Hudson River Park Trust's Tribeca Habitat Enhancement Monitoring Program

Year 1 Annual Report - Executive Summary

Prepared for

The Hudson River Park Trust

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EXECUTIVE SUMMARY

In the summer of 2021, Hudson River Park Trust installed over 200 habitat enhancement structures between Piers 26 and 34 in the Hudson River. The types of structures deployed included biohuts, textured concrete pile encasements, pile wraps, reef balls, and gabions. The purpose of this effort was to increase the Hudson River Park's oyster population and provide habitat for benthic, epibenthic, and mobile organisms. In accordance with the permit conditions issued for the Project, three monitoring areas must be assessed yearly over five years post-installation: oyster health and performance, estuarine community utilization (including benthic, epibenthic, and mobile organisms), and water and sediment properties.

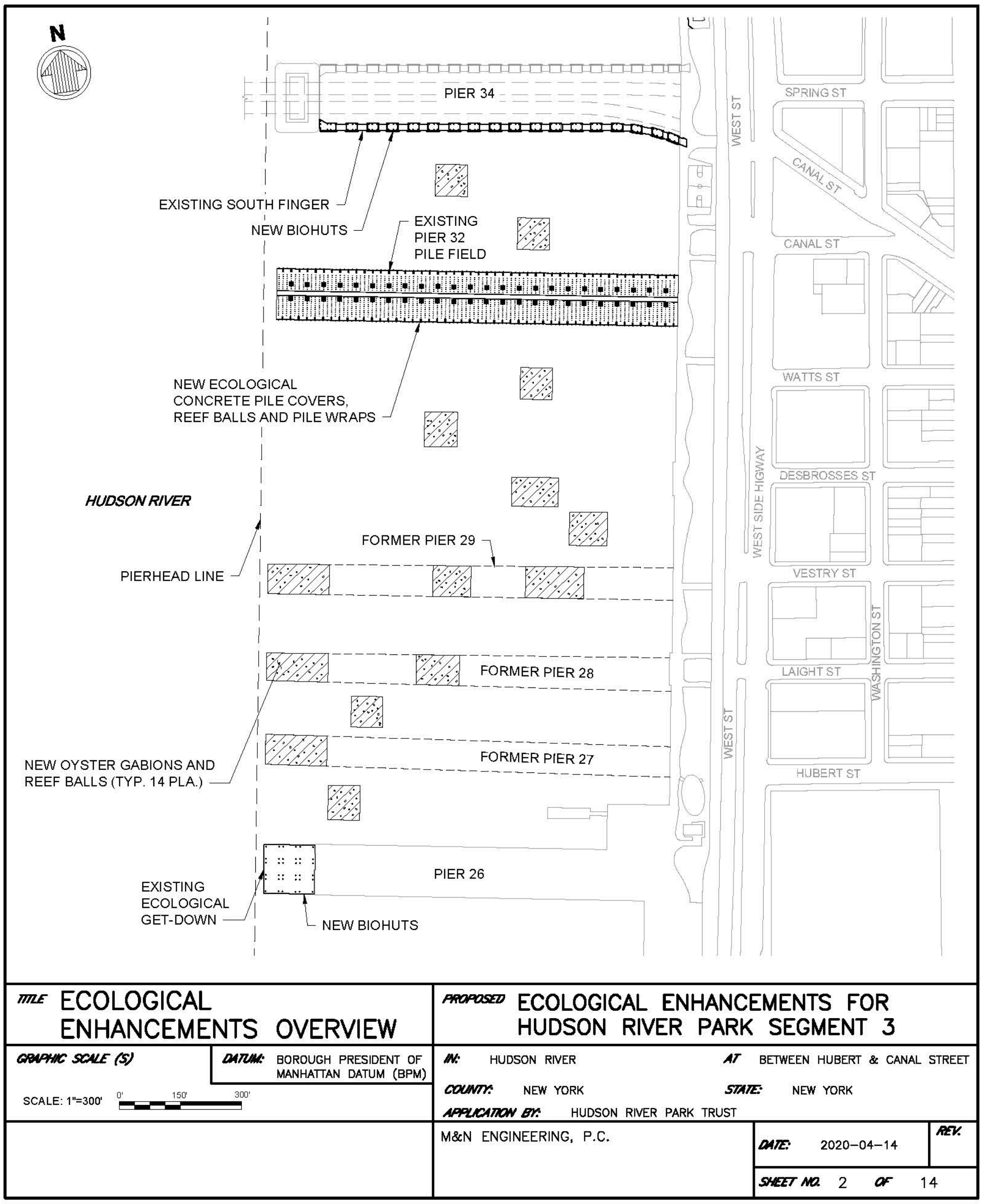

Figure 1. Layout of enhancement structure clusters within the Tribeca Enhancement area. "G" indicates a gabion, "R" indicates a reef ball. ID number of randomly selected structures within each cluster are outlined in the table

