Southern Connecticut State University

Werth Center for Coastal and Marine Studies

WCCMS Annual Report 2017-2018

Prepared by:

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Prepared for:

The Werth Family Foundation, Woodbridge, CT

March 2018

CCMS Annual Benchmark/Evaluation Report 2017-2018

Each year the participating faculty of the WCCMS will prepare and submit to the Werth Family Foundation an annual report describing the Center activities. This report will be generated each year and will be made available in electronic and hard copy form. It will provide definitive information and detailed summaries of all yearly projects, events, activities, forums, and accomplishments conducted/achieved by the Center and its personnel.

The WCCMS Annual Report will be completed and submitted to the Werth Family Foundation during February/March of each year. Contents of the WCCMS 2017-2018 Annual Report are described below.

Werth Center for Coastal and Marine Studies Reauthorization

Every five years, Centers within the Connecticut State College and University System are required to complete and submit a report describing their mission, outcomes and financial stability. The Werth Center for Coastal and Marine Studies was established March 16, 2007 as the Center for Coastal and Marine Studies by the CSU Board of Trustees (BR07-10), and was last reauthorized for continuation by the Board of Regents on November 15, 2012 until December 31, 2017.

This past year the WCCMS co-coordinators prepared and submitted the continuation report required by the Connecticut Board of Regents for Higher Education for the reauthorization of the WCCMS. SCSU President Joe Bertolino reviewed the evaluation of the Werth Center for Coastal and Marine Studies and recommended that its authorization be continued. The report was then submitted and discussed with the Board of Regents on October 17, 2017 in Hartford. At that meeting, *the Board of Regents for Higher Education unanimously approved continuation of the Werth Center for Coastal and Marine Studies at Southern Connecticut State University until December 31, 2024*.

Report Highlights Include:

The WCCMS has sponsored 14 Long Island Sound Annual Seminar Series Presentations (2004-2016). Faculty and students from Biology, Earth Science, Geography, Marine Studies, Chemistry and Environmental Studies were in attendance.

Students participating in WCCMS research (2012-2017) represent 11 different major and minor programs including biology, chemistry, marine studies, earth sciences, physics, geography and mathematics. Two thirds (66%) of participating students are female, one third (33%) male with undergraduates representing 85% of participating students.

Forty eight undergraduate or graduate students representing Biology, Earth Science, Geography, Marine Studies, Physics, Chemistry and Environmental Studies have been provided with stipends ($500-$2000) during one or more semesters to support research opportunities in the laboratories of WCCMS scientists (2012-2017). During the past 5 years, over $128,000 in

research stipends (40% of total Werth Foundation support to WCCMS) have been awarded to undergraduate and graduate student research assistants.

Thirty seven (77%) of participating CCMS students have been listed as co-authors on posters or papers presented at local and regional meetings and symposia. Twenty seven (56%) of those students are listed as co-authors on published abstracts. Participation at meetings has included Long Island Sound Research Conferences, CSU Faculty Research Conferences, Regional Benthic Ecology Meetings, American Society of Limnology and Oceanography Meetings, and Geological Society of America Annual Meetings.

Student retention and graduation rates are critical in the assessment of undergraduate and graduate program quality. Of the 48 students participating in WCCMS, 38 of the students would have been eligible to graduate at the time of this report. Of those 38 students, 35 (92%) graduated with a bachelors or master's degree from SCSU. Thirteen (34%) students completed written Honors or Department Theses.

Following graduation, our students have been accepted to graduate programs (34%) or have been employed by the private or governmental agencies and businesses. Students participating in CCMS research have been accepted in excellent graduate programs at SCSU, Rensselaer Polytechnic Institute, Worcester Polytechnic Institute, Penn State, Columbia University, Clark University, University of Rhode Island, University of Connecticut, NOVA University, and North Carolina State University, in many cases with full financial support.

I. Research Projects

Water Quality Monitoring in New Haven Harbor

Faculty Dr. Vincent T. Breslin
Environment, Geography and Marine Sciences

Student Participants

Summer 2017; Fall 2017; Spring 2018

Nick Devito, Undergraduate Student, Chemistry
Cassandra Bhageloo, Undergraduate, Chemistry
Nicole Woosley, Undergraduate Student, Biology

Summer 2017

Riley Bachard, Masuk High School Capstone Project

Spring 2018

Renee Chabot, Undergraduate, Chemistry
Haley Lepsik, Undergraduate, Elementary Education

Long Island Sound is an ecologically diverse environment with rich and varied ecosystems for marine organisms while also providing important environmental and recreational services for Connecticut and New York residents. Despite its ecological and economic importance, water quality throughout the Sound is vastly under-monitored, particularly in the especially vulnerable and densely populated coastal embayments. The Long Island Sound Study recently highlighted the importance of expanding and integrating water quality monitoring efforts throughout the Sound to provide uniform, reliable near-shore monitoring data to watershed managers and the broader scientific/technical community. The students and faculty of the Werth Center for Coastal and Marine Studies at SCSU established a long-term water quality monitoring program at Long Wharf Pier, New Haven harbor in January 2012. Weekly water quality testing at this location occurs once per week coinciding with high tide. Water quality and meteorological parameters measured include salinity (ppt), specific conductance (mS/cm), dissolved oxygen (mg/L), air and water temperature (°C), wind speed (m/s), relative humidity (%), light intensity (lux), secchi disk depth (m), turbidity (NTU), Chlorophyll *a* and pH.

Results to Date/Significance

WCCMS students have now completed six years of continuous water quality monitoring at the Long Wharf Pier, New Haven, CT. In the summer 2017, Riley Bachard, from Masuk High School, Monroe, CT joined our water quality monitoring team for a summer internship. Riley participated in the water quality monitoring at Long Wharf for his Capstone Project at Masuk High School.

Renee Chabot, undergraduate Chemistry, is in the process of preparing graphs to analyze the long-term trends in the water quality at Long Wharf, New Haven. Results of our monitoring show that water temperature (-0.8 to 26.8°C) at the pier at Long Wharf, New Haven displays a seasonal trend. Dissolved oxygen concentrations (1.65 to19.18 mg/L) at this location also vary with temperature as oxygen solubility in water is a function of water temperature (greater solubility at lower water temperature). Additionally, there have only been three instances (8/16/12, 7/24/13 and 9/11/15) when the dissolved oxygen level measured below the threshold suitable to sustain marine life (3 mg/L). Salinity at this location at high tide varies within a narrow range (9.8 to 30.5 ppt). Water clarity, as measured using a secchi disk, varies from 0.30 to 2.5 meters. Chlorophyll-a concentration measured using UV/Vis spectrophotometry and fluorescence range from 0.13 to 80.6 µg/L. The ranges of these values for these water quality parameters are typical for similar parameters reported for other Long Island Sound coastal embayments.

