SURFO Initial Presentation Abstracts and Schedule

Corliss Auditorium
9:00 – 12:00 AM
Thursday, 30 June 2022

TABLE OF CONTENTS

Graduate School of Oceanography 2022 SURFO Initial Presentations

June 30, 2022, 9:00 AM – 12:00 PM
Corless Auditorium

Seminar Abstract

Jon Carter

DESIGNING A STREAMLINED SONAR ATTACHMENT FOR THE HERON AUTONOMOUS SURFACE VEHICLE

The Heron Autonomous Surface Vehicle (ASV) is a remotely controlled robot that glides along the ocean surface to collect specified forms of data. Frequently, the Heron ASV collects SONAR data to map the ocean floor. SONAR transducers can be mounted to the Heron ASV using simple nut and bolt attachments, but this creates substantial drag and worsens user interface. An aerodynamic outer shell can alleviate drag while providing an aesthetic quality to the transducer. Additionally, a latching deployment mechanism contributes to a better attachment and user experience. The aerodynamic shell was designed in Fusion 360, a computer animated design (CAD) software, then 3D printed and attached to the SONAR transducers. The latching mechanism was tested using slide-bolt latches. The completed Heron ASV with streamlined SONAR attachments will be tested in the field once construction is complete.

Jon Carter will enter his senior year at Duke University in fall of 2022. He is majoring in Biomedical Engineering and minoring in visual arts. Mingxi Zhou is his advisor, and he is working in the Smart Ocean Systems Laboratory.

Graduate School of Oceanography

2022 SURFO Initial Presentations

June 20, 2022, 9:00am – 12:00pm, 1:00pm-3:00pm

Corless Auditorium

Arnaldo Díaz Martínez

DYNAMICS OF NUTRIENT LIMITATIONS AND GRAZING CONTROLS OF PHYTOPLANKTON IN THE NARRAGANSETT BAY DURING SUMMER

Phytoplankton are vital microscopic organisms that are not only critical to the base of the marine food web but also are the basis of the biogeochemical carbon cycle in the oceans. Through photosynthesis, they contribute to more than half of the primary productivity in the aquatic environment. Light availability, temperature and nutrients affect phytoplankton communities and in temperate coastal areas, these factors are subject to substantial change by seasonal and spatial shifts. For this purpose, we aim to investigate the nutrient limitation and grazing control in the phytoplankton communities of Narragansett Bay during Summer 2022. By utilizing the dilution method, we will estimate phytoplankton growth and grazing by microzooplankton to better understand the effect of nutrient limitations in the Bay during the summer. The effect of individual nutritive elements, such as nitrate, silicate, and phosphate on phytoplankton growth and microzooplankton grazing is still poorly constrained. The Narragansett Bay Long Term Plankton Time Series will provide us a better understanding of the different nutrient stocks present in the Bay and their variability. We will take into consideration the in-situ variability of the nutrient stocks and connect it to our phytoplankton growth and microzooplankton grazing observations. The results will provide a better understanding of the role of individual nutrient stocks on the changes observed in the phytoplankton communities that are vital to the overall productivity in Narragansett Bay.

Arnaldo Díaz Martínez will enter his 5th year at the University of Puerto Rico in Mayagüez for the fall semester of 2022. He is majoring in general Biology with a concentration in marine sciences. Dr. Susanne Menden-Deuer is his SURFO advisor and Andria Miller is his SURFO mentor.

