of three geomorphologic types: headland, hammock, and drowned river valley. Rates and areas of transgression were determined using ArcGIS and aerial photography taken in 2002 and 2017. The total area of marsh created at the upland boundary at each site ranged from 0.11 ha to 2.01 ha. Rates of transgression ranged one order of magnitude from 4.56 x 10-6 ha per m of upland boundary per yr (ha m-1 yr-1) to 4.50 x 10-5 ha m-1 yr-1. Hammock marshes showed the slowest rate of transgression by an order of magnitude compared to the other two marsh geomorphologic types. Headland marshes showed the highest rates of transgression (2.46- 4.50 x 10-5 ha m-1 yr-1), followed by drowned river valley marshes (1.15-1.64 x 10-5 ha m-1 yr-1), and hammock marshes (4.56-7.07 x 10-6 ha m-1 yr-1). These results are consistent with the literature as previous studies have predicted that headland marshes would show the highest rates of transgression because they are directly adjacent to lagoonal systems with direct exposure to waves and long fetch, whereas hammock marshes and river valley marshes are afforded some level of protection from adjacent lagoons.

Masters Student; Oral

Field Surveys and Comparative Parasitology of Freshwater Native and Invasive Snails in Virginia

Fowler, Amy[1], April MH Blakeslee[2]
1. George Mason University 2. East Carolina University

Invasive species are often detrimental to native flora and fauna and can also carry parasites that may be of human concern. Differences in infection susceptibilities between native and invasive hosts have been shown to modulate aquatic invasions and contribute to the success of invasive species in areas where native snails are more heavily parasitized. We surveyed native and invasive freshwater snails at six sites in Northern Virginia in summer 2018, targeting invasive mystery snail populations. Native and invasive snail populations were hand and visually surveyed for 1 hour along a ~30m transect for abundance and diversity at a maximum water depth of 1m. At least 100 individuals of each invasive and native snail species along a size gradient were brought back to the laboratory, dissected and examined for parasite abundance and diversity. In addition to the invasive species, the following five native snail species were collected: *Campeloma decisum, Pleurocera virginica, Lymnaea sp., Physa sp,* and *Helisoma anceps*. Across all sites, mystery snails had lower average trematode prevalence (3.9%) than native snails (5.6%), but this was highly variable at the site level. The exact species identifications for the trematodes are undergoing genetic confirmations, but we suspect that there are at least five different species. Additional parasites found during dissections include ciliates and the symbiotic oligochaete of many molluscs, *Chaetogaster limnaei limnaei*. Knowing whether these invasive species have higher or lower parasite loads than native snails may be helpful in predicting future ecosystem-level impacts, if the snails continue to spread.

Poster

Diamondback Terrapin Nesting Habitat and Projected Sea Level Rise

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1. William & Mary 2. Virginia Institute of Marine Science

Diamondback terrapins face a variety of ecological and human pressures. As a species reliant on the availability of optimal nesting sites, the effects of climate change and sea level rise are important to consider when determining appropriate conservation methods for terrapins. Our research focuses on the potential impacts of sea level rise on diamondback terrapin nesting locations along tidal shorelines in Virginia. Utilizing GIS and maximum entropy modeling (Maxent), we have edited and analyzed spatial data and to determine optimal nesting habitats and how these locations will change as rising sea levels force land use shifts. Through our analysis, we determined that essential nesting habitat factors include: distance to beaches, distance to core habitat (the marsh habitat terrapins occupy when not nesting), salinity, and placement of roads. Using this information, we have created a model showing the current distribution of terrapin nesting habitat throughout Virginia. Further, we are able to project the location of future terrapin nesting habitat in 2030, 2050, 2075, and 2100. Our results demonstrate how future terrapin nesting habitat will grow and shrink across Virginia shoreline. With this information, conservation efforts can be focused on the current terrapin nesting habitats most threatened by rising waters.

Undergraduate Student; Poster

Utilizing an SMZ-18 Zoom Stereomicroscope and Scanning Electron Microscope for Identifying and Calculating Abundance of Diatom Species from Blackbird Creek.

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Diatoms are unicellular microalgae present in water and are sensitive to environmental fluctuations, making them great bioindicators. Species are seasonally dependent, and their presence varies with environmental conditions. Species were examined at various sites at Blackbird Creek Marsh in Delaware, allowing for water quality assessment. We hypothesized that the presence of diatom taxa found in our genetic study, (*Cyclotella, Thalassiosira, Skeletonema. Entomoneis sp.,* and *Navicula*), would be confirmed in our study, providing insight into the relationship between diatom community structure and environmental quality. An SMZ-18 Zoom Stereomicroscope was utilized to isolate and process diatoms from seasonally-collected water samples into 2 mL vials. A 50% concentration of $H_2SO_4HNO_3$ acid was added to vials, removing organic debris. Samples were further processed, mounted onto 25 mm aluminum stubs, and placed into a dessicator. Stubs were then placed in a Scanning Electron Microscope. Diatoms were subsequently imaged under low vacuum. Small montages were then produced at resolution: 1536 x 1024 and map size: 7 x 7. Diatoms species were later identified, and abundance was calculated. *Thalassiosira sp., Cyclotella sp., Navicula sp.,* and *Biddulphia sp.* were the dominant species present in the samples and provided us with an insight into water quality at Blackbird Creek.

Masters Student; Ignite Talk

Effects of Substrate Protection and Type on Ribbed Mussel Recruitment for Living Shoreline Applications

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Ribbed mussels are one of the functional dominant species in eastern United States salt marshes, providing ecosystem services including particulate nutrient filtration and enhanced vegetative growth. Wetland loss in the Delaware Estuary has resulted in ribbed mussel population declines. As interest in living shorelines grows, incorporation of ribbed mussels represents an opportunity to enhance ecological structure and function. Since 2008, the Partnership for the Delaware Estuary has sustained 14 living shorelines, with ribbed mussel recruitment exhibiting temporal and spatial variability. Where mussel recruitment was high, density was greater in components providing refuge (i.e., oyster shell bags) relative to materials that did not (i.e. coir fiber logs). The goal of this study was to test whether substrate protection or substrate type affect ribbed mussel recruitment.

Two multi-factor experiments, at representative rivers of the Delaware Bay, NJ, evaluated recruitment on exposed vs. protected surfaces and interactive effects between substrate protection methods and substrate types. Results showed ribbed mussel recruitment was not consistent across substrate type, but was significantly greater on protected substrates. Additionally, interstitial space was the primary location of recruitment. These results indicate that material selection and material protection can affect ribbed mussel colonization in living shoreline projects.

Poster

Obligate v. Opportunist: The Ecology of the Hard Clam Pathogen, Quahog Parasite Unknown (QPX)

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A critical question in the management of QPX disease is whether QPX is an obligate or opportunistic pathogen. Although most evidence suggests that QPX is an opportunist, it is managed based on the assumption that it is an obligate pathogen, resulting in significant economic losses. In order to determine whether or not the presence or abundance of QPX equates to disease in hard clams, we performed a two year survey throughout the marine district of New York and quantified QPX abundance in clams and the environment using newly developed quantitative PCR (qPCR) and nested qPCR assays. QPX was prevalent in clam tissue and pallial fluid; in individual clam samples, when QPX was abundant in the pallial fluid it was absent or low in the tissue, and vice versa. QPX was also regularly detected in sediment and seawater samples, but its distribution was not strongly related to the prevalence or intensity of QPX in hard clams. Although QPX is widely distributed in the marine environment, it may have a unique relationship with the hard clam and be a common component of the clam microbiota. This study supports that QPX is an opportunistic pathogen, highlighting the need for improving current management approaches.

PhD Student; Oral

Accrual of Nutrients in Living Shorelines in Relation to Natural Fringing Tidal Marshes

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1. William & Mary 2. Virginia Institute of Marine Science

Soil and plant metrics were determined for thirteen paired sites of natural fringing tidal marshes and Living Shorelines in Virginia. The paired sites varied along a spectrum of marsh connectivity and age of Living Shoreline. Along three transects in each marsh, soils were cored from upper and lower elevations dominated by *Spartina patens* and *S. alterniflora*, respectively. Bulk density, % Organic Matter (OM), and total soil carbon (C), nitrogen (N), and phosphorus (P) were determined. In addition, leaves were collected along the same transects at the end of the growing season for determination of total C, N, and P. For both Living Shoreline and natural marshes, pools of C, N and P varied widely and were site-specific. Nutrient accumulation rates generally decreased with age of the Living Shoreline. Low marsh soils tended to accumulate a higher percentage of nutrients, relative to high marsh soils. Living Shorelines had much lower %OM, %CNP, and higher bulk density relative to natural fringing marshes. Similar to other created marshes, these Living Shorelines accrete organic matter rapidly and establish bulk soil characteristics representative of more mature wetland systems. Using the measured rates of standing stocks of C, N and P, we estimate Living Shoreline marshes take on average 18, 13 and 8 years, respectively, to accrue nutrients at the level observed in reference fringing marshes.

