

Community Oyster Monitoring Report 2024



Purpose

The Eastern oyster (*Crassostrea virginica*) is native to the Hudson River Estuary and once grew here in great abundance; as it stands today, wild oyster populations are less than 0.01% of what they once were historically (McCann 2018). Eastern oysters perform a myriad of ecosystem services that are valuable to preserving and improving the health of the river such as nutrient fixation, water filtration, and habitat engineering. The Park's River Project conducts numerous oyster monitoring projects to better understand the growth, mortality, and functions of oyster populations over time within the Park's Estuarine Sanctuary. The Park has partnered with the Billion Oyster Project and U.S. Army Corps of Engineers to conduct large-scale habitat restoration projects such as the Tribeca and Gansevoort Habitat Enhancement Projects (2021-present), which include the deployment of 300+ submerged habitat structures, seeded with a combined 35 million oyster spat. Juvenile oysters are known as spat once they affix to a surface, following their free-floating planktonic stage of development, and their annual settling or recruitment offers valuable information on the bivalve's populations.

The Community Oyster Project was launched in 2017 to assess the potential use of historic pile field sites as oyster habitat. Oyster wraps – aquaculture mesh enclosures deployed in the river on remnant piles from what was once Pier 32 (**Figs. 1 & 2**) – are monitored throughout the growing season to assess change over time and to engage students and volunteers of all ages in environmental fieldwork and stewardship.

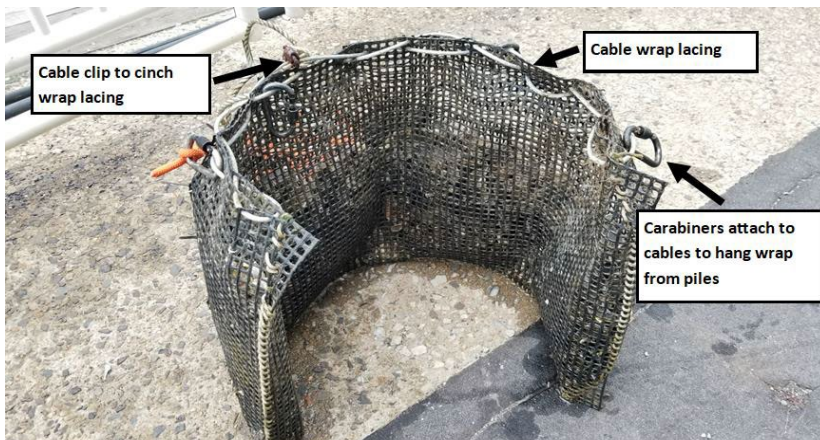


Fig. 2 | A standard oyster wrap with key components labeled.

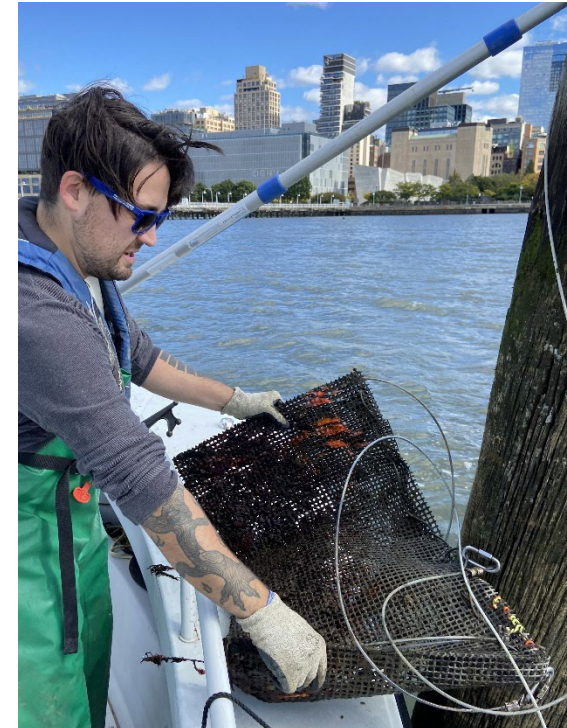


Fig. 1 | Oyster wrap being deployed for winter in the Pier 32 pile field, October 2024.

Key Research Questions

- How do oyster length and mass change over the monitoring season?
- How can oyster monitoring events engage volunteers across various age and career levels?
- What other species in the estuary are supported by the oyster reefs?
- How can oyster wraps & mini reef balls act as sampling devices for spat recruitment in the Lower Hudson Estuary?

