

Southern Connecticut State University

Werth Center for Coastal and Marine Studies



WCCMS Annual Report 2014-2015

Prepared by:

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Biology

Prepared for:

The Werth Family Foundation, Woodbridge, CT

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CCMS Annual Benchmark/Evaluation Report 2014-2015

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 of each year. Contents of the WCCMS 2014-2015 Annual Report are described below.

I. Research Projects

Assessment of Beach Erosion and Coastal Storm Damage Vulnerability at East Haven and West Haven, CT

Faculty Dr. James Tait
 Science Education and Environmental Studies

Student Participants

Summer 2014; Fall 2014; Spring 2015

Catherine Cota, Undergraduate Student, Honors College
Kaitlyn Stobierski, Undergraduate Student, Honors College

Summer 2014; Fall 2014; Spring 2015

Michelle Ritchie, Undergraduate Student, Geography Department
Fatima Cecunjanin, Undergraduate Student, Geography Department

Project Description

Several research initiatives have been initiated in response to the coastal impacts of hurricanes Irene and Sandy. The cities of East Haven and West Haven suffered severe damages to coastal properties as a result of these storms. Research activities include surveying beach profiles in order to assess beach stability (wide beaches were the most common source of protection against storm wave damage), mapping flood plains from the two storms and potential future storms, and creating coastal vulnerability maps and assessments. This research is being conducted in close liaison with city engineering and public works department to assure maximum usefulness of the data.

Results to Date/Significance

Pre- and post-Sandy profiles and observations pointed out the critical role of beaches in protecting shorelines from storm wave damage. The critical point of impact for Irene in CT was the Cosey Beach area of East Haven. The principle reason for this is that residents of the area

had allowed their fronting beach to erode to the point of having no beach at high tide. The presence of a beach, even a relatively small one as it turns out, allows wave energy to be dissipated before interacting with structures such as coastal homes. This research also led to the discovery that Connecticut's beaches are chronically eroding because of a process we have termed *wave energy asymmetry*. Storm waves generated within Long Island Sound have the power to severely erode the beaches on which they break. According to well-accepted models of beach behavior, fair weather swell waves push the eroded sand back onshore and restore the beach. A seasonal pattern of erosion and accretion occurs. In Long Island Sound, there winds lack a sufficient fetch to generate swell waves capable of moving sand back on shore. The progressively eroding beaches eventually leave shoreline structures without the protection of a buffering beach. This research led to the publication of a chapter, *Observations of the Influence of Regional Beach Dynamics on the Impacts of Storms Waves on the Connecticut Coast During Hurricanes Irene and Sandy*, in the book Learning from the Impacts of Superstorm Sandy published by Elsevier in November of 2014. The New England District of the U.S. Army Corps of Engineers used our findings to help define a potential coastal resilience project for the Cosey Beach area of East Haven, Connecticut.

Potential Effects of Phytoplankton Abundance and Diversity on the Eastern Oyster, *Crassostrea Virginica*, in Long Island Sound

Faculty Dr. Sean Grace
 Biology, SCSU

Student Participant(s)

Summer 2009; Spring 2015

Melissa Krisak, M.S. Biology Thesis Graduate Student

The purpose of this study was to examine factors that relate to abundance and diversity of phytoplankton, including the effects of site, season, temperature, turbidity and salinity and how they relate to phytoplankton abundance throughout Long Island Sound. Abundance and diversity was determined from plankton tow samples, which was examined via microscopy in order to characterize phytoplankton. Other instruments utilized on site were Hobo temperature recorders, a refractometer, and secchi disk. Further phytoplankton abundance analysis took place through the use of flow cytometry from niskin sample collections at the National Marine Fisheries Lab in Milford, CT. Glycogen analysis of oyster tissue was carried out to determine the effect of phytoplankton abundance as an available energy source. The effects of season and site will be examined with a 2-factor ANOVA, where independent variables equal season and site and the dependent variable is abundance of phytoplankton. The effects of temperature, turbidity and salinity on phytoplankton abundance were also examined with Pearson and/or Spearman correlations.

Results to Date/Significance

Temperature and salinity were found to be well within the oysters' range of tolerance and thus the physical aspects of sites measured could support a re-introduction of oysters. Biologically, the proper phytoplankton species were present in LIS to support a re-introduction of oysters. Though seasonal community changes were observed at each station examined, and variability between stations was influenced by sampling schedule, changing light irradiance, and location each station did have phytoplankton present. However, in terms of food availability this part of the study shows that appropriate plankton were available for oysters during fall 2009 and spring 2010. But, was plankton abundance great enough for oyster survival? At 2 sites examined, (Housatonic and New Haven stations) results of glycogen content were not identical, but were able to support oysters similarly and comparable enough between stations to support oyster populations. In conclusion, support from aquaculture efforts is necessary in order to sustain a harvestable population in an environment with a plentiful food source.

