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Community Oyster Monitoring Report 2025

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Purpose

The Eastern oyster (*Crassostrea virginica*) is native to the Hudson River Estuary and once grew 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 valuable ecosystem services such as nutrient fixation, water filtration, and habitat engineering. The Park's River Project conducts numerous oyster monitoring projects to better understand the dynamics of oyster populations within the Park's Estuarine Sanctuary. The Park has partnered with various groups including the Billion Oyster Project to conduct large-scale habitat restoration efforts such as the Tribeca and Gansevoort Habitat Enhancement Projects (2021-present). These projects saw the deployment of 300+ submerged habitat structures, seeded initially with a combined 35 million juvenile oysters (spat).

Two forms of habitat enhancement structure 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. Oyster wraps, aquaculture mesh enclosures, are deployed sub tidally on the remnant piles of Pier 32 (**Figs. 1 & 2**). Mini reef balls, dome-shaped concrete semi-spheres, are deployed intertidally off the Gansevoort salt marsh (**Fig. 4**).

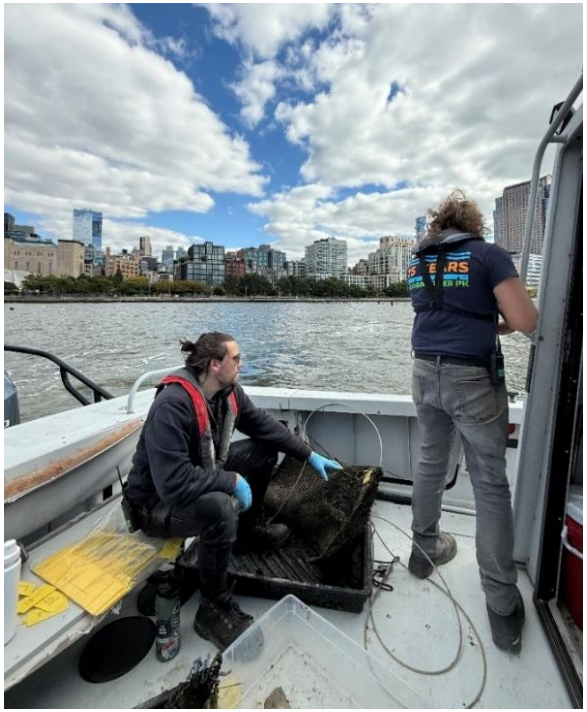

Fig. 1 | Oyster wrap being deployed for winter in the Pier 32 pile field, October 2025.

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

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?

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Oyster Wrap 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 cables (**Fig. 1**).
- Each spring, a subset of 5 wraps are retrieved and moved to floating docks off Pier 40 for monthly monitoring during peak growth season (June-October).
- Oysters in the wraps are predominantly sourced from Fishers Island Oyster Farm in Long Island Sound, though in the past some have come from the Supporting Oyster Aquaculture and Restoration (SOAR) program through the Nature Conservancy. Wraps are re-stocked each year in June to compensate for overwinter mortality.
- In 2025, wraps were monitored at least monthly from June to October 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, all live oysters were measured (mm) and weighed (g) by volunteers using calipers and pocket scales.
    - Once counted, all dead oysters were broken at their hinge into half-shells, so they are not counted again in future events.
- Wraps were returned to the pile field for overwintering in October 2025 (**Fig. 1**).
- Monthly data were compiled and analyzed using Microsoft Excel.

