

ORRP 2012 Final Progress Report

NY/NJ Harbor Estuary Program Habitat Work Group

Project Information:

Project Title: *Oyster Restoration Research Project (ORRP 2012)*

NEI Job code: 0294-021 **Project code:** 2012-0020

Reporting Period: April 30, 2012 – May 31, 2013

Project Partners: The Hudson River Foundation, NY/NJ Baykeeper, University of New Hampshire, NY Harbor School

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Project Summary

The goal of the overall Oyster Restoration Research Project (ORRP) is to further scientific understanding of oysters reintroduced into the NY/NJ Harbor Estuary. In 2009, a partnership of more than 30 foundations, not-for-profits, and state and city agencies formed for the purpose of creating and conducting research at a series of oyster reef research sites in the Hudson Raritan Estuary. In 2010, partners built six experimental oyster reefs at locations geographically distributed throughout the Estuary (see Figure 1). In 2010 the NY/NJ Harbor & Estuary Program (HEP) provided \$70,000 for materials and equipment and in 2011, HEP provided \$100,000 for the monitoring of the ORRP reefs. This report describes the final phase of the project, for which HEP provided \$80,000 for a final year of monitoring of the oyster reefs, oyster aquaculture, and experimental methods to reduce transport of “spat on shell” (baby oysters). These tasks supported by the NY-NJ Harbor & Estuary Program are described specifically below.

These steps were designed to assist in determining the feasibility of achieving the oyster restoration targets of the Hudson-Raritan Estuary Comprehensive Restoration Plan (www.watersweshare.org), and to gain local and practical oyster restoration experience.

As described in detail in the Oyster Restoration Research Project Final Technical Report (Grizzle *et al.* 2013), studies focused on assessing the development (oyster growth and survival) and performance at five experimental reef sites in the NY-NJ Harbor Estuary (Bay Ridge Flats, Governors Island, Hastings-on-Hudson, Soundview Park, and Staten Island). Please refer to the [technical report here](#) for detailed information about the results of the study.

Course of Action

- 1) **General Project Management:** activities included developing a Quality Assurance Project Plan (QAPP), a safety plan, and field training for students. Specific tasks conducted are as follows:
 - The **QAPP** was approved on April 28, 2012
 - A **Safety plan** was completed for the field work. The safety plan details appropriate clothing to be worn in the field dependent on the work site, identifies potential hazards, and locates the closest emergency facility to each reef site. The project manager had a copy of the safety plan

at every monitoring event, and reviewed the plan details with field technicians prior to starting work.

- **Field Technician Training:** Staff and student field technicians from New York Harbor School, Rocking the Boat and Bronx River Alliance all completed training sessions in preparation for the spring and summer reef monitoring. In total 36 people were trained as field technicians using manuals developed for this project, Species Identification Sheets, and Data Collection Sheets. 4 SCUBA divers were trained using printed out maps to orient divers at each reef site. Dive technicians were similarly trained to collect specimens and record observations from the experimental reefs.

- 2) **Reef Monitoring for oyster survival and sustainability:** Reef monitoring was conducted to further scientific understanding of oysters reintroduced into the NY/NJ Harbor Estuary in order to determine if oyster restoration at the targeted scale is achievable. The platform for this research was the experimental oyster reefs built from rock, shell, and oyster spat-on-shell (SOS) that were constructed in the fall of 2010. The 2012 monitoring followed the same protocols as the previous years (Nov 2010 - October 2011). Reefs were also monitored for a natural oyster spat settlement. Specific tasks conducted are as follows:

Spring Reef Monitoring

REEF	DATE MONITORED
Govenors Island	April 30 and May 14, 2012
Bay Ridge Flats	May 7, 2012
Soundview	May 7, 2012, July 10
Hastings	May 11, 2012
Staten Island	May 15, 2012 and May 31, 2012

Fall Reef Monitoring

Reef Site	Date
Staten Island reef	9/20/2012
Soundview reef	10/2/2012
Soundview reef (off reef – northern area)	10/3/2012
Hastings on Hudson reef	10/11/2012
Bay Ridge Flats reef	10/1/2012 and 10/15/2012 and 10/29/2012*
Govenors Island reef	10/22/2012

- **Data Management:** The project's Principal Investigator Dr. Ray Grizzle developed an electronic database for the purpose of maintaining data collected in 2012 at all reef monitoring events and site visits to deployed water quality monitoring instruments. All 2012 reef development data (oyster growth, mortality, site characteristics, and presence of aggregating species) have been entered into the established datasheet by the project manager and quality controlled for data analysis purposes according to QAPP guidelines.