Testing for the Presence of Seasonal Beach Profiles on the Connecticut Coast

Faculty Dr. James Tait
Department of the Environment, Geography and Marine Sciences

Student Participants

Summer 2017

Brooke Mercaldi, Undergraduate Student, Environment, Geography and Marine Sciences

Fall 2017

Brooke Mercaldi, Undergraduate Student, Environment, Geography and Marine Sciences
Mathew Connors, Undergraduate Student, Environment, Geography and Marine Sciences
Shannon Bronson, Undergraduate Student, Environment, Geography and Marine Sciences

Volunteer

Jade Serrano, Undergraduate Student, Environment, Geography and Marine Sciences

Project Description

Ongoing multi-year research focused on testing for seasonal beach profiles on the Connecticut coast continues. Profiles have been measured at five study sites in fall of 2015, winter of 2015, spring of 2016, summer of 2016, fall of 2016, spring of 2017, summer of 2017 and fall of 2017. Previous studies by Werth Center researchers have pointed to lack of energy in the fair-weather wave field as being responsible for chronic erosion of Connecticut beaches and exposing coastal structures and infrastructure to damages. The predominant model for annual beach behavior posits an annual equilibrium between a robust beach during fair weather waves and a smaller, eroded beach during periods of seasonal storminess. In this model, sand is transferred to offshore bars during storms and then returned to the beach by more moderate fair weather waves. Such changes in sand storage are referred to as seasonal beach profiles. The fair-weather waves on most beaches are derived from distant storms. A process called velocity dispersion sorts these waves into highly coherent wave trains (or swell) that are moderate in height and long in period. Such waves transport sand shoreward and rebuild the beach. On the Connecticut coast such waves are filtered out by Long Island.

The current research involves testing the scenario above by measuring beach profiles at five Connecticut beaches on a seasonal (four times per year) basis in order to establish the presence or lack of seasonal beach profiles (i.e., does the beach ever accrete and, if so, is there ever full recovery after a storm?). The beaches included in the study include Sherwood Island State Park, Bayview Beach in Milford, Hammonasset Beach State Park, Rocky Neck State Park, and Ocean Beach in New London. Since the Race at the east end of Long Island Sound is a possible entry point for large ocean swell, it is possible that beaches at the eastern end of the Sound exhibit

seasonal behavior while beaches further from the Race do not. The results of this study will provide key information concerning the state of vulnerability of Connecticut beaches.

Results to Date/Significance

This study is in an intermediate stage. Repeated observations suggest profiles are mainly immobile with transport of sand offshore or alongshore during high-energy events. The main regime is erosive with only minor gains, those gains being likely the result of alongshore transport from other parts of the beach rather than recovery of sand lost to erosion by the action of fair weather waves. The one exception to this pattern might be Ocean Beach in New London. These results will help us identify areas of high exposure along the Connecticut coast.

The Effects of Temperature on the Photosynthetic Yield of Intertidal Apozooxanthellate Colonies of Temperate Corals

Faculty Dr. Sean Grace
Biology

Student Participant(s)

Spring 2018

Julia Honan, SCSU Biology Honors Student

Intertidal temperate corals experience quiescence in the winter (a form of diapause) and thus exhibit no tentacular activity. Though no activity is noted, corals can maintain their symbiotic relationship with unicellular dinoflagellates known as zooxanthellae. Zooxanthellae photosynthesize and translocate the products of photosynthesis to the coral host (energy). This study will examine the photosynthetic yield (rate) of zooxanthellae in quiescent corals during winter 2018 and during their exit from quiescence through spring and summer 2018.

Results to Date/Significance

To date we have visited the intertidal site at Bass Rock in Narragansett, Rhode Island 3 times (all during the spring low tides) and accessed the photosynthetic rate of approximately 350+ polyps both with and without zooxanthellae. Preliminary results indicate the quiescent corals with zooxanthellae do photosynthesize but at a lower rate than colonies in warmer waters which brings the definition of quiescence into question. Hence temperate corals may experience this form of diapause differently than what is currently know. Assessments will continue throughout summer 2018.

Werth Center for Coastal and Marine Studies Aquarium

Faculty Dr. Vincent T. Breslin
Environment, Geography and Marine Sciences

Student Participants

Summer 2017; Fall 2017; Spring 2018

Nick Devito, Undergraduate Student, Chemistry
Matthew Connors, Undergraduate, Environment, Geography and Marine Sciences
Cassandra Bhageloo, Undergraduate Student, Chemistry
Nicole Woosley, Undergraduate Student, Biology
Malery Breben, Undergraduate Student, Biology

Spring 2018

Renee Chabot, Undergraduate Student, Chemistry
Haley Lipsik, Undergraduate Student, Elementary Education

Werth Center facilities in the new science building include two large (approximately 2500 gallon each) display aquaria, touch tank (500 gallons) and associated laboratory (SCI 111). WCCMS students and staff have supervised the conditioning of the aquarium system and the introduction of fish and invertebrates. Marine fish were first introduced to the aquarium in December 2015 (Tank #2 coastal aquarium) and January 2016 (Tank #1 open water aquarium). The aquaria were designed to mimic Long Island Sound ecosystems and contain only local fish and invertebrate species. Student interns have performed frequent water quality testing (4-5 days per week) and fish and invertebrate condition observations (6-7 days per week). Student interns are also responsible for daily feeding of the fish and invertebrates in each aquarium and touch tank.

Results to date/Significance

WCCMs student interns have completed two years of water quality measurements on the aquarium system. We continue to add new fish and invertebrates to the aquarium facility. Most recently, three large black sea bass were donated by the aquaculture facilities at the Sound School, New Haven and are now acclimated in aquarium tank 2.

Similar to last year, WCCMS will host an Aquarium Open House in March 2018 to allow students throughout the campus an opportunity to tour the facilities and learn about LIS fish and invertebrates. We continue to utilize the aquarium facility in support of educational programming. This spring 2018, Haley Lepsik is developing additional lesson plans for use in our facility tours. The lesson plans are linked to appropriate Connecticut State Standards and Next Generation Science Standards. We expect to schedule three additional school group visits to the laboratory during the spring 2018 semester.

Macroalgae as Bioindicators for Mercury Contamination in Long Island Sound

Faculty Dr. Sean Grace
Biology
Dr. Vincent Breslin
Department of the Environment, Geography and Marine Sciences

Student Participants

Fall 2017; Spring 2018

Cassandra Bhageloo, Undergraduate Student (Chemistry)

Characteristics that make macroalgae good bioindicators for metal contamination include wide distribution and abundance, ease of collection and identification, year round availability, and tolerance of a wide variety of temperatures and salinities. In addition, the use of biological species such as macroalgae to monitor for marine pollution allows for the assessment of effects of contamination on living organisms and their environment as well as their potential for use as a means of bio-remediation. Furthermore, studies focused on the use of macroalgae as bioindicators for trace metal contamination such as mercury show that the concentration of metal in the sediment, water column, and macroalgae are typically proportional.

Former WCCMS student researcher Lela Jackson (2016) conducted a preliminary study examining trends of mercury contamination in the macroalgal species *Chondrus crispus* collected from six harbors along the CT coastline. Results showed no clear west to east pattern of mercury contamination along the northern coast of LIS. The highest concentration of mercury was found in *Chondrus crispus* collected from Westbrook (22.6 µg/kg) located in eastern LIS, and the lowest mercury concentration was found in New Haven (10.6 µg/kg) which is located in central LIS. The proposed study will also focus on mercury contamination in the LIS by analyzing macroalgae from harbors in each of the three basins, WLIS, CLIS, and ELIS. This study will expand the geographical region examined and include species of green (*Ulva lactuca, Codium fragile*), brown (*Fucus vesiculosus, Fucus distichus*) and red macroalgae (*Chondrus crispus, Grateloupia turutura*) and will focus primarily on determining the affinity of macroalgae to act as bioindicators for mercury contamination. Freeze-dried algae tissue samples (0.100-0.250 g) will be analyzed directly for mercury by thermal decomposition amalgamation and atomic absorption spectrophotometry using a Milestone DMA-80 direct mercury analyzer.