Methods

- Oyster wraps are temporary oyster habitat structures made of marine-grade plastic mesh (**Fig. 2**). They are attached onto piles with PVC-coated steel cable (**Fig. 1**).
- Each spring, a subset of the wraps are retrieved and moved to floating docks off Pier 40 for monthly monitoring during peak growth season (June-October). Different wraps are retrieved each year, with some staying in the pile field for extended periods.
- Oysters in our wraps came from two stocks: Fishers Island, an oyster farm in the Long Island Sound; and the Supporting Oyster Aquaculture and Restoration (SOAR) program, part of The Nature Conservancy's mission to support oyster restoration across the East Coast. Wraps are restocked each year to compensate for overwinter mortality, and as needed throughout the monitoring season. Current wrap oysters are predominantly sourced from Fishers Island.
- In 2024, wraps were monitored with the help of corporate groups and student volunteers.
 - All oysters were initially checked and sorted for mortality. After a brief training demonstration by Park staff, a random sample of 50 live oysters were measured and weighed by the volunteers.
 - Once tallied, all dead oysters were broken at their hinge into half-shells so they may no longer be counted in future events.
- Wraps were returned to the pile field for overwintering in October 2024 (**Fig. 3**).
- Monthly data were compiled and analyzed using Microsoft Excel.

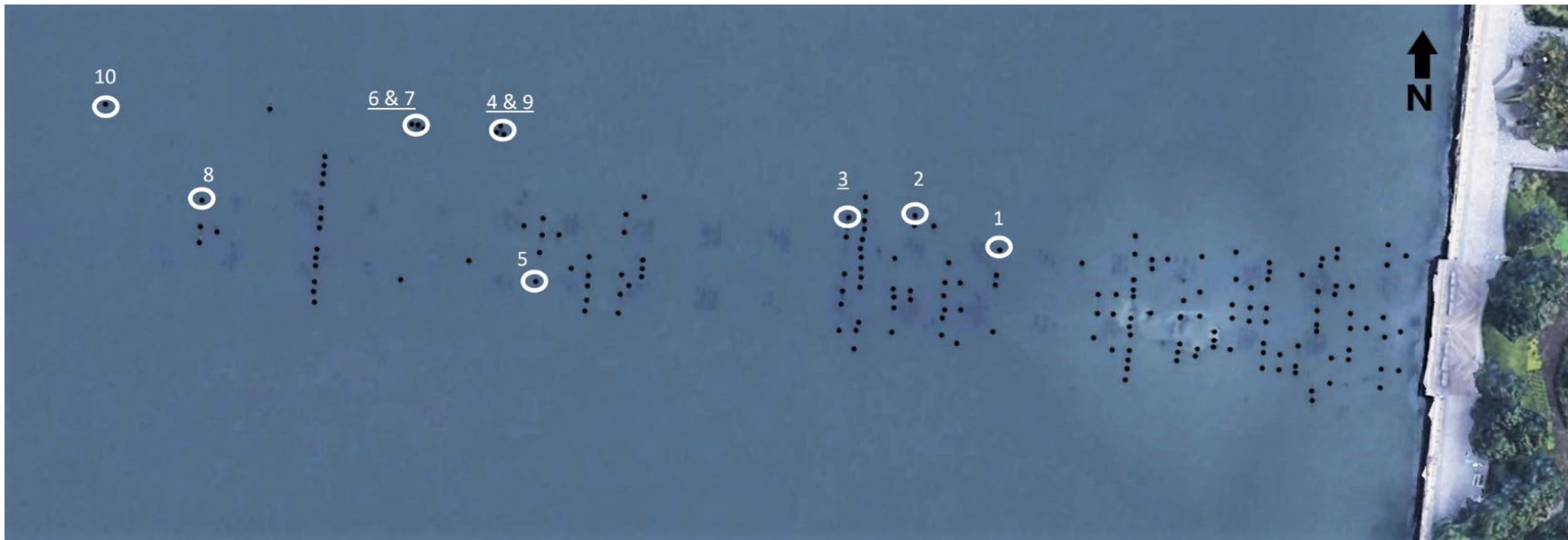


Fig. 3 | Satellite map of the Pier 32 pile field; indicating oyster wrap placements in 2024. Underlined numbers denote wraps monitored this season.

Major Findings

Growth

Despite high rates of mortality due to wrap disturbances this season, oysters exhibited a statistically significant ($p < 0.05$) amount of growth in Wraps 3, 4, and 6, increasing on average by 6-16mm and 14-40g. Wraps 7 and 9 showed no significance in either mass or length increase. High turnover of oysters in some wraps “reset” them as older individuals perished and were replaced with younger, smaller oysters of more uniform size.