Poster

Changes in Submerged Aquatic Vegetation (SAV) in North Carolina's Estuaries

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1. East Carolina University

The State of North Carolina is concerned about the loss of submerged aquatic vegetation (SAV), which comprises significant fish and wildlife habitat in low-salinity estuaries. We made rapid assessments of SAV occurring along shore-parallel transects in 1-m deep water using single-beam SONAR and underwater video in the Albemarle Sound (AS), the Pamlico River (PR), and the Neuse River (NR) estuaries. In the AS, transects totaled 496 km, with SAV on 90 km or 18% of the linear extent (LE) along shore. Compared with historical estimates (from NOAA and the State of NC), there had been 120 km (24.2% LE) of SAV occurring on the same transects, indicating a loss of 30 km (6% LE). In the PR, transects totaled 431 km with 6 km having SAV (1.4% LE). Historical SAV along the transects in the PR totaled 29 km (6.7% LE), indicating a 5.3% LE loss of SAV. Finally, the NR transects totaled 237 km with SAV found on 10 km (4.2% LE), compared with 11 km (4.6% LE) historically. We conclude that the linear extent SAV habitat has declined and gained in different estuaries. Overall, there was a decline in SAV LE from 13.7% to 9.1%, a 4.6% loss.

Undergraduate Student; Poster

Suppression of Growth Driven by Sea Level Rise in Coastal Mid-Atlantic Forests

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1. Partnership for the Delaware Estuary 2. Monmouth University 3.University of Minnesota Duluth 4. Academy of Natural Sciences of Drexel University

Accelerating sea level rise threatens Mid-Atlantic coastal forests. Higher tides amplify storm surge heights, thereby exacerbating the frequency and duration of saltwater flooding in coastal forests. The effects are already apparent: snags dominate the tidal marsh fringe. Salt intolerant trees, such as Atlantic white cedar (*Chamaecyparis thyoides*), have undergone dramatic declines. Less is known about the tolerance, or resilience, of other common trees to the impacts of sea level rise. The goal of this study was to compare tree ring widths in pitch pine (*Pinus rigida*) with chemical or physical indicators of salt water stress along an elevation gradient from the tidal marsh to the interior forest. We cored pitch pines in low-lying forests (< 3 m above sea level) in Woodbine, Cape May County, New Jersey. We analyzed growth patterns by a) comparing suppression (ring width indices <0.9) to extreme high water datasets, b) preparing chronologies for trees with different topographical positions, and c) searching for consistent growth suppression in the last decade. We also used x-ray fluorescence (XRF) to inventory changes in chemical signatures within selected cores. We found evidence of high water impacts to tree growth, as well as possible evidence of changing chemical dynamics. These analyses provide critical information on forest resiliency to coastal impacts in the Mid Atlantic.

PhD Student; Oral

LC-MS/MS Analysis of UV-Filter and Paraben Micropollutants in Sediments Obtained from the Tidal Freshwater Potomac River

Haji, Tovga, Thomas B. Huff, Gregory D. Foster
1. George Mason University

Pharmaceutical chemicals and personal care products (PPCPs) are emerging pollutants of concern in human and ecological health. The specific PPCPs targeted for analysis were UV filters and parabens. They are mild endocrine disrupting chemicals (EDC) and persistent, bioaccumulative, and toxic substances (PBTs). Objectives of this study were to (i) develop new methods for the analysis of UV-filters and parabens in sediments using the LC-MS/MS instrument, (ii) determine if UV filters and parabens in sediments are associated with wastewater treatment plant discharge, and (iii) establish whether the source profiles of UV-filters and parabens in sediments is unique geospatially. Through QuEChERS and dSPE extractions and LC MS/MS analysis the concentrations of butyl paraben, isobutyl paraben, octocrylene, and oxybenzone were determined. Results processing indicated the sources of the compounds were not associated with wastewater treatment plant discharge and they were not unique geospatially. Risk Index values to the fathead minnow (*Pimephales promelas*) of each compound were calculated. The risk indexes of the sum of the compounds was above the threshold of toxicity. Further research in different environmental matrices, sampling locations, and quality assurance must be done to gain a better understanding of these compounds and their behaviors during sample processing.

Undergraduate Student; Poster

Carbon Balance of seagrass and its effect on ecosystem health

Heit, Evan, Jessie C. Jarvis
1. UNCW

The overall objective of this study is to identify why some seagrass meadows are more resilient to stress and disturbance than others, by quantifying the response of physiological processes that affect positive carbon storage in *Zostera marina* to stressful environmental conditions. Specifically, we quantified differences non-structural carbohydrate reserves (NSC) between individuals collected from stable (North Carolina) and declining (Virginia) seagrass meadows in response to temperature and light stress under controlled experimental conditions. These populations are of particular interest as they are both located near the southern limit of *Z. marina's* geographical distribution along the Western Atlantic Ocean where impacts of climate change, including warmer temperatures and low light conditions, are expected to occur first. We found greater carbohydrate reserves under stressful conditions for NC populations, indicating a localized resilience to temperature and light stress. These results provide a better understanding of the physiological mechanisms underlying the response of seagrass meadows to anthropogenic stressors.

Undergraduate Student; Poster

Controls on Nitrous Oxide Distribution and Air-Sea Flux in Estuarine Waters

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1. University of Maryland Center for Environmental Science

Nitrous oxide (N2O) has a greenhouse gas potential ~300 times greater than CO2 and is naturally produced as a byproduct of nitrogen cycling. Eutrophication contributes to low-oxygen conditions in estuaries, altering nitrogen cycling and affecting N2O availability, but a large knowledge gap remains regarding controls and distributions of N2O. We aimed to better understand N2O availability through ecosystem-scale experiments in Rock Creek, a tidal tributary to the Patapsco River. We experimentally altered oxygen levels in the creek by turning an engineered aeration system on and off over a 10-day period. During the experiment, surface and bottom water samples were collected at several stations in July 2018. We took additional samples when aerators were off in October 2018. Samples were collected via an in situ headspace extraction technique and were validated against samples preserved with HgCl2. Results reveal strong spatial and temporal variation in N2O, ranging from 2.2–25.9 nM during July and 19.5–41.2 nM in October. N2O was generally supersaturated indicating high rates of production and likely fluxes of N2O to the atmosphere. N2O concentrations were also suppressed in anoxic bottom waters. These new data will help broaden our understanding of N2O cycling, availability, and distribution within estuarine ecosystems.

Masters Student; Poster

Species Distribution Modeling of Proxy-Relevant Planktic Foraminifera

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1. George Mason University 2. U.S. Geological Survey

Planktic foraminifera abundances and distributions, i.e. faunal assemblages, have been used to reconstruct oceanographic conditions from Earth's ancient past. Here we examine the utility of Species Distribution Models (SDMs) in characterizing the ecology of modern foraminifera and how this can inform reconstructions of past oceanographic states from Earth's climatic history. Standard faunal assemblage proxy reconstructions often reduce multidimensional environmental data into a single variable, typically temperature. However, when environmental covariates feature strong spatial autocorrelation, these traditional methods may incorrectly interpret information from other variables as a temperature signal. Using modern machine learning-based SDMs we show that while temperature is an unquestionably important control on foraminifera distribution, other environmental factors appear to play a non-trivial role. This has implications not only for temperature values derived from standard assemblage-based reconstructions, but also may help reconcile apparent mismatches between proxies and climate model simulations.

PhD Student; Oral

Assessing Heavy Metal Pollution in Estuarine Systems Along the Eastern United States in Relation to Land Use Changes

Jezycki, Kristen, Nathaniel Weston
1. Villanova University

Salt marshes are vital ecosystems that provide important ecosystem services such as coastal protection and nutrient cycling but are increasingly threatened by climate change and anthropogenic stressors. This study assesses how human activities including historical land use changes have influenced the delivery of heavy metals from the landscape to the coast in nine salt marsh ecosystems along the East Coast of the United States. We hypothesized that watersheds with more historical developed and agricultural land use changes would be correlated with the delivery of heavy metals to the coast, the chronology of land use changes and policy decisions would be tied to the history of heavy metal delivery to the coast, and that closer proximity of human activities to the coastal zone would result in a higher pollution delivery. To test these hypotheses, two sediment cores were taken from each of the nine marsh sites and dated in the laboratory using lead-210 (210Pb) radiodating techniques. Sediment samples were hot-acid digested and analyzed for heavy metal contents by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Concentration chronologies and inventories were used to link historical land use changes to heavy metal pollution over time to show how these salt marsh systems act as a record of pollution to the coast.