Beach Stability and Maintenance Options for the Town of West Haven

Faculty Dr. James Tait
 Science Education and Environmental Studies

Student Participants

Summer 2014; Fall 2014; Spring 2015

Kaitlyn Stobierski, Undergraduate Student, Honors College
Catherine Cota, Undergraduate Student, Honors College
Steve Krozer, Undergraduate Student, Honors College

Project Description

The town of West Haven, CT, has approximately 3.5 miles of public beaches, the largest public beach in the state. The beaches were developed in the 1950's to attract economic development. This development included a U.S. Army Corps of Engineers beach nourishment project. The cost per linear foot at the time was \$55.41. The Corps has replenished the beach sand several times. The most recent project was a replenishment of the western beaches in fall of 2014. The cost of the project was \$842.22 per linear foot. The cost of future replenishment will only rise and the town is faced with a beach maintenance obligation that has become unsustainable.

In an effort to provide some sustainable options to the town of West Haven, students have measured 22 beach profiles along 3 of the 3.5 miles of town beaches. Profiles were measured in the summer of 2012 and in the summer of 2013 and the summer of 2014. Profile data will be analyzed for changes in beach volume and changes in beach width at various locations along the shoreline. This data will be used to assess the stability of the beaches in various locations.

This assessment will then be used to generate a cost/benefit analysis for beach maintenance. Several options will be presented to the city with difference financial obligations and different levels of benefits. The basic strategy is counter-intuitive. Instead of focusing on beach replenishment for the most erosive and *unstable* beaches, beach maintenance would be focused

on the most *stable* beaches. Highly unstable beaches could be allowed to revert to nature. Stable beaches would be the most cost effective to maintain. The other class of beaches that would be important to maintain, even if unstable, are the ones protecting important infrastructure from wave damage.

Student researchers are working in conjunction with the assistant commissioner for public works for the town of West Haven.

Results to Date/Significance

Profile data has been entered into a computer database and is in the process of being analyzed. One of the students, Kaitlyn Stobierski, is doing the cost/benefit analysis and developing the various sustainable beaches options for the town. She is conferencing with the assistant commissioner of public works regularly. Information about the monetary value of infrastructure such as gas lines, sewers, water lines and other infrastructure is currently being gathered.

Water Quality Monitoring in New Haven Harbor

Faculty Dr. Vincent T. Breslin
 Science Education and Environmental Studies
 Dr. James Tait
 Science Education and Environmental Studies
 Dr. Elizabeth Roberts
 Biology

Student Participants

Summer 2014; Fall 2014; Spring 2015

Hollie Brandstatter, Undergraduate Student, Marine Studies
Dylan Steinberg, Undergraduate Student, Marine and Environmental Studies
Aubrey Tigno, Undergraduate Student, Biology

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 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), and pH. Chlorophyll *a* measurements at this location will begin in March 2013.

Results to Date/Significance

To date, we have completed three continuous years of monitoring at this location. Water quality sampling is conducted two times per week, once at high tide and once at noon to determine water quality variability based on tidal stage. Water temperature (-0.8 to 25.2°C) at the pier at Long Wharf, New Haven displays a seasonal trend. Dissolved oxygen concentrations (1.65 to 19.18 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 two instances (8/16/12 and 7/24/13) 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 27.2 ppt). Water clarity, as measured using a secchi disk, varies from 0.05 to 2.5 meters. As of March 2015, we have managed to capture this year's spring phytoplankton bloom using chlorophyll-*a* concentration measurements through UV/Vis spectrophotometry and fluorescence measurements. Currently, our chlorophyll-*a* concentrations range from 0.62 to 32.2 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. The water quality monitoring program is networked with similar citizen/scientist monitoring programs throughout Long Island Sound.

Undergraduate Biology student Aubrey Tigno is working with Biology Professor Elizabeth Roberts on determining fecal coliform bacteria concentrations at the Long Wharf pier. The Werth Center recently purchased an IDEXX Quanti-Tray Sealer (\$3,938). The Sealer is a motor-driven, heated roller instrument designed to seal IDEXX Quanti-Trays. This Sealer, used with Quanti-Trays and any IDEXX Defined Substrate Technology reagent, automates the sample handling of coliform bacterial enumeration. Coliform bacteria are used as an indicators of possible sewage contamination because they are commonly found in human and animal feces. Although they are generally not harmful themselves, they indicate the possible presence of pathogenic (disease-causing) bacteria, viruses, and protozoans that also live in human and animal digestive systems. Therefore, their presence suggests that pathogenic microorganisms might also be present and that swimming and eating shellfish might be a health risk.

