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Long Island Sound Water Quality Monitoring Program **August 11, 2023**

July

HYJUL23 Water Quality Summary

Dempsey Update

We are back to full capacity and are welcoming additional researchers on our summer surveys. If you have any questions or want more information on the Dempsey, please contact Matthew Lyman at: matthew.lyman@ct.gov.

2023 Sampling Schedule

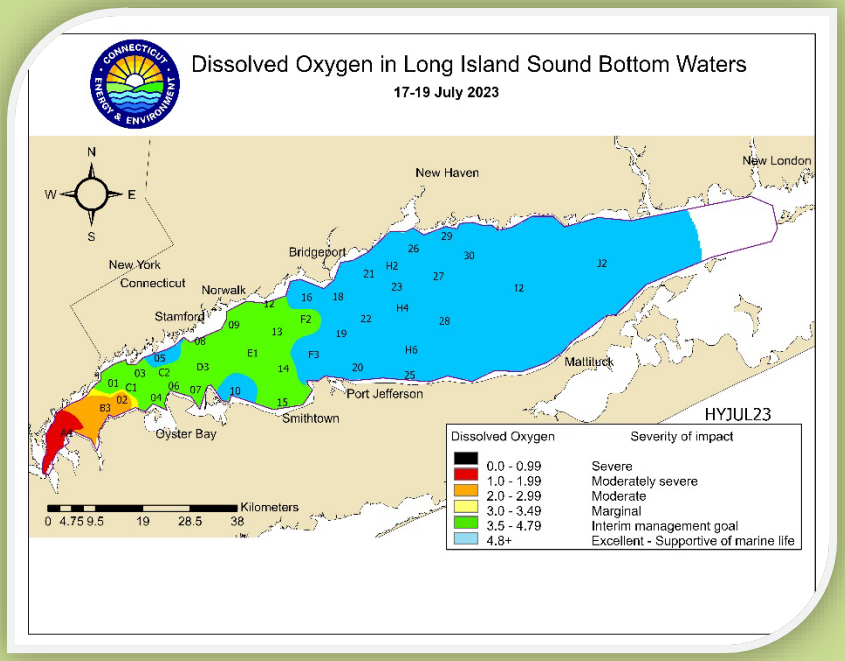
The 2023 Long Island Sound Sampling began on 3 January 2023. All scheduled cruises except for CHFEB23 and WQMAR23 (maintenance issues) were completed as scheduled. The next survey is WQAUG23, scheduled during the week of July 31. Click the link to learn more about the program and our sampling schedule: Long Island Sound Water Quality and Hypoxia Monitoring Program Overview (ct.gov)

Dissolved Oxygen Summary

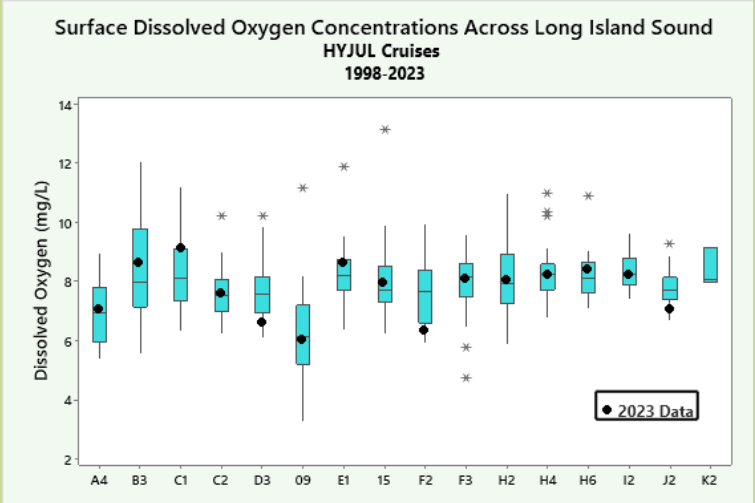
CT DEEP sampled 40 stations during the HYJUL23 survey that was conducted 17-19 July 2023. The lowest dissolved oxygen (DO) recorded during this survey was at Station A4 with a concentration of 1.85 mg/ L. The next lowest DO occurred at Station B3 with a concentration of 2.70 mg/L. These numbers are significantly lower than during the HYJUL22 and HYJUL21 survey when the lowest DO was 2.77 and 3.32 mg/L, respectively, at Station A4. In HYJUL23, one other station (02) was below 3.0 mg/L and 16 stations were below 4.8 mg/L.