Graduate School of Oceanography 2022 SURFO Initial Presentations

June 30, 2022, 9:00 AM – 12:00 PM, 1:00 PM - 3:00 PM
Corless Auditorium

Seminar Abstract

Nathan Gonzalez

ASSESSING SHORELINE EROSION USING DIGITAL ELEVATION MODELS DERIVED FROM PHOTOGRAMMETRY AND BATHYMETRY MODELS

Access to consistent above-to-below tide digital elevation models (DEMs) of the shoreline are vitally important in understanding coastal erosion, especially for coastal communities that may be predisposed to flooding and other dangers. High-definition DEMs make tracking the changing shape of the coastline feasible and can help inform sustainable coastal infrastructure. In order to construct DEMs of different beaches around Narragansett Bay, data will be gathered conducting surveys using a low-cost unmanned surface vehicle (USV) with an attached single beam echo sounder (SBES) as well as an unmanned arial vehicle (UAV) using a high definition camera. Fusing the SBES data with the UAV-based photogrammetry, DEMs will be generated across the data sets. However, fusing the two data sets is particularly difficult because they are of vastly differing resolutions. MATLAB, and other softwares, will be used to develop a process for this fusion that will result in high-definition DEMs. The softwares used to process the photogrammetry and bathymetry data are the Geographic Information System (GIS) ArcMap 10.8 and Agisoft Metashape Professional. Over time as more data is collected, current and previous DEMs will be compared to provide accurate predictions of the rapidly changing coastline.

Nathan Gonzalez will be entering his Junior year at Gordon College in Wenham, MA in fall 2022. He is majoring in Applied Physics and Mathematics with a concentration in Engineering Physics. This summer, he is working in the Robotics Laboratory for Complex Underwater Environments (RCUE) under the advising and mentorship of Dr. Stephen Licht.

Graduate School of Oceanography
2022 SURFO Initial Presentations

June 30, 2022, 9:05 AM – 11:53 AM
Corliss Auditorium

Seminar Abstract

HuxleyAnn Huefner

EFFECTS OF COLD-WATER CORAL RUGOSITY AND PATCH LENGTH ON NEAR-BED FLOW PATTERNS

D. pertusum is the primary reef-building coral species of the deep but the depth at which they live makes them difficult to study. Though there have been flume studies, none have specifically looked at patch length or had such rigorously quantified rugosity estimates. This experiment aims to evaluate how rugosity and the length of the reef affect the water flow and thus impact biological processes such as feeding and reproduction. We hypothesize that the differences in upstream vs downstream velocities and turbulence will be greater in a higher-rugosity reef and a longer reef. Coral models will be 3D scanned to obtain detailed structure estimates including surface area to volume ratio, density, and height. Coral models will be placed in an experimental flume, where velocity and turbulence metrics will be measured directly upstream and downstream of each coral structure using an acoustic doppler velocimeter (ADV). These effects will be compared between a low-rugosity reef and a high-rugosity reef, as well as between reefs of different downstream length, in order to determine the roles that rugosity and patch size may have in flow speed and turbulence between the upstream edge versus the downstream edge of a reef. This experiment will help form a more complete picture of how cold-water corals can alter flow patterns within a colony-to-patch scale, adding to the knowledge base of bio-physical interactions that can inform scientists and managers to better protect critical deep-sea habitats in the future.

HuxleyAnn is from Salt Lake City, Utah and is entering her senior year at Scripps College. She is majoring in biology and minoring in history. Her SURFO advisor is Andrew Davies and her SURFO mentor is Jane Carrick.

Graduate School of Oceanography
2022 SURFO Initial Presentations

June 30, 2022, 9:00 AM to 12:00 PM
Corless Auditorium or ZOOM

MODELING AND EXPERIMENTAL ANALYSIS OF DIFFERENTIAL THRUST ON A LOW-COST, LIGHTWEIGHT UNMANNED SURFACE VEHICLE

Seminar Abstract

Ashley Hutchins

Unmanned surface vehicles are used in a wide variety of commercial, scientific, and military applications. Low-cost, lightweight USVs with open-source, easily accessible hardware and control software can greatly expand the scope and feasibility of coastal research and monitoring. This paper presents a core mechatronic system which is used to create a low-cost, lightweight USV using commercially available drone hardware and software. Two fixed thrusters provide propulsion and rotational moments to enable turning of the USV through differential thrust. A model is developed to evaluate potential thruster locations and orientations sufficient to meet the operational needs of the USV. The utility of the model and the core mechatronic system concept is validated by two different platforms, a stand up paddle board and a bodyboard. Experimental testing under various wind conditions will refine the model to verify these potential thruster locations on each platform. This defines a standard set-up, operational procedure, and experimental protocols to deploy the core mechatronic system on these platforms and similar ones in the future.

