

## In this issue >>>

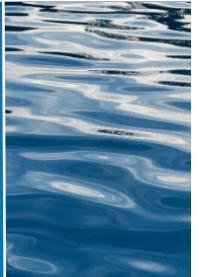
- 2024 Sampling Schedule
- Dempsey Update
- Weather
- Spotlight-Remote Sensing and Chlorophyll
- New Faces



# Long Island Sound Water Quality Monitoring Program

June 2024

# Spring

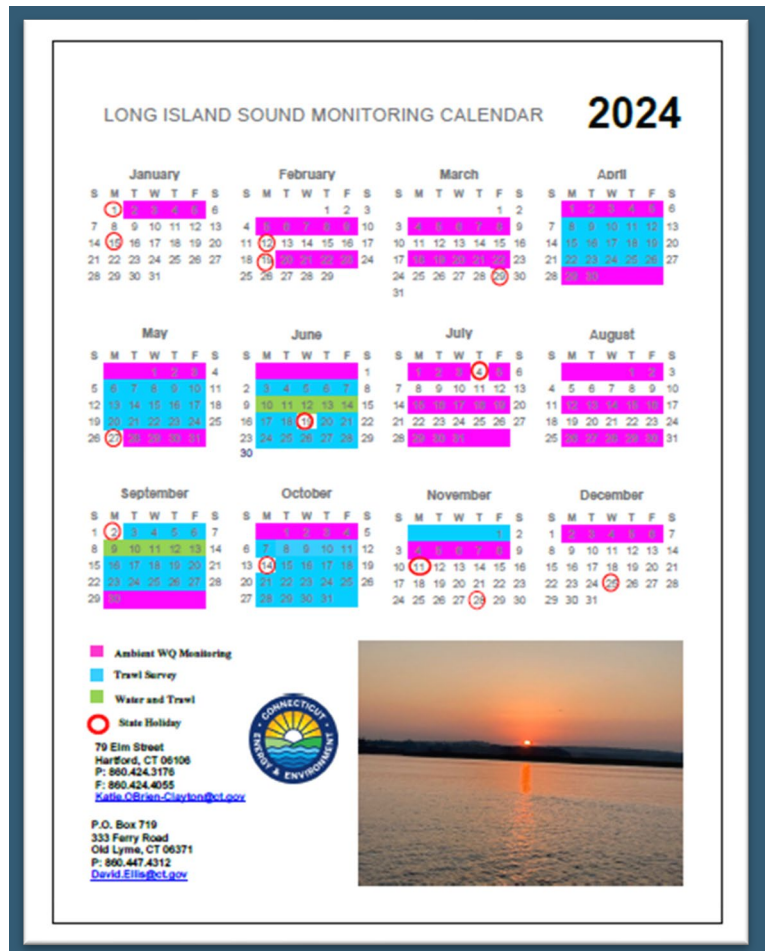


## Dempsey Update

Recent maintenance on The Dempsey updated the heating and AC, added a new transducer for the depth finder, and added a windlass to the bow for the new anchor. Research Vessel Engineer Marc Harrell joined the crew in Fall 2023 (see New Faces Section). The Dempsey is currently underway for the [Spring Trawl Survey](#). If you have any questions or want more information on the Dempsey, please contact Matthew Lyman at [matthew.lyman@ct.gov](mailto:matthew.lyman@ct.gov) or Captain Tommy Seda at [Tommy.Seda@ct.gov](mailto:Tommy.Seda@ct.gov).

## 2024 Sampling Schedule

The [2024 Long Island Sound Sampling](#) began on January 2, 2024. All cruises to date were completed as scheduled. Below are the anticipated sampling dates for the year.