Results to Date/Significance

Results show that macroalgal tissue mercury concentrations in Long Island Sound varied by species. *Codium fragile* tissue mercury contents were lowest and ranged from 3.5 µg/kg in Norwalk to 8.1 µg/kg in Milford. Highest measured mercury concentrations were measured in *Fucus vesiculosus* with concentrations varying from 28.4 µg/kg in New Haven to 42.1 µg/kg in Norwalk. In general, mercury concentrations were lowest in green algae species, intermediate in red algae species and highest in brown algae species. No clear west to east trend in algae mercury concentrations were observed in Long Island Sound.

Cove River Marsh Recovery

Faculty Dr. Scott Graves
Dr. James Tait
Department of the Environment, Geography and Marine Sciences

Project Description

The town of West Haven several years ago undertook a salt marsh restoration project that involved replacement of a tide gate and removal via cutting and herbicide of invasive common reed (*Phragmites australis*). Unfortunately, recolonization by native marsh grasses has been very problematic. Studies of marsh elevations, characterization of the marsh surface, water level changes, sediment samples, and observations via drone have been conducted in order to understand current marsh dynamics and to develop hypotheses concerning the failure of the marsh to thrive.

Results to Date/Significance

Marsh elevation data, sediment samples, and extensive drone observations have been collected twice at this point in time. Thi study is significant in that coastal environments such as salt marshes, which are highly important coastal ecosystems, will come under increasing stress as a result of climate change. Specifically, with sea level rise, marsh surfaces will be subjected to increased periods of inundation by salt water. This will result, eventually, in losses of high marsh grasses such as *Spartina patens* and *Dystichlis spicata*, and eventually loss of low marsh grasses (*Spartina alterniflora*). The grasses are keystone species in the marsh ecosystem. The study is also significant in that it investigates a marsh that is completely surrounded by an urbanized environment. During sea level rise, marshes typically responded by migrating landward. In this case, there is no place for the marsh to go. The surrounding development presents a barrier to marsh migration. At this point in time, marsh still remains degraded. There are plans to use a very high-resolution GPS system to make centimeter scale measurements at monumented locations.

A Comparison of Acid Digestion Methods for Marine Sediment to Optimize Metal Recovery

Faculty
Dr. Vincent Breslin
Department of the Environment, Geography and Marine Sciences
Dr. James Kearns
Chemistry

Student Participants

Summer 2017; Fall 2017; Spring 2018

Joshua Green, Undergraduate (Chemistry)

At present, the WCCMS harbor sediment studies examining the spatial variation of sediment metals in CT harbor sediments has focused on the determination of copper, iron, and zinc extracted by using the USEPA Method 3050 method. The analytical methods yield measurable quantities of these elements in the sediment digests and flame AAS is sufficient for these elements to be quantified with acceptable recoveries (88- 92%) from NIST SRM 2702 estuarine sediment. However, other trace elements including lead, chromium and lead are of interest from an ecological and toxicological perspective in these sediments but the USEPA method 3050B/Flame AAS techniques is insufficient for recovering measurable amounts of these elements in sediment sample digests. Therefore, a major goal of this research is to develop a marine sediment digestion protocol that will extract a higher percentage of contaminant metals from the sediment.

The sediment digest variables to be examined in this study are temperature, pressure (open vs closed vessel), and the types and concentration of the extraction solutions. This study will employ both oxidizing (HNO_3 and H_2O_2) solutions and mineral acid (HCl) as the primary digest solutions. As most contaminant metals in marine sediments are surface associated, hydrofluoric acid will not be used as an extraction solution. To compare open vs closed digest systems, a microwave closed system digest protocols will be developed for comparison to similar acids used in lower temperature, open vessel digest protocols. Adjusting sediment acid digestion variables (temperature, open vs closed vessel, acid types and quantities) in multiple acid digestion techniques will yield a digest method with increased contaminant metal recoveries. The benchmark for the recovery of metals will be the certified metal recovery for NIST SRM 2702 estuarine sediment and PACS-3.

Results to Date/Significance

To date, the US EPA Method 3050B nitric acid digestion procedure, the aqua regia (HNO_3-HCl) acid digestion procedure and a nitric acid digestion at low temperature (20°C) have been completed on the certified standard reference marine sediment and harbor (New Haven, Black Rock, Stamford) sediment samples. Copper, zinc and iron concentrations have been quantified in the digest solutions using flame atomic absorption spectrometry. Results show that digest metal recoveries from the marine sediment samples vary among the acid digest techniques. Zinc recoveries from the PACS-3 marine sediment ranged from 40% using a room temperature nitric acid digest technique to a 92% zinc recovery using the aqua regia digest technique. Copper recoveries were higher for all digest techniques examined ranging from 93% for the room temperature nitric acid digest to 100% for the aqua regia acid digest. For the metals examined, higher temperature during the digestion process does improve the digest efficiency. A closed-vessel digest technique is currently under development.

Assessing the Effectiveness of a U.S. Army Corps of Engineers Beach Replenishment Project at Hammonasset State Beach

Faculty Dr. James Tait
Department of the Environment, Geography and Marine Sciences

Student Participants

Spring 2018

Jade Serrano, Undergraduate Student, Environment, Geography and Marine Sciences
Brooke Mercaldi, Undergraduate Student, Environment, Geography and Marine Sciences

Project Description

In October of 2017, the state of Connecticut initiated a $9 million beach replenishment project at Hammonasset Beach State Park, located in Madison, Connecticut. This plan involved placing 270,000 cubic yards of sand along the western beaches at Hammonasset in order to increase the width of the existing beach. Hammonasset has had chronic erosion problems, particularly along the western beaches. It should be noted that Hammonnasset is the second largest attraction in the state of Connecticut after the casinos and is therefore economically important to the state. The beach fill material was dredged from the mouth of the Housatonic River for the purpose of maintaining a navigation channel. It was subsequently shipped 33 miles to Hammonasset by barge then pumped as a slurry onto the beach. The sand was allowed to dewater then it was graded into a design shape which included a wide berm and a gently sloping beach face. The process took several months. However, winter storms in 2017/2018 appear to have undermined the design of the project. Werth Center researchers are now working with the Park management and with the Army Corps of Engineers to 1) evaluate the effectiveness of the project design and 2) help the Park develop a sediment management plan by studying sand dispersal patterns. By creating a plan to track, retrieve, and redistribute existing sediments, instead of continuously importing new sediments, The Werth Center will be helping Hammonasset and the state of Connecticut environmentally and economically.

Results to Date/Significance

Park management has met with Werth Center researchers and preliminary discussions have occurred. Contact has also been made with the Project Director at the New England Division of the Army Corps of Engineers and documents pertaining to the project have been obtained. Visual observations of the project have been and a study design has been devised.