Masters Student; Oral

Estimates of Lost Ecological Subsidies by Over-Harvesting of Shad and River Herring in Chesapeake Bay

Kennedy, Victor
1. Chesapeake Biological Laboratory

From the time of the first European colonists to the late 1800s, Chesapeake Bay was celebrated for its aquatic bounty. Fishers harvested multiple millions of shad, river herring, oysters, and blue crabs, and multiple thousands of sturgeon and terrapins. Market hunters shot many thousands of waterfowl for sale. As these resources were over-exploited, the bounty was squandered. There are now bans on harvesting shad, river herring, sturgeon, and terrapins and there are bag limits for waterfowl. This overharvesting has undoubtedly changed the Bay's aquatic food web. I will illustrate one possible change deriving from the collapse of the fisheries for shad and river herring, using data from a successful Potomac fishery from 1814-1824. I focus on the lost ecological subsidy to Bay trophic levels once provided by the hundreds of millions of eggs and resultant larvae that would have been produced by the millions of shad and river herring that were caught in that decade on their way to spawn. I then speculate on that lost subsidy in these times of even greater depletion of these fish stocks in the Bay.

Oral

Presence and Risk of Pharmaceuticals and Personal Care Products in Surface Water and Benthic Sediment of the Tidal Freshwater Potomac River

King, Tabitha, Lisa McAnulty, Thomas B. Huff, Gregory D. Foster
1. George Mason University

Pharmaceuticals and personal care products (PPCPs) constitute an ever-increasing list of chemicals being studied due to their common presence in industries and households (e.g., antibiotics, blood pressure medication, nicotine metabolites, etc.). Often, these substances are hardly metabolized by the human body. Trace levels of PPCPs are known to persist downstream from wastewater treatment plant outflows in water bodies that also serve as sources of drinking water. This study analyzes the presence and risk of 108 PPCPs in three locations along the Mid-Atlantic's Potomac River. Hunting and Creek and Gunston Cove are two study sites influenced by wastewater treatment plants, while Dogue Creek is used as a control since it is fed by surface and groundwater flow. Liquid- and solid-phase extraction techniques are used in combination with LCMS-8050 triple quadrupole mass spectrometry to determine the presence of target compounds. Ecological risk analyses utilize the Environmental Protection Agency's ECOSAR model to calculate the Predicted No Effect Concentration (PNEC). The results indicate that geospatial variability from treated water outflows exists in present PPCPs, some of which are at potentially hazardous concentrations.

Masters Student; Poster

Legacy Pesticides in Riverine Marsh Sediment Cores From the Tidal Freshwater, Oligohaline, and Mesohaline Zones of the Potomac River

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1. George Mason Univeristy 2. George Mason University/Department of Chemistry/PEREC 3.George Mason Univeristy/SCRIF 4. George Mason University/Department of Environmental Science & Policy/PEREC

Marshes in riverine estuaries provide an enhanced deposition zone for sediments, nutrients, and pollutants, such as pesticides. The watershed of the tidal Potomac River has many unique hydrologic and geologic characteristics that make it ideal for a spatial and temporal study on pesticides associated with aquatic geosolids. The tidal river has undergone an extensive transformation in land use over the past nine decades, primarily from the conversion of forested and agricultural land use to urban and suburban land use. Marshes play an important role as pesticide sinks through deposition and burial processes that occur in their sediments. As a result, marshes act as filters for particle-associated contaminants. Many pesticides partition between the organic matter component of total suspended solids (TSS) based upon their physicochemical properties. In general, hydrophobic pesticides have very large partition coefficients favoring enrichment in the non-polar regions of TSS. Sediment cores were obtained from selected marshes along the tidal Potomac River and sectioned for geologic chronology and chemical analysis. The historical record of pesticides in sediment cores were determined using GC-MS. Depth profiles for the cores were also developed based on total organic carbon, total nitrogen, and particle size. The profiles were then used to compare the spatial and temporal distributions of these chemicals to determine the effect of watershed demographics, management practices, use statistics, restrictions, and changing land use patterns on the concentrations and sediment chronology of the pesticides.

PhD Student; Oral

Presence and Sources of Pharmaceutical and Personal Care Products in Water and Sediments in The Tidal Freshwater Potomac River and Its Tributaries

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1. George Mason University 2. George Mason University Dept of Chemistry, PEREC 3.George Mason University, PEREC

In recent years, it has come to light that aquatic systems are becoming increasingly contaminated by manufactured pharmaceutical and personal care products (PPCPs). Among concern is the emergence of high levels of prescription medications found in surface water and sediment samples worldwide. This study focused on the occurrence and sources of multiple PPCPs groups, with an emphasis on opiates. Due to the potency and accessibility of these substances, they have been popular for both medical treatment and recreational use despite the associated high risk of addiction and overdose. As the opioid epidemic continues to proliferate, it is estimated that the concentrations of these substances will continue to increase in aquatic systems. A multi-component mixture of these analytes was selected for the quantification of the concentrations of the PPCPs in water and sediment samples from the tidal freshwater Potomac River (TFWPR) near Washington, DC. The PPCPs in these samples were analyzed for the compounds of interest using a Shimadzu Model 8050 triple quadrupole LC-MS, which has proven to be reliable at determining PPCPs at sub-ppb concentrations in environmental matrices. The PPCPs were detected and quantified in all matrices at ppb concentrations, which were analyzed statistically using Principal Components Analysis, Kruskal-Wallis, and Spearman Rank correlations via Minitab. Observed concentrations in the TFWPR were the greatest in sediments. It was observed that some opiates showed preference for concentration in the water column, while others preferred settling into the sediment.

PhD Student; Oral

Genetic Diversity of *Spartina Alterniflora* in a Large-Scale Marsh Restoration Project in Chesapeake Bay: Effects of Dieback and Age with Comparisons to a Wild Reference Marsh

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Poplar Island is one of the largest marsh restoration projects in the Chesapeake Bay with hundreds of acres of *Spartina alterniflora* planted from plugs produced by seed from a non-local nursery. Observations of *S. alterniflora* die back in certain cells and questions about the source and diversity of S. alterniflora transplants prompted an initial investigation of genetic diversity of *S. alterniflora* across the island. In this pilot study, we performed transects to sample three distinct planting areas (cells) with different ages and histories of dieback, as well as a nearby reference marsh (Tar Island MD) that had not experienced restoration. We genotyped plants at eight microsatellites, assessing genetic diversity, structure, and indices of clonality. Allelic richness (but not heterozygosity) was slightly higher in the Poplar Island restored cells compared with the reference marsh, which showed the highest clonality index, with 10 of 40 individuals sharing the same multi-locus genotype. Marsh areas experiencing die back had lower multi-locus diversity indices than those that did not, but these differences were subtle. Overall, dieback does appear to affect genetic diversity but the largest differences were observed between restored and local wild marshes, the latter showing a greater likelihood of vegetative reproduction.

Ignite Talk

Dissolved Organic Matter Flocculation in Coastal Streams and Its Effects on Water Quality

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1. Longwood University

The formation of "dead zones", or regions of low dissolved oxygen, in coastal ecosystems is attributed to excess nutrient runoff. However, recent studies suggest that the export of dissolved organic matter (DOM) from land to coastal waters can also deplete oxygen through the stimulation of bacterial growth. When terrestrially-derived DOM mixes with saline estuarine waters, flocculants of particulate organic matter are produced, providing potential habitat for bacteria to more readily access carbon and nutrients. We investigated the response of bacteria to flocculant production using fresh water from a stream draining a wetland and a stream draining a former agricultural field at Longwood's Hull Springs Farm, Westmoreland County, VA. Laboratory experiments were conducted in air-tight bottles where salt was added to simulate the local salinity gradient, 0 - 13 PSU. Flocculant production and bacterial respiration were measured after a 7-day incubation in the dark. Flocculant production increased with increasing salinity, especially in the wetland stream. Bacterial respiration also increased with increasing salinity, likely related to increased flocculant production, and was highest in the wetland stream compared to the agricultural stream. These results suggest that the quantity and quality of DOM inputs to coastal ecosystems influence water quality, and consequently, ecosystem health.

Ignite Talk

Relationship of Benthic Community Condition Measures with Flow and Hypoxia in Chesapeake Bay

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1. Versar, Inc. 2. Department of Biological Sciences, Old Dominion University

Chesapeake Bay is a spatially complex ecosystem subject to multiple sources of variability. Water quality is usually influenced by years of high and low precipitation and hence river flow. Pulses in river flow following severe rain events bring increased nutrient loads and organic matter into Chesapeake Bay, which exacerbate hypoxia. In this study we examine 23 years of probability-based, benthic community data. Generalized linear models were used to evaluate the correspondence between measures of benthic community condition and river flow and hypoxia as categorical predictor variables. Measures of benthic community condition included the benthic index of biotic integrity (B-IBI) and benthic index attributes such as abundance, biomass, and species richness. Preliminary results suggest an association between benthic condition and the magnitude and timing of pulses in river flow.