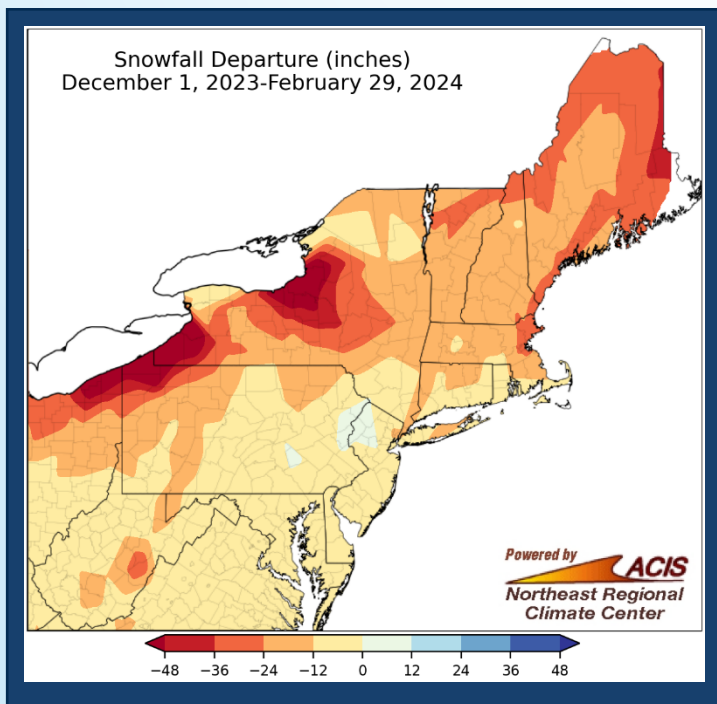
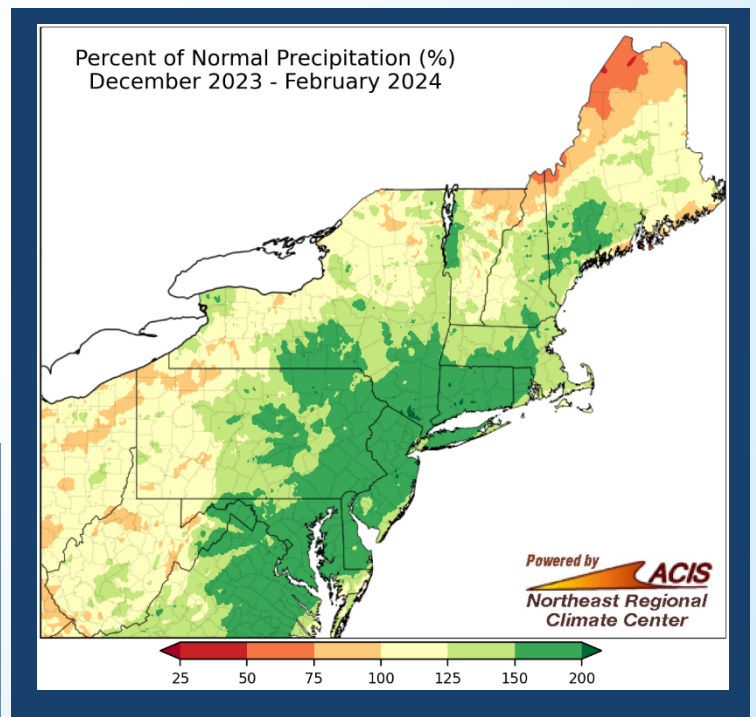
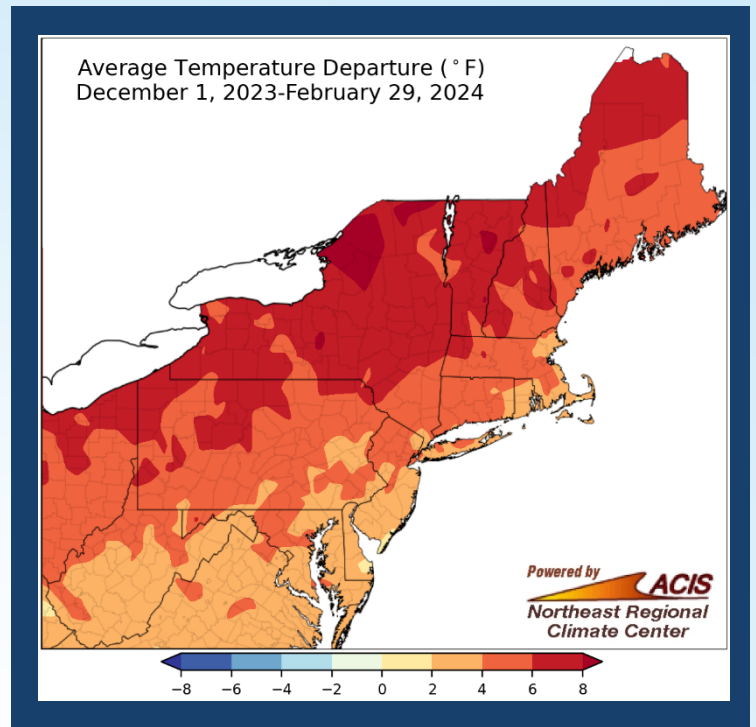
# Weather