Spatial Trends in Sediment Mercury in Connecticut Embayments

Faculty Dr. Vincent T. Breslin
 Science Education and Environmental Studies

Student Participants

Summer 2014; Fall 2014; Spring 2015

Jeremy Flanders, Undergraduate Student, Chemistry and Marine Studies

Fall 2014; Spring 2015

Jeremy Flanders, Undergraduate Student, Chemistry and Marine Studies
Samantha Andrews, Undergraduate Student, Environmental Studies

Harbor sediments, due to the restricted water circulation and the proximity to multiple sources of industrial and municipal wastewater, are often contaminated with metals of environmental concern. Sediment metal contents vary as a function of sediment type and coastal harbors are usually characterized by a variety of sedimentary environments. The presence of contaminated sediment in Connecticut harbors is an issue of concern. WCCMS faculty and students have sampled sediment from 12 Connecticut harbors and embayments over the past decade (2002-2013). Many of the sediment samples collected from these harbors have been analyzed for copper, iron, zinc, loss on ignition and mean grain-size. WCCMS researchers are analyzing these archived sediments for the presence of mercury using the Milestone DMA-80 direct mercury analyzer.

Results to Date/Significance

Sediment mercury concentrations have been determined on archived samples for Black Rock, New Haven, Stamford, Clinton, and Milford harbors (2013). This past year analyses have focused on mercury determinations on sediment samples collected from Mystic and Stonington harbors (2014). Mercury determinations have now been completed for 12 Connecticut harbors and Jeremy Flanders is writing the results of these measurements in his Chemistry Department Honors Thesis. Jeremy is examining the spatial distribution of mercury in CT harbors and the physical and chemical factors controlling the distribution of mercury in sediment.

Analysis of the Dispersment Pattern of Beach Fill Material on West Haven Beaches

Faculty Dr. James Tait
 Science Education and Environmental Studies

Student Participants

Fall 2014; Spring 2015

Ryan Orłowski, Undergraduate Student, Earth Science Student
Dylan Steinberg, Undergraduate Student, Earth Science Student

Project Description

The town of West Haven is faced with the problem of maintaining 3.5 miles of public beaches on a chronically eroding coast with the cost of beach replenishment nearing \$1,000 per linear foot. This is clearly unsustainable. Knowledge of sediment transport or dispersal patterns is key for making sound management decisions. In other words, if the beaches are eroding, where is the sand going? And if this is known, would it be possible to reclaim that sand?

In fall of 2014, the U.S. Army Corps of Engineers sponsored a beach replenishment project on 4,500 feet of West Haven's western most beaches. The cost of the project was \$3.79 million. Replenishment projects are typically built with the expectation that there will be a period of fairly rapid erosion and the beach attains its equilibrium profile. This research involves measuring beach profiles of the project and in areas adjacent to the project in both the alongshore and offshore direction. Movement of sand will be determined using conservation of mass. Loss of sand in one area shown by profile lowering should be accompanied by profile growth in another area. For the Werth Center for Coastal and Marine Studies, this represents a fortuitous \$3.79 million experiment.

Results to Date/Significance

Preliminary profile measurement are being taken.

Spatial Trends in Sediment Metals in Mystic and Stonington Harbors

Faculty Dr. Vincent T. Breslin
 Science Education and Environmental Studies

Student Participants

Summer 2014

Jihan Hallawa, Undergraduate Student, Chemistry
Jeremy Flanders, Undergraduate Student, Chemistry and Marine Studies

Fall 2014; Spring 2015

Jihan Hallawa, Undergraduate Student, Chemistry
Jeremy Flanders, Undergraduate Student, Chemistry and Marine Studies
Samantha Andrews, Undergraduate Student, Environmental Studies

The objective of this study is to conduct a high spatial resolution sampling of Mystic and Stonington harbors in eastern Long Island Sound to determine levels of sediment metal contamination. This study examines the sediment composition and physical characteristics (grain size, and loss on ignition) at predetermined stations throughout each harbor. This study will also analyze the sediment for metals including iron, copper, zinc, mercury and manganese. Results of this study will be compared to the results which have been found in previous studies. Sediment metals will be compared to their respective crustal abundances to determine the extent of contamination due to anthropogenic discharges. The sediment metal concentrations will be compared to previously published sediment quality guidelines to determine if sediment metal concentrations are causing harm to living marine resources.

Results to date/Significance

Sediment samples were collected from 19 stations in Mystic harbor and 12 stations in Stonington harbor during July/August 2014. The Mystic harbor sediment samples have been examined for physical characteristics (predominant grain size, LOI) and digested for metal analyses. The Stonington harbor sediment samples are currently archived frozen awaiting analysis. Both Jihan Hallawa and Jremy Flanders are using results from Mystic harbor analyses in support of their respective Chemistry Department Honors Theses in May 2015.