Mortality

Rates of oyster mortality were significantly higher this year due to dock failure (**Table 1**). During the monitoring season, oyster wraps are tied off from a gangway to a floating dock at Pier 40. This dock was detached from its mooring piles, causing the gangway to drop and come to rest on the river bottom. As a result, wraps 6 and 9 detached and were smothered in mud on the riverbed, necessitating scuba divers to retrieve them. The wraps that remained attached to the gangplank were also disturbed and faced more sedimentation than usual, which cuts off the flow of oxygen and nutrients to oysters, resulting in mortality ranging as high as 50-81% for the fallen/crushed structures. Outside of this irregular dock failure, monthly mortality rates in the wraps were between 1-20%, far more typical for this region and previous years of survey.

Supported Species

- A variety of fish and other species were observed inside the wraps. Some common sights include oyster toadfish (*Opsanus tau*), skiliffish (*Gobiesox strumosus*), feather blennies (*Hypsoblennius hentz*) (**Fig. 4**), blue crabs (*Callinectes sapidus*), mud crabs (*Panopeus & Rhithropanopeus sp.*), and mud dog whelks (*Tritia obsoleta*).
- Innumerable sessile organisms encrust the oyster shells, including juvenile oysters, other bivalve mollusks, sponges, barnacles, polychaete worms, anemones, and more.



Fig. 4 | Feather blenny occupying a vacant oyster shell. Many mobile and sessile species use the oyster wraps and their contents as habitat, shelter, and feeding/breeding grounds.



Fig. 5 | A volunteer measures oyster lengths using calipers during a monitoring session.

