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Abstract

The Long Island Sound (LIS) has been a historically significant marine natural resource for Connecticut's economy, residents, and native species. Despite its recognized value, water quality monitoring has only been conducted by a handful of government agencies, nonprofit organizations, and academic institutions. Among those is Southern Connecticut State University's Outer Island water quality monitoring program which began in June 2013. Outer Island (OI) is located 3 miles from the coastline of Stony Creek, Branford, Connecticut within the Thimble Islands. The archipelago is highly depended upon by local businesses and recreational boaters during the summer season. This study aims to enhance our understanding of annual trends in water quality in Long Island Sound, as it may have a critical impact on local ecological and economic systems.

The Outer Island water quality monitoring program has been conducted daily every summer (June-August) for the past 10 years. The parameters of the study include dissolved oxygen, salinity, water temperatures, specific conductance, turbidity, and pH. Due to variation in Island Keeper intern engagement dates, complete data sets could only be established for the month of July for each year. Monthly means were calculated for each water quality parameter and regression analysis was used to determine trends over the past 10 years. This study and its results demonstrate the critical need for analyzing long-term seasonal trends in the marine environment.

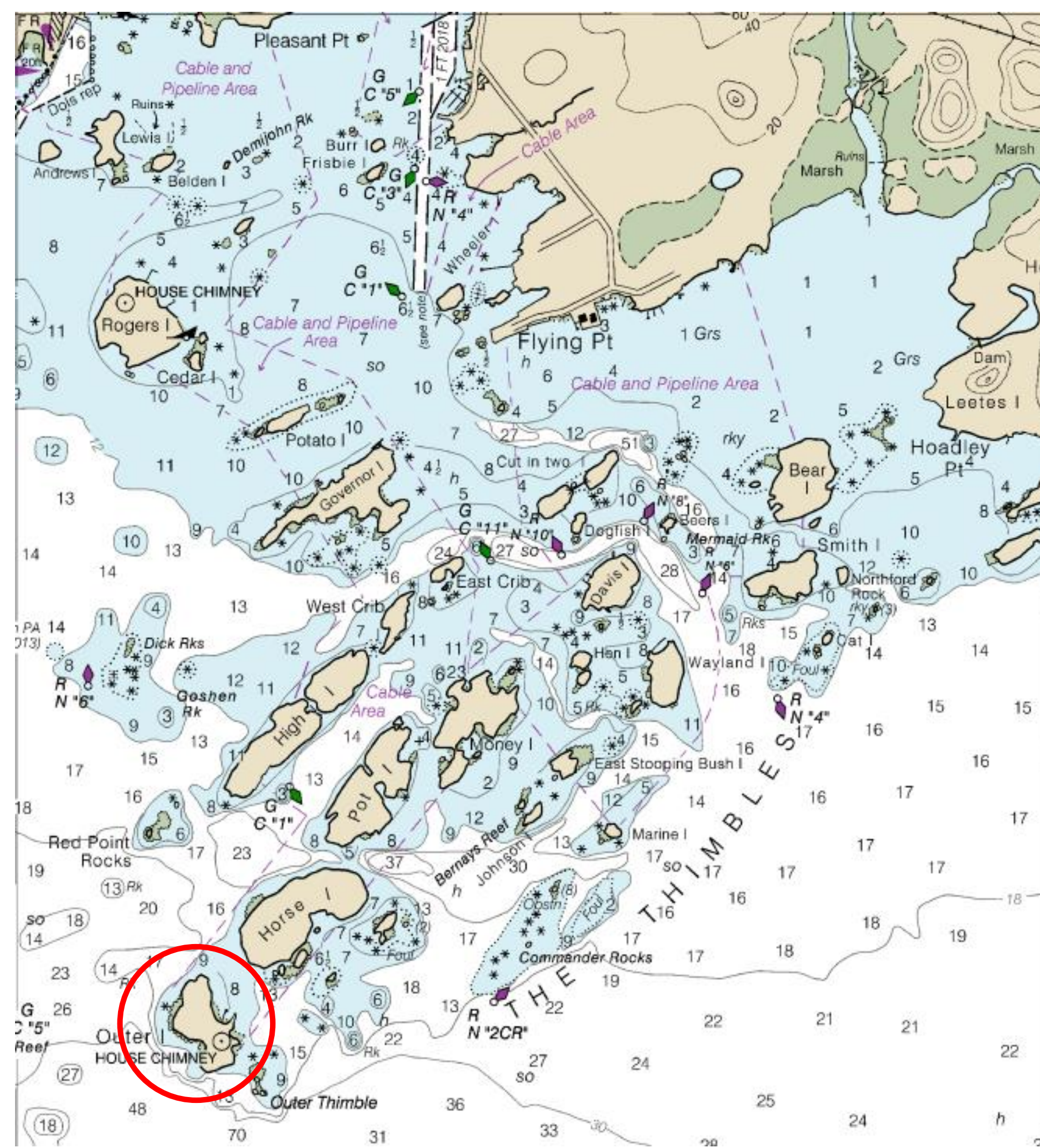


Ian Bergemann using a Beta Horizontal water bottle for sample collection

Water Quality Parameters

Parameter	Device	Purpose
Salinity (ppt)	YSI Pro30	Salinity is directly related to water density and habitable ranges for marine species.
Water Temperature	YSI Pro30	Temperature impacts the solubility of gases such as oxygen and carbon dioxide in the water column, as well as habitable ranges for marine species.
Specific Conductance (mS/cm)	YSI Pro30	Conductivity is the ability of a solution to conduct electricity. It is proportional to salinity.
Dissolved Oxygen (mg/L)	YSI Pro20	It is critical to monitor DO levels because levels below 5mg/L are considered approaching hypoxia. 3 mg/L are considered hypoxic and can lead to negative ecological impacts for species.
Turbidity (m)	Secchi Disk	Indication of light penetration via a black and white disk being lowered into the water till it is no longer visible. Light is an essential resource for photosynthesizing organisms in LIS.
pH	Oakton pH Testers	pH measures the acidity or alkalinity of the water column which is important for species tolerance levels.