The Effects of Dormancy on Competition Outcomes between Marine Sessile Invertebrates

Faculty Dr. Sean Grace
 Biology, SCSU

Student Participant(s)

Summer 2014; Fall 2014; Spring 2015

Gabrielle Corradino, Biology, Graduate Student

Research suggests that the temperate coral *Astrangia poculata* is overgrown during the winter months by other marine invertebrates because this coral species undergoes dormancy (hibernation). The suggestion is being investigated for the first time in situ by tagging (aluminum tree tags) and following the competitive outcomes of 30 *A. poculata* colonies both in the intertidal (Bass Rock, Narragansett, RI) and subtidal (Fort Wetherill, Jamestown, RI) through the winter months (2013-2015). Using SCUBA, bi-monthly examinations of these interactions are taking place.

Results to Date/Significance

Results to date (February 2015) demonstrate that no overgrowth occurred in either intertidal or subtidal studies examining the competitive interactions between corals and ‘other encrusting invertebrates’. Results also show that intertidal colonies go into and get out of the diapause state sooner than subtidal colonies. All corals survived and increased in size (based on polyp number). Dormancy was further examined with laboratory studies designed to determine the temperature on which dormancy commenced and when corals became non-dormant. Results show that all corals can survive for up to 5 days in ice (once thawed). Results of this study were presented at *The 51st Annual Conference of the Animal Behavior Society* in August 2014 at Princeton, NJ. Presentation was entitled: Dormancy Behavior in Intertidal and Subtidal Populations of *Astrangia poculata* with Gabrielle Corradino. Also, results are currently being written up as a Master’s thesis for Gabrielle Corradino (expected graduation May 2015) and publication in the international journal Coral Reefs.

Effects of water flow on the capture ability of the temperate coral *Astrangia poculata*

Faculty Dr. Sean Grace
 Biology, SCSU

Student Participant(s)

Fall 2014, Spring 2015

Sarah Koerner, Biology, Undergraduate Student (Biology Honors Major)

Recent work suggests that water flow is important in explaining many aspects of a sessile organism's ecology and physiology. Small, sessile aquatic organisms like corals, anemones and sponges carry on simple respiration, in which dissolved oxygen diffuses into their cells from the surrounding water and carbon dioxide diffuses out of their cells back into the water, so that no specialized respiratory structures are needed. In addition to renewal of essential gases, water flow and mixing provide a continuous supply of nutrients and prey which allows some animals (for example, anthozoans like anemones, corals and hydroids) to feed as passive suspension feeders. Though this may appear to be an ideal feeding mechanism energetically, it has clear mechanical constraints. When water flow is very high, holding structures such as tentacles into the flow to capture prey may be difficult or impossible and polyps may collapse because of the water strain. Laboratory studies will be designed to determine the relative importance of water flow on the feeding biology of *A. poculata*. Laboratory experiments will be completed in a recirculating flume, (Vogel style racetrack flume) powered by a 3hp trolling motor.

Results to Date/Significance

Sarah has completed all preliminary flume runs to properly characterize the flow in and around coral colonies. She has decided on flow speeds that are similar to those experienced in nature and is currently waiting to collect more corals via SCUBA to initiate the feeding studies. Sarah is expected to complete the study by March 2015 and present this to the department and her Honor's Colloquium during the spring 2015 semester.

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 four regional experts during the Spring 2014 to discuss topics concerning the health and quality of Long Island Sound and its environs as part of the **Eleventh Annual Seminar Series on Environmental Issues of Long Island Sound 2014**.

The seminar series consisted of three separate one-hour seminars by invited experts on Long Island Sound environmental issues during the Spring 2014 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 2014 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	Attendance
3/26/2014	Ingestion, depuration, and the cellular effects of TiO ₂ nanoparticles in the blue mussel (<i>Mytilus edulis</i>), and the eastern oyster (<i>Crassostrea virginica</i>) John J. Doyle, Post-Doctoral Researcher, Department of Marine Sciences, UCONN, Avery Point	19

Abstract: Coastal ecosystems in close proximity to densely-populated, industrialized regions are particularly vulnerable to the infiltration of anthropogenic materials such as nanoparticles. Little data exist regarding the effects of nanoparticles on suspension-feeding bivalves, which are pervasive throughout the benthos, and play a critical role in benthic-pelagic coupling and nutrient cycling. The purpose of this research was to determine the effects of TiO₂ nanoparticles on suspension-feeding bivalves. The experiments were carried out on two bivalve species: the blue mussel, *Mytilus edulis*, and the eastern oyster, *Crassostrea virginica*. Initial studies were performed to understand the behavior of TiO₂ nanoparticles in natural seawater. Additionally, the ingestion, bioaccumulation, and depuration of TiO₂ nanoparticles were examined in both mussels and oysters. The final portion of this project explored the *in vitro* effects of TiO₂ nanoparticles on bivalve hemocytes using a suite of immunotoxicology biomarkers. Results showed that TiO₂ nanoparticles readily agglomerate when exposed to aqueous media. Furthermore, nanoparticles are incorporated into marine snow, and are recalcitrant in natural seawater. Feeding experiments demonstrated that agglomerated nanoparticles can be captured on the gills of suspension-feeding bivalves. Following capture, nanoparticles are quickly removed from the gills, mantles, and digestive glands indicating no accumulation in bivalve tissues. Exposure of bivalve hemocytes to TiO₂ nanoparticles revealed minor changes in hemocyte viability, but significant changes in phagocytosis and the production of reactive oxygen species. Understanding the interactions between nanoparticles and coastal organisms, specifically suspension-feeding bivalves, is critical as these organisms are consumed by, and may transfer nanomaterials to, humans. The results of