Poster

Ability of Salt Marsh Mallow to Retain Nitrogen and Increase Carbon in Soil Organic Matter in Farm-Field Buffer Strips

Long, E. Victoria, Linda K. Blum
1. University of Virginia

Salt marsh mallow (*Kosteletzkya pentacarpos*) mallow is a salt-tolerant, perennial plant with an extensive root system. In May 2018, buffer strips of four agricultural fields, bordering salt marshes, were planted with mallow to determine this plant's potential to increase retention of nitrogen and sequestration of carbon in buffers. After one growing season, soil samples were collected from inside the agricultural field, inside buffer strips with and without planted mallow, and outside the field. Soil samples were also collected from native mallow populations from nearby salt marshes to allow comparison between the soils of native, established mallow populations and those planted in buffers. Soil organic matter, soil salinity, pH, CEC, carbon and nitrogen concentrations, as well as other plant nutrients, were measured. Preliminary results show higher concentrations of carbon and nitrogen in mallow buffers, as compared to buffers without mallow, suggesting that mallow may improve the ability of buffer strips to retain nitrogen. In the longer-term, the effect of mallow on soil carbon content will depend on the balance between organic matter production and decomposition, particularly if higher nitrogen content stimulates decay. Continued sampling of these experiments in the future will be crucial to determine if mallow improves buffer strip function.

PhD Student; Oral

Of Crabs and Clams: OA and Salinity on Marine Invertebrate Growth and Armor

Longmire, Katherine, Rochelle Seitz
1. Virginia Institute of Marine Science

Ocean acidification (OA), coupled with other stressors like salinity, could be detrimental at the species and ecosystem levels. Decreased carbonate negatively impacts calcifying species, yet the effects of OA and salinity combined are less well known, and many studies disregard interacting species. Multi-species studies involving OA and other stressors are crucial to comprehend the full threat of OA. Our objectives were to assess direct effects of long-term exposure to decreased pH and salinity on a predator, *Callinectes sapidus*, and its prey, *Mercenaria mercenaria*. Juvenile *C. sapidus* (n = 24; 50-80 mm CW) and juvenile *M. mercenaria* (n = 112; 10-15 mm shell length) were held in mesocosms of crossed pH and salinity treatments for eight weeks. Water quality and chemistry were monitored regularly, and clams were measured weekly. After eight weeks, crab carapace and claw strength were assessed using force meters. Of the growth parameters, clam weight decreased significantly in treatments with low pH combined with both high and low salinity, compared to high-pH treatments. Crab carapace and claw strength data are currently being analyzed. Understanding how OA interacts with other stressors to affect species responses is necessary for future management of exploited species in an altered ecosystem.

Masters Student; Oral

Characterizing Water Quality and Hydrologic Parameters of Urban Streams in Central Virginia

Lucas, Rikki, Paul Bukaveckas
1. Virginia Commonwealth University

Tributary streams regulate the transport of nutrient and sediments to Chesapeake Bay. The capacity of streams to attenuate downstream transport of nutrients is tied to their hydrologic functioning; specifically, transient storage processes, which slow down the movement of water and allow for greater biogeochemical cycling. The objective of this study was to characterize variability in transient storage among urban streams in the Richmond area. Urban streams were deeply incised with unstable banks and low transient storage. Lowest transient storage was observed in the channelized and concreted segment of Reedy Creek. Surprisingly, this site exhibited a wide range of transient storage, with higher values in summer, when extensive biofilms colonized the channel. A more naturalized section of the concrete channel was found to have greater transient storage, owing to the accumulation of substrates and vegetation. Our findings suggest the possibility of developing best management practices to enhance stream functioning by passive restoration of concrete channels. Discontinuing the practice of removing in-stream structure such as woody debris would allow for sediment accumulation and re-vegetation without the costly and intrusive effects of removing concrete. Our findings suggest there may be low cost options to partially restore their functioning.

Masters Student; Poster

We are the Robots: Studying Coastal Ecosystems a Using Remote Control Robot

Luczkovich, Joseph[1], Roger A. Rulifson[1], Mark W. Sprague[1], JP Walsh[2], Ramone Lopez[1]
1. East Carolina University 2. University of Rhode Island

Remote observations of coastal and estuarine ecosystems and animals residing in them are becoming cheaper to obtain, the technology is more accessible and being commonly used. We report here how an autonomous vehicle, a Liquid Robotics (Sunnyvale, CA) SV2 Wave Glider equipped with a fluorometer, ADCP, wave height sensors, meteorological sensors, CTD, hydrophones and acoustic tag detectors, has been used to study the behavior and habitat use of fishes and whales in the coastal environment off North Carolina. This new instrument – named Blackbeard – was used to conduct affordable, long-term passive acoustic monitoring of marine animals and the coastal ocean acoustic environment. Funded by the National Science Foundation Major Research Instrumentation program, it is available for use by scientists in the AERS region. Examples for some recent data collection and studies involving passive acoustic monitoring of fish populations offshore will be presented. Striped cusk eels, searobins, oyster toadfish, red drum, weakfish, spotted seatrout, silver perch, and grouper spawning calls were detected in different areas and depths offshore, with the drum fishes and sea trouts close to the inlets and artificial reef structures, and grouper further offshore in deeper water. Whales and dolphins that feed on these fishes were recorded.

Poster

Plenty of Fish: Connecting Social and Ecological Systems in Small-Scale Fisheries in the Philippines

Marriott, Sara
1. George Mason University

Preliminary work by Rare, an international NGO, indicated success in increasing fish biomass with their managed access and marine reserve governance approach. However, there is still a need to link the governance strategy with the ecological results. Using a large database of fisheries dependent and independent data from Rare, I am researching how social and ecological systems are connected within the small-scale fisheries in the Philippines. Small-scale fishery management solutions are necessary to creating a sustainable ecosystem of natural resources and those who use them, not only in the Philippines but worldwide. The proposed research investigates the impacts of mangrove edge habitat, governance strategy, and social trust on biomass and catch in small-scale fisheries in the Philippines. Using interdisciplinary mixed methods, the research aims to link the ecological response to the social responses and vice versa. The results will tell a holistic story of how we can increase sustainability in under-reported fisheries. My research builds on the empirical work that Rare has conducted. My goal is to inform NGOs and managers, which strategies may improve livelihoods of fisher communities while also improving the health of the ecosystem.

PhD Student; Poster

Presence and Risk Assessment of Antidepressants in Tidal Freshwater Potomac River Water, Sediments, and Fish

McAnulty, Lisa, Thomas B. Huff, Gregory D. Foster
1. George Mason University

Potomac River water, sediment, and fish samples collected downstream of wastewater treatment plants were analyzed for antidepressants to assess their presence and ecological risk in the aquatic environment. Water was collected and extracted by solid phase extraction techniques, and the collected sediment samples were extracted following QuEChERS (quick, easy, cheap, effective, rugged, safe) protocol. Samples collected from white perch (*Morone americana*), banded killifish (*Fundulus diaphanus*), pumpkinseed (*Lepomis gibbosus*), bluegill (*Lepomis macrochirus*), and brown bullhead (*Ameiurus nebulosus*) followed a modified QuEChERS extraction protocol. Analytes were quantitated via liquid chromatography tandem mass spectrometry. The hazard quotient (HQ) was used to assess the toxicity for each antidepressant and was calculated following U.S. Environmental Protection Agency (EPA) guidelines. Most antidepressants detected were found to be ubiquitous at all sampling locations; however, a significant geospatial distribution exists for some antidepressants within the sampling sites. Comparing detected antidepressant HQs against U.S. EPA guidelines, several antidepressants were calculated to pose a potential risk to aquatic organisms.

Undergraduate Student; Upgoer Style Poster

An Evaluation of Non-Invasive Sampling Methods in Determining River Herring Run Count

Melton, Jessie, Kim de Mutsert
1. George Mason University

Alewife (*Alosa pseudoharengus*) and Blueback Herring (*Alosa aestivalis*), collectively known as river herring, are anadromous species of fish that spend a majority of their life in marine waters, but migrate to freshwaters in order to spawn. The Potomac Environmental Research and Education Center (PEREC) conduct surveys of river herring spawning annually in tributaries of the Potomac River. The intent of the current study is to determine whether there are alternative methods for studying the spawning populations of river herring in place of using block nets. Block nets result in high mortality rates, require high costs of labor, large amounts of time, and can be difficult or impossible to set up during high flow events or inclement weather. One alternative method studied is the use of environmental DNA (eDNA). eDNA refers to the DNA that has been left behind in the water column in the form of feces, scales, or gametes. The second introduced method implemented is the use of video surveillance. eDNA collection and video surveillance were implemented during the sampling seasons of 2017 and 2018, in addition to setting block nets and ichthyoplankton nets. Data are compared between the three methods to determine the effectiveness and limitations of each.

