RHODE ISLAND CONSORTIUM FOR
Coastal Ecology
Assessment
Innovation &
Modeling

SOUND BITE ABSTRACTS

The interplay between sediment nutrient cycling and microbial communities in seasonally hypoxic basins. Katherine Bell, Graduate Student, University of Rhode Island

We have done work with both sediment coring/profiling and benthic lander deployments to explore the relationships between benthic nutrient cycling, microbial communities, and hypoxia. Relationships between these three factors have been explored in Greenwich Bay, RI and the Gulf of Mexico.

Collaboration in the Arts and Sciences. Georgia Rhodes, Staff/technician, Rhode Island School of Design

A primer and update of current research at the RISD Nature Lab.

Once Upon a Data Visualization: Visual Datasets for SimpleChartsRI. Sean Khang, Undergraduate Student, Rhode Island College

SimpleChartsRI is a web-based data visualization tool that aims for simplicity and accessibility for users. The tool allows users to create charts and graphs through 3 simple steps. It is aimed towards HS STEM teachers and students. It requires no experience in using these types of tools and is free. This year, the tool has updated its sample page, which allows users to access quick datasets, enabling teachers to use it to complement their real-time lessons in the classroom. The reason for creation is to provide teachers with an easy tool for chart and graph creation as well as an interactive tool to use in the classroom. Another is for students to gain early exposure to data science, data analytics, and data visualizations. Many careers are seeking future employees with these abilities, and with the help of this tool, students will gain just that.

Assessment of a sediment process-based ecosystem model with in-situ benthic flux data in Narragansett Bay. Jongsun Kim, Post-Doc, University of Rhode Island

Our modeled sediment-water nutrient fluxes are compared with in-situ measurements from Narragansett Bay (NB) to validate the performance of the new sediment processes model. Comparisons of model results from different regions of NB indicate that the degree to which sediment processes influence ecosystem function is spatially variable.

Different bacterioplankton groups encode diverse metabolic pathways that provide a reservoir of biochemical processes involved in marine biogeochemical cycling. The complexity of biochemical connections, however, poses challenges in the visualization of metabolic systems and the accessibility of visualizations to a general audience. Here, we developed a web-based visualization portal for the interactive representation of complex metabolic networks. This web application was applied to visualize the metabolism of a key species known to respond to algal blooms at the Narragansett Bay. Further application of this web-based portal will enable the visualization of fundamental biological and biochemical processes related to the ecological health and provide accessibility of this information to a broader audience of scientists interested in studying the Narragansett Bay.

Development of a web-based visualization portal for the interactive representation of complex metabolic networks. Christopher Powers, Graduate Student, University of Rhode Island

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A Spin-Coated Hydrogel Platform Enables Accurate Investigation of Immobilized Individual Single-Walled Carbon Nanotubes. Matthew Card, Graduate Student, University of Rhode Island

Semiconducting single-walled carbon nanotubes (SWCNTs) have been used extensively as near-infrared sensors due to their unique optical properties. It is desirable to improve these sensors by approaching single molecule analyte detection using isolated SWCNTs. It is well known that SWCNTs are very sensitive to their surrounding environment, and methods of obtaining individual SWCNTs such as glass deposition can induce spectral heterogeneity. In this work, we have designed a novel spin coated hydrogel platform that mitigates SWCNT interactions with the surrounding environment, recapitulating fluorescence properties from similar solution-based sensors. The SWCNTs can then be functionalized with DNA, aptamers, and polymers to sense phosphate, nitrate, and heavy metals in the surrounding environment at relevant concentrations.

The RI-CAIM Smart Bay: Real-time monitoring of Narragansett Bay utilizing remote sensing platforms. Kristofer Gomes, Post-Doc, University of Rhode Island

Autonomous buoy platforms have been deployed within Narragansett Bay, located at GSO's Long-Term Plankton Time Series site and the mouth of Greenwich Bay. These systems can measure physical, chemical, and biological conditions at high-temporal resolution, and are coupled with a telemetry system for real-time data analysis. Data generated from these buoys are publicly available, providing real-time monitoring of Bay conditions, and supporting modeling efforts to better understand and forecast events driven by physical, chemical, and biological processes, including the formation of phytoplankton blooms. Remote sampling platforms will be deployed during the summer of 2022 for high frequency collection of filtered samples and triggered during forecasted phytoplankton blooms. Data generated from these samples will improve our understanding of short time-scale changes in phytoplankton gene e

Fabrication of Low-Cost SERS sensors for the detection of Nitrite. Robert Chevalier, Graduate Student, University of Rhode Island

As we continue our work on developing a selective SERS sensor for the detection of Nitrite in seawater via Surface-Enhanced Raman Spectroscopy (SERS) and selective surface chemistry, an important step in our work has been investigating the fabrication of low-cost SERS substrates. Our development of in-house SERS substrates that are more suitable for our work compared to what is commercially available, will clear up some questions we've been having about our surface chemistry, specifically is our problem the chemistry? or the substrate?