this research will provide insight into how a potential anthropogenic contaminant could affect living marine resources and human health.

Date	Seminar	Attendance
4/8/2014	Insights of the Shoreline Preservation Task Force: Policy, Politics, & Coastal Climate Change in Connecticut James M. Albis, Chair, Shoreline Preservation Task Force 99th Assembly District – East Haven, CT	35

Abstract: Connecticut’s coastline suffered tremendous damage during Tropical Storm Irene in August 2011. While storm surge, rain, and wind combined to cause this destruction, it was no doubt exacerbated by rising sea levels over the past several decades. In February 2012 then-Speaker of the House Chris Donovan commissioned the Task Force on Shoreline Preservation to investigate the issues of sea level rise and extreme weather and examine their interconnectivity. The task force consisted of legislators, coastal engineers, a land use attorney, an environmental advocate, and an East Haven homeowner whose home was damaged in the storm. After nearly a year of presentations from field experts, state agencies, and others, and public hearings across the Connecticut shoreline, the task force released a list of recommendations in January 2013. By and large, the task force found that communities are woefully underprepared for the effects that these types of storms could have in the future, and the effects of rising seas on low-lying communities. Additionally, there are significant political challenges that must be confronted as these issues continue to be addressed on the local, state, and federal level.

Date	Seminar	Attendance
4/30/2014	Eutrophic Condition and Habitat Status in Connecticut and New York Embayments of Long Island Sound. Jamie Vaudrey, Ph.D., Department of Marine Sciences, University of Connecticut, Avery Point, CT	22

Abstract: Long Island Sound is noted as America’s most urbanized estuary, but what does this mean to the life inhabiting these waters and we humans who depend upon the Sound for livelihood and recreation? How do our daily habits and future choices influence the marine realm? Long Island Sound includes over seventy small harbors and bays which serve as the entry point to people visiting the Sound. While much is known about the status of the deeper portions of the Sound, very little is known about these small shallow embayments. The shallow areas host a great diversity of habitats which in turn serve as nursery and feeding grounds for many commercially and recreationally important species. A rapid assessment approach was used to determine the extent and degree of hypoxia experienced in eight embayments during late summer of 2011 and 2012. Habitat characteristics were assessed and compared to the nitrogen load and trophic status of these embayments. Work continues in 2013 and 2014 with plans to relate nitrogen load to a measure of susceptibility to eutrophication in 50 embayments. Results indicate that embayments exhibit hypoxia in the innermost portions of the embayment, even in eastern areas where Long Island Sound does not exhibit hypoxia.

II. 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:

Cities of East Haven and West Haven: Dr. Tait, Dr. Graves, Dr. Akpinar Ferrand 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. Dr. Tait, Dr. Akpinar Ferrand, and student researchers are also working with Kevin White, City Engineer for the city of East Haven on beach erosion and storm flood plain analysis. The goal is to provide a coastal vulnerability assessment erosion and coastal resilience plan.

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 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.

Colleges of Ocean Science Education Excellence (COSEE) Report: Dr. Breslin collaborated with nine co-authors on the soon to be published National Science Foundation supported COSEE OCEAN Inquiry Group Report (http://scholarworks.umb.edu/environment_pubs/1) which provides a fresh look at how broader ocean science literacy can be developed, especially through less-recognized channels such as opportunistic learning, the private and “third” sectors, and the enormously varied activities under the heading of “informal science education.” Collaborators included Paul Boyle, President, American Zoological Association, Jerry Schubel, President, Aquarium of the Pacific, Sartah Schroedinger, Senior Program Manager, NOAA Office of Education and Steven Uzzo, Vice President of Science and Technology, New York Hall of Science.

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.