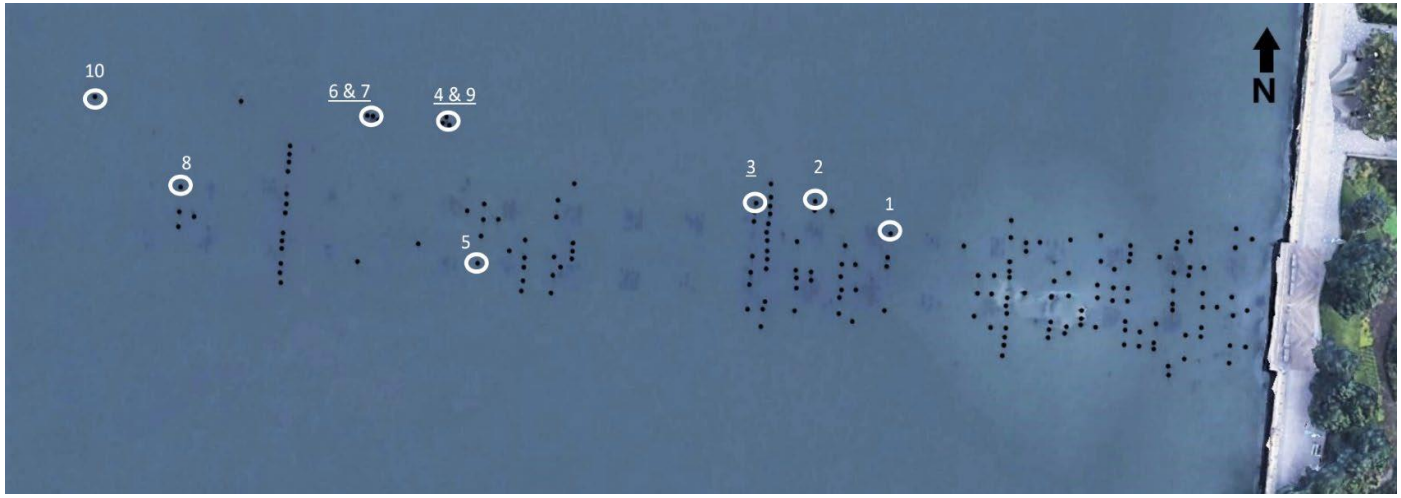

Fig. 3 | Satellite map of the Pier 32 pile field; indicating oyster wrap placements in 2025. Underlined numbers denote wraps monitored this season (3,4,6,7,9).

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Reef Ball Methods

- Four miniature, concrete reef balls were deployed within two inlets at the Gansevoort salt marsh to act as a proxy for the larger, 3-6’ reef balls comprising the adjacent Gansevoort habitat enhancement area.
- Two reef balls were deployed intertidally (not submerged during low tide) and two were deployed subtidal, at the Western & Eastern inlets, respectively.
- In 2025, reef balls were monitored monthly with the help of corporate groups and student volunteers.
    - After a brief training demonstration by Park staff, all live oysters within two quadrats (one per side) had shell length (mm) measured with calipers.
- Reef balls were returned to the eastern Pier 40 dock for overwintering in October 2025.

Fig. 4 | A mini reef ball seeded with oyster spat being monitored.

Fig. 5 | One of two inlets where reef balls were deployed at the Gansevoort salt marsh, tied to bolts driven into the rock.

Shell Bag Methods

- The Park continues to partner with visiting scholars from New Jersey City University and Cornell University to track and monitor spat settlement within the Park
    - Shell bags are deployed at various water depths throughout the Park from June-September and then collected at the end of the season for spat enumeration.
    - See our Visiting Scholars page for more details.
- In alignment with the Park’s mission of sustainability, plastic-free Natrx basalt shell bags were trialed alongside reefballs.
    - Basalt shell bags saw heavy deterioration within the inlets, likely due to high water energy and the jagged rip rap.
    - Non-plastic alternatives will continue to be explored.

Major Findings

Growth

Oysters exhibited a statistically significant ($p<0.001$) amount of growth in all five wraps. Over the season, oysters in wraps 3, 4,7 and 9 grew 6-11mm and 15-26g, on average. This shows a growth of 8.4% to 15.5% in length, and 17.0% to 39.4% in mass. (**Table 1**). Wrap 6 showed a slower rate of growth, with a mean size increase of 1.3mm and 7g. Leading to a length increase of 1.4% and a mass increase of 8.9% (**Table 1**). These growth rates align with annual changes observed in previous seasons.

As highlighted in (**Fig. 11A**), oyster mass distribution in the oyster wraps changed significantly between June and October. In June, most oysters weighed between 50-80g, while in October the average weight was 80-110g. October also saw a number of oysters grown substantially large, including six that weighed in at over 250g.

The oysters exhibited similar monthly changes in their length distribution. In June, the average oyster length was between 65-85mm (**Fig. 11B**). In October, the average length increased to 75-95mm, with seven oysters having grown to over 135mm during the season. Such growth is not uncommon in healthy, young oysters during the summer, where peak ecosystem productivity allows them to grow rapidly.

Spat recruitment in the oyster wraps was considerably lower in 2025 compared to 2024. This year, 10 oyster spat were recorded (**Table 1**) compared to 57 spat being recorded in 2024. Visiting scholar shell bags reported a similar drop in recruitment. This could be due to environmental conditions, competition, or random year-to-year variations in oyster recruitment throughout the Hudson.