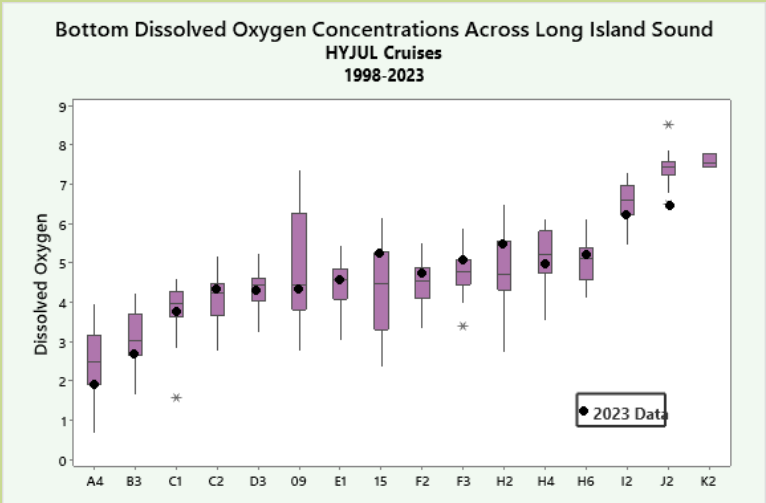
In 2023, 108.8 km^2 (42.01 mi^2) of bottom water had concentrations below 3.0 mg/L and an additional 514 km^2 (198.46 mi^2) of bottom water had concentrations below 4.8 mg/L (but above 3 mg/L).

In 2022, 48.6 km^2 of bottom water had concentrations below 3.0 mg/L and an additional 176.65 km^2 of bottom water had concentrations below 4.8 mg/L (but above 3 mg/L). In 2021, 0 km^2 of bottom water had concentrations below 3 mg/L and 522.7 km^2 had concentrations below 4.8 mg/L. During the HYJUL20 survey, there were 1476.9 km^2 of bottom water that had DO concentrations less than 4.8 mg/L, and 144.4 km^2 were less than 3.0 mg/L. Comparatively, in 2019 there were 511.8 km^2 of bottom water with DO concentrations less than 4.8 mg/L, and 46.1 km^2 of bottom water was less than 3.0 mg/L.



Preliminary data from this survey and prior 2023 cruises are available in Excel spreadsheet format as well as on the UCONN ERDDAP site.





Temperature Data Summary

Bottom and surface water temperatures continue to rise with a 1.66˚C increase of average surface temperatures and a 1.37˚C increase of average bottom temperatures from WQJUL23 to HYJUL23.

The maximum surface water temperature during the HYJUL23 survey occurred at Station 04 (25.48˚C) while the maximum bottom water temperature occurred at Station H2 (22.82˚C).

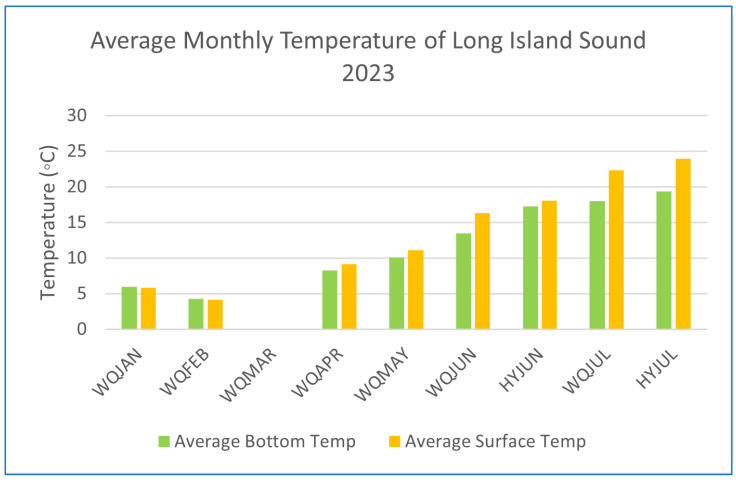
The average surface and bottom water temperature for HYJUL were higher in 2023 than in 2022.