Masters Student; Oral

Implications of Biochar Addition on Plant-Microbial Interactions and Soil Respiration

Mitra, Siddhartha[1], Ariane Peralta[2], Andrew Zimmerman[3], Chad Lane[4], Andrew Wozniak[5]
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Biochar has been added to soils in numerous coastal settings to improve crop yield as a fertilizer, to sequester carbon through organic matter enrichment, and to structurally stabilize soils and minimize erosion. However, the effect of biochar on plant-microbe interactions and subsequent carbon mineralization is less well-known. Indeed, the addition of biochar to soil has been shown to result in carbon losses (i.e., positive priming effect) and carbon gains (i.e., negative priming effect). A multifactorial experiment was designed to test the hypothesis that biochar addition to soils increases plant growth when interspecific competition for nutrients is absent (i.e., in the absence of plant-microbe competition for nutrients). Results revealed that soil carbon and nitrogen content generally increased with addition of biochar. Specifically, the biochar treatment decreased soil C/N ratios and became more enriched in d13C and d15N with incremental additions of the C4-derived biochar. Increasing amounts of biochar added to soils corresponded with decreased amount of carbon dioxide (CO2) respired, regardless of the presence of microbes or plants.

Poster

Introduction to a Site-Based Wetland Decision Tool for Guiding Salt Marsh Restoration in New Jersey

Moody, Joshua[1], LeeAnn Haaf[1], Metthea Yepsen[2], Danielle Kreeger[1], Elizabeth Semple[3]
1. Partnership for the Delaware Estuary 2. New Jersey Department of Environmental Protection Division of Science and Research 3.New Jersey Department of Environmental Protection Office of Coastal and Land Use Planning

Tidal marsh restoration activities across the Mid Atlantic have been numerous in recent years. Many implemented projects have achieved success in meeting goals and past efforts to standardize project monitoring have resulted in an increase of comparative data. But, many questions remain regarding how to identify of site-specific deficiencies and how to pair these deficiencies with appropriate tactics. The Partnership for the Delaware Estuary and the New Jersey Department of Environmental Protection are in the initial stages of developing a site-specific decision tool, suitable for a range of expertise, to standardize guidance on assessing site-specific conditions and needs for intervention. Users will compile desktop and field-based data using established protocols that relate to a series of informative salt marsh function attributes. To identify potentially problematic conditions, collected data will be evaluated against user-selected criteria, from a variety of recommended sources, to identify attributes of concern. These attribute-specific results are then integrated using a spreadsheet formatted with Boolean algebraic formula to identify combinations of problematic conditions. Unique combinations will trigger output regarding next steps, such as no action, continued monitoring, or intervention. This tool seeks to standardize the use of data streams so individuals can perform consistent, scientifically defensible site assessments.

Poster

Do Non-Native Seaweeds Harbor Non-Native Invertebrates on the US West Coast?

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1. George Mason University 2. University of Alabama Birmingham.

In the invasion meltdown hypothesis, the negative impacts of multiple non-native species are exacerbated by their interactions with each other. Non-indigenous foundation species, like macroalgae, can harbor fellow non-native invertebrates, possibly aiding and abetting in further spread. We tested this hypothesis by sampling macroinvertebrate communities associated with the invasive red alga *Agarophyton vermiculophyllum* at 15 sites along the west coast of North America from California to Oregon in the summer of 2017. *A. vermiculophyllum* invaded the west coast of North America in the mid-1900s and has since spread to almost every estuary. *A. vermiculophyllum* has provided novel substrate in locations where native species were lacking. At a coarse scale, 30 macroinvertebrate taxa were associated with *A. vermiculophyllum*, including molluscs (snails, mussels, limpets, clams), crustaceans (amphipods, isopods, crabs, mites, insect larvae, shrimp, ostracods), annelids (polychaetes, oligochaetes), cnidarians (anemones, hydroids), bryozoans, and tunicates. Further investigations will identify specimens to species level to determine if any are non-native, and to pinpoint possible origins for selected species. Due to the cryptic nature of many of these organisms, we anticipate uncovering several non-native macroinvertebrates that use the non-indigenous seaweed *A. vermiculophyllum* as habitat, supporting the invasion meltdown hypothesis.

PhD Student; Poster

Ichthyoplankton Assemblage Structures in Gunston Cove, VA - Long-term Trends in a Recovering Tidal Freshwater Embayment

Mueller, Amanda[1], R. Christian Jones[2], Kim de Mutsert[2]
1. Environmental Consulting & Technology, Inc. 2. George Mason University

Gunston Cove, VA, an embayment of the Potomac River, is a tidal freshwater system utilized by anadromous, estuarine, and freshwater species of fish for both spawning and larval development. Historically polluted by point source pollution from a wastewater treatment facility, water quality has improved since nutrient loading from the effluent was significantly reduced, starting in the 1980s. This improvement allowed for a transition from a phytoplankton-dominated ecosystem to a submerged aquatic vegetation (SAV)- dominated ecosystem in the last decade. This study aimed to determine effects of observed trends in environmental quality on ichthyoplankton assemblage structures and abundances. Using data from bimonthly pelagic ichthyoplankton tows conducted since 1993, multivariate statistical approaches were employed to explore relationships between assemblages and environmental variables associated with nutrient loading. A significant difference was found between assemblage structures sampled within the cove during phytoplankton and SAV dominated time periods. Increases in abundance of fish species that utilize SAV habitats for spawning were found to be significant and correlated with decreases in total nitrogen, total phosphorus and total suspended solids. Outcomes from this analysis support an increased understanding of the effects of point source nutrient reduction on the ecology of ecosystems undergoing recovery.

Ignite Talk

Forecasting Future Estuarine Hypoxia using a Wavelet Based Neural Network Model

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1. United States Naval Academy 2. Johns Hopkins University

Ecosystem based modeling and predictions of hypoxia in estuaries and their adjacent coastal areas have become increasingly of interest to researchers and coastal zone managers. Although progress has been made in modeling oxygen dynamics and short-term predictions, there is still a lack of long-term forecasts that incorporate multiple inputs including climatological effects such as El Niño-Southern Oscillation (ENSO) events. In this study, we first develop a hypoxic volume index (HVI) using 26-years of hypoxic volume (< 2.0 mgl-1) measurements from the main-stem of the Chesapeake Bay. Then a cross-wavelet analysis is used to identify input parameters in order to build a neural network model of future hypoxic volume. The time-forward dynamic model uses cross-bay winds along with the Oceanic Niño Index (ONI), and Susquehanna River flow indexes to predict a hypoxic volume index over the next several years. Wavelet analysis indicates an 18-month phase lag between Susquehanna River index and hypoxic volume index. The neural network model yields excellent training, and validation results and reasonable long-term predictions illustrating the usefulness and promise of this approach. Model results could be used as a climatologically based hypoxic volume baseline for comparing actual hypoxic volume response to nutrient load reductions.

Poster

Heterotrophic Spatial Patterns in *Thalassia testudinum* in Ambergris Caye Lagoon, BZ

Murphy, Theresa[1], Ryan J. Woodland[1], Danielle Quill[1], Paul Billeter[2], Cameron Allen[2]
1. College of Southern Maryland / UMCES - Chesapeake Biological Laboratory 2. College of Southern Maryland

Human activities can have a harmful effect on the ecological function of coastal ecosystems. Increased human development can alter the amount of nutrients available to aquatic primary producers, often increasing the concentration of nutrients beyond the assimilative capacity of established primary producer communities, particularly in naturally oligotrophic environments. This influx of nutrients can alter the structure and strength energy pathways with consequences at multiple trophic levels of coastal food webs, including reduced foraging opportunities, linearized trophic pathways and niche collapse. In this project, we conducted a baseline study within the fringing lagoon of Ambergris Caye, Belize, with a goal of analyzing spatial patterns between shore side human development and indicators of nutrient enrichment in the seagrass ecosystem. We used δ13C and δ15N natural abundance stable isotope composition of turtle grass *Thallassia testudinum* as well as turtle grass epiphyte load (mg/cm2) as indicators of local nutrient availability. Preliminary results suggest a general decline in nutrient availability from south-to-north, coincident with the dominant patterns in shore side land use and human population density along the coast.