Fig. 6 | A volunteer measures oyster lengths using calipers during a monitoring session.

Fig. 7 | A wild Eastern oyster settled in a tide pool at Pier 26.

Fig. 8 | A gabion stocked with oysters, on deck of research vessel for biannual monitoring.

Reef ball oysters grew significantly ($p < 0.001$) throughout the season as well (**Fig 12**), with an average length increase between 156.3% and 177.2%. Reef balls #2 and #3, which were subtidal, experienced higher growth (177.2% and 163.5%) compared to reef balls #4 and #5 which were intertidal (156.3% and 160.5%). Oysters on the #2 & #3 grew slightly larger (mean 41.7mm to 38.7mm) than on #4 & #5 ($p=0.038$), though these subtidal structures also exhibited fewer oysters near the base of the reef ball. Intertidal reef balls saw higher mean oyster densities over the summer, but by October, nearly all 4 exhibited approximately ~400 oysters/m^2.

There is preliminary evidence of marginal spat recruitment on the reef balls. Two spat (3mm and 6mm), were recorded in October. These individuals were too small to be a part of the original set from July, pointing towards mid-season settlement. In upcoming monitoring seasons, spat settlement will be easier to quantify as the original oysters continue to grow past the size of new growth.

Mortality

Oyster wraps experienced a highly variable 9-17.5% average monthly mortality rate (**Table 1**). This rate is consistent with previous years, before a high mortality event in 2024 when two wraps were prolongingly submerged in mud during a dock collapse. The three remaining wraps also suffered higher levels of sedimentation, leading to higher-than-average mortality throughout the five wraps.

Overwinter mortality continues to be present as harsh winter conditions lead to a significant die-off of oysters. This year, the average winter mortality rate was 32% for wraps 3, 4, 6, 7 and 9. A substantial increase compared to the average 12.6% mortality during the summer.

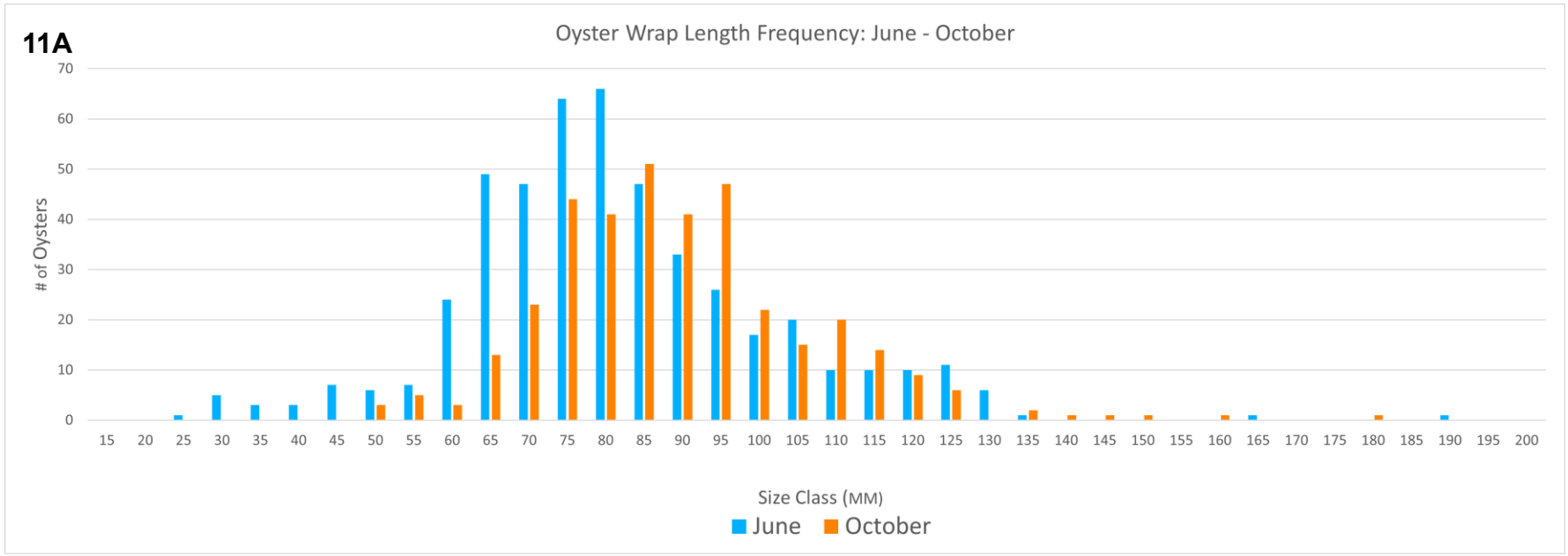
Juvenile oysters are more vulnerable to winter mortality, resulting in a higher presence of mature old-growth oysters when the wraps are retrieved in June. Harsh winter conditions include freezing temperatures, lower food availability, and a higher vulnerability to parasitic diseases due to weaker immune systems.