Characterization and Quantification of Microplastics in Wastewater Treatment Facility Effluent

Faculty

Dr. Vincent Breslin
Department of the Environment, Geography and Marine Sciences

Student Participant

Inara Ramos
Graduate Student (Environmental Education)

Plastics represent a growing percentage of the anthropogenic debris entering the world's oceans. Sources of plastic debris include litter, stormwater runoff, wind-blown debris and *in-situ* degradation of plastics. Once released to the environment, plastics including bags, bottles, wrappers and Styrofoam may fragment into smaller pieces due to mechanical, photochemical and biological processes to form microplastics. Plastics are also manufactured in small sizes in consumer products including synthetic fibers in clothing and microbeads in cosmetic products. Machine washing of clothes and consumer use of cosmetic products including facial scrubs and toothpaste in the home can result in washing microplastics directly down the drain only to end up in a municipal wastewater treatment facility (WWTF). Municipal wastewater treatment facilities are not specifically designed to remove microbeads from wastewater entering wastewater treatment facilities. As a result, WWTFs have been identified as primary sources of microplastics to tributary rivers and coastal estuaries through the direct discharge of treated wastewater.

The goal of this proposed research is to quantify and characterize microplastics discharged in the effluent from three WWTFs along the Quinnipiac River: Meriden, Cheshire, and North Haven. These WWTFs were selected based on differences in the plant design, wastewater capacity, the size of the populations served, and the ease of access to effluent discharge channels for sampling. It is hypothesized that microplastics will be identified in the wastewater from each of these WWTFs and microplastic concentrations will differ among the WWTFs sampled and vary within each facility during periods of high (spring) and low (summer) wastewater flow.

Results to Date/Significance

Meriden and North Haven WWTF were sampled on two occasions: July and November 2017 using a plankton tow (n=3 or 4) deployed in the effluent discharge channel of each facility. Using an Omano optical microscope (45x magnification), the WPO filter membranes were examined for the presence of microplastics. Microplastics were counted and characterized as film, fragments, foam, fibers or beads. Microplastics were imaged using an Optix Cam Summit K2 10 MP digital camera with applied vision software. The applied vision software also allows for the dimensional analysis of each microplastic identified. Microplastic polymer verification will be accomplished by selecting random samples of microplastics within each classification category and analyzing them by Infrared Spectrometry – Attenuated Total Reflectance Spectrometry (IR-ATR); (range 500-4000 cm^{-1}). Results to date show that microplastics

sampled from both facilities are primarily in the form of fibers, fragments and foam pieces. Number of microplastics present in individual net tows at each facility varied widely. Effluent total microplastics varied from 85 at Meriden in July 2017 to 215 in Meriden in November 2017. North Haven total effluent microplastics ranged from 85 in July 2017 to 127 in November 2017. Microplastic polymer verification efforts are currently underway.

***Cliona celata*, Bio-eroding and Changing Temperate Reefs from Mixed Highly Biodiverse Communities to Single Low Diverse Habitats**

Faculty Dr. Sean Grace
Biology

Student Participant(s)

Fall 2015; Spring 2016; Fall 2017

Jennifer Lazor, Undergraduate Student, Biology
Todd Massari*, Graduate Student, Biology

Project Description

Competition between the temperate scleractinian coral *Astrangia poculata* and the Red Boring spring *Cliona celata* was examined *in situ* at Fort Wetherill, Jamestown, Rhode Island. Coral-sponge assemblages were examined using 3, 30m transects at 14m depth. Out of 2,758 corals examined, 21% were in association with the sponge. *Cliona celata* bores under the coral decreasing its attachment strength and ultimately leading to coral dislodgement. The attachment strength of corals alone and those in competitions with the boring sponge was examined.

Results to Date/Significance

Sponges significantly decrease the attachment strength of corals ($T=697$, $P<0.001$). Corals were three times likely to be dislodged when in an assemblage with sponges than alone. Though corals are not overgrown by sponges (not observed in this study), corals that were movable by simply pushing on them increased when in competition with the sponge. Additionally, attachment strength was not dependent on the amount of sponge bio-erosion but dependent on the area of coral in contact with the sponge. Like tropical reefs that may be moving to sponge dominance, temperate corals were negatively affected by boring sponges which decrease their attachment strength thus increasing the likelihood of dislodgement.

A resultant article of this research will be submitted for publication to the Journal of Experimental Marine Biology and Ecology this spring 2018 semester.

Plastic Microbead Accumulation in Eastern Oysters

Faculty

Dr. Vincent Breslin
Department of the Environment, Geography and Marine Sciences

Student Participant

Qiana Mendez
Undergraduate Student (Chemistry)

The Eastern oyster (*Crassostrea virginica*) has played an important ecological, economic, and historical role in Connecticut's coastal waters. Along the Connecticut shoreline today, about 45 businesses farm shellfish on 22,000 acres of leased state land and another 67,000 acres on privately owned property. Recently, the identification of plastic microbeads derived from consumer cosmetic products represent a potential threat to shellfish and may represent a significant vector for microbead contamination in humans. Microbeads are typically composed of polyethylene or polypropylene and do not biodegrade in the marine environment. These microbeads are washed down bathroom drains and are capable of bypassing municipal wastewater treatment systems and entering the marine environment. Previous WCCMS research has shown that microbeads in New Haven harbor range in diameter from 20-750 µm and concentrations ranging from 0.005 – 1.48 microbeads/m^3. It is likely that Eastern oysters (*Crassostrea virginica*) along the Connecticut shoreline are ingesting and accumulating plastic microbeads in their soft tissues given the presence of plastic microbeads suspended in the water column in Connecticut harbors and the ability of oysters to ingest and sequester suspended microplastics in the 5-50 µm size range. This study will harvest oysters from the lower Housatonic River estuary and examine their soft tissues for the presence of microbeads.

Results to Date/Significance

Thirty oysters were collected at each of two locations in the lower Housatonic river estuary in September 2017 using an oyster dredge from a commercial oyster boat. Each oyster sampled was cleaned, weighted, measured and shucked to obtain the soft tissue. The soft tissue was then digested in nitric acid and the digest solution filtered using a 0.45 micron membrane filetr. The filters were then examined for the presence of microplastics using an Omano optical microscope (45x magnification). Microplastics were imaged using an Optix Cam Summit K2 10 MP digital camera with applied vision software. The applied vision software also allows for the dimensional analysis of each microplastic identified. All digests (60) have been completed and Qiana Mendez is examining the filters for microplastics. Tissue residue and sand present on the filter membranes following nitric acid digestion may require a further wet peroxide oxidation extraction and density separation to further isolate microplastics.

Assessing the Effectiveness of a U.S. Army Corps of Engineers Beach Replenishment Project at Hammonasset State Beach

Faculty Dr. James Tait
Department of the Environment, Geography and Marine Sciences

Student Participants

Spring 2018

Jade Serrano, Undergraduate Student, Environment, Geography and Marine Sciences
Brooke Mercaldi, Undergraduate Student, Environment, Geography and Marine Sciences

Project Description

In October of 2017, the state of Connecticut initiated a $9 million beach replenishment project at Hammonasset Beach State Park, located in Madison, Connecticut. This plan involved placing 270,000 cubic yards of sand along the western beaches at Hammonasset in order to increase the width of the existing beach. Hammonasset has had chronic erosion problems, particularly along the western beaches. It should be noted that Hammonnasset is the second largest attraction in the state of Connecticut after the casinos and is therefore economically important to the state. The beach fill material was dredged from the mouth of the Housatonic River for the purpose of maintaining a navigation channel. It was subsequently shipped 33 miles to Hammonasset by barge then pumped as a slurry onto the beach. The sand was allowed to dewater then it was graded into a design shape which included a wide berm and a gently sloping beach face. The process took several months. However, winter storms in 2017/2018 appear to have undermined the design of the project. Werth Center researchers are now working with the Park management and with the Army Corps of Engineers to 1) evaluate the effectiveness of the project design and 2) help the Park develop a sediment management plan by studying sand dispersal patterns. By creating a plan to track, retrieve, and redistribute existing sediments, instead of continuously importing new sediments, The Werth Center will be helping Hammonasset and the state of Connecticut environmentally and economically.