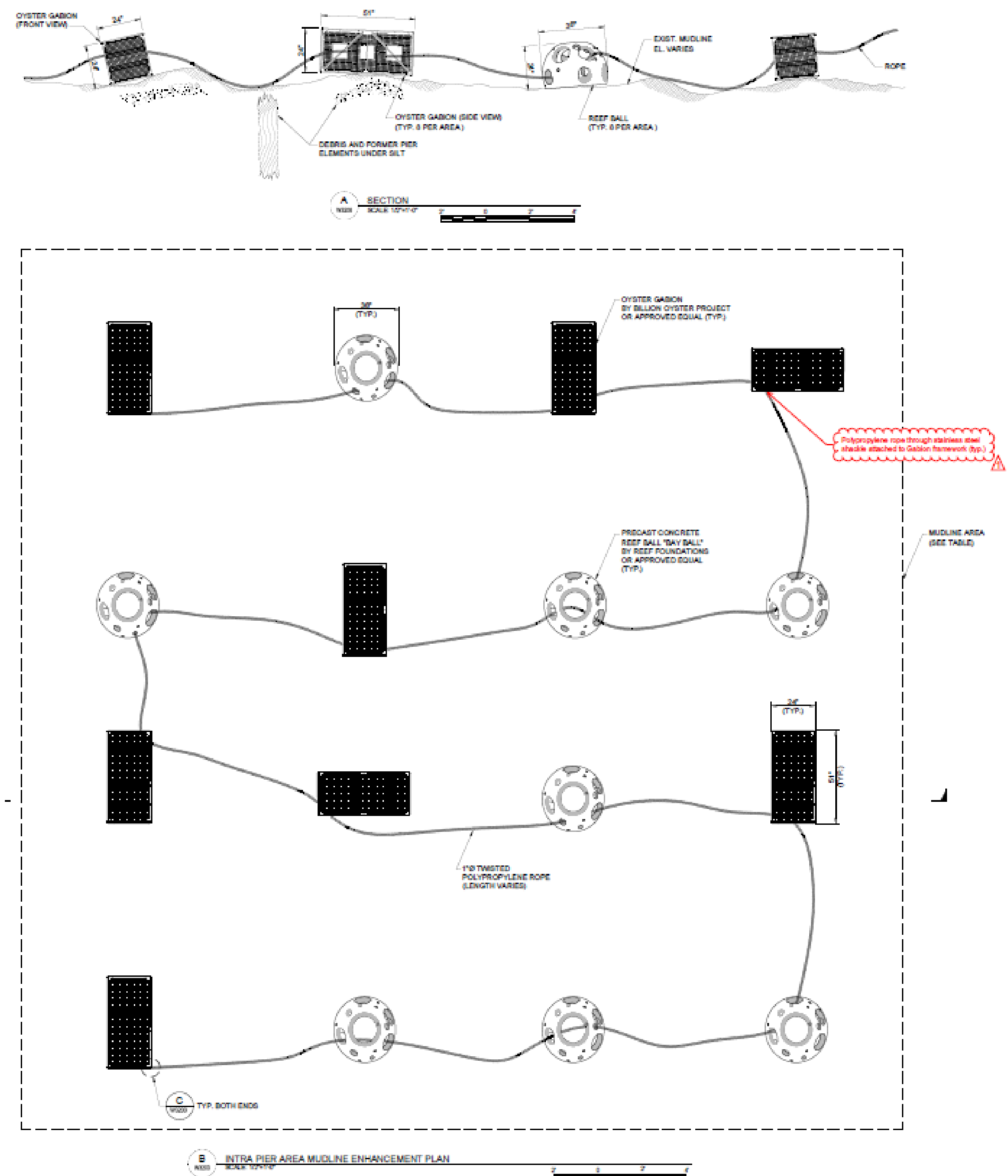

Figure 2. Layout of a representative individual enhancement structure cluster in profile (top) and from above (bottom) delineating rigging and placement.

Oyster Health and Performance

In summer (July) and fall (September), a representative sample of habitat enhancement structures from each cluster were retrieved via crane to the deck of a research vessel for growth/mortality assessments. The July 2022 data for oyster density and size suggest promising overwinter survival and individual growth, comparable to other recent studies in the region. Additionally, metrics for oysters on both substrates were similar, suggesting that both reef balls and gabions initially provided similar habitat enhancement potential for oyster populations. The September 2022 data indicated mortality based on a mean decrease in