William Wallace, Professor, Biology, CUNY College of Staten Island, NY: Dr. Breslin and Jeremy Flanders (Undergraduate Student, Chemistry) worked with Dr. Wallace and his students analyze freshwater mussel tissues for mercury. Dr. Wallace and his students visited SCSU on several occasions during the Spring/Summer 2014 to analyze mercury concentrations in mussel tissues sampled from industrial and suburban NY harbor tributary river locations in an effort to examine sediment mercury transport through the food chain. Dr. Wallace and his students were

trained on the use of the DMA80 mercury analyzer under the supervision of Jeremy Flanders. Future collaborations among the participants will be encouraged in the future.

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 curriculum, that focus 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 2014-2015 research presentations is listed below:

Presentations

Tait, J. and Cherry, C., 2015. Seasonal wave energy asymmetry, beach erosion, and wave damage during hurricanes Irene and Sandy (*abstract accepted*). Coastal Sediments 15. San Diego, CA, May 11-15.

Hollie Brandstatter (Undergraduate Presenter) and V.T. Breslin. (Published Abstract and Oral Presentation). 2014. Case Study: New Haven Harbor Water Quality Monitoring Program, 2014 CT Volunteer Water Quality Monitoring Conference, Goodwin College, East Hartford, CT. July 25, 2014.

Geist, N. and V.T. Breslin. 2014. (Oral Presentation; Published abstract). Prevalence of Disease, Growth Abnormalities and Tissue Metal Contents in Eastern Oysters (*Crassostrea virginica*) along the Connecticut Shoreline. 34TH Milford Aquaculture Seminar, February 24-26TH 2014, Courtyard by Marriott, Shelton, CT.

Tait, J., Cota, C., Stobierski, K., Ritchie, M., Cecunjanin, F., and Cherry, C., 2014. From a SENCER model course to providing data for policy decisions. Washington D.C. Symposium, National Center for Science and Civic Engagement, September 28-30.

V.T. Breslin, Seminar (Invited). Legacy and Emerging Contaminants in Long Island Sound: Are We Fouling our Own Nest? Educational Lecture Series, Cultural Arts Center, Whitney Center, Hamden, CT. April 9, 2014.

Gabrielle Corradino (Graduate Presenter) and S.P. Grace. (Oral Presentation). 2014. The 51st Annual Conference of the Animal Behavior Society. Princeton, NJ. Dormancy Behavior in Intertidal and Subtidal Populations of *Astrangia poculata*. August 14, 2014.

Gabrielle Corradino (Graduate Presenter) and S.P. Grace. (Oral Presentation). 2014. NEERs (New England Estuarine Research Society) annual conference. Dormancy in intertidal and subtidal populations of *Astrangia poculata*. April 16-18, 2015.

Southern Connecticut State University

First Annual Undergraduate Research and Creative Activity Conference

Saturday March 28th, 2015

The Werth Center for Coastal and Marine Studies fellows will be well represented at the SCSU URECA research conference with eleven students participating in six presentations. The student authors and their research project titles are presented below:

Oral Presentations

Hollie Brandstatter,
Dylan Steinberg and
Aubrey Tigno Case Study: New Haven Harbor Water Quality Monitoring Program

Jeremy Flanders Variation in Sediment Contamination in Coastal Embayments along the
Connecticut Coastline

Poster Presentations

Jihan Hallawa and
Samantha Andrews Sediment Arsenic Concentrations in an Urban and Suburban Connecticut
Coastal Embayment

Michelle Ritchie and
Fatima Cecujanin Assessing Coastal Vulnerability in East Haven in the Wake of Irene and
Sandy

Kaitlyn Stobierski
and Catherine Cota Beach Stability and Maintenance Options for the Town of West Haven

Ryan Orłowski and
Dylan Steinberg Dispersal Pattern of Beach Fill Material From a Rescent U.S.A.C.O.E.
Replenishment Project in West Haven, Connecticut

Publications

Boyle, P., V. T. Breslin, L. C. Brisson, J. Fraser, A.J. Friedman (editor), K. Gardner, S. Schoedinger, J. Schubel, S. Uzzo, and S. Yalowitz. (2014). Opportunities for Creating Lifelong Ocean Science Literacy. Colleges of Ocean Science Education Excellence (COSEE) Ocean Inquiry Group Report. National Science Foundation sub-award number OCE-1038853 to the New York Hall of Science, in collaboration with Award OCE-1039130, to the University of Massachusetts, Boston. 123 pp.

Gabriel Neil Geist and Vincent Breslin. (2014). Prevalence of Disease, Growth Abnormalities, and Tissue Meatl Contents in Eastern Oysters (*Crassostrea virginica*) along the Connecticut Coastline. Abstracts of Technical Papers of the Milford Aquaculture Seminar. *Journal of Shellfish Research*, 33(2):552.