Results to Date/Significance

Park management has met with Werth Center researchers and preliminary discussions have occurred. Contact has also been made with the Project Director at the New England Division of the Army Corps of Engineers and documents pertaining to the project have been obtained. Visual observations of the project have been and a study design has been devised.

Subtidal Recruitment and Settlement of the Temperate Scleractinian Coral *Astrangia poculata*

Faculty Dr. Sean Grace
Biology

Student Participant(s)

Academic Year 2015, 2016, 2017

Gabriella DiPreta, Biology, Graduate Student

The recruitment and settlement of temperate corals will be examined at 12m depth at Fort Wetherill, Jamestown, RI. The frequency of settlement of corals on temperate reefs is unknown as is the preferred orientation of settlement substrate (vertical or horizontal). Temperate corals represent a unique model system for tropical species who recruit and settle at specific times throughout the year.

Results to Date/Significance
In summer 2017, terra-cota tiles have been placed in situ at 12 m depth at Fort Wetherill. Tiles have been secured to the horizontal and vertical substrate with z-spar (splash zone compound). At monthly intervals, the tiles have been photographed and all species settling on the tiles identified to species. Additionally, temperature measurements have been made in situ using Onset Hobo-temp recorders set to record temperature at 5 minute intervals from the initiation of the study till the end of the student (December 2018).

Hurricanes and Coastal Resilience: Palaeostorm Evidence from the Geological Record

Faculty Dr. Jason Kirby
Department of Geography, Liverpool John Moores University, Liverpool U.K.

Dr. James Tait
Department of the Environment, Geography and Marine Sciences

Student Participants

Spring 2018

Brooke Mercaldi, Undergraduate Student, Environment, Geography and Marine Sciences
Jade Serrano, Undergraduate Student, Environment, Geography and Marine Sciences
Lauren Brideau, Undergraduate Student, Environment, Geography and Marine Sciences

Project Description

In a time of climate change, there has been much speculation about whether warming ocean water is changing the frequency and intensity of North Atlantic hurricanes. One of the problems with trying to resolve this question is that hurricanes are essentially rare events and the historical record only goes back a few centuries. A much longer record may be contained in marsh sediments in the form of sedimentary (e.g., sandy layers) or chemical proxies.

Results to Date/Significance

This research is in its initial stages. The target marsh is Hammonasset because it is old and we have good relations with park management. Areas in which storm surge overwash might be likely have been identified. Methodology for obtaining and handling the cores is being developed. Lidar maps have been created. After being obtained, the cores will be shipped to Dr. Kirby's lab for study by Ms. Brooke Mercaldi who is currently a visiting student at LJMU.

II. Center-Directed/Sponsored Seminars

A goal of the Center is to conduct interactive faculty/student research and educational outreach programs that elucidate findings and provide public education on Long Island Sound and environs at all levels, including public schools, parochial schools, communities, and governmental agencies. As such, the Center sponsors an annual seminar series in the spring of each year. Center faculty invited three regional experts during the spring 2017 to discuss topics concerning the health and quality of Long Island Sound and its environs as part of the Thirteenth Annual Seminar Series on Environmental Issues of Long Island Sound 2017.

The seminar series consisted of three separate one-hour seminars by invited experts on Long Island Sound environmental issues during the spring 2017 semester. The list of speakers and topics is given below. A number of faculty teaching marine science, marine biology, geography, zoology, environmental science and earth science courses during the spring 2017 semester attended and encouraged their students to attend the seminar series. A primary goal of the seminar series is to distribute information about Long Island Sound research among faculty and to encourage interdisciplinary collaborative research at SCSU.

Date	**Seminar**
3/2/2017	**Koty Sharp** Assistant Professor, Biology, Marine Biology and Environmental Science, Roger Williams University, Bristol, RI **Exploring New England's Reefs: Using the Coral *Astrangia poculata* to Shed Light on Tropical Coral Microbiomes**

Understanding the associations among corals, their photosynthetic zooxanthella symbionts (*Symbiodinium*), and coral-associated prokaryotic microbiomes is critical for predicting the fidelity and strength of coral symbioses in the face of growing environmental threats. Most coral-microbiome associations are beneficial, yet the mechanisms that determine the composition of the coral microbiome remain largely unknown. We characterized microbiome diversity in the temperate, facultatively symbiotic coral *Astrangia poculata* at four seasonal time points near the northernmost limit of the species range. The facultative nature of this system allowed us to test seasonal influence and symbiotic state (*Symbiodinium* density in the coral) on microbiome community composition. Change in season had a strong effect on *A. poculata* microbiome composition. The seasonal shift was greatest upon the winter to spring transition, during which time *A. poculata* microbiome composition became more similar among host individuals. Within each of the four seasons, microbiome composition differed significantly from that of surrounding seawater but was surprisingly uniform between symbiotic and aposymbiotic corals, even in summer, when differences in *Symbiodinium* density between brown and white colonies are the highest, indicating that the observed seasonal shifts are not likely due to fluctuations in *Symbiodinium* density. Our results suggest that symbiotic state may not be a primary driver of coral microbial community organization in *A. poculata*, which is a surprise given the long-held assumption that excess photosynthate is of importance to coral-associated microbes. Rather, other environmental or host factors, in this case, seasonal changes in host physiology associated with winter quiescence, may drive microbiome diversity.

3/29/2017 **William Fitzgerald**
Professor Emeritus, UCONN Avery Point, Groton, CT

Mercury Cycling in the Coastal Zone

Mercury with its three phase nature has an extraordinarily complex and fascinating biogeochemical cycle, which includes the bacterial-mediated production of monomethylmercury (MMHg) in aqueous systems. MMHg is the form of Hg that bioaccumulates and biomagnifies in marine food webs, especially piscivorous fish, and represents the primary human health concern related to mercury in the environment. Most fish consumed by humans are of marine origin, and the coastal zone, including biologically productive upwelling regions, is the major source of marine fish productivity. Direct atmospheric deposition is presumed to be the principal source of Hg to remote continental shelf regions and the mixed layer of the ocean, whereas watershed inputs have greater importance nearer to shore. In Long Island Sound (LIS), for example, most of the Hg loadings are from the watershed This includes municipal and industrial point sources as well as Hg from rivers, a large portion of which is derived from atmospheric deposition to the watershed. This presentation will consider the relationships between Hg loadings and the sedimentary production of MMHg in the coastal zone. A regional historical perspective will be provided from a high-resolution chronology of Hg deposition between 1727 and 1996 as determined in a well-studied sediment core from the Pettaquamscutt Estuary in Rhode Island, northeast U.S. These new results for Hg accumulation in this scrupulously dated, varved repository (1–3 y resolution) provide a quantitative means for assessing the magnitude, timing, and relative source strengths of human-related Hg emissions and deposition over this 269 year period.