Undergraduate Student; Poster

Interannual Variability of Marsh Area in Three Locations of the Chesapeake Bay

Newton, Kajsa, Cassie Gurbisz
1.St. Mary's College of Maryland

Coastal marshes are vulnerable to intensifying effects of climate change, including sea level rise and storm events. Marsh loss in response to these stressors can manifest as edge erosion. Loss can be balanced by transgression into adjacent uplands in absence of physical barriers. Although multi-decadal marsh dynamics are well-documented locally in the Chesapeake Bay (CB), less is known about the relative roles of marsh erosion and transgression in CB more recently. This project addresses the following questions: (1) what rates are CB marshes currently changing and how do these rates compare to historic rates? (2) what extent is marsh loss balanced by gains through upland transgression? (3) can changes in marsh area be detected at the annual scale and, if so, what processes drive interannual variability? To address these, we delineated marsh boundaries at three locations in CB annually from 2002-2017 based on aerial photographs collected through the SAV monitoring program, quantified rates of shoreline change and upland transgression using the Analyzing Moving Boundaries in R (AMBUR) package, and compared these rates to local meteorological data. We anticipate this study will generate the preliminary data needed to assess the feasibility of similar larger-scale studies covering broader geographic regions.

Undergraduate Student; Poster

Food Web Effects of Water Quality Improvement and Invasive Species (*Ictalurus jurcatus*) Introduction in a Freshwater Tidal Embayment, Gunston Cove, Virginia, USA

Pehrson, Casey, Kim de Mutsert
1. George Mason University

Ecosystem modeling is being used to investigate effects on trophic dynamics of water quality improvement and the introduction of invasive *Ictalurus furcatus* (blue catfish) in a small, freshwater embayment on the tidal Potomac River. Trophic ecosystem models created using Ecopath with Ecosim (EwE) software simulate energy flows between populations, providing a method for the quantitative comparison of the system at snapshots in time. These populations have been monitored by GMU's long-term Gunston Cove water quality and fish community survey, which has documented water quality improvements that followed nutrient load reductions in the 1980s. However, the implications for trophic dynamics and ecosystem function have not been fully investigated. Few freshwater tidal ecosystems, such as Gunston Cove, are represented using ecosystem models, and the proposed research utilizes the existing data set to create "before" and "after" trophic models using EwE. It is hypothesized that post-recovery expansion in submerged aquatic vegetation is associated with increased diversity, however the effects of the invasive blue catfish are yet unknown. Further, indirect trophic implications are difficult to predict. The objectives of the project are to create representations of an ecosystem at different levels of eutrophication, which could be used as a management tool.

Masters Student; Poster

Do No Harm: Noninvasive Analyses of Wetland Plants in a Maryland Estuary

Powell, Dylan
1. St. Mary's College of Maryland

Coastal wetlands are vulnerable to the effects of climate change like sea level rise. Conservation efforts are increasingly focused on mitigating the damage caused by these stressors and enhancing wetland resilience. These efforts require long-term datasets that track the health of a particular ecosystem. Biomass is an established metric for measuring changes in macrophyte primary productivity and wetland health. However, quantifying biomass can be laborious and biased when monitoring efforts document changes in primary production at the same point in space over time. This study aims to establish baseline biomass data for a wetland monitoring project at St. Mary's College of Maryland and develop site-specific relationships between vegetation biomass and non-destructive measures of biomass. For this project, I harvested plant material within 15, 0.5m2 quadrats, measured the length of the 10 tallest shoots of each sample, and weighed dry plant material separated into 10-cm height intervals. I also collected field visual obstruction measurements. These data will be compared with the biomass measurements to determine whether these nondestructive measurements can accurately calculate dry biomass. I anticipate my results will inform future long-term field research at this location and assist in measuring biological responses to climate change and other disturbances.

Undergraduate Student; Poster

Preliminary Analysis of Mysid Habitat Preference in the Chesapeake Bay

Quill, Dani, Ryan Woodland
1. University of Maryland Center for Environmental Science

Mysids (Crustacea; Malacostraca) are an important but comparatively understudied component of the Chesapeake Bay ecosystem. Most existing data on mysids from this region come indirectly from diet studies of predatory fish, general zooplankton monitoring surveys, and laboratory exposure studies. The dietary studies indicate that mysids are often a significant component of the stomach contents of many ecologically and commercially valuable fish species. Not only are mysids dominant as prey in some predator diets, but they also perform the critical ecological function of coupling benthic and pelagic food webs in shallow coastal habitats. Despite their apparent importance to Chesapeake Bay food webs, their distribution, abundance, and trophic ecology are poorly understood. The goals of this project are to determine spatiotemporal patterns in mysid relative density and demographics within the Choptank and Patuxent Rivers, two Chesapeake Bay tributaries. From May to September in 2018, mysids were collected at n=6 river stations and vertical water quality profiles were recorded at n=3 locations per station. Preliminary analysis of water quality data will help inform which variables define habitable or preferred environments for local mysids. Moving forward, this data will be used in statistical models to examine the relationship between mysid densities and habitat conditions.

Masters Student; Poster

The Effect of Herbivory and Nutrient Addition on the Dynamics of the Macroalgae, *Dictyota spp*. on Caribbean Coral Reefs in St. Thomas, U.S. Virgin Islands

Ramseyer, Tanya[1], Teresa Turner[2], Marilyn Brandt[2], Tyler Smith[2]
1. George Mason University 2. University of the Virgin Islands

Caribbean coral reefs are experiencing an unwanted shift from coral to algal domination. Determining the factors leading to algal phase shifts is extremely important for managing the resilience and survival of Caribbean coral reefs. The brown, fleshy macroalgae *Dictyota spp*. (Phaeophyceae, Dictyotales) is abundant on shallow reefs throughout the Caribbean. In this study, factors controlling the growth of *Dictyota* were investigated by varying herbivory (caging) and nutrients (fertilizer addition) over two experiments on coral reefs near St. Thomas, United States Virgin Islands, where *Dictyota spp*. is hyper abundant (>35% cover). Experiment 1 measured *Dictyota* heights and percent cover at three sites (11-20 m) and showed no growth response to nutrient addition and a weak response to herbivory. To confirm results of Experiment 1, an additional caging and nutrient manipulation (Experiment 2) was conducted using the dependent variable, biomass, at one site (14 m depth). This showed a strong negative response of growth to nutrient addition through nutrient inhibition and an equally negative response to herbivory (loss of ~ 50% biomass over 21 days). The inhibitory effect of fertilization on growth was confirmed in a third experiment that showed increasing biomass loss over four levels of increasing fertilizer addition (0, 5, 10, 20 g). Overall, *Dictyota* was not nutrient limited at any sites, and was weakly controlled by herbivore populations. Factors responsible for *Dictyota* abundance on Caribbean reefs may reflect changes altered by overfishing and a reduction in coral cover. This study reinforces the need for essential management protecting coral reef ecosystems and herbivorous grazers from anthropogenic stressors.

Ignite Talk

Long Term Monitoring of Restoration Projects is Crucial for Recognizing Successes, Identifying and Fixing Problems, and Tracking Continuing Threats.

Reilly, Erin, Lora Harris
1. UMCES-Chesapeake Biological Lab.

The dune that separated a freshwater marsh from the Chesapeake Bay at Cove Point, in Calvert County, Maryland was breached during a storm event in 2007. In 2010, Dominion Energy Company closed the breaches, built up the berm, constructed a *Spartina* marsh, and built a riprap revetment and breakwater system to protect the project. As part of their commitment to the project, a plan for long term monitoring of the restoration project was developed that includes surveys for vegetation, water quality, elevation and imagery. Documenting the project after the initial restoration was crucial for identifying when goals have been met, such as identifying that it took 3 years for the planted vegetation to spread fully. Long term monitoring also allows for adaptive management to occur, such as when we identified that one of the 1-way valves was damaged, allowing water from the bay into the freshwater section of the marsh at high tide. Elevation transects show that the success of the restoration is threatened by erosion south of the breakwaters. This coincides with the locations of 2 overwash events in 2017 and 2018.

Poster

Is the Genie Out of the Bottle? The Spread of the Introduced Species, *Hermundura americana* (Polychaeta:Pilargidae), Throughout the Chesapeake Bay

Rodi, Anthony[1], Daniel M. Dauer[1], Roberto Llanso[2], Suzanne Arcuri[2]
1. Old Domonion University 2. Versar, Inc.

In 2009 the pilargid polychaete, *Hermundura americana*, was first recorded in the Chesapeake Bay at a single location in the Southern Branch of the Elizabeth River. Previously this species was only reported from the Gulf of Mexico. Over the next two years it became well established throughout the Southern Branch. In 2012 *H. americana* was found at a single location in the James River. By 2014 it had spread to much of the James River from the polyhaline to the oligohaline salinity zones in both muddy and sandy sediments. Although it is well established in these two Chesapeake Bay tributaries, *Hermundura americana* had not been found in any other location in the Bay through 2017. The mouth of the Chesapeake Bay appears to be a circulation or salinity barrier to its dispersal throughout the rest of the Chesapeake Bay. In 2018 *H. americana* was found at three locations in the upper Chesapeake Bay at a distance greater than 125 km from the James River. Now that it has been found beyond the presumed barrier of the Bay mouth, *H. americana* is likely to become established throughout the Chesapeake Bay.