The Northeast Regional Climate Center says it beautifully- “Warmer winters have become more common in the Northeast, with winter 2023-24 falling in line with that trend (and boosted by atmospheric teleconnections like a positive North Atlantic Oscillation). Cold air was hard to find as each of the three months of the season were warmer than normal for almost the entire region.”

While winter 2023-2024 wasn't the warmest on record for the LIS watershed, it ranked as the third warmest for Hartford, 4<sup>th</sup> for Central Park, 6<sup>th</sup> for Islip, Bridgeport, and LaGuardia with temperatures ranging from 3-5 degrees above normal.

Winter was also wet around the Long Island Sound Watershed. Hartford received 18.28 inches of precipitation between December 2023 and February 2024, ranking it the wettest on record for the city. Winter 23-24 ranked third wettest on record for Bridgeport, Islip, and Kennedy Airport and 4<sup>th</sup> wettest for LaGuardia. Central Park received closer to normal amounts (14.04 inches). Most of that precipitation fell in the form of rain. Snowfall across the region ranged from 9-15 inches below normal.

March continued to be wetter than normal, with all sites ranking March 2024 as their wettest on record, and warmer than normal by 4-7 degrees.



The warmth persisted into April, as did the rain. The warm temperatures should contribute to smaller Delta-Ts and possibly reduced stratification. However, the warmth and precipitation are fueling algal blooms, particularly in the Western Sound. Read On for more details.

# Remote Sensing in Long Island Sound

Federal, state, and local water-quality monitoring programs have identified a suite of indicators related to the biological integrity, trophic state, and recreational suitability of nearshore waters.

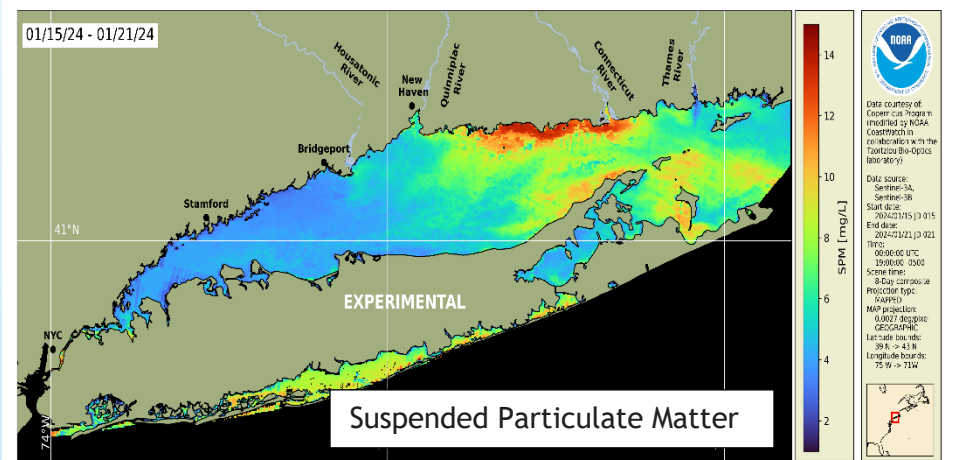
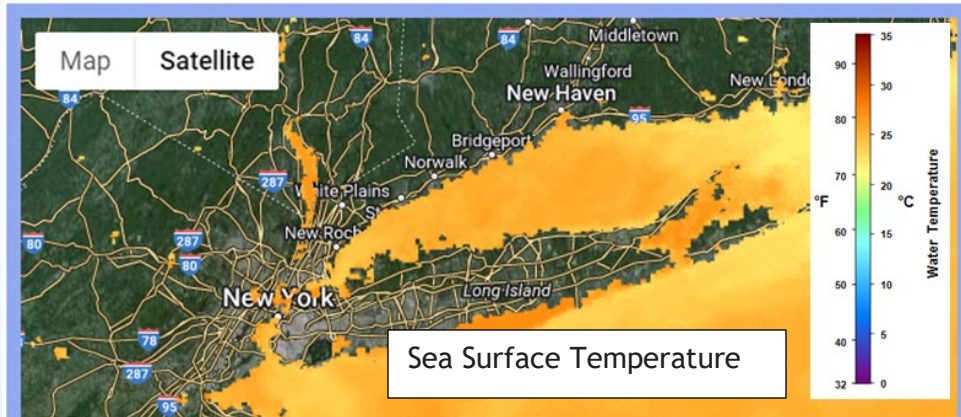
Some of the most widely used indicators include chlorophyll a (Chla), water clarity and turbidity, and dissolved organic carbon (DOC), also used to grade water quality in Long Island Sound (LIS). Here, we have been developing satellite products for all these key parameters using algorithms optimized for LIS. We are also developing new products relevant to harmful algal bloom (HAB) monitoring, including algorithms for red/brown tide detection and retrieval of multiple phytoplankton pigments beyond Chla for optical discrimination of phytoplankton community structure. We use multi- and hyper-spectral satellite imagery at three resolutions: 1km, 300 m, and 10-30 m.