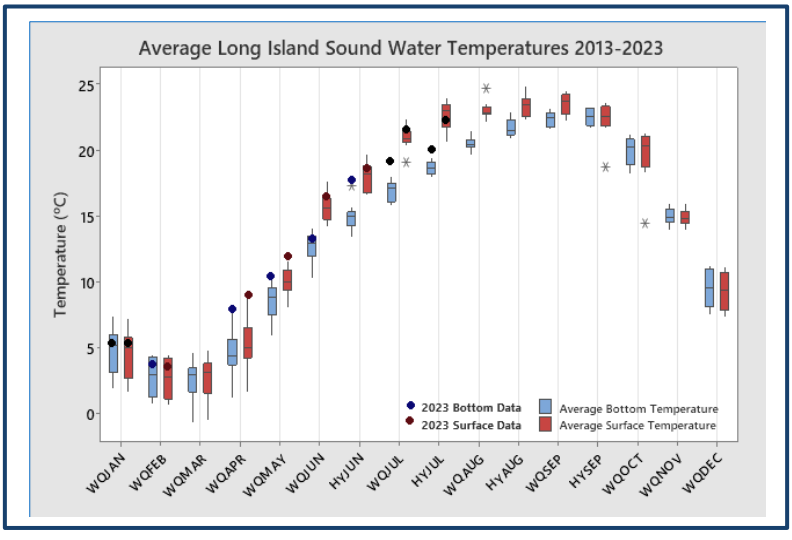
Delta T (ΔT)

The greatest temperature difference between the surface and bottom waters during the HYJUL23 survey was 7.79˚C, measured at Station H6. The smallest temperature difference was 1.25˚C at Station J2. ΔT's averaged 4.32˚C during the HYJUL23 survey.

Delta T (ΔT) is the difference between the surface and bottom water temperature. Differences in water temperature contribute to stratification and exacerbate hypoxic conditions. In general, the shallower coastal stations tended to have the smallest temperature differences, as they are more susceptible to mixing, weather, and anthropogenic influences (human caused Influences). The greater the delta T, the greater the potential for hypoxia to be more severe.

In June, DEEP's hypoxia monitoring cruises began. The DEEP's monitoring program records water temperatures and salinity during its hypoxia monitoring cruises to help estimate the extent of favorable conditions for the onset and ending of hypoxia. Water temperature plays a major role in the timing and severity of the summer hypoxia event. Water temperature differences in the western Sound during the summer months are particularly influential in contributing to the difference in dissolved oxygen content between surface and bottom waters.





Note: WQMAR23 survey could not be completed due to maintenance

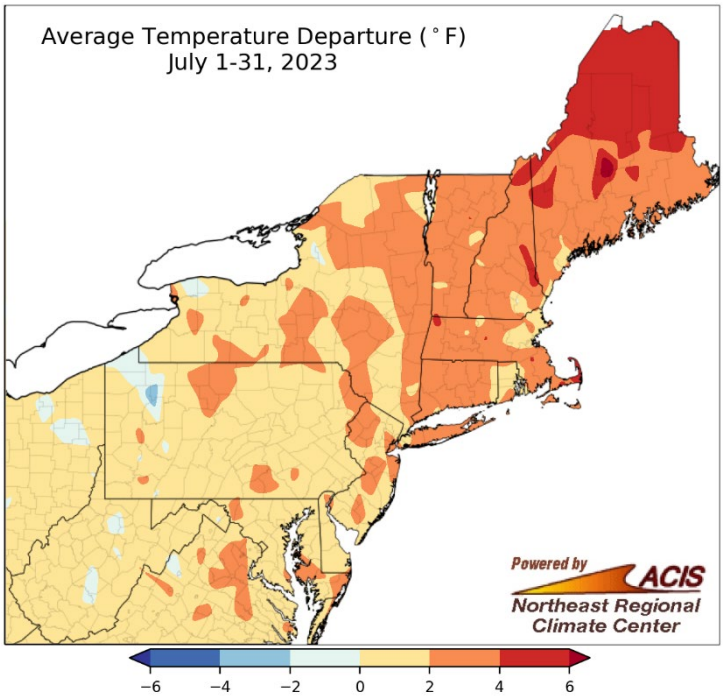
Weather

July was a warm, wet month with near-daily severe weather. Twenty-three major climate sites rank July 2023 among their 20 warmest Julys on record and nineteen climate sites saw July among their 20 all-time warmest months on record. Average temperatures range from near normal to 6°F above normal. Along with record heat, many areas saw extreme rainfall and flash flooding. The wettest areas saw more than 200% of normal precipitation. Hartford, CT, Albany, NY and Worcester, MA had this July among their all-time wettest months on record. Precipitation ranged from 101% of normal to 250% of normal, for an average of 141% of normal and total precipitation of 6.14 inches across the Northeast.