Poster

Genetic Diversity of Eastern Oysters from Wild and Restored Reefs in the Chesapeake Bay

Ryan, Dana, Laura Eierman
1. SUNY Cortland

The eastern oyster is a keystone species and ecosystem engineer that creates habitat for over 200 species. The Chesapeake Bay oyster population is approximately 1% of its historical size. In response, restoration programs have sought to reestablish oyster populations by outplanting hatchery-produced oysters onto the reefs. However, captive breeding may cause a loss in genetic diversity in the reestablished population. A loss in genetic diversity can hinder the ability of a population to adapt to environmental changes. Our objective was to compare the genetic diversity among four oyster reefs: two wild reefs and two restored reefs, with a pair of reefs (wild and restored) from each shore of the Bay. We extracted DNA from 30 oysters per reef and amplified twelve microsatellite loci to genotype each oyster. We then completed an ANOVA to compare genetic diversity among the reefs. The results obtained will be used to assess how broodstock are selected to be used in the hatchery for restoration programs.

Undergraduate Student; Poster

Influence of Sea Level Rise on Saline Marsh Retreat and Succession

Sacatelli, Rachael
1. Rutgers Unviersity

By the end of the 21st century, more than 90% of the world's coastlines will experience sea level rise. Sea level rise changes surface water inundation and groundwater levels, which affect the health and distribution of the saltwater tidal marsh vegetation. Saltwater tidal marsh vegetation relies on the ebb and flow of the tides to maintain a very delicate zonal distribution. In the Mid-Atlantic region of the United States, native grass halophytes dominate regularly inundated marshes. The non-native common reed, *Phragmites australis,* now occupies the upland edge of most of these saline wetlands. Previous aerial studies have suggested that *P. australis* has done particularly well with ecological changes driven by sea level rise. By way of salt intrusion or inundation, sea level rise fuels the mortality of shrubs or trees fringing the salt marsh. This mortality provides an opportunity for the invasion of *P. australis* into the open space. We calculated rates of *P. australis* movement over time in saltwater tidal wetlands in New Jersey using historical aerial imagery to quantify the successional movement on the marsh and find relationships between such movement and inundation and ground water levels. The patterns observed using the aerial imagery help us understand how the saltwater tidal marshes are changing as sea level rises and what role *P. australis* plays in those changes.

Masters Student; Poster

Impacts of Intense Algal Blooms on the Cycling of Dissolved Organic Matter and Benthic Metabolism in the Lower York River Estuary

Sacks, Joshua[1], Mark Brush[2], Iris Anderson[2]
1. The College of William & Mary 2. Virginia Institute of Marine Science

The lower York River Estuary experiences annual sequential algal blooms by the species *Margalefidinium polykrikoides* and *Alexandrium monilatum*, which greatly increase production of dissolved organic matter (DOM) and may impact benthic microbial metabolism. To characterize the composition and lability of the DOM pool produced by these blooms, water from cultures of both species was filtered and incubated for two weeks in the light and dark, with a microbial inoculum added after one day. Water samples were collected throughout the incubation. To assess the impact of the blooms on benthic metabolism, cultured cells from both species were suspended over sediment cores collected from the York River and incubated for six hours. Water samples from both experiments were analyzed for total dissolved organic carbon, dissolved inorganic carbon, chromophoric dissolved organic matter, and spectral slope ratios. The results suggest that bloom species alter the quantity and composition of DOM present in the water column, and that both photodegradation and microbial decomposition play a role in degrading the DOM. The blooms do not appear to affect benthic microbial metabolism on short timescales. This study provides a basis for modelling the impacts of algal blooms on DOM cycling in the York River.

Undergraduate Student; Oral

Varying Maturity Schedules of River Herring Spawning in Tributaries of the Chesapeake Bay

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1. George Mason University 2. Smithsonian Environmental Research Center 3

An important tool of fisheries management is the use of a reproduction schedule of spawning adults to determine when, how often, and how many spawning events occur for any given species. Previous research has shown that male river herring mature before females at 3 to 4 years old and individuals can also spawn multiple times with lifespans reaching 7 years. The purpose of this study was to examine maturity and spawning strategies of adult river herring returning to Chesapeake Bay tributaries to spawn. River herring were collected during spawning runs from seven Chesapeake Bay rivers (Chickahominy, Choptank, James, Nanticoke, Potomac, Rappahannock, and Susquehanna). Otoliths and scales were used to determine the age of each individual and spawning characteristics. Chi-square tests were employed to determine if the frequency of each sex and virgin versus repeat spawner differed. Maturity schedules were analyzed using multinomial distribution models and maximum likelihood methods to determine the probability of maturation at each age. Preliminary results show populations in the Potomac and Nanticoke Rivers have more repeat spawners. Also, the populations in the Potomac River show females maturing before males. Understanding the frequency at which individuals spawn allows for better estimation of spawning stocks in future years.

Poster

Investigation of Tidal Marsh Drowning

Scott, Tyler
1. St. Mary`s College of Maryland

Marshes are a valuable component of coastal ecosystems. However, they are also vulnerable to sea level rise (SLR), particularly if local sediment supply is insufficient to support vertical accretion. Long-term monitoring is necessary to track marsh responses to SLR and develop response plans, if appropriate. The main goal of this project was to establish long-term marsh monitoring plots and collect baseline data in a salt marsh located on the campus of St. Mary's College of Maryland. In addition, we observed that marsh condition differed (hummocky and soft vs. flat and firm) on opposite sides of the tidal creek that intersects the marsh. Therefore, we also aimed to determine whether differences in sediment properties or accretion rates could account for this apparent difference in marsh condition. To address these goals, we established 20 0.25 m2 quadrats along four transects laid perpendicular to the tidal creek. Within each quadrat, we measured sediment accretion rates using feldspar marker horizons, plant species composition and density, and sediment grain size and organic content. We anticipate that our results will inform future marsh monitoring efforts at this site and help explain locally variable marsh responses to environmental stressors.

Undergraduate Student; Poster

Of Plastic Nurdles and Hungry Dolphins in the Tidal Potomac River

Sklarew, Dann
1. George Mason University

The plastic stuff we drop, by accident or by design, litters our campus streams and drifts downward with every snow melt and every passing summer storm. Along the way, it gets crushed and shredded and broken up into little pieces no larger than Styrofoam pellets, little nurdles.

Threatened migratory fish, already decimated by overfishing and habitat destruction, pass through our microplastic debris fields as they travel upstream from the ocean to breed in our watershed. Rippling schools of river herring and shad – even a huge and now extremely rare Atlantic sturgeon returnee – may swallow or breathe this debris in through their gills. The nurdles don't necessary pass through the fish.

Crews of majestic, frolicking bottlenose dolphins chase these fish schools, enjoying our estuary's local sashimi (albeit potentially laced with plastic metabolites). If and when these fish populations rebound as a result of our several decades of Chesapeake habitat restoration, our recently launched fishing moratoriums and growing trash management and climate action movements, both dolphin visitors and human denizens of the Potomac watershed should be the beneficiaries. We once again will share the bounty and the beauty of a healthy Potomac River ecosystem across at least two thriving, sentient species.

This presentation introduces nascent PEREC studies of microplastics and dolphin migration in the tidal Potomac River, with hopes of catalyzing collaboration on these topics with nearby and like-minded estuarine researchers.

Ignite Talk

Tidal Marsh Vulnerability to Rising Sea Level Along the Southern Coast of North Carolina: A 30-Year Record of Change

Solohin, Elena
1. Indiana University

Tidal marshes are increasingly threatened by global climate change and anthropogenic activities. Future rates of sea level rise (SLR) and altered sediment supply due to land use change may impact wetland's ability to keep pace with rising seas in the future. We used a combination of in-situ biomass measurements, and remote sensing techniques to estimate how tidal marsh biomass health and resilience has changed over time in a Southeast estuary of Cape Fear River, North Carolina. Aboveground biomass and marsh elevation were measured at 10 sites across the estuary. We established a relationship between in-situ biophysical variables and biomass estimates, derived from remote sensing data. The derived relationship was then calibrated and validated using field measurements for spatio-temporal adjustments and biases. In addition, the study created a time series analysis of Normalized Difference Vegetation Index (NDVI) and then correlated it to climate variables of temperature and precipitation, temperature's seasonality, as well as historical sea-level data, and sediment supply. Google Earth Engine (GEE), a cloud computing platform, was used to process 500 Landsat scenes acquired between 1986 and 2017 for the period from June to October, and approximately 100 Sentinel-2 images. In addition, we used the Margin change Quantification Tool to quantify the marsh margin changes in the last 30 years.