Supported Species

- A variety of fish and invertebrates were observed using oyster wraps and reef balls for shelter. Common sightings include juvenile oyster toadfish (*Opsanus tau*), skilletfish (*Gobiesox strumosus*), feather blennies (*Hypsoblennius hentz),* gobies *(Gobiosoma spp.*), blue crabs (*Callinectes sapidus*), mud crabs (*Panopeus & Rhithropanopeus sp*.), pacific shore crabs (*Hemigrapsus sanguineus*), and mud dog whelks (*Tritia obsoleta).*
- Innumerable sessile organisms encrust the oyster shells, including juvenile oysters, other bivalve mollusks, sponges, barnacles, polychaete worms, anemones, sea squirts, and more (**Fig. 10**).
- The park is also home to larger and more permanent habitat enhancement structures such as gabions (**Fig. 8**), full-sized reef balls, textured piles, and bio huts. Acting as artificial reefs, these structures are home to marine life that aren't commonly seen in our smaller structures. During monitoring events this season, fish sightings included cunner (*Tautogolabrus adspersus*), black sea bass (*Centropristis striata*), blackfish (*Tautoga onitis*), and American conger eels (*Conger oceanicus*).

Fig. 9 | Oyster toadfish are a common sight amongst oysters and benthos.

Fig. 10 | Oysters often act as habitat for numerous sessile organisms. This oyster has sea squirts, barnacles, mussels, and juvenile oysters attached.