[NOAA CoastWatch](#) exists to help people find, choose, and use satellite data products for ocean, coastal, and inland water applications. We have been leveraging the capacity of CoastWatch to transition our satellite products (along with associated uncertainties) to actionable information and adoption by LIS stakeholders. We use the CoastWatch interactive and interoperable data portals to facilitate search and analysis of multiple products, visualization, and customizable data downloading. Curated data collections served by CoastWatch include sea surface temperature (SST), ocean color data, sea surface height (SSH), wave heights and currents, ocean winds (magnitude and direction), salinity, and visible imagery, which can be integrated with our new products.

A multidisciplinary ecological project financed by the Sea Grant programs of New York (NYSG) and Connecticut (CTSG) and the U.S. Environmental Protection Agency (EPA) through the Long Island Sound Study (LISS) is currently underway, being led by the [Tzortziou Bio-Optics laboratory](#).

Together with developing satellite algorithms and products, Dr. Maria Tzortziou and her team will gather optical, biogeochemical, and ecological measurements in the Sound to better monitor, assess, and manage the quality of estuarine water, ecological processes, and ecosystem stressors. This includes eutrophication, hypoxia, and the growth of algal blooms.

A key project objective is to develop actionable, and interoperable satellite data products and services that can be used by different stakeholders to enhance the health, management, and sustainability of the Sound.



# Phytoplankton Monitoring in Long Island Sound

## Temporal and Spatial Variations of Phytoplankton Cell Abundance

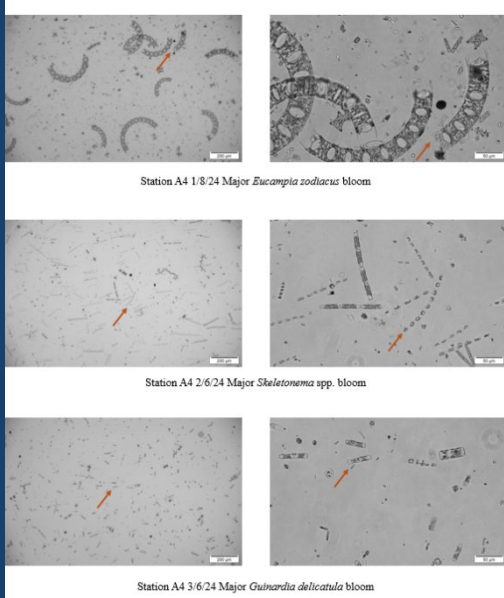
Since 2002, the Connecticut Department of Energy and Environmental Protection (CTDEEP), with funding from the federal Environmental Protection Agency (EPA) Long Island Sound Study (LISS), has been monitoring the composition and abundance of phytoplankton populations at specified sites across Long Island Sound. A map of the monitoring stations can be found here: [Long Island Sound Monitoring Stations](#). A total of 218 samples (109 each from the surface and bottom waters) were delivered to [Dr. Senjie Lin's research group](#) for analyses in 2023.

Analyses of CTDEEP samples, led by Dr. Huan Zhang, found that identified phytoplankton communities continued to show temporal and spatial changes from west to east in 2023. Abundances peaked in February with smaller minor blooms occurring in May and July-September.