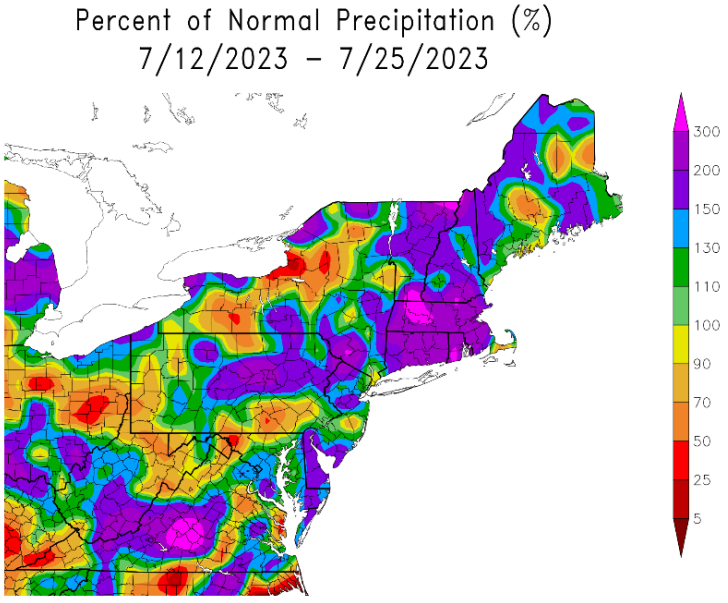
Hartford, CT had a 2.5°F departure from normal temperature of 74.3°F. The average temperature for the month of July was 76.8°F. Hartford also experienced a jump of 334% of normal precipitation at 13.93 inches versus a typical 4.17 inches of rainfall in July. **Hartford, CT was ranked 1st among the 20 wettest sites in the Northeast.**

Bridgeport, CT had a warmer than normal July averaging 76.9°F with a 1.2°F departure from a normal temperature of 75.7°F. Bridgeport, CT was ranked 14th among the 20 warmest sites in the Northeast. Precipitation was 231% of normal reaching 7.68 inches compared to a normal 3.32 inches.

Islip, NY also had above average temperature. There was a 2.0°F departure from a normal temperature of 75.0°F, with the average temperature in Islip, NY this July being 77.0°F. For precipitation Islip, NY had 221% of normal precipitation at 7.19 inches. Normal precipitation was 3.26 inches. Islip, NY ranked 3rd wettest and 9th warmest out of the top 20 sites in the Northeast.



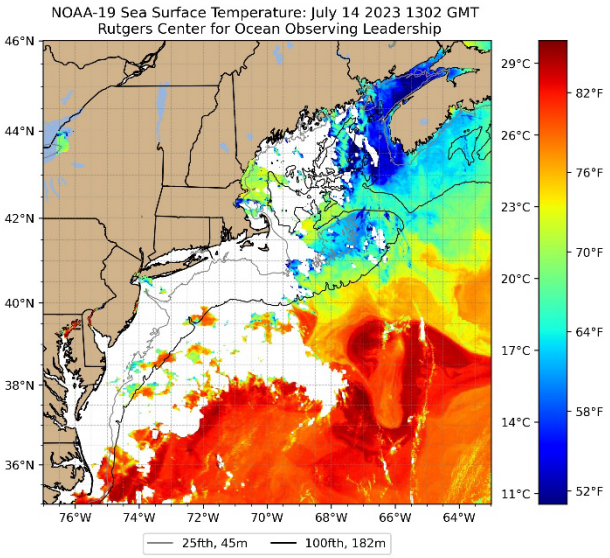
July average temperatures ranged from 2°F below normal to 6°F above normal.