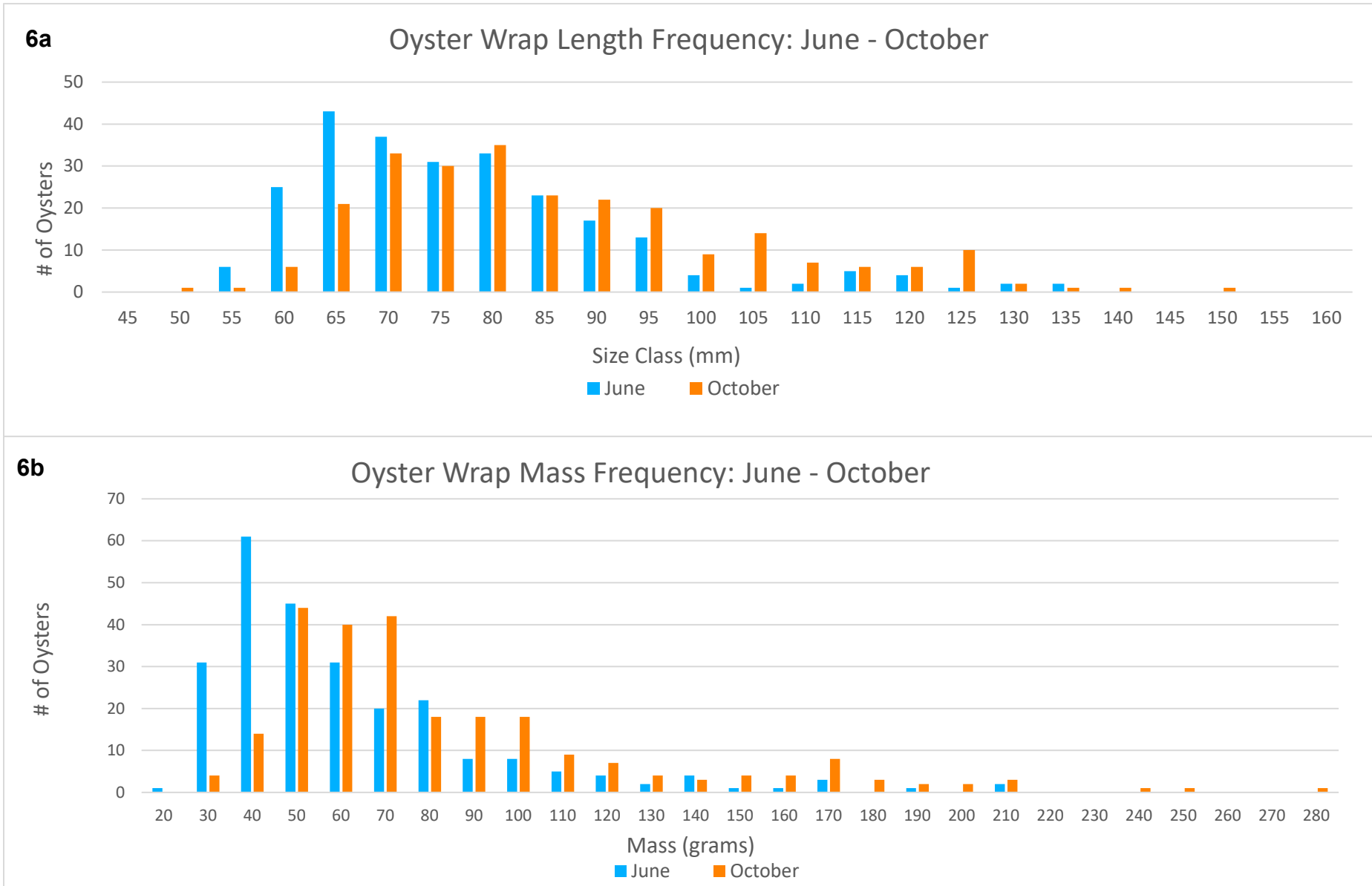


Fig. 6 | Size class histograms comparing oyster lengths (**A**) and masses (**B**) across all wraps between the start and end of the monitoring season. Overall growth of both metrics was found to be significant ($p < 0.05$) despite the amount of replenishment due to oyster mortality.



Fig. 7 | The Gansevoort salt marsh viewed from shore, where two miniature reef balls were deployed in 2024.



Fig. 8 | A miniature reef ball that is seeded with oyster spat, ready for deployment in the salt marsh.

Breaking New Ground

As the Park seeks to employ novel forms of habitat enhancement, we deployed miniature reef balls (**Fig. 8**) seeded with oyster spat for the first time. Rather than placing these mini-reef balls in the inter-pier spaces alongside full-sized enhancement structures, these were deployed in the recently constructed Gansevoort salt marsh (**Fig. 7**). One miniature reef ball was placed in each of two openings in the northern revetment where water flows in and out with the tide to inundate the marsh. The shoreward opening allowed the reefball to experience near-total submersion, while the western reef ball was exposed at low tide. Interestingly, the submerged reef ball suffered near total mortality whereas the intertidal reef ball displayed highly productive growth (**Fig. 8, 9**). Historically, oyster reefs in the estuary grew in intertidal zones close to the shore. And in fact, regular exposure to atmospheric oxygen and UV radiation from the sun may benefit oysters and other sessile organisms by combatting aquatic pathogen growth. The Park plans to use these smaller, easily retrievable structures to engage students and the community in oyster monitoring on site at Gansevoort.

Planted in 2022, the Gansevoort Peninsula salt marsh calls back to a time when the entire periphery of Manhattan – as well as much of the surrounding areas – was dominated by such coastal marshland. These ecosystems are highly productive and store large amounts of carbon for their size. Over 80% of historic salt marshes within the five boroughs were cleared or drained to make way for urban development. As we come to learn more of the many ecosystem services these habitats provide (carbon sequestration, biodiversity, flood mitigation, etc.), practitioners across the eastern seaboard are fighting to protect what remains of our salt marshes and restore what once was. Up until 1980, one of the largest trash incinerators in the city operated on Gansevoort peninsula. Only 4 decades later, the Gansevoort salt marsh has taken its place as a so far highly successful constructed salt marsh.

Table 1 | Individual oyster wrap length and mass growth rates, mean monthly mortality, and total wild spat observed across the monitoring season.

Wrap #	Length Growth Rate	Mass Growth Rate	Mean Monthly Mortality	Total Spat
3	+19.30%	+58.21%	8%	20
4	+8.08%	+29.79%	7%	3
6	+22.03%	+81.08%	23%	22
7	+5.06%	+16.26%	9%	9
9	+2.25%	+11.44%	29%	3