4/19/2017 **David Kozak**
Senior Coastal Planner, CT Department of Energy and Environmental Protection

Connecticut's Coastal Marshes – Their Origins, Significance and Expected Response to Sea Level Rise

With sea-level rise in Long Island Sound predicted to be as much as six feet by the end of this century, the remaining salt marshes on Connecticut's coast are particularly vulnerable to disappearing completely unless steps are taken to preserve them. Marshes, transitional landscapes that provide critical habitat and food supply for wildlife, also buffer shorelines against flooding and storm surge. But many marshes were filled or have been severely compromised by development, making it even more important to preserve those that remain. DEEP and other coastal planners are using the Sea Level Affecting Marshes Model (SLAMM), to show how the sea-level rise will impact specific marshes and adjacent roads vulnerable to flooding. Using sea-level rise predictions, land surface elevations, tidal data and other variables, the model shows how a marsh is likely to change and identifies where conservation resources can be used most effectively. For example, the Great Island marsh on the lower Connecticut River is now mainly a "high marsh" system flooded by high tides three to four times a month. However, by 2085 the marsh will become mainly a "low marsh" system that floods twice a day. The SLAMM model shows undeveloped property adjacent to the marsh that could be purchased to enable the marsh to "migrate" inland and preserve both the high and low marsh. Some communities in New Jersey and Rhode Island are dumping dredge spoils or sand onto marshes to raise their elevation as a buffer against sea-level rise.

Collaborations and Partnerships

As part of our continuing efforts to strive for excellence in research and public education and outreach the Center will focus on establishing working relationships with different local, state, and federal groups and agencies that share this common interest and focus. Each year, the Center provides information concerning the number and nature of collaborations established. Examples of recent and on-going Center partnerships include:

Similarities and differences between genomes of temperate and tropical corals: Dr. Grace is collaborating with Drs. (Ilaina Baums, Katie Barott, Kathryn Stankiewicz, Sheila A. Kitchen, and Meghann K. Devlin-Durante: Department of Biology, Pennsylvania State University; Koty Sharp: Roger Williams University; Hollie Putnam: University of Rhode Island; Randi Rotjan, Sarah Davies, John Finnerty, and Leslie Kaufman: Boston University) to determine the genome of the temperate coral *Astrangia poculata*. By determining the order of DNA nucleotides (the genome) in this corals species which, unlike tropical corals, exists over a large geographic and temperature range (0° – 30° C) we will be able to examine the factors that are expected to affect corals and their survival in the future when sea-water temperatures and pCO2 levels are expected to increase. As of January 23rd, 2018 Dovetail has completed the sequencing and have begun the initial assembly of the genome. We hope to have a draft very soon!

Hidden problems in secret corals; exploring microplastic abundance in local, temperate corals along an urban gradient: Dr. Grace is collaborating with Dr. Randi Rotjan (Boston University, New England Aquarium); Dr. Juanita Urban-Rick (University of Massachusetts Boston –School for the Environment); and Dr. Koty Sharp (Roger Williams University, Department of Biology) to determine the extent and impact of microplastics (beads and fibers) and microbial bio-films in a temperate coastal coral along an urban gradient. The highly populated New England coast's only scleractinian coral *Astrangia poculata* is likely heavily exposed to pollutants and microbeads. Their level of exposure could depend on an urban areas use of either sewer or septic systems. We hypothesize that there will be a difference between corals growing in areas with sewerage versus septic in terms of microbead accumulation, since microbeads are mostly produced from the personal care industry. However, given the prevalence of microfibers from multiple sources, we hypothesize a more even distribution of microfibers in all urban areas. (Funded through Boston University Grant to Rotjan, Urban-Rich, Sharp and Grace: $10,000).

The Rise of Turfs: Phase shifts in macroalgal dominance affecting hard bottom reefs in Narragansett Bay and Long Island Sound: Dr. Grace is collaborating with Dr. Colleen Feehan (Montclair State University) examining the ecological consequences of a change in the dominant macroalgal species in local coastal waters. Typically, Southern New England hard bottom reefs are dominated by the kelp (Saccharina latissimi) however this species and all its benefits (increased biodiversity and productivity) has been replaced locally with r-selected 'rattier' turf macro-algal species. This collaboration will examine hard bottom reefs to document this change and determine the factors responsible for these changes.

Cities of West Haven and East Haven: Dr. Tait and student research assistants are working with Mark Paine, Assistant Commissioner of Public Works for the city of West Haven, in documenting and assessing on-going beach erosion and other problems. In particular, they are monitoring the fate of a beach replenishment project that stretches from Tyler Street to Bradley Point. They have also conducted studies on beach stability for the entire West Haven coast that can be used to refine beach sand management for the city. Dr. Tait, Dr. Mathew Miller (EGMS geographer) and student researchers are also working with Kevin White, City Engineer for the city of East Haven, on a comprehensive coastal vulnerability assessment and coastal resilience plan. The goal is to improve the city's resilience to storms and sea level rise with tools such as beach nourishment and a system of raised levee's that would serve as recreational space as well as flood control measures.

Long Island Sound Coastal Embayment Water Quality Monitoring Program: WCCMS researchers are participating partners in the Long Island Sound Study funded Long Island Sound Embayment Monitoring Project. This program, now referred to as the Unified Water Study, is organizing and standardizing water quality measurements in the region to assure reliable, high quality water monitoring data for researchers and managers. This program is a collaboration between WCCMS, the Long Island Sound Study, New England Interstate Water Pollution Control Commission, The Maritime Aquarium, UCONN, Save the Sound and the Citizens Campaign for the Environment.

Sound School, New Haven and UCONN Avery Point vessel operations: WCCMS researchers chartered ship time aboard vessels from the Sound School and UCONN Avery Point. These collaborations are especially valuable as our students gain experience conducting research in Long Island Sound and as long-term users, we have been granted in-house charter rates with both organizations. WCCMS researchers are also collaborating with Sound School faculty and students in monitoring water quality in New Haven harbor.

The Maritime Aquarium at Norwalk and SCSU are developing a memorandum of understanding to facilitate collaborations among faculty, staff and students of our two institutions. At present, Maritime Aquarium staff are assisting Dr. Breslin with the stocking and maintenance of the two large display aquaria associated with the Werth Center in the new science building. The Maritime Aquarium has generously donated most of the fish species currently on display in the aquaria. WCCMS and SCSU are currently developing a memorandum of understanding to formalize this relationship. Three WCCMS students were employed as interns at the Maritime Aquarium during the past year: Hollie Brandstatter, Laura Bracci and Nicole Woosley. We anticipate increasing student internships at the aquarium due to the experience our students are gaining monitoring water quality and feeding the fish and invertebrates in the Werth Center Aquaria.

PerkinElmer, a company headquartered in Massachusetts with a facility in Shelton, CT provides instruments and services designed to help improve human and environmental health. PerkinElmer donated several pieces of instrumentation to the university in support of research and education programs. PerkinElmer donated an Inductively Coupled Plasma Optical Emission Spectrophotometer (ICP-OES) to Dr. Breslin's laboratory 211 in the new science building.