Approximately 110 species were identified with diatoms dominating the assemblages followed by dinoflagellates.

Annual average phytoplankton abundance in 2023 was generally higher in the Western LIS than in the Eastern Sound. Overall, cell concentrations were higher at stations A4-F2 than at stations east of them (H4-K2). Annual average cell concentrations for stations in the Western Sound (A4-F2) were  $9.6-14.02 \times 10^5$  cells·L<sup>-1</sup>, while those in the Central Sound (H4, I2) were  $8.1-8.2 \times 10^5$  cells·L<sup>-1</sup>, and those in the Eastern Sound (J2, K2) were  $3.3-6.6 \times 10^5$  cells·L<sup>-1</sup>.

This disparity progressed into 2024 as can be visualized in these adjacent images from January, February, and March. The top three sets of images are from Station A4 near Execution Rocks in Western LIS. These images show major diatom blooms for all three months. The bottom set of images are from Station I2 in the Eastern Sound and show low cell abundance and debris.



Phytoplankton microscopy images from Station A4 showing major blooms in Western LIS, Spring 2024.

Top: 1/8/24- *Eucampia zodiacus*

Middle: 2/6/24- *Skeletonema* spp.

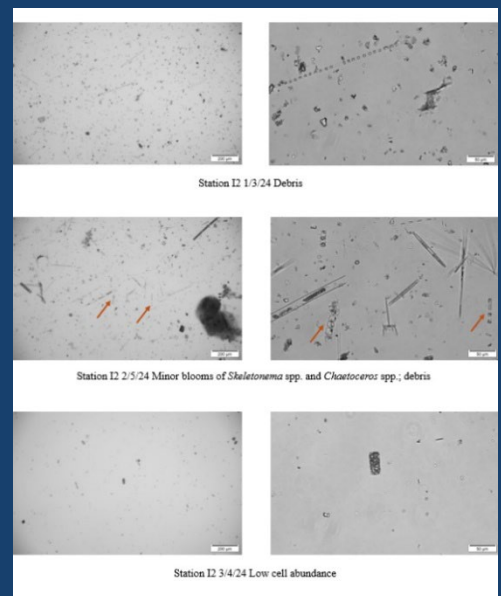
Bottom: 3/6/24 – *Guinaradia delicatula*

Phytoplankton microscopy images from Station I2 showing low cell abundance in Eastern LIS, Spring 2024.

Top: 1/3/24- Debris

Middle: 2/5/24-minor bloom *Skeletonema* spp., *Chaetoceros* spp., and debris

Bottom: 3/4/24 – Low cell abundance

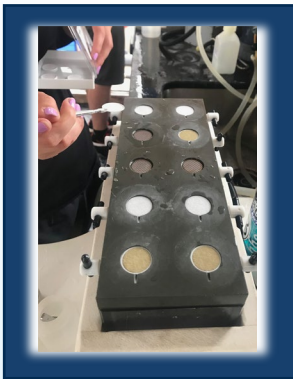


## High Performance Liquid Chromatography (HPLC)

Traditional microscopic methods for plankton identification yields very detailed information at the species level. However, accurate species composition is very labor intensive, costly, and impractical for studies of communities over broad spatial and temporal scales. Another limitation of microscopic examination is that small cells (< 5 µm) can be very difficult to identify. Further, some cells may be destroyed by preservatives.

Since August 2002, CTDEEP has also been gathering data on phytoplankton community composition by characterizing phytopigments using HPLC. HPLC analyses are conducted at the University of Maryland Horn Point Lab. Data are available upon request.

HPLC data are being used in the development of the LIS algorithms for the remote sensing products.