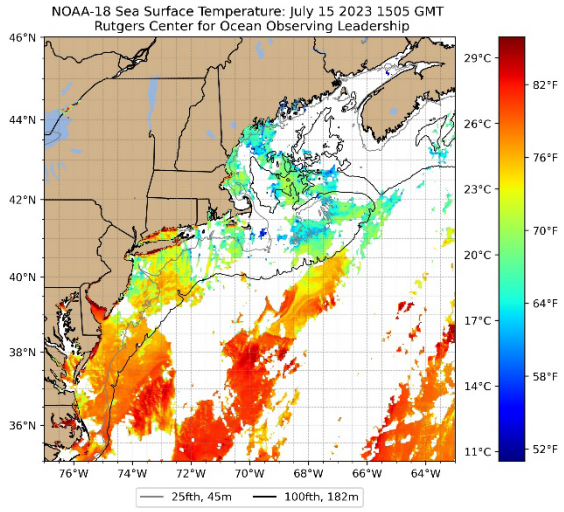


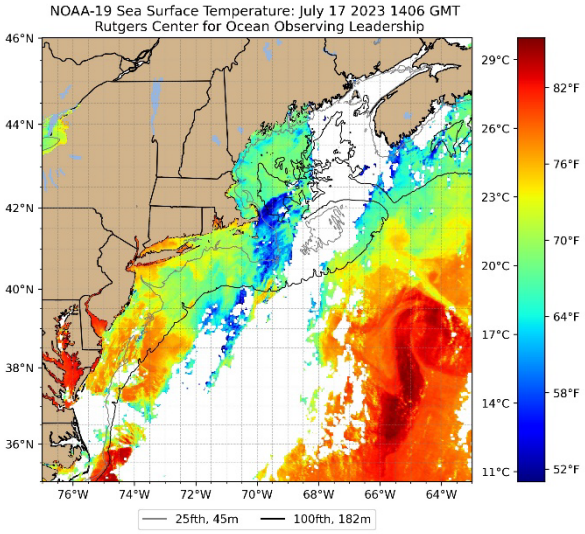
The second half of July shows extraordinarily high percent of normal precipitation across the Northeast.

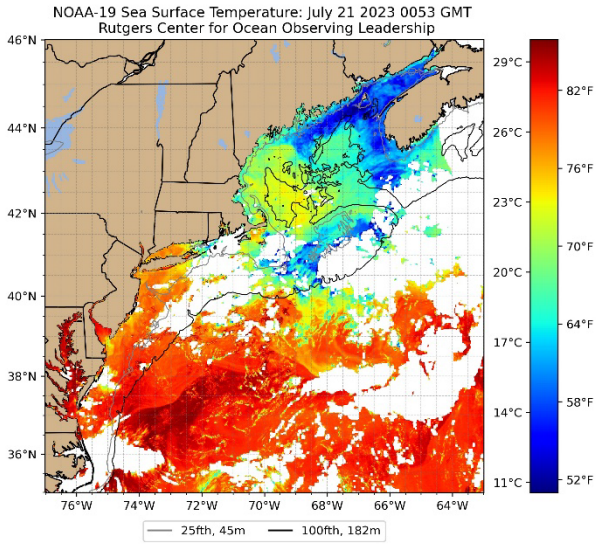
All data and images were from the Northeast Regional Climate Center's website. Please visit http://www.nrcc.cornell.edu/ for more information.

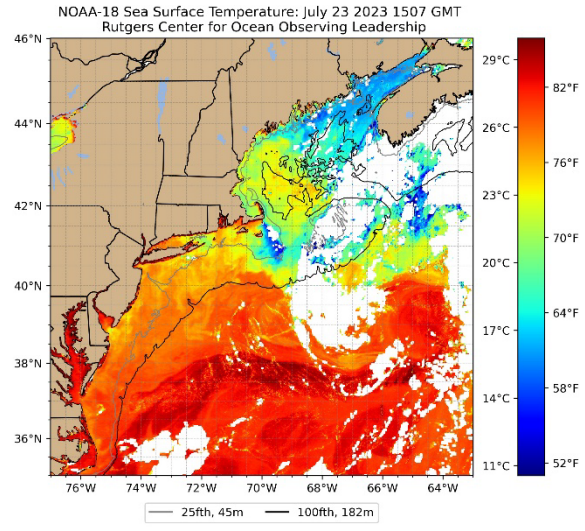
Sea Surface Temperature

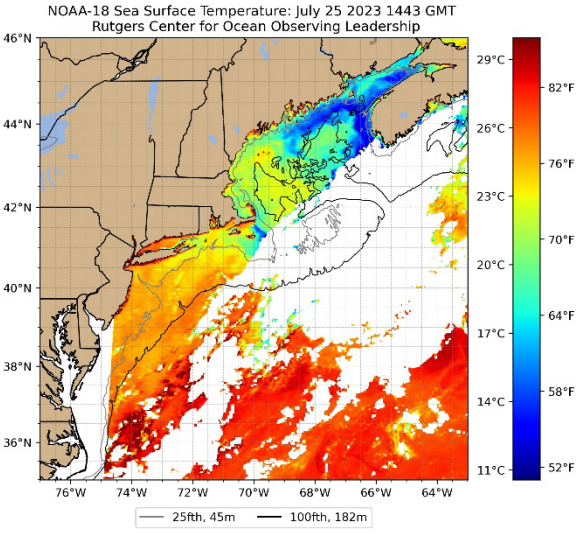












Sea Surface temperature data from Rutgers University IMCU Coastal Ocean Conservation Lab illustrates how currents and fronts impact water temperatures in the Sound and offshore.