Varekamp, J.C., A.E. McElroy, J.R. Mullaney, B.J. and V.T. Breslin. 2014. Metals, Organic Compounds, and Nutrients in Long Island Sound: Sources, Magnitudes, Trends and Impacts. Chapter 5. Long Island Sound: Prospects for an Urban Sea. Editors: Latimer, Swanson, Tedesco, Yarish, Stacey and Garza. Publisher: Springer Series on Environmental Management. 558 pp. ISBN: 978-1-4614-6125-8.

Tait, J. and Akpinar Ferrand, E., 2014. Observations of the Influence of Regional Beach Dynamics on the Impacts of Storm Waves on the Connecticut Coast During Hurricanes Irene and Sandy. In J. Bret Bennington and E. Christa Farmer (Eds.), *Learning from the Impacts of Superstorm Sandy* (pp. 69-88). Academic Press, Elsevier.

Participation

V.T. Breslin, Seminar (Invited). Legacy and Emerging Contaminants in Long Island Sound: Are We Fouling our Own Nest? Educational Lecture Series, Cultural Arts Center, Whitney Center, Hamden, CT. April 9, 2014.

Student Theses and Reports/Advisors

Student	Thesis Title	Completion Date
Kristin Russo	Sediment Metal Contamination in Stamford and Greenwich harbors.	May 2014
Jremy Flanders	Variations in Sediment Mercury Contamination in Coastal Embayments along the Connecticut Coastline	May 2015
Jihan Hallawa	A Comparison of Sediment Arsenic Contamination in an Urban and Suburban Connecticut Coastal Embayment	May 2015

Kaitlyn Stobierski,	Economic Analysis of Beach Sand Replenishment by the City of West Haven, CT Spring 2015.	May 2015
Melissa Krisak	Potential effects of phytoplankton abundance and diversity on the eastern oyster, <i>Crassostrea virginica</i> , in Long Island Sound.	May 2015
Gabrielle Corradino	Dormancy in intertidal and subtidal populations of the Temperate scleractinian coral <i>Astrangia poculata</i> .	May 2015
Sarah Koerner	Effects of water flow on capture ability of corals.	May 2015

Grants

Fourteenth Annual Seminar Series on Environmental Issues in Long Island Sound. Southern Connecticut State University Faculty Development Grant, Spring 2015. PIs – J. Tait, V. Breslin, and S. Grace. Total Funds: \$2,500.00

Grain-Size Effects on Arsenic and Cadmium Concentrations in Connecticut Harbor Sediment. Connecticut State University 2014 Research Grant. Project Duration: June 1, 2014– May 30, 2015. PI – V.T. Breslin. Total Funds \$4,450.

Outer Island Programs. Community Foundation of Greater New Haven, Outer Island Executive Committee. Project Duration: June 2013 – May 2017. PI – V.T. Breslin. Total Funds \$41,600.

Microwave Assisted Digestion of Marine Sediment and Oyster Tissues. Connecticut State University 2013 Research Grant. Project Duration: June 1, 2013– May 30, 2014. PI – V.T. Breslin. Total Funds \$4,650.

Dormancy in temperate corals. Connecticut State University 2013 Research Grant. Project Duration: June 1, 2013-May 30, 2014. PI- S.P. Grace. Total Funds \$3,816.00.

VI. Accounting, Budget Expenditures and Grant Writing

Academic Year 2014-2015 Itemized Budget Justification

Funds totaling \$75,000 were requested for Year 9 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 (\$9,180 expended)

Werth Foundation funds were used in support of salaries for faculty mentoring students during the Summer 2014. Professors Breslin (\$3,000), Tait (\$2,000) and Grace (\$1,000) were compensated for mentoring student research projects (\$1,080 fringe benefits). The SCSU Dean of Arts & Sciences provided faculty reassigned time (3 credits time each for Breslin and Tait) during the academic year in support of managing the CCMS activities and programs. Reassigned time (6 credits) for faculty in support of CCMS management totaled \$11,231.

Technical support funds were used for Honoraria in support of the CCMS water quality monitoring program (Hollie Brandstatter and Peter Broadbridge \$1,299.99). An honorarium (\$99.99) was paid to John Doyle, UCONN in support of his participation in the 2014 Long Island Sound Seminar Series. Finally, Melisa Krisak was paid an honorarium (\$700) in support of the completion of her thesis research concerning phytoplankton abundance on oyster health and populations.

Student Research Fellowships (\$28,500 expended)

A major portion of the Center budget consists of funds in support of undergraduate and graduate student summer 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 2014 (9 students; \$13,500), Fall 2014 (9 students; \$7,200) and Spring 2015 (10 students; \$7,800). Fellowship amounts per student ranged from \$300-\$2,000 per semester (30-200 hours @ \$10/hour). The CCMS has a system-wide mission to support student research. This past year, the CCMS supported fifteen 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 \$28,500.