total oyster densities of approximately 48%, which, while significant, is comparable to other regional studies. Mean size for oysters on both substrates combined increased by 12.4 mm in September, suggesting substantial growth in only two months. Size-frequency analysis indicated notable growth in that the largest size class of oysters measured increased from 75 mm to 105 mm. Perhaps more importantly, the size-frequency data indicated some amount of natural recruitment based on several oysters of <25 mm on both substrate types. There was a wide range (from 0% to 95%) of live oyster coverage on the reef balls. Dead oyster shells were present in many of the quadrats, and evidence of predation by crabs and oyster drills was observed.

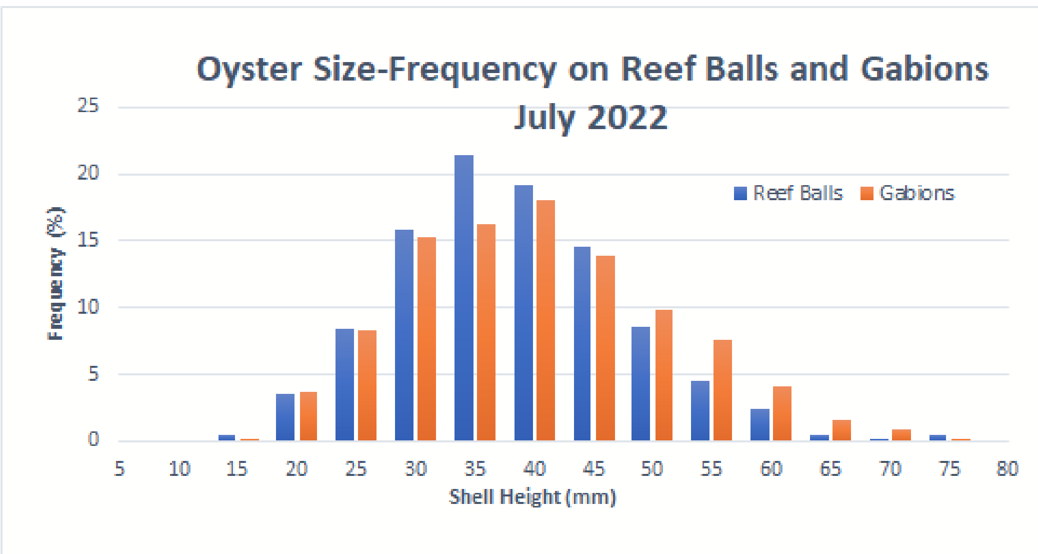

Figure 3. Size-frequency distribution by substrate type in July 2022.