Outer Island, Branford, CT

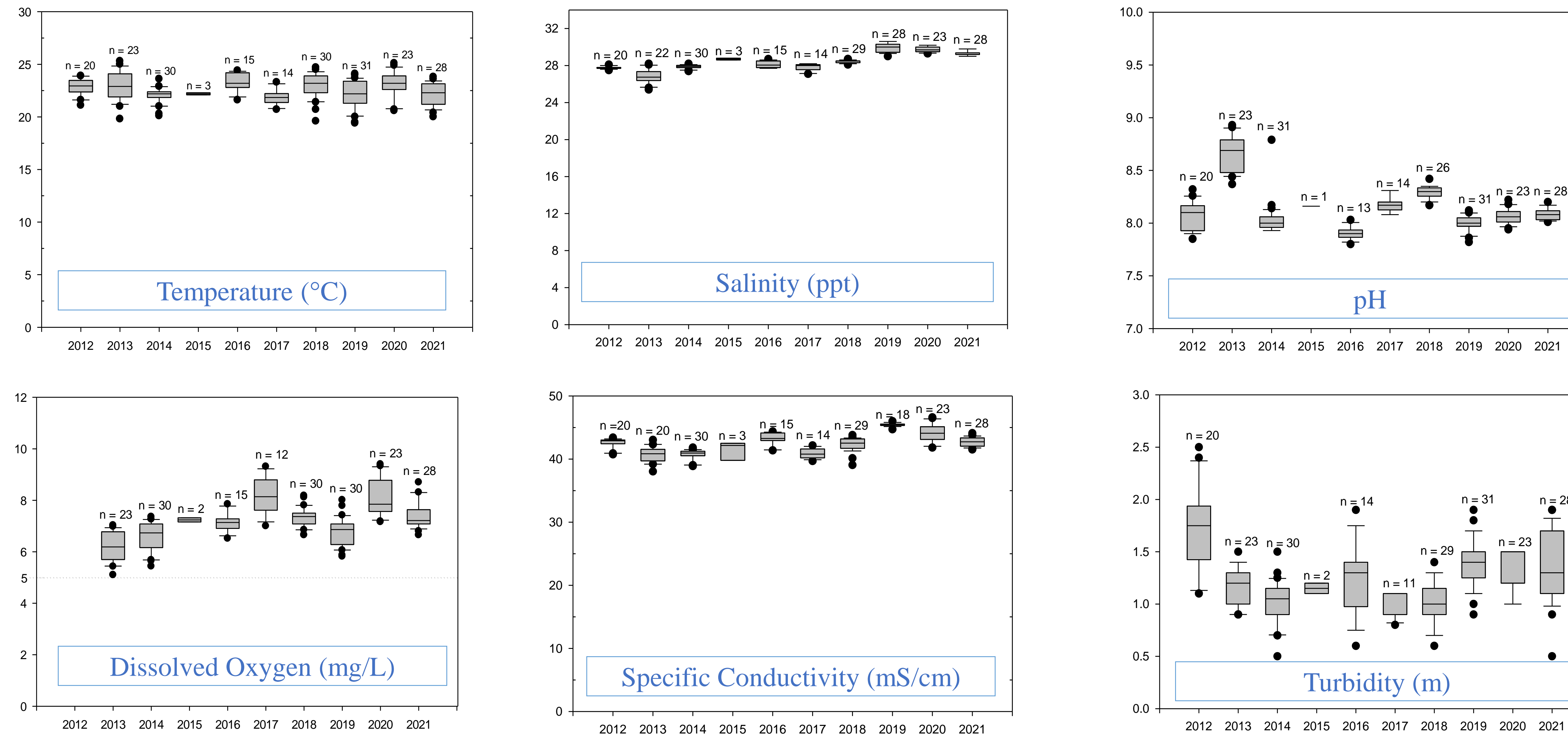


Outer Island is 3 acres of granite outcropping, boulder and cobble beaches, and two small salt marshes. It is located in the outermost of the Thimble Islands, located off the coast of Stony Creek, Branford, Connecticut. OI is a part of the Stewart B. McKinney National Wildlife Refuge

Acknowledgements

This research was made possible by the generosity of the Werth Center for Coastal and Marine Studies as well as Southern Connecticut State University. The author would like to thank previous island keeper interns, volunteers and staff from the United State Fish and Wildlife Service, Outer Island Executive Committee, Friends of Outer Island, and the Werth Center for Coastal and Marine Studies.

Annual Trends



Lauren Gervais deploying a YSI Pro20 to measure dissolved oxygen.

Discussion

- The results provide an insight into annual summer water quality trends for Long Island Sound (LIS).
- Dissolved Oxygen (DO) concentration over the past 10 years during the month of July at Outer Island was on average above 5 mg/L. This is comparable to CT's DEEP Long Island Sound Water Quality Monitoring Program. Data from July 1998-2021, shows DO levels exceeding 4.8 mg/L for most of LIS. Below 5 mg/L is considered a threshold for healthy water quality, below 3 mg/L is considered hypoxic and can pose a threat to marine life.
- Decadal Outer Island water temperatures for July remained relatively stable at 22.5°C. This data was compared to the Long Island Sound Study which reported an increasing trend in LIS water temperature since 1960s, with an annual summer mean of 20.19°C over the past 10 years.
- Salinity remained within a narrow range (27-30 ppt). Salinity in LIS typically varies from 23 ppt in the western end and 35 ppt in the eastern end (Long Island Sound Study, 2021).
- Annual July pH at Outer Island varied between 7.9-8.4. This range is comparable to the LIS Water Quality Monitoring Program which had an average pH of 7.6 from 2014 – 2018.
- Trends for water clarity for the past 10 years during July at Outer Island show a range of 1.0-2.5 meters depth. These results are comparable to measurements taken by CT's DEEP Long Island Water Quality Program which had similar ranges of secchi disk depths (1.0-2.9 meters).
- The Outer Island water quality monitoring program examined the trends of six different water quality parameters in Long Island Sound over the past 10 years during the month of July. The results highlight the significance of long-term data collection for trend analysis of water quality and how it may impact local economic and ecological systems.