IV. Community Outreach, Education, and Research Communication

A continuing goal of the Center is to establish and maintain a variety of community outreach programs that include educational activities at many levels, as appropriate. An important function of the Center will be to prepare and distribute educational materials, including new curricula that focuses on the importance of Long Island Sound and environs. Communication of research results will be an important role for this Center. It is an expectation that all participating faculty and students will communicate the results of their research to the scientific community, appropriate government agencies and the local community. A list of 2017-2018 research presentations is listed below:

Presentations

Jackson, L., Edson, C. and V.T. Breslin. 2017. (Oral Presentation; Published abstract). Plastic Microbead Contamination in New Haven and Mystic Harbors, Connecticut. 2017 Coastal & Estuarine Research Federation 24th Biennial Conference, November 5-9, 2017, Providence, RI.

Tait, Connors, Bronson, Bracci and Becker Wave Energy Asymmetry, Seawalls and Beach Erosion on a Fetch-Limited Shoreline. 2017 CSCU Faculty Research Conference, Central Connecticut State University, March 25, 2017.

Massari, T. and S.P. Grace (Poster Presentation). April 2017. 46th Annual Benthic Ecology Meetings. "Effects of the Red Boring Sponge *Cliona celata* on the attachment strength of the temperate scleractinian coral *Astrangia poculata"*. Myrtle Beach, South Carolina.

DiPreta, G.M. and S.P. Grace (Poster Presentation). April 2017. 46th Annual Benthic Ecology Meetings. "Seasonal growth of the temperate coral *Astrangia poculata* from 1972 to 1981 using historical photographs". Myrtle Beach, South Carolina.

Grace, S.P. August 2, 2017. 2nd Annual Astrangia Working Group Meeting. "Epi-genomics and the genetics associated with the temperate corals". Roger Williams University, Bristol, Rhode Island.

Gabriella DiPreta presented at the 2nd Annual Temperate Reef Ecology Meeting (August 2017). Roger Williams University, Bristol, Rhode Island.

Grace, S.P. February 23rd, 2018. Invited talk. "Competition on changing reefs, do the native species have what it takes?" George Mason University, Fairfax, Virginia.

Grace, S.P. and C.L. Feehan. March 29, 2018. 47th Annual Benthic Ecology Meetings. "The Perils of Settling on Turf: Reduced Attachment Strength of Kelps and Consequences for Holdfast Morphology". Corpus Christi, Texas.

Kathryn H. Stankiewicz, Sheila A. Kitchen, Meghann K. Devlin-Durante, Iliana B. Baums, Sean Grace, Randi Rotjan, Koty Sharp, Hollie Putnam, Sarah Davies, Katie Barott, John Finnerty, and

Leslie Kaufman. May 2018. Marine Evolution Conference. "The Genome of *Astrangia poculata*". University of Gothenberg, Strömstad, Sweden.

Publications

Grace, S.P. 2017. Winter quiescence, growth rate and the release from competition in the temperate scleractinian coral *Astrangia poculata* (Ellis & Solander 1786). Northeastern Naturalist (Special Winter Ecology Issue) 24: 119-134.

Tait, J., Orlowski, R., Brewer, J., and Miller, M., (**in press**). Coastal sediment management as a response to intensifying storms and sea level rise: a case study. *In*, Towards Coastal Resilience and Sustainability, C.P. Heidkamp and J.E. Morrissey (Eds.), Routledge.

Participation

Breslin, V.T. Seminar (Invited). Plastic Microbead Contamination in Coastal Waters: Impacts and Challenges. Environmental Issues Seminar Series, Three Rivers Community College, Norwich, CT. February 21, 2018.

Breslin, V.T. 2017. Seminar (Invited). Legacy and Emerging Contaminants: Challenges to Long Island Sound Water Quality. 2017 Annual December Seminar, Extreme Wastewater: Down the River and Around the Sound, Laboratory Analysts of Connecticut, Goodwin College, East Hartford, CT. December 1, 2017.

Breslin, V.T. Seminar (Invited). The Environmental Consequences of Consumer Microbeads in Long Island Sound. Environmental Advisory Council Meeting, City Hall, New Haven, CT. April 5, 2017.

Tait, J. Panel Discussion: Academic and Citizen Science Collaborations with Local Municipalities. 21st GLOBE Annual Meeting -- New Haven, Connecticut, USA30 July - 03 August 2017

Tait, J. Panel Discussion: The Importance of Ongoing Environmental Monitoring; the Value of Citizen Science and GLOBE; How Local GLOBE Students Can Connect their Data Collection to the Needs of a Local Stakeholder/Municipality. 21st GLOBE Annual Meeting -- New Haven, Connecticut, USA30 July - 03 August 2017

Grace, S.P. 2017. Dr. Grace was co-host and co-organizer for the 2nd Annual Temperate Reef Ecology Meeting held at Roger Williams University in Summer 2017 (August 1-3). This meeting introduced over 35 coral scientists to temperate corals and how these corals may be used as a model system to study tropical reef systems that are currently under threat. A third meeting is planned for summer 2018 as well.

Student Theses and Reports/Advisors

Student	Thesis Title	Completion Date
Qiana Mendez	An Examination of the Tissues of the American Oyster for Microplastics in the Housatonic River Estuary	May 2018
Joshua Green	A Comparison of Acid Digestion Methods for Marine Sediment to Optimize Metal Recovery	May 2018
Inara Ramos	Contribution of Wastewater Treatment Facility Effluent of Microplastics to the Quinnipiac River, CT	May 2018
Todd Massari	*Cliona celata*, Bio-eroding and Changing Temperate Reefs from Mixed Highly Biodiverse Communities to Single Low Diverse Habitats	May 2016

Grants

Plastic Microbead Accumulation in Eastern Oysters. Connecticut State University 2017 Research Grant. Project Duration: June 1, 2017– May 30, 2018. PI – **V.T. Breslin**. Total Funds $3,700.

Fourteenth Annual Seminar Series on Environmental Issues in Long Island Sound. Southern Connecticut State University Faculty Development Grant. Spring 2017. PIs – V.T. Breslin, S. Grace and J. Tait. Total Funds $4,000.00.

Undergraduate Participation in Regional Conferences

Jackson, L., Breslin V.T. and S. Grace. 2017. (Poster) Mercury Sorption in *Chondrus crispus* (Stackhouse 1797) in Long Island Sound. Coastal & Estuarine Research Federation 24th Biennial Conference, November 5-9, 2017, Providence, RI.

Joshua Green (Poster). New England Water Innovation Conference, Worchester Polytechnic Institute, Wooster, MA. Assessment of Acid Digestion Protocols for Estuarine Sediment to Optimize Trace Element Recovery Using ICP OES Analyses. September 18th 2017.

Qiana Mendez (Poster). New England Water Innovation Conference held at Worchester Polytechnic Institute. Her presentation was on Plastic Microbead Accumulation in Eastern Oysters, September 18th 2017.

Jackson, L., Breslin V.T. and S. Grace. 2017. (Poster) Mercury Sorption in *Chondrus crispus* (Stackhouse 1797) in Long Island Sound. Undergraduate Chemistry Research Symposium, American Chemistry Society, University of New Haven, April 29th, 2017.