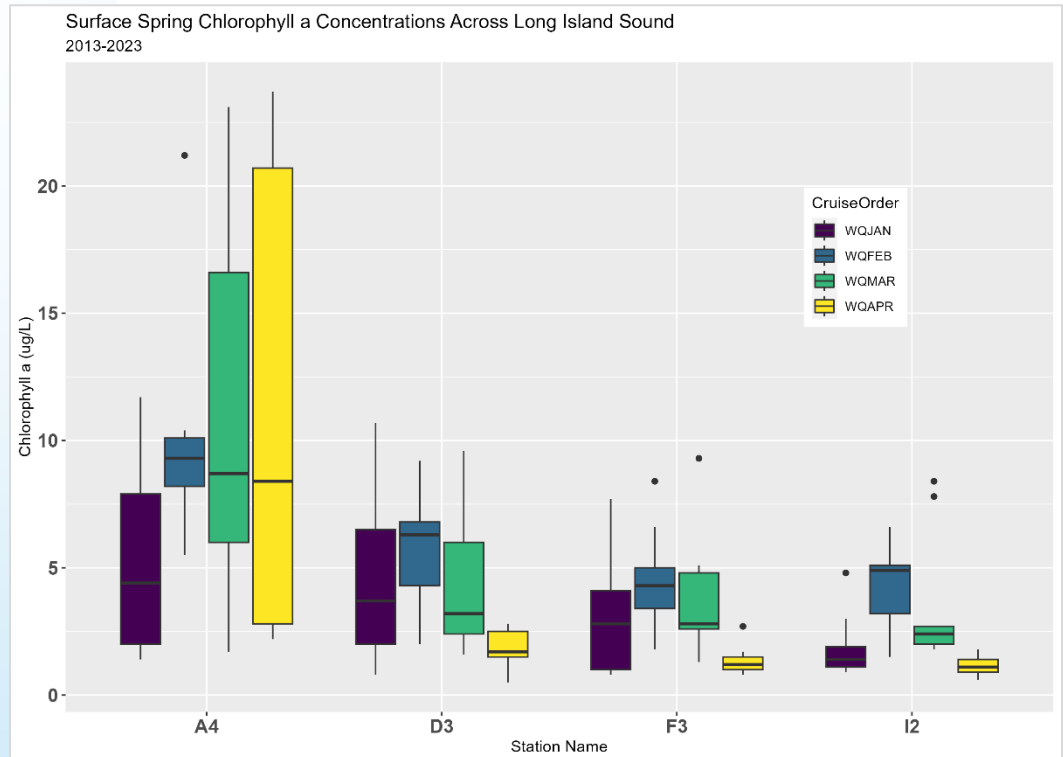
# Chlorophyll Sampling in Long Island Sound

Since 1991 CTDEEP has been monitoring chlorophyll a (Chl a) concentrations across Long Island Sound. Grab samples are collected at 17 stations from 2m below the surface and 5 m above the sediment. Additionally, in situ Chl a data are collected during water column profiles with a YSI EXO multi-parameter sonde at all stations (use with caution). Data are available for download from the [Water Quality Portal](#) or the [UCONN ERDDAP](#).

Grab samples are also collected and analyzed for phytopigments at 10 stations utilizing High Performance Liquid Chromatography (See sidebar).

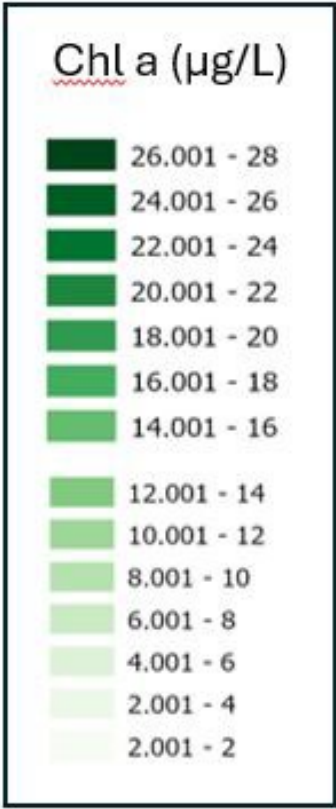
Recently, in concert with the Remote Sensing group, we have added an additional grab sample collection at 0.5 m to assist with algorithm validation at select sites (varies by survey) across the Sound.

Interpolated images on the next page illustrate the progression of phytoplankton blooms in 2003, a year with large hypoxic area (345 sq mi) versus 2023, a year with lower hypoxic area (126.8 sq mi). The graph below shows the wide variability in Chl a concentrations in the Western Sound during the Spring months, while concentrations in the Eastern Sound are more consistent.



Unfortunately, data from 2024 have not been returned by the lab yet. However, the NOAA CoastWatch Program created a [video of weekly LIS chlorophyll a concentrations](#) obtained from the OLCI satellite and interpreted using the LIS optimized algorithm from January to April 2024 specifically for use in this newsletter. Additional parameter videos for the same timeframe include [CDOM](#) (Colored Dissolved Organic matter) and [SPM](#) (Suspended Particulate Matter).