Decadal trends of the neurotoxin-producing diatom Pseudo-nitzschia in Narragansett Bay, Rhode Island, USA. Katie Roche, Graduate Student, University of Rhode Island

In 2016-17 in Narragansett Bay (NB), Rhode Island, USA, shellfish harvesting closed for the first time due to the presence of domoic acid (DA), a neurotoxin produced by diatoms within the Pseudo-nitzschia (P-n) genus, despite P-n being previously observed for 50 years in NB in the Long-Term Plankton Time Series (NBPTS). This study investigates whether the 2016-17 NB HABs were caused by shifts in P-n species composition and/or environmental conditions to aid in prediction of future DA events. Species composition, chemical, and physical data were compared in samples from the NBPTS site during three time periods: prior to the HAB events, during the two closure years, and subsequent years. This allows us to understand the historical trends in P-n species composition and the impact of shifting thermal and nutrient regimes on the occurrence of HABs.

Biofouling of Marine Sensors. Kayla Kurtz, Graduate Student, University of Rhode Island

This presentation will discuss the biofouling potential of marine sensors in Narragansett Bay. Both natural biofilms and model biofouling organisms have been investigated. Commercial and in-house sensors were compared.

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Seasonal and Algal Bloom-Mediated Bacterioplankton Dynamics in the Narragansett Bay. Zachary Pimentel, Graduate Student, University of Rhode Island

Bacterioplankton are fundamental players in biogeochemical cycles and are great sensors of physicochemical changes in the ocean. In this research, we present year-round observations of bacterial community dynamics at the Narragansett Bay Long-Term Plankton Time Series. A seasonal-mediated community shift was identified along with nutrient variability. A historically large algal bloom provided an opportunity for the characterization of bloom-responding bacterioplankton. Further documentation on the dynamics and function of bacterial communities in the Bay will set the stage for modeling their contributions to this important ecosystem.

Metabarcoding reveals diatom community is temperature dependent in Narragansett Bay. Diana Fontaine, Graduate Student, University of Rhode Island

Diatoms are key phytoplankton in marine environments, contributing 40-50% of marine primary production. The influence of particular species on marine ecosystem function can be difficult to identify because diatoms have a wide size range and can be morphologically cryptic. We employed a metabarcoding approach to capture the extent of diatom diversity and its environmental drivers in NB, where diatoms dominate phytoplankton biomass. Although metabarcoding was an inadequate means to determine relative abundance, it provided significant insights into diatom diversity in the time series, revealing 11 genera not previously observed with microscopy. Many of the newly identified genera occurred frequently and were comprised of small diatoms missed with microscopy. Their frequent occurrence suggests they may be more important contributors to phytoplankton communities than previously recognized.

Thermal trait variation among phytoplankton taxa

Tatiana Rynearson, Faculty, University of Rhode Island

Marine phytoplankton generate half of global primary production, making them essential to ecosystem functioning and biogeochemical cycling. Though phytoplankton are phylogenetically diverse, studies rarely designate unique thermal traits to different taxa, resulting in coarse representations of phytoplankton thermal responses. Here we assessed phytoplankton functional responses to temperature using empirically derived thermal growth rates from four phytoplankton functional types. Our data suggest phytoplankton functional types may be characterized by different thermal traits. Using modeled sea surface temperatures for 1950-1970 and 2080-2100, we identified taxon-specific projections of growth and geographic distribution, with low-latitude coccolithophores facing considerable decreases and cyanobacteria substantial increases in growth rates. These results suggest that the singular effect of changing temperature may alter phytoplankton global community structure, owing to the significant variability in thermal response between phytoplankton functional types.

Long-term changes in Narragansett Bay phytoplankton community composition. Patricia Thibodeau, Post-Doc, University of Rhode Island

I will show preliminary results analyzing long-term trends of phytoplankton community data regarding changes in abundance and timing for diatoms and dinoflagellates.

Bringing Scientists Back to School. Sonia Refulio-Coronado, Graduate Student, University of Rhode Island

Middle school classroom initiative engaging postsecondary researchers, a RI C-AIM action led by C-AIM's student and post-doc liaison.