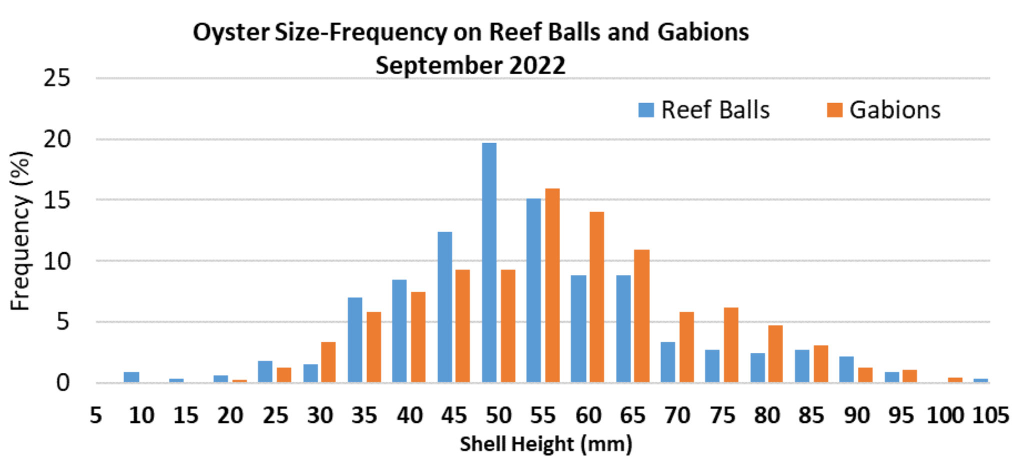

Figure 4. Size-frequency distribution by substrate type in September 2022

Epibenthic Community Monitoring

Like the oyster health and performance monitoring, the epibenthic community monitoring plan employs a repeated measures statistical design to sample invertebrates on the substrates. This sampling was conducted alongside the above oyster monitoring using the same quadrats for comparability. Species richness on the reef balls ranged from three in bare quadrats to seven in quadrats with more oysters, with a total of fourteen different epibenthic species representing eight different phyla observed in the quadrat samples. Species richness on the gabions was similar to that found on the reef balls, with a total of seven invertebrate species and one fish species observed. There were no new species observed on gabions that had not been observed on the reef balls. Species observed on the enhancement structures included sessile, encrusting species as well as mobile species and both individuals and colonial species. All observed epibenthic species are ones that are common in the Hudson Raritan Estuary.

Figure 5. Representative 0.05 m^2 quadrat placed at randomly selected locations on reef balls.

Mobile Community Monitoring and Water Quality

Species composition and relative abundance of mobile fishes and large invertebrates within the study area was assessed weekly from mid-July through September using two types of unbaited traps (larger "pots" and small "wire mesh traps"). The two types of traps were deployed in strings of eight traps (four pots and four wire mesh) each, with three trap strings totaling twelve pots and twelve wire mesh traps deployed in the Enhancement area and two strings totaling eight pots and eight wire mesh traps deployed in the Control area. After a soak time of approximately one week, all traps on a given line were retrieved and all fish and invertebrates in the traps were identified, counted, measured, and released. Traps were then cleaned and re-deployed for the next week-long sampling period. Water quality was also measured at surface and bottom locations during each mobile community sampling event in both the Enhancement and Control areas.