Permanent Equipment and Service Contracts (\$15,416 expended; \$7,900 pending)

The Werth Center recently purchased an IDEXX Quanti-Tray Sealer (\$3,938) for Dr. Elizabeth Roberts (Biology) in support of coliform bacteria determinations for the water quality studies. The Sealer is a motor-driven, heated roller instrument designed to seal IDEXX Quanti-Trays. This Sealer, used with Quanti-Trays and any IDEXX Defined Substrate Technology reagent, automates the sample handling of coliform bacterial enumeration. Werth funds (\$6,000) will also be used this Spring to purchase a total station for use in support of the beach surveying programs. A total

station is an electronic/optical instrument used in surveying. Finally, a Metler Toledo analytical balance (\$1,900) will be purchased for use in the analytical laboratory in support of harbor sediment metal analyses.

Funds in the service contract budget category were used to purchase a service contract for fiscal year 2014-2015 for the PerkinElmer AAnalyst 800 Atomic Absorption Spectrophotometer (\$7,128). Werth funds were also used to purchase a one year service contract (2014-2015) for the Milestone DMA 80 Direct Mercury Analyzer (\$4,350).

Ship Time (\$3,096.29 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. Werth Foundation funds supported two research/education cruises to sample sediments in two eastern Long Island Sound harbors in the Summer 2014. CCMS researchers chartered (\$696.29) the R/V Challenger, a 25' Boston Whaler, UCONN Avery Point, CT in support of sediment sampling activities in Mystic harbor (7/17/2014) and Stonington harbor (8/5/2014). Funds totaling (\$600) were used to charter the R/V Island Rover, Sound School, New Haven, CT on 8/12/2014 to collect sediment in New Haven harbor. The R/V Island Rover was also chartered on October 23 and 24 in support of education cruises for students in MAR 210 Coastal Marine Studies. The R/V Island Rover was also chartered on November 14, 2014 in support of a charter for the students of HON 270 Science along the Connecticut Coastline. Sediment samples acquired during this cruise were analyzed for contaminant metals.

Travel Funds (\$183.12 expended; \$980.80 pending)

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. Travel funds were used to support personal auto use for travel to and from the Mystic and Stonington harbor sediment sampling cruises (\$183.12). We anticipate supporting travel for Dr. Breslin and one or more students to the 24th Annual Long Island Sound Citizens Summit concerning nitrogen in LIS and Dr. Breslin's participation in the Northeast Shellfish Sanitation Association Conference on April 22-23, 2015. Total travel funds for these two meetings are estimated to be a total of \$500. Dr. Tait will be traveling to San Diego, CA to present a poster at the Coastal Sediments 15 conference on May 12, 2015. Dr. Tait's poster concerns damages to the Connecticut coastline by Irene and Sandy. Travel costs will be supported by an SCSU AAUP contribution of \$1,200 and WCCMS funds totaling \$480.80.

Publication Costs (\$192 expended; \$150 pending)

A total of \$600 was budgeted for publication costs for FY 2013-2014. Funds have been used primarily in support of printing large format posters (3' x 4') for student research posters. Additional funds (\$150) will be used for printing posters for student in support of their participation in the Southern Connecticut State University First Annual Undergraduate Research and Creative Activity Conference, Saturday March 28th, 2015.

Expendable Supplies (\$4,388)

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, SCUBA diving expenses, 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 (\$4,388.49). Additional funds were used for the purchase of chemicals, supplies and reagents for chlorophyll *a* determinations and general office supplies. Additional supply funds will be used in support of student-faculty research projects during Spring 2015.

Food/Refreshments (\$582.75)

Funds were also used this year for the purchase of refreshments (3 seminars @ \$194.25 per seminar) in support of the Long Island Sound Seminar Series (\$582.75).

Balance of Funds

To date, CCMS has expended \$61,538.65 of the \$75,000 funds budgeted for FY 2014-2015. The majority of the remaining funds will be used to purchase equipment for WCCMS laboratories and field studies. A total station for use in support of the beach surveying programs (\$6,000) and an analytical balance (\$1,900) will be purchased this Spring. Additional travel (\$980.80) and supply funds will be used during the Spring 2015 semester in support of student research projects.

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 2014

Grain-Size Effects on Arsenic and Cadmium Concentrations in Connecticut Harbor Sediment. Connecticut State University 2014 Research Grant. Project Duration: June 1, 2014– May 30, 2015. PI – V.T. Breslin. Total Funds \$4,450.

Dormancy in temperate corals. Connecticut State University 2013 Research Grant. Project Duration: June 1, 2013-May 30, 2014. PI- S.P. Grace. Total Funds \$3,816.00.

SCSU Faculty Development Grant 2015

Fourteenth Annual Seminar Series on Environmental Issues in Long Island Sound. Southern Connecticut State University Faculty Development Grant, Spring 2015. PIs – J. Tait, V. Breslin, and S. Grace. Total Funds: \$2,500.00