Ashley Hutchins is a returning University of Rhode Island student with a degree in Ocean Engineering finishing a degree in Marine Biology by Spring 2023. Dr. Stephen Licht is her SURFO advisor. Roy Gilboa and Greg Bales are her SURFO mentors.

Graduate School of Oceanography
2022 SURFO Initial Presentations

June 30, 2022, 9:00 AM – 12:00 PM, 1:00 PM – 3:00 PM
Corless Auditorium

Seminar Abstract

Kayli Matsuyoshi

IMPROVING THE GNSS-IR METHOD TO MEASURE SEA LEVEL RISE

Sea level height remains an essential component of climate change, tsunami surge, and wave propagation models. As a result, there is a growing need to monitor changes in sea level accurately, frequently, and at low cost. This can be accomplished using Global Navigation Satellite System interferometric reflectometry (GNSS-IR). A GNSS receiver's signal-to-noise ratio data captures direct satellite signals and signal noise reflected off the surface of an adjacent body of water. Reflected signals are isolated to derive the distance from the land-mounted GNSS antenna to the water surface, and thus sea level at the receiver's location. This method adds the benefit of a fixed terrestrial reference frame, creating the potential to complement and calibrate existing tide gauge measurements. To strengthen the GNSS reflectometry method, signals from a suite of satellite constellations are utilized to calculate sea level over three months at a GNSS receiver in Newport, Rhode Island. Previous work performing computations with only the US GPS and Russian GLONASS satellite constellations demonstrated little improvement in matching tide gauge measurements. By including European Galileo satellites and Chinese BeiDou satellites in the method, significant improvements in accuracy and temporal resolution are expected.

Kayli Matsuyoshi will be entering her senior year at the University of California, San Diego in the fall of 2022. She is majoring in oceanic and atmospheric sciences at Scripps Institution of Oceanography and minoring in mathematics. Her SURFO advisor is Dr. Meng (Matt) Wei and her SURFO mentor is Sandra Slead.

Graduate School of Oceanography
2022 SURFO Initial Presentations

June 30, 2022, 9:00 AM – 12:00 PM
Corliss Auditorium

Seminar Abstract

Rhiannon Moore

MAPPING BIOGEOCHEMICAL CYCLING OF CARBON AND NITROGEN IN THE NORTHWEST ATLANTIC OCEAN

The distribution, movement, and cycling of marine nutrients is key to understanding animal migrations, food web dynamics, and ecosystem health. However, the biogeochemical processes underlying nutrient transport are difficult to observe directly. Bulk isotope methods can be used to measure nutrient cycling across broad spatial areas. This study seeks to examine the geospatial variation in carbon and nitrogen in the continental shelf of the Northwest Atlantic Ocean, from the Mid-Atlantic Bight to the Gulf of Maine. It is hypothesized that coastal regions will have stable isotope values influenced by terrestrial primary production and anthropogenic nitrogen, and latitudinal isotope trends will be influenced by changing plankton communities and temperature. We hypothesize that nitrogen isotopic ratios will follow a gradient from high to low as distance from anthropogenic nitrogen sources increased, and that the baseline carbon source will increase further offshore due to a decrease in available terrestrial production. Zooplankton will be collected across the U.S. northeast continental shelf, and bulk-tissue stable isotope analysis will be used to determine the $\delta^{15}N$ and $\delta^{13}C$ values at each site. These data will then be used to create a generalized additive model (GAM) of the relationship between isotopic variation and latitude, longitude, and water depth. Results from this project characterize the biogeochemical processes of the continental shelf of the Northwest Atlantic, which can be used to inform future research on animal foraging and migration.

Rhiannon Moore will be entering her senior year at Emory University in Atlanta, Georgia, in fall of 2022. She is majoring in biology and political science. This summer, she is working with advisor Kelton McMahon under the guidance of mentors Catrina Nowakowski and Lindsay Agvent.