During Year 1 monitoring, a total of 157 mobile community traps were fished successfully in the Control area, while 232 traps were fished successfully in the Enhancement area. A total of 712 fish and crabs were collected over ten weekly trap recoveries between July and September, with black sea bass (*Centropristis striata*), oyster toadfish (*Opsanus tau*), blue crab (*Callinectes sapidus*), and spider crab (*Libinia* spp.) being the most abundant species. Thirteen of 21 taxa were represented by three or fewer individuals. Catch was similar in both areas with 1.79 individuals per trap per week in the Control and 1.85 individuals per trap per week overall in the Enhancement area. This was generally the pattern for individual species as well, except for a trend towards more *Centropristis striata* in the Enhancement area, and tautog, with eight individuals, being exclusive to the Enhancement area. Water quality was typical of a healthy mesohaline estuarine location, with salinity ranging between 18.27 and 26.49 psu. Bottom dissolved oxygen in the project site only rarely fell below 4.0 mg/L stress threshold, reaching a minimum of 3.93 mg/L in the Control area on September 7.

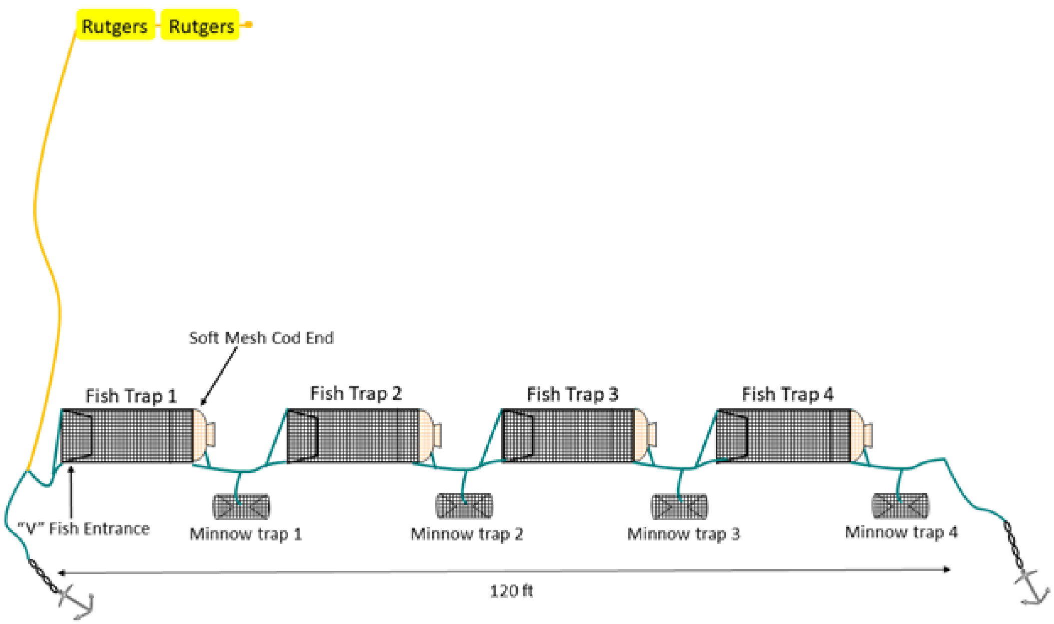

Figure 6. Diagram of trap string. Inter-trap distance is not to scale.

<u>Year 1 Lessons Learned and Recommendations</u>

Post-field season assessment of the monitoring techniques and field efforts yielded important insights into the Year 1 efforts as well as considerations for future sampling efforts.

1. The polypropylene line used to lash together enhancement structures within a cluster must be weighted so as to mitigate entanglement risks and ensure smooth operation of research vessels within the monitoring area.
2. The use of non-destructive sampling techniques (imaging) for gabion sampling was found to be suitable and to provide data comparable to previous studies utilizing destructive techniques (specimen harvesting), the formation of surface rust on the metal mesh caused difficulties in visual observation.
    a. Additional photographs and care may be needed to analyze the epibenthic community to the desired degree of taxonomic specificity in future monitoring seasons, especially for smaller species.
    b. A camera rig that attaches to the sampling quadrat will assist in creating consistent photograph fields of view.

3. An unexpected number of small fishes were found within the enhancement structures themselves during oyster monitoring. Protocol will be developed to quantify these organisms for future seasons in line with existing nekton sampling techniques used by the Rutgers team.