Long Island Sound Research Projects 2011-2013

The influence of gelatinous zooplankton on nutrient cycles, hypoxia, and food webs across Long Island Sound

R/CE-31-NYCT

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Sea Grant Funding	Match
Year 1: $96,609	Year 1: $29,523
Year 2: $98,878	Year 2: $31,960

In this two-year study, researchers will look at the impacts of gelatinous zooplankton, primarily ctenophores (comb jellies) and to a lesser extent cnidarians (jellyfish), on nutrient cycles, hypoxia, and food webs across Long Island Sound (LIS). None of the current models used to describe the LIS ecosystem considers the role of gelatinous zooplankton within food webs although these organisms play a significant trophic role in the planktonic community. They undergo seasonal large population blooms and crashes and are often effective top predators feeding on copepods, mysids, and larvae of bivalves, crustaceans and fish. In some ecosystems, the abundance of gelatinous zooplankton appears to be increasing and their seasonal range shifting or expanding as has been shown in some Long Island embayments. By determining the nutrient-release rates and oxygen consumption rates of gelatinous zooplankton, the researchers will expand food web models of LIS. In addition, they will study the timing of the peak abundance of gelatinous zooplankton to determine overlap with the spawning period of commercially important LIS species. Such data will help resource managers assess the impact of gelatinous zooplankton grazing on larval lobsters and hard clams.

Comparative Analysis of Eutrophic Condition and Habitat Status in Connecticut and New York Embayments of Long Island Sound

R/CE-32 CTNY

Vaudrey, Jamie and Yarish, Charles
Department of Marine Sciences, University of Connecticut

Sea Grant Funding	Match
Year 1: $99,999	Year 1: $0
Year 2: $99,999	Year 2: $0

While nitrogen loading and eutrophication and resulting negative impacts on estuarine life have been extensively studied in Long Island Sound, little is known about the impacts on more than 60 small embayments that surround Long Island Sound. This study will survey habitat characteristics of 8 representative embayments in Connecticut and New York, looking at estuarine status and the susceptibility of these embayments to hypoxia. Estuarine health, as indicated by eutrophication

symptoms, habitat type, and dominant marine plants, will be linked to contributing stressors such as nitrogen, temperature, and flushing time. Baseline data will be developed, and compared to historic data to provide insights and establish a framework for future research related to eutrophication and climate change. The ability of the habitats to support economically and ecologically important eelgrass will also be assessed using a GIS model.

Phase shifts among primary producers within Long Island Sound: Will anthropogenic stressors continue to expand the niche of PSP- and DSP-producing dinoflagellate blooms?

R/CMB-38-NYCT
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Sea Grant Funding	Match
Year 1: $99,981	Year 1: $29,180
Year 2: $98,979	Year 2: $29,867

Harmful algal blooms (HABs) have increased globally, with growing negative impacts on human health, fisheries, and economies. In Long Island Sound (LIS), the composition of its primary producers has undergone a fundamental change during the past decade as intense toxin-producing dinoflagellate blooms of *Alexandrium fundyense* and *Dinophysis acuminata* have become annual events within nearshore regions. This two-year project is based on the hypothesis that this phase shift has been initiated by a series of anthropogenic alterations to LIS ecosystems including nitrogen loading, organic matter loading, and factors related to climate change including increasing temperatures and increasing CO_2 concentrations. Determining the primary causes of dinoflagellate blooms that produce PSP and DSP (two shellfish poisons) in LIS will be the first step toward developing plans to control and mitigate these events. This project will generate near-real time reports for the NYSDEC and the CT Dept. of Aquaculture regarding densities of the bloom organisms across NY and CT, serving as an early warning system for bloom events within the LIS ecosystem. Data will be made accessible to the public and information will be provided to regulatory and management agencies to protect human health and minimize the future impacts of toxic dinoflagellates on LIS.

Sources and Fate of Nitrogen in the North Shore Embayments

R/CTP-44-NYCT

Hanson, Gilbert N. and Wong, Teng-Fong
Geosciences, Stony Brook University

Sea Grant Funding	Match
Year 1: $98,781	Year 1: $36,792
Year 2: $99,699	Year 2: $36,792

This two-year study will investigate the sources and fate of nitrogen in two diverse harbors on Long Island's north shore. Stony Brook Harbor exhibits ecosystem diversity with minimal anthropogenic impact while Port Jefferson Harbor, a hub of ferry transport and recreation, has high anthropogenic impact with nitrogen inputs from two sewage treatment plants and non-point sources due to lawn

fertilizer and on-site septic systems. Characterization of submarine groundwater discharge will be accomplished by incorporating temperature and conductivity sensors, electrical resistivity, and seepage meter measurements. This study will focus on nitrogen transformations as groundwater exits the area's shallow aquifer and travels through the subterranean estuary into the embayment. The researchers will use monitoring well samples, transects, and embayment water samples to determine *in situ* denitrification in the subterranean estuary. Study results will include submarine groundwater discharge maps for the two harbors and reports of the amount and type of nitrogen entering and traversing the subterranean estuary-- information crucial to municipalities considering switching from on-site wastewater disposal systems to sewage treatment plants. This study will provide information to predict future loads of nitrogen to embayments due to population growth, equipping town planning boards with valuable decision-making tools. Results will also allow Long Island Sound Study planners to propose data-driven nitrogen load reduction legislation.

Systematic Evaluation of Nitrogen Removal by BMPs in the Long Island Sound Watershed

R/CTP-45 CTNY
Anisfeld, Shimon C. and Benoit, Gaboury
School of Forestry and Environmental Studies, Yale University

Sea Grant Funding	Match
Year 1: $99,999	Year 1: $27,728
Year 2: $99,909	Year 2: $28,263

Constructed wetlands and retention basins (known as "wet ponds") are Best Management Practice (BMP) measures used to manage stormwater runoff in order to improve water quality in the Long Island Sound watershed. The hope is that physical and biological processes within these manmade structures help to remove nitrogen and thus reduce the nitrogen load entering the Sound. However, evidence is needed to show whether (and under what conditions) these BMPs actually work effectively to remove nitrogen, and how they might be improved. This project will construct water and nitrogen budgets for a number of representative ponds and wetlands to evaluate their success in nitrogen removal. Nitrogen concentrations and uptake will be measured, along with parameters that might affect BMP efficiency, such as water temperature, water residence time, soil characteristics, and vegetative cover. The results will help in future BMP design to best remove nitrogen and improve water quality and estuarine health.

Nitrogen Removal Capacity of Connecticut Estuaries: Assessing Distribution and Controls

R/CTP-46 CTNY

Tobias, Craig R., University of Connecticut Dept. of Marine Sciences and Song, Bongkuen , University of North Carolina at Wilmington

Sea Grant Funding Match
Year 1: $37,999 Year 1 $0

In a small-scale one-year pilot project, researchers will quantify seasonal removal rates of nitrogen in tidal reaches of a Connecticut estuary. They will examine the two key processes by which nitrogen is removed from wastewater. These processes are denitrification, a microbial process which ultimately results in nitrogen gas, and a recently discovered bacterial nitrogen removal process that occurs in underwater sediments. Nitrogen removal will then be mapped and provide clues to whether hot spots for these processes persist over time and space or are transient. This information will help inform future management choices.