Werth Center Fellows Alumni Update

Sarah Koerner (Werth Center Fellow 2014, 2015) is continuing in (Fall 2016) the Ph.D. Program at NOVA-Southeastern University in Florida working with Joana Figueiredo, Ph.D. (Coral Larval Biologist) and regularly presents her research at regional meetings.

Undergraduate Research and Creativity Conference

Southern Connecticut State University

Werth Center for Coastal and Marine Studies Participants

April 8th, 2017

Werth Center for Coastal and Marine Studies students were well represented at the second annual undergraduate research and creativity conference held at SCSU. The following students presented poster presentations at the conference.

Students	**Presentation Title**
Shannon Bronson	Testing for Seasonal Beach Profiles on Connecticut's Beaches
Lela Jackson	Analysis of Mercury Sorption in Macroalgae across the Long Island Sound West to East Gradient
Hollie Brandstatter	Aquaria Research and Undergraduate Inclusion

VI. Accounting, Budget Expenditures and Grant Writing

Academic Year 2017-2018 Itemized Budget Justification

Funds totaling $75,000 were requested for Year 12 to support the research and educational mission of the Center (see attached budget spreadsheet). Three columns are shown in the budget sheet showing the Werth Foundation request, the Werth Foundation Fund Disbursement (how dollars were actually spent) and the SCSU Matching Funds (dollars committed by the University or obtained from other sources).

Professional Salaries and Honoraria ($9,047.80 expended)

Werth Foundation funds were used in support of salaries for faculty mentoring students during the summer 2017. Professors Breslin ($3,000), Tait ($2,000) and Grace ($2,000) were compensated for mentoring student research projects ($1,260 fringe benefits). The SCSU Dean of Arts & Sciences provided faculty reassigned time (3 credits time each for Breslin, Grace and Tait) during the academic year in support of managing the CCMS activities and programs. Reassigned time (9 credits) for faculty in support of CCMS management totaled $18,216.

Azm Hussein, undergraduate Computer Science major, paid ($787.80) as a work study student in the fall-spring academic semesters in support of his efforts to update and revise the WCCMS website (https://www.southernct.edu/research/research-centers/ccms/).

Student Research Fellowships ($30,000 expended)

A major portion of the Center budget consists of funds in support of undergraduate and graduate student research stipends. A major goal of the Center is to increase undergraduate student participation in the processes of "doing science" through participation in faculty guided research projects. The CCMS awarded fellowships during summer 2017 (7 students; $10,500), Fall 2017 (9 students; $10,000) and spring 2018 (10 students; $9,500). Fellowship amounts per student ranged from $500-$2,000 per semester (50-200 hours @ $10/hour). The CCMS has a system-wide mission to support student research. This past year, the CCMS supported twelve different students in six different academic fields (Biology, Chemistry, Environmental Studies, Marine Studies, Geography and Honors) in support of faculty-directed research projects during this past year totaling $30,000.

Permanent Equipment and Service Contracts ($16,817.39 expended)

Funds were used to purchase a Mettler 104E analytical balance ($1,833.36) with the capability of weighing to an accuracy of 0.0001 gram. The analytical balance is used in support of the harbor sediment studies and the DMA 80 mercury analyzer.

Funds ($2,000.03) were also used to join a consortium of colleges and universities to have Dovetail Genomics, LLC. determine the genomic structure/character of the temperate coral *Astrangia poculata*. The genome will be used to examine epigenetics factors that affect the

aposymbiotic nature of the corals symbiosis with zooxanthellae.

Funds in the service contract budget category ($12,984) were used to purchase a service contract for fiscal year 2017-2018 for the PerkinElmer AAnalyst 800 Atomic Absorption Spectrophotometer ($8,484.00). Werth funds were also used to purchase a one year service contract (2017-2018) for the Milestone DMA 80 Direct Mercury Analyzer ($4,500).

Ship Time ($3,800 expended)

Funds for chartering ship time were budgeted ($4,500) to provide access to field sample sites for research and education along the Connecticut shoreline and in Long Island Sound. Funds totaling ($1000) were used to charter the R/V *Island Rover*, Sound School, New Haven, CT to collect sediment in New Haven harbor on June 29, 2017. This cruise was conducted in support of Dr. Breslin's research examining the effects of sediment dredging in New Haven harbor on sediment quality. The R/V *Island Rover* was also chartered ($1,800) for three 2 hour cruises in New Haven harbor in support of educational programming. Cruises for MAR 210 were scheduled for 10/27 and 10/28 and a cruise for HON 270 was scheduled for 11/2. Sediment samples obtained during these cruises were examined for metals in support of the WCCMS harbor studies. The R/V Spirit of the Sound (Maritime Aquarium) was chartered ($1,000) in support of sediment sampling in Norwalk harbor on April 8, 2017.

Long Island Sound Seminar Series ($1,644)

Funds were allocated to support the annual spring Long Island Sound Seminar Series. This year marks the 15th consecutive year that the Werth Center for Coastal and Marine Studies has hosted the seminar series. Funds were used to purchase refreshments ($644) for the seminars and a $500 honorarium was paid to two of the four invited seminar speakers ($1,000).

Travel and Conference Funds ($0 expended to date)

Travel funds totaling $1,500 were budgeted to reimburse costs associated with travel in support of field sampling activities and attendance at local, regional and national scientific meetings. WCCMS students have submitted abstracts for poster presentations at the Undergraduate Research and Creativity Conference at SCSU in April, the Regional American Chemical Society Conference at Quinnipiac University on April 28th, 2018 and the Northeast Algal Society meeting at University of New Haven on April 13-15, 2018.

Publication Costs ($0 expended to date)

A total of $600 was budgeted for publication costs for FY 2017-2018. Funds will be used primarily in support of printing large format posters (3' x 4') for student research posters for upcoming meetings.

Expendable Supplies ($6,633.34 expended)

Funds for laboratory and office supplies ($5,000) were budgeted to allow the purchase of materials in support of the CCMS research and educational initiatives. Supply funds were used to purchase

laboratory chemicals, tank gas for instrumentation, cartridges for water purification systems, standard reference materials for laboratory instrument calibration, supplies for the sediment metals research and laboratory and field supplies for the sediment grain size and beach surveying research. Additional funds were used for the purchase of chemicals, supplies and reagents for water quality and aquarium supplies and general office supplies. Supplies were also purchased to support educational and aquaculture activities in the Werth Center aquarium laboratory. Supplies include filter cartridges for 30 gallon aquaria, water quality test kits, and water quality meters. Supply purchases exceeded the budgeted amount as supply needs were increased due to new research initiatives.

Balance of Funds

To date, CCMS has expended $67,943 of the $75,000 funds budgeted for FY 2017-2018. A portion of the remaining funds ($2,000) will be used to purchase materials and supplies in support of WCCMS laboratories and field studies. Funds will also be used to support student travel in April to regional conferences to present research posters. Additional funds ($1,500) will be used to purchase Werth Center graduation sashes and apparel for student interns. The remaining balance of funds will be carried over to FY 2018-2019.

Matching Funds

Each of the following grant awards listed have been used in support of CCMS research and education activities.

Connecticut State University Research Grant Award 2017-2018

Plastic Microbead Accumulation in Eastern Oysters. Connecticut State University 2017 Research Grant. Project Duration: June 1, 2017– May 30, 2018. PI – **V.T. Breslin**. Total Funds $3,700.