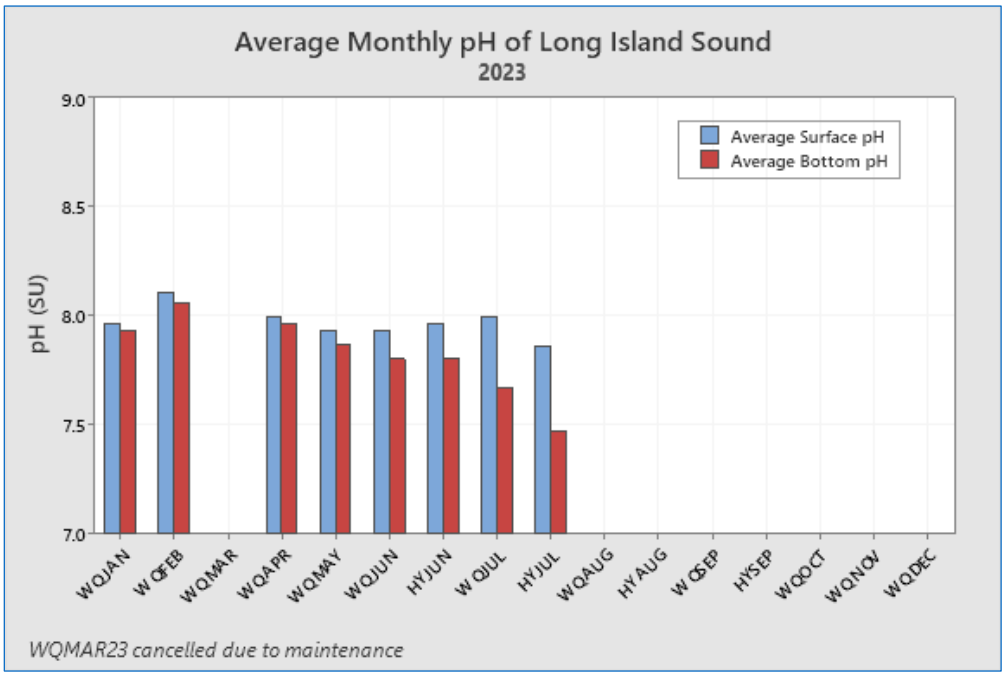
Between the first images taken July 14th and the last image taken July 25th, the surface water temperature of the sound increases from roughly 23ºC (73.4ºF) to 26ºC (78.8ºF).

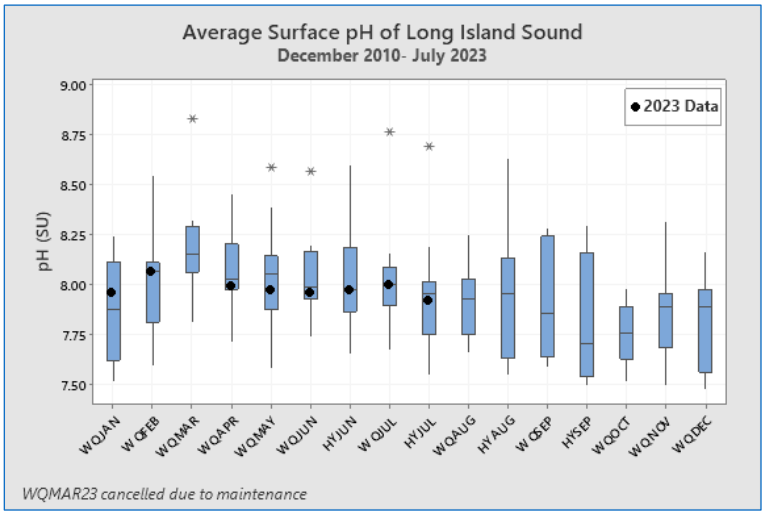
More information about sea surface temperature can be found on the Rutgers University Satellite Imagery website.
[Sea Surface Temperature - IMCS Coastal Ocean Observation Lab (rutgers.edu)]