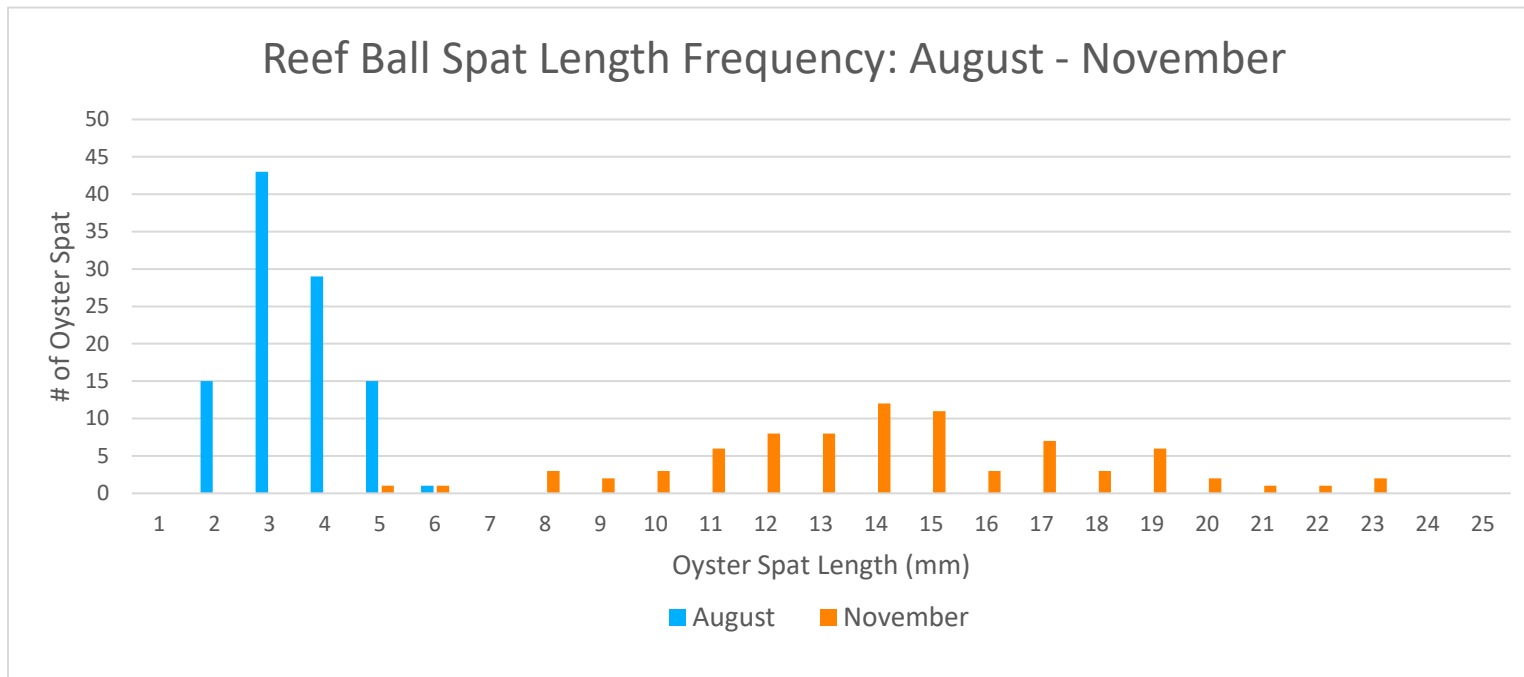


Fig. 9 | Comparative spat lengths on miniature reef ball RB2 that was deployed in the Gansevoort salt marsh from 8/28/24-11/2/24. Spat exhibited exceedingly higher growth rates (average 315%) when compared to mature oysters (average 39.36%) (Fig. 6).

Takeaways

Hudson River Park's Community Oyster Project demonstrates the suitability of the Park's Estuarine Sanctuary as an oyster habitat. Barring unforeseen structural mishaps this season, oysters in all wraps have grown significantly since their respective deployments in 2018 & 2021. Though the oysters' growth has slowed significantly, this is not unexpected after several years, after which growth rates tend to depress if oysters persist (Harding 2020).

Fostering stewardship through citizen science is a core goal of the Park's Community Oyster Project. This season, 105 volunteers from corporate and student groups participated in oyster monitoring events. Education through hands-on field science empowers community members to build positive environmental behaviors and connect with their local waterways.

Future Directions

Hudson River Park's Pier 32 oyster wraps will continue to be monitored as a part of the Tribeca Habitat Enhancement Monitoring Plan to assess the growth and retention of oysters in the Park's Estuarine Sanctuary. Further assessments with the help of collaborating researchers such as spat surveys, gonad condition indexing, and genetic analyses to determine wild oyster settlement origin are being explored by Park staff.

Building upon the successes of miniature reef balls this season, the Park plans to continue experimenting with paired oyster and salt marsh habitat enhancements. Five reef balls with spat are currently overwintering beneath the Pier 40 East floating dock, tied off so they are suspended on the riverbed until their deployment in the marsh next Spring alongside experimental basalt shell bags..



Fig. 10 | Oysters being rinsed and scrubbed in preparation for monitoring.



Fig. 11 | One of the largest oysters in the Park, found under Pier 40 in 2018, now measures in at 210mm and 1286g, supporting many younger oysters, mussels, barnacles, and other sessile organisms.

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