Graduate School of Oceanography
2022 SURFO Initial Presentations

July 2, 2022, 9:30 AM – 11:40 AM
Corliss Auditorium or ZOOM

Seminar Abstract

Loreto Paulino Jr

Passive Air Sampling for Outdoor and Indoor Volatile and Ionic PFAS

Per- and polyfluorinated alkyl substances (PFAS) have attracted global attention due to their extreme resistance to environmental degradation in aquatic environments, which leads to high toxic levels of PFAS exposure to humans. Currently there is a growing recognition that air emissions of PFAS, significantly contribute to elevated PFAS exposure to humans. Volatile and neutral precursor PFAS can volatilize from their site of origin into the atmosphere. Source points of these PFAS air emissions have yet to be fully understood; therefore, novel detection tools are needed to detect these volatile PFAS precursors and ionic PFAS within an air medium. Passive sampling has been proven to be an effective detection tool for quantification of gas-phase trace organic contaminants such as volatile PFAS. Here we test the first application of a graphene-based nanosheet as reduced graphene oxide (rGO) film and compare it to three other promising PFAS air sampler sorbent materials: polystyrene copolymer resin (XAD), cyclodextrin, and a modified incinerated algae. Using two different environments with expected high PFAS concentrations: indoor and outdoor settings, the performance of each sampler will be evaluated based on their PFAS uptake. Further research in suitable quality detection tools for PFAS can help pinpoint areas that require immediate attention and emphasize the hazards of PFAS as a whole class rather than only legacy PFAS.

Loreto Paulino Jr is a rising senior at the University of Guam. He majors in Chemistry with a minor in mathematics. His past research experiences revolved around corals and mathematical modelling where he grew to love ocean research. This summer he wants to dive more into chemistry ocean research. Dr. Lohmann is his SURFO advisor and Dr. Becanova is his SURFO mentor.

Graduate School of Oceanography
2022 SURFO Initial Presentations
June 30, 2022
Corliss Auditorium
Seminar Abstract

Margaret Rettig

SPATIOTEMPORAL PATTERNS IN PARASITIC DINOFLAGELLATE (*SYNDINIALES*) DIVERSITY IN THE SUBARCTIC NORTH PACIFIC

Parasitic protists represent important agents of mortality in plankton communities, influencing phytoplankton bloom dynamics, species succession, and host community diversity. One major group of parasites, *Syndiniales,* are ubiquitous across marine environments, often dominating the relative read abundance in global protist communities. Despite their prevalence in plankton communities, the role of parasitism in marine food webs is not well understood. Here, we will analyze *Syndiniales* community composition and diversity using high-throughput sequencing of the 18S rDNA V4 region of water column samples collected during the 2018 North Pacific NASA Export Processes in the Ocean from Remote Sensing (EXPORTS) field campaign. Examination of *Syndiniales* diversity will provide insight into the structure and variation of protist parasite communities and improve our understanding of parasitism in plankton food webs.

Margaret Rettig will enter their junior year at Bowling Green State University in Bowling Green, Ohio in the fall. They are majoring in Marine and Aquatic Biology with a second major in Data Science. Erin Jones is their SURFO mentor and Tatiana Rynearson is their SURFO advisor. This summer, Margaret will be examining patterns in parasitic dinoflagellate diversity using bioinformatic techniques.

Graduate School of Oceanography
2022 SURFO Initial Presentations

June 30th, 2022, 9:00 AM – 3PM
Corliss Auditorium

Seminar Abstract

Elisabeth Sellinger

ANALYZING DOMOIC ACID PRODUCTION OF TOXIGENIC *PSEUDO-NITZSCHIA* SPECIES ISOLATED FROM NARRAGANSETT BAY, RI IN NUTRIENT-LIMITING CONDITIONS

Amnesic shellfish poisoning (ASP) has become an increasingly relevant problem in the last few decades. The onset of ASP illness occurs after consuming shellfish that bioaccumulate in the toxin-producing diatom species *Pseudo-nitzschia (P-n)*. Although not all *P-n* are known to produce the toxin domoic acid (DA), in species that do, certain environmental conditions are thought to trigger DA production, which is a risk for incidences of ASP. Since the first significant outbreak of ASP in 1987 on Prince Edward Island, Canada, *P-n* has been tracked and studied globally. Narragansett Bay (NBay), RI, houses several *P-n* species, some of which produce DA. While diatoms in this genus have existed in this area for many decades, only recently have DA levels reached high enough concentrations to require shellfish harvest closures as seen in 2016 and 2017. Beginning in 2017, after the last closure, the Jenkins lab began weekly sampling from multiple sites in NBay. These samples are used to analyze nutrient levels, phytoplankton cell counts, DA levels, DNA, chlorophyll levels, and to isolate *P-n* monocultures. Using these monocultures, nutrients such as nitrogen, phosphorus, and silica can be varied to affect *P-n* growth rates and evaluate DA production in order to better understand the drivers behind DA production. With this information, shellfisheries and public health officials can be more accurately informed of toxic bloom events.