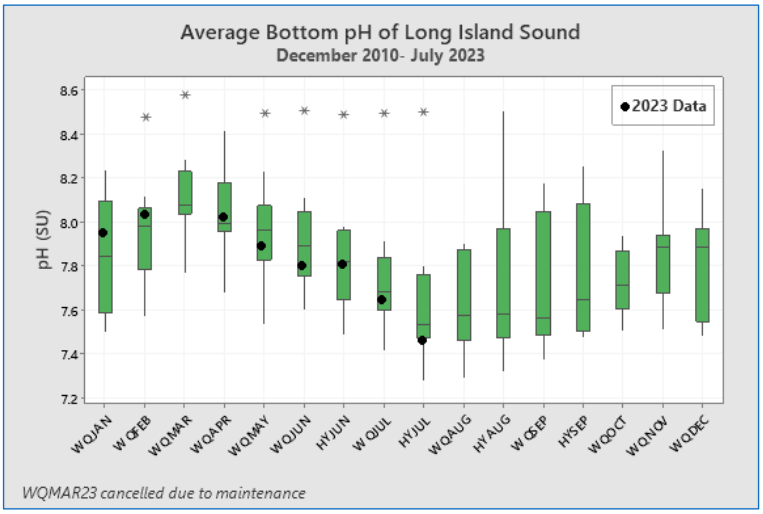
pH

The average surface and bottom pH from all the stations across LIS during the HYJUL23 survey were 7.85 and 7.48 SU, respectively. The lowest bottom pH was 7.18 (Station A4), the highest bottom pH was 7.78 (Station 02), the lowest surface pH was 7.58 (Station 18), and the highest surface pH was 8.00 (Station C1).

The average surface and bottom pH graphs for all the cruises from 2010 to date only include the 17 year-round water quality stations.





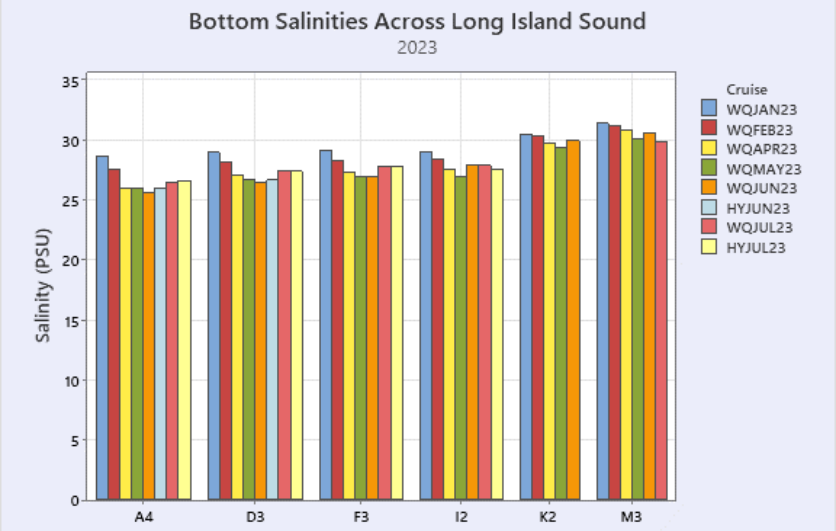


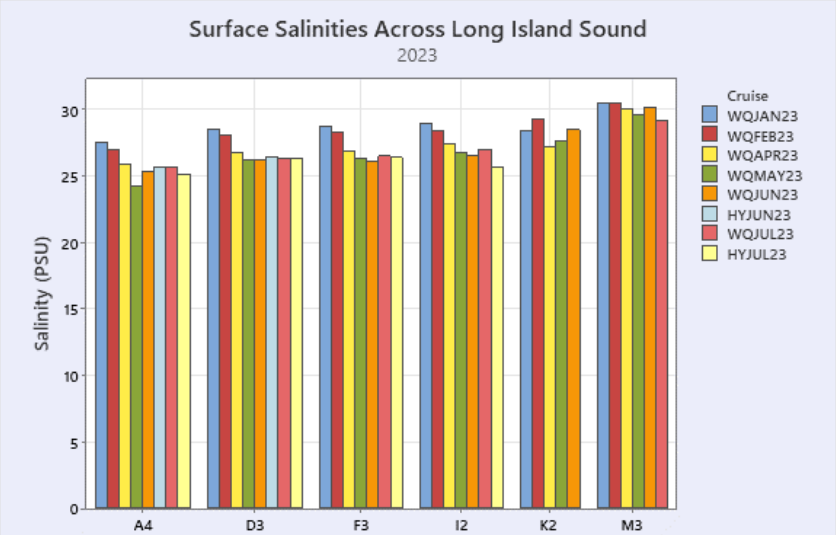
Salinity

Surface salinities across Long Island Sound generally decrease slightly from January through May due to snow melt and spring rains. The less dense freshwater will float on top of the denser saltwater contributing to stratification and impacting hypoxia. Additionally, nutrients carried by runoff fuel phytoplankton growth. Surface and bottom water salinities in 2023 were constant across much of the Sound. The heavy precipitation contributed to decreased surface salinities. While CT DEEP did not sample Station K2 off the mouth of the Connecticut River during the HYJUL23 survey, USGS gage data from Old Lyme (01194796) indicate salinity values at or close to 0 PSU from 11 July though 25 July. These data are provisional.