# Progression of Spring Bloom 2003



# Progression of Spring Bloom 2023



# Discussion, Ongoing Synthesis Work, and Recommendations

Highlighting the ongoing monitoring work is important. However, what's being done with all the data and how can it be used to address management needs or shape future monitoring efforts?

The multidisciplinary ecological project spearheaded by the Tzortziou Bio-optics group hopes to “facilitate the transition from research to practice and societal benefits” including assisting with early decisions on Harmful Algal Bloom outbreaks leading to impacts on aquaculture and shellfish operations, updating/development of water quality targets or Total Maximum Daily Loads, and extending the spatial and temporal scope of field studies to evaluate management actions on nutrient reductions across the Sound and its watershed.

Future work could include moving into the embayments and up the watershed (UWS and USGS already collect chl a samples), exploring the need to collect grab samples at other depths (e.g., 0.5 m “super surface”) for chlorophyll and HPLC analyses as part of the Base monitoring program, and further synthesis work exploring zooplankton and phytoplankton interactions.

## ORISE PROJECT

*Youngmi Shin*

Youngmi Shin is an ORISE Fellow with the Long Island Sound Study. She is working with Dr. Melissa Duval utilizing Generalized Addictive Nonlinear Models (GAMs) to analyze CTDEEP plankton data for functional responses of phytoplankton to changes in water temperature and nutrient variability as well as exploring the timing of peak blooms.

Contact Youngmi ([Shin.Youngmi@epa.gov](mailto:Shin.Youngmi@epa.gov)) or Melissa ([Duval.Melissa@epa.gov](mailto:Duval.Melissa@epa.gov)) for more information.

## Journal Publication

*Senjie Lin, Huan Zhang  
and Tangcheng Li*

Drs. Lin, Zhang, and Li are working on a paper for publication examining the trends of phytoplankton abundance in Long Island Sound over time and in relationship with environmental conditions. They too are utilizing CTDEEP datasets.

Contact Senjie ([senjie.lin@uconn.edu](mailto:senjie.lin@uconn.edu)) for more information.



# New Faces

This 2024 season we are welcoming our newest Seasonal Resource Assistants, Gabrielle Pezich and Lauren Witick, as well as Research Vessel Engineer Marc Harrell.



Hello everyone! My name is Gabrielle Pezich, and I am excited to join the Connecticut Department of Energy and Environmental Protection as a seasonal resource assistant for the Long Island Sound Monitoring Program.

I received my Master of Environmental Science and Management (MESM) degree from the University of Rhode Island, specializing in conservation biology. During my graduate studies, I worked at the University of Rhode Island Graduate School of Oceanography's Coastal Resources Center (CRC).