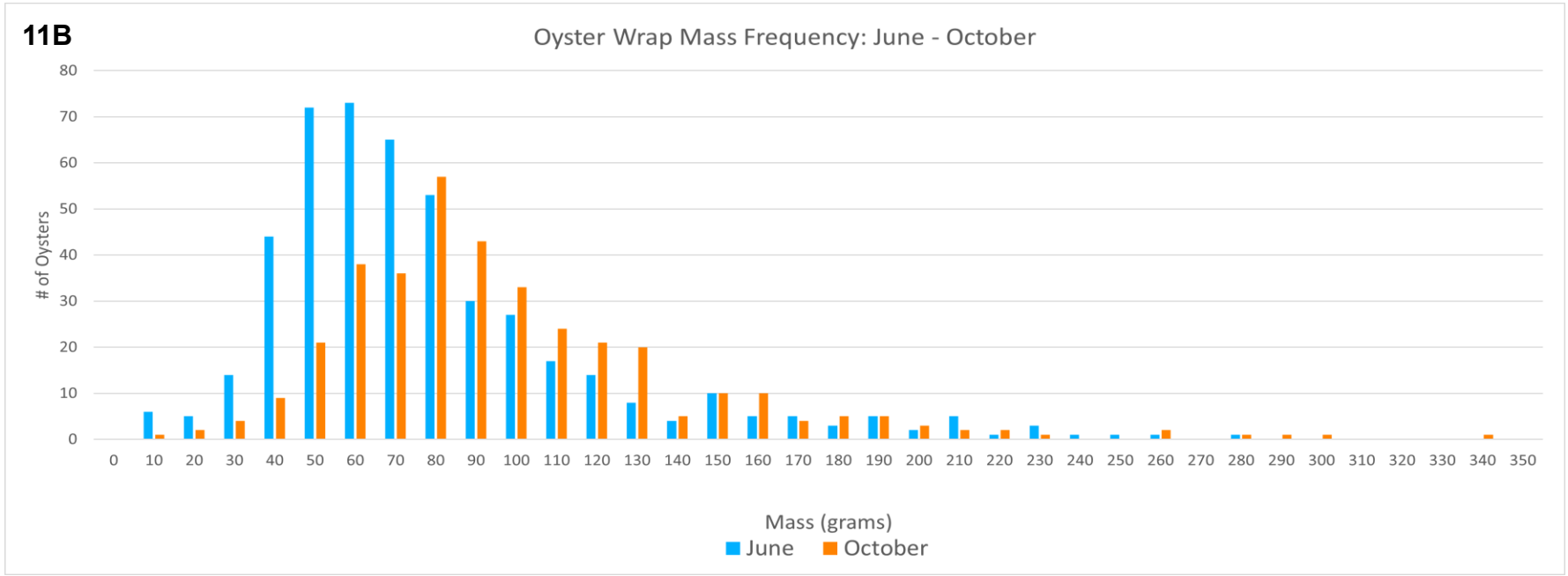


Fig. 11 | Oyster length (**a**) and mass (**b**) size class frequency across all wraps between the start and end of the monitoring season. Overall growth of both metrics was found to be significant ($p<0.05$).

Table 1 | Mean growth rates, mean monthly mortality, and total wild spat observed across the 2025 monitoring season, by wrap.

Wrap #	Length Growth Rate	Mass Growth Rate	Mean Monthly Mortality	Total Spat
3	13.6%	17.0%	8.9%	0
4	8.4%	38.4%	17%	1
6	1.4%	8.9%	9.6%	2
7	13.4%	33.2%	9.8%	6
9	15.5%	35.5%	17.6%	1

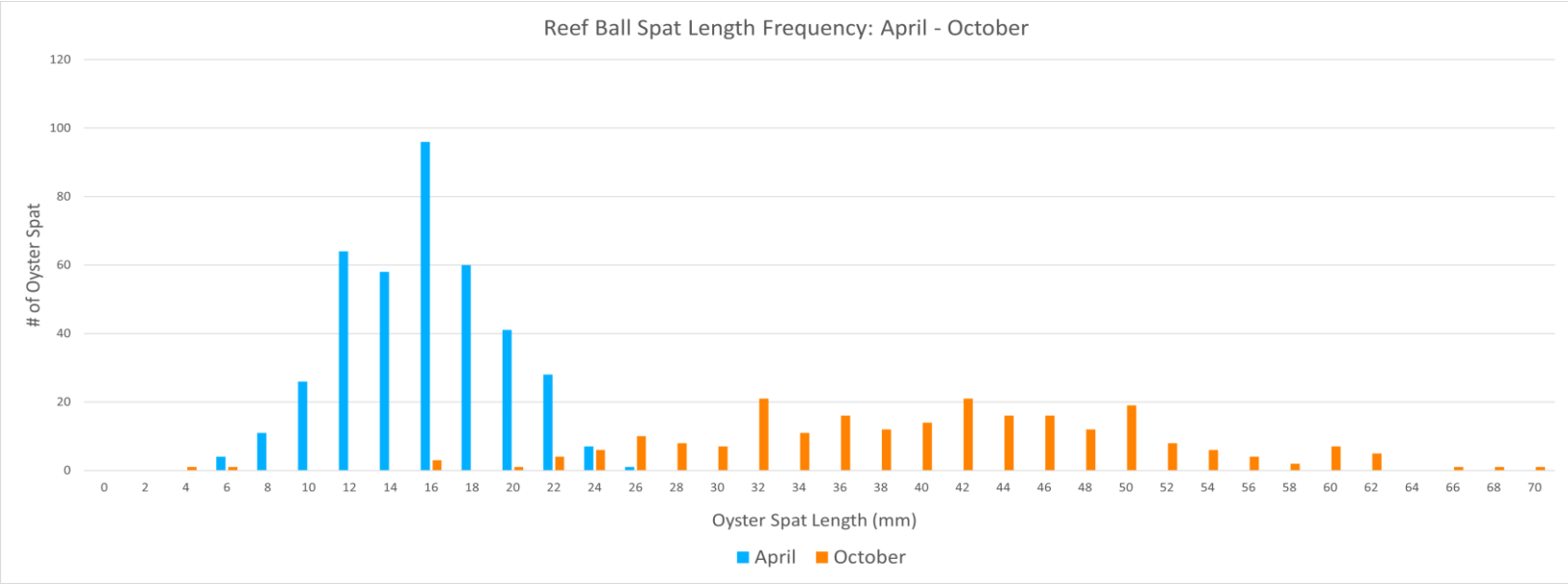


Fig. 12 | Size class histogram comparing spat lengths across all four miniature reef balls deployed in the Gansevoort salt marsh, 4/22/25-10/22/25.