Elisabeth Sellinger is entering her senior year at the University of Colorado at Boulder in the Fall of 2022. She is majoring in Ecology and Evolutionary Biology and minoring in Atmospheric and Oceanic Sciences. Bethany Jenkins is her SURFO advisor and Bryan Plankenhorn is her SURFO mentor.

Graduate School of Oceanography
2022 SURFO Initial Presentations

June 30, 2022, 9:00 AM – 12:00 PM; 1:00 PM – 3:00 PM
Corless Auditorium

Seminar Abstract

Kate Silvester

ANALYZING BIOFOULING PROPERTIES AND SPORE ADHESION STRENGTH OF ULVA FROM MACKEREL COVE

Biofouling is the accumulation of unwanted debris or organisms on a surface and can consist of micro- to macro-organisms. The marine alga *Ulva* is a model organism in biofouling studies and this project will aim to answer how the *Ulva* spore adhesion strength changes over a season. Biofouling is a costly problem as man-made structures often require replacements or treatments to prevent biofouling so understanding the ways in which *Ulva* attaches to surfaces will provide more successful anti-fouling treatments. There are multiple species of *Ulva* at the Mackerel Cove, RI that release spores at various phases of the moon cycle so there will be multiple sampling sessions to assess the changes in spore adhesion strength. After forcing the release of zoospores from the samples, they are assessed for quadriflagellated spores via microscopy which will indicate that the algae are ready for settlement. I will compare the number of settled spores per unit area on control glass slides to the number of settled spores remaining after exposure to a calibrated water jet. I expect to see differences in the numbers of attached cells after the water jet due to the changing compositions of *Ulva* species throughout the season.

Kate Silvester will be entering her fifth year of her undergraduate degree at University of Colorado, Boulder in Fall 2022 where she studies Ecology and Evolutionary Biology and Anthropology. Lucie Maranda is her SURFO advisor.

Graduate School of Oceanography
2022 SURFO Initial Presentations

June 30, 2022, 9:00 AM - 12:00 PM, 1:00 PM - 3:00 PM
Corless Auditorium

Seminar Abstract

Bryca Song-Weiss

ASSESSING BEACH SYSTEM CHANGES AND ANTHROPOGENIC SIGNATURES ALONG THE RI SOUTH SHORE

Barrier beaches provide critical services to coastal communities by absorbing storm impacts and contributing to coastal economies, including tourism and fishing. However, the capacity of Rhode Island's beaches to provide protection and maintain these ecosystems is threatened when storms surpass and erode dunes. Furthermore, this beach loss stands to worsen from anthropogenic structures, increased storms and sea-level rise, which contribute to coastal erosion. With reduced beach volume/dune height, the capacity of barrier beaches to protect and recover is undermined, making monitoring of these parameters and understanding the mechanisms behind their changes critical. Beaches on the south shore of Rhode Island have historically been monitored with surveys and, more recently, aerial light detection and ranging (LiDAR), providing valuable longer-term data. We will supplement these data with terrestrial LiDAR to obtain the finer temporal/spatial resolution necessary to observe some anthropogenic processes. Sediment cores will then be collected and analyzed to observe micro-stratigraphic records of the processes behind the larger morphologic changes. By combining these methods at different scales, it is expected that variation in human imprints along the beach will be evident and quantifiable.

Bryca Song-Weiss is majoring in Earth and Environmental Science at Vanderbilt University, entering her senior year in fall 2022. J.P. Walsh is her SURFO advisor and Victoria Fulfer, Emily Hall, and Isabel Whaling are her mentors.