PhD Student; Oral

Nekton Monitoring to Assess Beneficial Reuse of Dredged Material in Salt Marsh Restoration

Szczepanski, Jack, Robert George, Thomas Hopper
1. Princeton Hydro, LLC

Salt marsh restoration projects are implemented in many coastal areas, but the influence of salt marsh enhancement efforts on nekton communities is poorly understood. Nekton, classified as free-swimming fish, shrimp, and crabs, use various habitats within the marsh at different stages of their life history. Different restoration efforts may impact the nekton community in different ways. One method of marsh restoration involves application of a thin layer of uncontaminated dredged material to areas of the marsh that exhibit stress relative to decreased elevation. This new thin layer of dredged material increases the elevation of the marsh plain but also fills in large and expanding ponds and pannes associated with subsidence. Changes to other marsh features, including carbon cycling, water depth, and tidal movement, could also influence habitat use by nekton. Surveys were conducted to examine nekton assemblages during the 2017 growing seasons at this layer placement sites in Avalon and Fortescue, NJ. Species richness and density were compared between sites at both locations that were enhanced and those that weren't. Richness was not greatly affected by enhancement while there was some variation in species density at Fortescue. Both richness and density varied between control and enhanced sites in Avalon.

Poster

Seasonal, Inter-annual and Longitudinal Patterns in Estuarine Metabolism Derived from Diel Oxygen Data

Tassone, Spencer, Paul Bukaveckas
1. Virginia Commonwealth University

Twenty-three station-years of diel oxygen measurements (~800,000) for the James River Estuary were analyzed to characterize seasonal, inter-annual and longitudinal patterns of ecosystem metabolism (Gross Primary Production, Respiration, and Net Ecosystem Metabolism). Seasonal patterns in GPP and R tracked water temperature and PAR, with large (3-5 fold) differences between winter and summer months, except during high discharge events when metabolism declined by 40%. Inter-annual differences were small by comparison to seasonal variation. Longitudinal patterns of increasing GPP and R, and decreasing NEM, were observed with increasing salinity. Inferences regarding net autotrophy and heterotrophy showed positive estimates of NEM at the chlorophyll maximum (tidal fresh segment) and negative values for the saline portion of the estuary. Overall, the James River Estuary had a negative area-weighted NEM over the 3-year period when data for all segments were available and that seasonal variation in metabolism was largely driven by water temperature and PAR. The relative importance of allochthonous inputs (based on inferred R at GPP=0) indicate that R was largely supported by autochthonous production.

Oral

Stream Geochemistry and Land Use in Northern Virginia

To, Holly, Gregory Foster
1. George Mason University

Major ions in surface waters typically include sodium, potassium, calcium, magnesium, chloride sulfate and carbonate-bicarbonate. These ions are derived naturally from the weathering of geologic solids, such as igneous rock, carbonates and clay minerals. The proportions of major ions in stream water can be altered significantly by land use, especially in urban watersheds. For example, road salt in winter produces enhanced concentrations of sodium and chloride ions, which can impact water quality. Stream water was collected in six drainage basins in the northern Virginia region that discharge into the tidal Potomac River to test the hypothesis that urban watersheds (>40% urban/suburban land use) have much greater altered proportions of major cations and anions in stream water relative to pristine watersheds. Water samples were collected biweekly to monthly in plastic bottles and returned to the laboratory for analysis. The water was analyzed initially for pH, electrical conductivity, turbidity, alkalinity and total suspended matter. Subsequently, more detailed analysis of major ions in the water samples was performed using ion chromatography. Chemical analysis showed substantially varying water chemistry among the watersheds seasonally. Urban streams showed elevated levels of suspended sediment, sodium ions and chloride ions, indicating anthropogenic pollution altered the natural geologic weathering profiles of the major ions. The water chemistry of urban watersheds shows seasonal NaCl correlations with land use, and that water changes more substantially relative to less developed watersheds.

Undergraduate Student; Poster

Fish Habitat and Passage Assessment of American Eel (*Anguilla rostrata*) in Chesapeake Bay Tributaries

Walker, Nicholas, Vivek Prasad, A. Dolloff, Kim de Mutsert, A. Alonso Aguirre
1. George Mason University

American Eel (*Anguilla rostrata*) are a long-lived, migratory species capable of inhabiting more habitats than any other diadromous fish in North America. The Chesapeake Bay historically had the largest harvest of yellow stage (adult) eels. We compiled over a century of observations of American Eel occurrences along with the presence of dams (counting only those without fish passage) and land/water use to suggest prioritized areas for further studies. Eel abundance was based on density (eels/km2), summing the results upstream to downstream, while dams were calculated downstream to upstream. Land/water use considered water, plant cover, barren areas and impervious surfaces. We delineated 24 Bay-tributary watersheds based on digital elevation models and divided each of these into subwatersheds when the mainstem was longer than 50 km. This work was inspired by the Nature Conservancy's Fish Habitat Decision Support Tool but uses its own data and ArcGIS model. Results suggest the upper reaches of the Potomac and Nanticoke rivers are good candidates for further study. Fewer than 2% of the dams in the studied area have fish passage provisions. Sections of the James and Rappahannock rivers may have seen a decrease in eel densities although this could be due to sampling bias.

PhD Student; Oral

Using Acoustic Indicators to Assess Habitat Quality of Oyster Mariculture and Wild Reefs

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Oyster reefs provide high-quality habitat to fish and invertebrate species, offering refuge, food, and settlement space. Centuries of harvest and disease pressure have left oyster reefs depleted, leading to cultivation of oysters through mariculture. Within estuaries, physical structure of individual habitats likely causes differences in their soundscapes, which have been demonstrated to influence community structure and oyster settlement. To quantify this variability, we took acoustic samples of both an intertidal and a subtidal site to characterize soundscapes of oyster reef, oyster mariculture, and mudflat habitats. We hypothesized that due to increased presence of invertebrates and fishes, wild reef and mariculture habitats would project higher sound pressure levels (SPLs) than mudflat habitats. During the summer season, mariculture and reef SPLs were significantly higher than mudflat SPLs. Frequency band analysis indicated that the presence of snapping shrimp and invertebrates at mariculture and reef habitats caused this difference. However, no significant differences were observed in the fall or winter periods, indicating a seasonal dependence. These findings support earlier research on wild reefs and present a previously unquantified account of oyster mariculture soundscapes. Similarity of soundscapes between reef and mariculture habitats suggests a new indicator of habitat value of oyster mariculture in estuarine environments.

Undergraduate Student; Poster

Assessing Changes to Rainwater Nitrogen Delivery in Sussex County, Delaware

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Nitrogen is both an essential nutrient fueling primary production, fisheries, and healthy ecosystems and, when delivered in excess, a pollutant implicated in estuarine eutrophication worldwide. At the watershed scale, point (e.g., wastewater) and non-point (e.g., agriculture, run-off, atmospheric deposition) nitrogen sources are targeted for reduction to minimize negative impacts on estuaries. Historically, atmospheric deposition accounts for ~15-25% of nitrogen loadings to the Delaware Bay and its sub-estuaries. Rainwater samples were collected on an event basis at an NADP site in Lewes, DE from 1993-2016. Over that span, fossil fuel emissions policies and technology have reduced nitrate emissions and rainwater concentrations (mean [NO3-]2016 = 45% mean [NO3-]1993) considerably. Concurrently, Sussex County, Delaware has seen a ~75% increase in population, increased seasonal tourism, and the conversion of much of its agricultural land to residential and commercial use though rainwater ammonium [NH4+] concentrations show no detectable change. How these land-use and emissions changes have impacted the quantities and characteristics of organic nitrogen (~21-44% of the total dissolved nitrogen pool) is unknown. Rainwater samples were collected in the fall and winter of 2018-2019 to characterize rainwater dissolved organic nitrogen for comparison to previous work. Implications for nitrogen delivery to Delaware waters will be discussed.

Poster

How is the Genetic Variation of a Blue Crab Reovirus Affected by Geography and Host Life History?

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The blue crab, *Callinectes sapidus*, inhabits both temperate and tropical estuaries of the western Atlantic, along which it exhibits a variable life history of either seasonal or year-round activity. Crabs throughout this range are host to a crab-specific reovirus 1 (CsRV1) at varying prevalence. Little is known about how populations of marine pathogens are connected over oceanographic distances, or how host life history affects pathogen-host interactions. To begin to understand pathogen population connectivity across this range, we identified CsRV1 infections from crabs from Massachusetts to Uruguay and investigated the genetic variation of one segment of the CsRV1 RNA genome. Phylogenetic comparisons revealed genotype clustering of CsRV1 genotypes in accordance with their geographic origins. Greater nucleotide variability was found among virus strains from subtropical and tropical locations than from temperate locations, and comparison of protein translations showed similar differences. The fact that CsRV1 genetic variability changes with latitude suggests that geography, climate or host life history may contribute virus genome evolution. The next step is to analyze the whole CsRV1 genomes, for a more complete understanding of virus and host population structure and to identify possible patterns of gene flow driven by oceanographic forces, animal behavior, and life history.

PhD Student; Oral

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