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Takeaways

Hudson River Park's Community Oyster Project demonstrates the suitability of the Park's Estuarine Sanctuary as an oyster habitat. Oysters throughout our habitat enhancement structures continue to grow significantly, despite some environmental challenges.

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

As the Park continues to work with local stakeholders, we're continuing to understand that this region requires more collective effort to overcome the larvae and substrate limitations in order to create self-sustaining oyster populations in NYC.

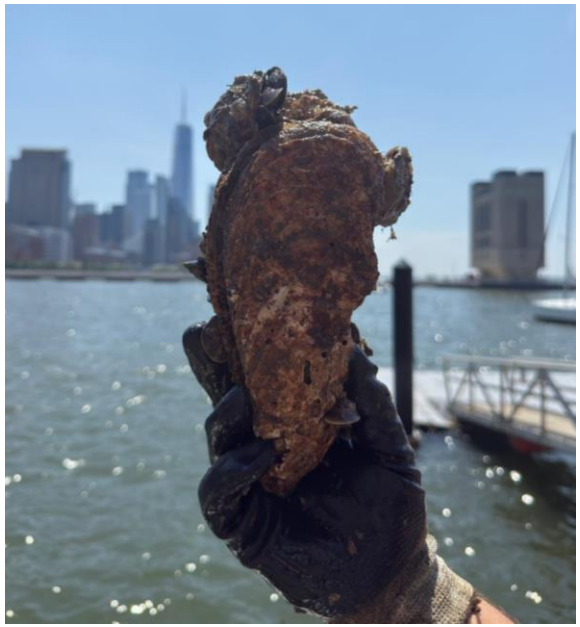

Fig. 13 | One of the largest oysters in the Park, found under Pier 40 in 2018, now measures in at 210mm and 1,192 g.

Fig. 14 | Gansevoort habitat enhancement structures exposed during a significant low tide.

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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.

Cornell University's Matt Hare has been working with the Park for years to better understand the spatial distribution of oyster spat in the Lower Hudson. By conducting genetic analyses on spat and oysters sampled from within the Park, broodstock of origin can be identified based on similarities of genetic markers. In 2024, nearly all oysters sampled within the Park showed high similarly to the Tappen Zee wild oyster population (**Fig. 15**). It is currently unknown where juvenile oysters from enhancemnt projects are settling, but preliminary models predict they may be carried to the western shore of the Hudson to New Jersey. Further research hopes to identify precise destinations of restored oyster spat through wider specimen collection throughout the lower estuary.

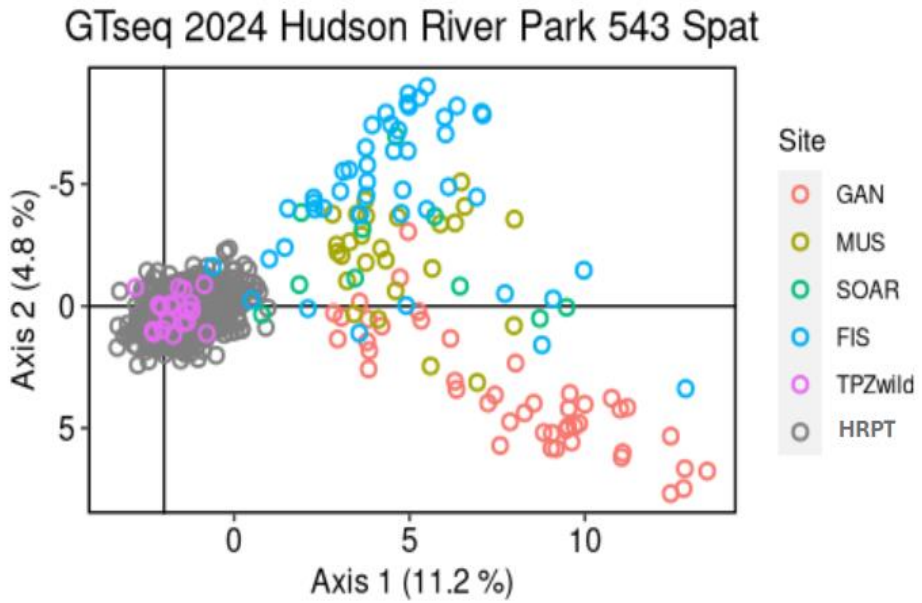

Fig. 15 | Principal component plot showing genetic similarity of oyster spat found in Hudson River Park. For more information, reference Matt Hare's section on our Visiting Scholar Research page.

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