	A4	D3
2023 Surface	25.13	26.31
2009-2023 Average Surface	25.84	26.53
2023 Bottom	26.64	27.41
2009-2023 Average Bottom	26.59	27.53

Surface salinity values during the HYJUL23 survey were slightly below the 2009-2023 average for Station A4 and bottom salinity values were slightly above the 2009-2023. 2023 averages for surface and bottom salinity were within 0.2 PSU of 2009-2023 averages at Station D3.





Note: WQMAR23 survey could not be completed due to maintenance
HYJUN23 only sampled two of the six stations represented (A4 & D3)
WQJUL23 did not have salinity data for station K2.
HYJUL23 only sampled four of the six stations represented (A4, D3, F3, I2)

Spotlight: Saltwater Invasive Species

Invasive species can harm the environment, the economy, and recreational activity by outcompeting native species and dominating habitats. They can be introduced to the Long Island Sound from ballast water held in cargo ships, biofouling, or the accumulation on ship hulls, fish bait, release of aquatic pets, and other ways. These species can harm the environment, the economy, and recreational activity by outcompeting native species and dominating habitats.

Devil's Tongue Weed
Grateloupia turuturu

- A red alga or seaweed
- Large and flat as opposed to the native red alga which is branched
- Discovered on the sound in 2004
- Attaches to hard surfaces and will cover 100% of the habitat it invades
- Competes with native species for space, light, and nutrients

More info on saltwater invasive species: https://longislandsoundstudy.net/2021/02/aquatic-invaders-of-the-sound/

Dasysiphonia japonica

- Red seaweed
- Native to the Northwest Pacific
- Decaying blooms associated with fish die-offs in the Sound – considered a HAB (harmful algal bloom)
- Toxins lethal to fishes and bivalve larvae
- Invasion worsened with climate change and ocean acidification

Sea Squirt
Didemnum vexillum

- A soft-bodied marine invertebrate
- Grows on hard surfaces
- Filter feeding
- Large ones will shoot water from their filtering siphons when they are picked up, thus giving them the name 'sea squirts'
- Cause damage to human structures and can outcompete and suffocate filter-feeding bivalves (mussels, scallops, oysters)

European Rock Shrimp or Rockpool Shrimp
Palaemon elegans

- Recent invader of the Long Island Sound
- Inhabits coastal rockpools, shallow rocky areas, and man-made structures
- Extremely competitive
- Abundant populations will displace and reduce native coastal species

More info: https://www.dec.ny.gov/animals/114382.html
https://invasions.si.edu/nemesis/species_summary/96466

Spotlight:
Freshwater Invasive Species

Chinese Mitten Crab
Eriocheir sinensis

- Can damage fishing gear, clog pumps and intake pipes, cause riverbank erosion from burrowing activities, and outcompete native species for food and habitat
- Found in a Greenwich pond in 2012
- There are no native freshwater crabs in New England
- **If found,** please follow instructions on the website linked below for how to **contain and report it**

Water Chestnut
Eleocharis dulcis

- Found in Connecticut in 1999
- Populations along the Connecticut river south of Hartford and in connected ponds
- Rooted, annual plant with triangular floating leaves and feather-like submerged leaves
- Sharp spiny fruit can cause injury if stepped on
- Dense growth makes fishing, boating, and swimming nearly impossible

More info and volunteer opportunities: www.ctriver.org/

How you can prevent the spread of aquatic invasive species:

1. Before leaving the water:
   - Clean anything that has come in contact with water (boat, shoes, toys, etc.) making sure to rinse any sand or mud and remove all plant material.
   - Drain all water from boat, kayak, or canoe before transporting.
2. At home or prior to your next location:
   - Dry anything that has come into contact with water (boats, trailers, anchors, propellers, fishing equipment, clothing, dogs, etc.) for a minimum of one week during hot/dry weather and four weeks during cool/wet weather.
3. If drying is not possible:
   - Wash with hot water (preferably high pressure).
   - Dip equipment into 100% vinegar for 20 minutes before rinsing.
   - Use a 1% salt solution (1oz. per gallon) or soap and hot water (Lysol, boat soap, etc.) for 10 minutes before rinsing.
   - Freeze for at least 24 hours.

For more information on common freshwater invasive species in Connecticut please visit:
https://portal.ct.gov/DEEP/Invasive-Species/Examples-of-Aquatic-Invasive-Species-In-Connecticut

For more information on the Long Island Sound Water Quality Monitoring Program please visit:
Long Island Sound Water Quality and Hypoxia Monitoring Program Overview (ct.gov)

Or contact us:
Katie.obrien-clayton@ct.gov
79 Elm Street
Hartford, CT 06106
(860) 424-3176