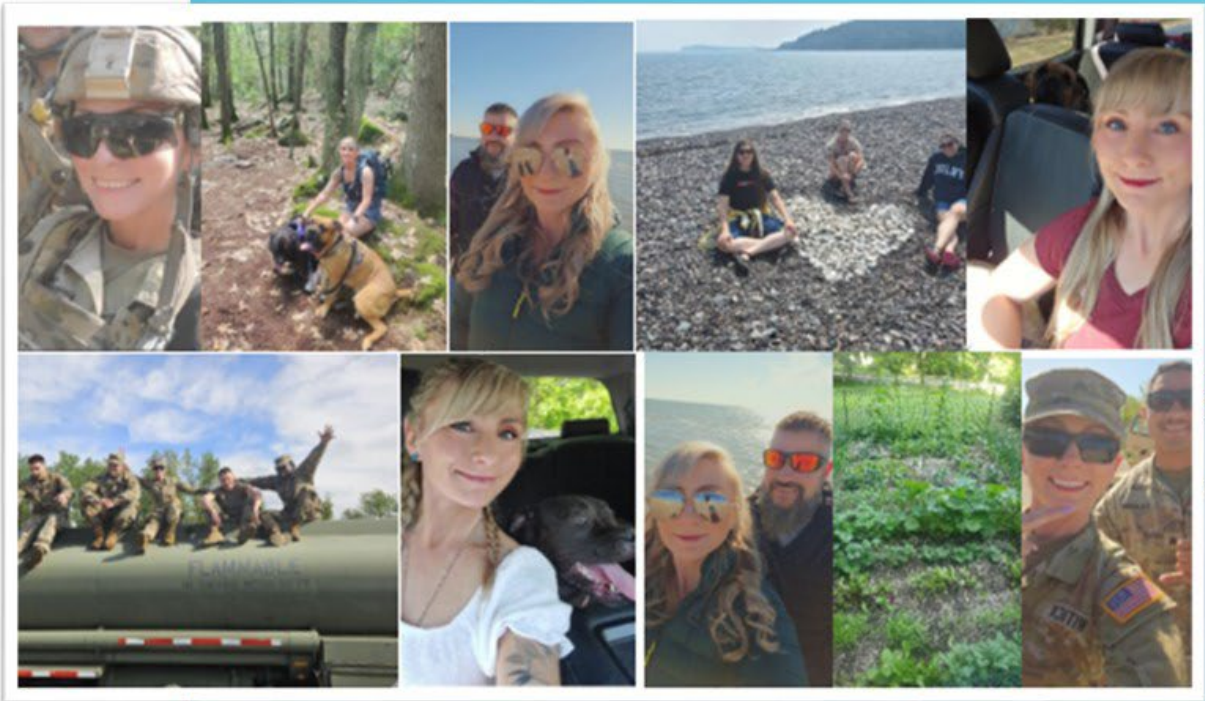
I worked with their Communications and Coastal Resilience teams to generate awareness for coastal and ocean issues and assist with projects targeted towards building the capacity of the communities and people of Rhode Island, helping them to be more resilient to increasing storms and rising seas.

I am an overall outdoor and travel enthusiast and am thrilled to be spending some time back in New England. I enjoy swimming, paddleboarding, hiking trails, and pressing any flowers I find along the way. In my time off, I am looking forward to exploring new places in Connecticut, especially any bookstores, because I am an avid reader.

I am looking forward to gaining new skills while working as part of a team to monitor and assess the water quality of the Long Island Sound.

Hi everyone! My name is Lauren Witick and I'm extremely excited to join the seasonal staff for the Long Island Sound Water Quality and Hypoxia Monitoring Program. I'm originally from Hancock, Maine near Bar Harbor, spending most of my time sailing in Frenchmen's Bay with my family and investigating all the cool things that washed up on shore, however I've lived in CT most of my adult life. I have my Bachelor's in Environmental Science from Southern New Hampshire State University and I'm currently working on my master's in Marine Science from Unity Environmental University set to graduate by January 2025. I'm honored to be able to rejoin DEEP, as I was a seasonal at Franklin Swamp WMA in the past. I'm hoping to learn a lot and meet a lot of the great staff here in the Water Quality Program to network and build some positive relationships. I'm thrilled to be able to help preserve the fragile ecology of the Long Island Sound for both people and the marine life that call it home for many generations to come.

Currently I'm a Sergeant in the Army Reserves working as a Petroleum Specialist and have been enlisted for 8 yrs helping to pay for school (every little bit helps lol). Much like everyone here my passion is for the outdoors and especially for ocean ecology. When I'm not busy working or doing homework, you can find me hiking, camping, at the beach searching for shells, mountain biking, hanging out with my big goofy dogs, and tending my vegetable garden. Although I have several blackberry and blueberry bushes I planted last year that I'm excited from them to bloom too!





Hello! I am Marc Harrell, the Research Vessel Engineer onboard the R/V John Dempsey. I am originally from Georgia, however, I have spent most of my career working on the water in New England.

I spent 11 years on active duty in the United States Coast Guard with duty stations all along the east coast. My career spanned units at sea, ashore, and in the air. I am currently a Reservist and conduct boardings on US vessels out of Providence.

After my enlistment was completed, I was the captain and operations manager for Mystic Oysters in Noank, CT. I joined DEEP this past Fall and I am really enjoying the work especially with the very talented people I get to work with.

I live in Niantic, CT with my 16-year-old son who is currently a sophomore at the Sound School. When not at work, we can most certainly be found boating and fishing around the Sound.



For more information on the Long Island Sound Water Quality Monitoring Program please visit:  
<https://portal.ct.gov/deep-liswaterquality>

Or contact us:

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