- 3) **Water quality data** were collected by the project manager throughout the 2012 project duration. Water quality data were collected using a hand held YSI on the day of monitoring events and using continual data loggers i.e. sondes. Two sondes were temporarily installed at the Soundview and Hastings reef sites since April 2012. The sonde at Governors Island is managed by NYC DEP and is permanently stationed at that site. All 2012 sonde data from all three reefs have been collated into the Google doc water quality spreadsheet which is available online to all partners.
- 4) **Oyster Disease Testing:** Oysters from two of the reef sites and one aquaculture nursery site (Ecodock on Governors Island) were collected and sent to Haskins Shellfish Laboratory for disease testing after each fall monitoring event. Oysters from Soundview, Hastings and Governors Island ECODock were tested for the presence of oyster diseases MSX and Dermo. At Soundview and Hastings wild oysters from size classes <40mm and >60mm as well as oysters from the reef >60mm were collected. Oysters >60mm were collected from the ECODock nursery ground. About 20 oysters per size class were needed. In total for the fall 2012 disease testing six samples were sent to Haskins Lab.
- 5) **Water Filtration Rates:** Dr. Grizzle and his team completed the field work to determine the uptake of chlorophyll by the organisms inhabiting the reef. Dr. Grizzle has completed the data manipulation and the data analysis. These data are presented as part of the [final technical report](#).
- 6) **Final Report: ORRP Phase I: Experimental Oyster Reef Development and Performance Results.** This report describes the results of the data collected and analyzed under this project and summarized above as well as the data and studies from the previous years monitoring (2010-2011) and other studies of the Oyster Restoration Research Project (ORRP). Included in the report are the results of the data to assess development (oyster retention, growth and survival) and performance (water filtration and habitat provision) at the five experimental reef sites (Bay Ridge Flats, Governors Island, Hastings, Soundview and Staten Island). This report also provides an assessment of where additional efforts should be focused and questions that need to be answered in future efforts. The report is completed and available [here](#).
- 7) **Oyster Aquaculture:** Through the process of environmental and natural disease selection, oysters found in the NY/NJ Harbor Estuary may exhibit a natural resistance to two critical diseases; MSX and Dermo, as well as to other local environmental conditions (temperature, salinity, etc.). Creating and maintaining this native broodstock is an important milestone for the ORRP and represents a significant contribution to future oyster restoration efforts in the HRE. Eyed larvae spawned from these native oysters were grown in an oyster hatchery or lab to raise until one year old spat-on-shell. Specific tasks conducted are as follows:
 - The oysters used for this project were sourced from three locations, Bremen, Maine, Fishers Island, New York and Soundview Park, New York City
 - After setting the oysters spent two weeks in the lab and were then relocated into trays (Figure 1) at New York Harbor School's nursery on Governors Island. Throughout June and July, the trays were handled on a biweekly basis to remove fouling organisms and keep the trays free of sediment. Throughout August, September and October the oysters were relocated to the nursery in the Brooklyn Navy Yard.
 - The oyster nursery (figure 2) was constructed in June of 2012. The nursery consists of 800 supertrays. These trays are made from rigid, UV resistant polyethylene and are

designed for the culture of bivalves. The trays are stacked, connected by a bridle and suspended from polyethylene floats. It was determined early on that due to a vertical dissolved oxygen gradient at the site in the Navy Yard, stacks should be limited to only four trays rather than extend into the deeper areas with lower dissolved oxygen. Trays were stocked at densities dependant on the setting rate for each group.

- After a winter in this nursery there was some mortality that can be attributed to a number of causes. Oysters compete with each other for space on each shell (figures 3 and 4). The faster growing oysters generally out-compete slower growing oysters which are eventually overwhelmed and die. Sediment is an issue in both nurseries, more so at the Governors Island site. Trays are handled regularly to reduce sedimentation but it remains a source of mortality. Water quality in the Brooklyn Navy Yard site is influenced by the tier 1 combined sewer outfall located adjacent to the site. During and following rain events, the water quality at this site is affected and could be a source of mortality.
- The current number of live oysters has been estimated based on counts of individual trays conducted during the week of May 27th and are as follows.
 - Soundview: 120 blocks with a total of 120,000 live oysters
 - Muscongus Bay: 240 blocks with a total of 480,000 live oysters
 - Fishers Island: 480 blocks with a total of 864,000 live oysters

8) Reduce Transport of Planted SOS: ORRP's previous results suggested that a large percentage of the planted Spat-On-Shell (SOS) were hydraulically transported off the rip-rap and clam shell bases. Therefore, developing reef construction or reef maintenance techniques for retaining the planted SOS on the reefs is a critical obstacle to overcome when attempting oyster reef restoration in the high energy environments typical of NY/NJ Harbor. Continuing the ORRP's adaptive management approach, this task was intended to develop and test new methods for setting (SOS) which can withstand higher hydraulic energy environments and reduce the loss of oysters from transport off the reef bases. Specific tasks conducted are as follows:

- Several potential methods for reducing oyster transport from the experimental reefs were investigated and considered by a project team consisting of Jim Lodge from HRF, Ray Grizzle from UNH (ORRP PI), Greg Rivera from Cornell and Pete Malinowski of the NY Harbor School. After thoroughly considering all options the team decided the most promising method to test is the Spat-on-Shell block technique.
- The spat-on-shell that were transferred to 2'x2' x 8" – Supertrays and grown for one year in Wallabout Basin, Brooklyn NY. These oysters have been specially handled to encourage the oysters to grow together in the cages and form the desired SOS blocks. As of May 2013, the oysters are now starting to form large clumps of SOS but they have not yet formed the desired SOS Blocks. We will continue to monitor the oysters in the Superstrays during the summer growing season to determine when these oysters can be transplanted onto the Soundview Park and Governors Island reef sites. Once these oysters are placed on the reef, future monitoring activities (outside this project scope) will demonstrate how well the SOS blocks reduce transport.



Figure 1. Harbor School Students prep trays for relocation to the Navy Yard



Figure 2. Brooklyn Navy Yard Oyster Nursery



Figure 3. Harbor School Student with 1 month old spat-on-shell.



Figure 4. Year old Spat-on-shell, May 2013

9) **Results and Conclusion:** Based on the four development criteria (oyster retention, growth and survival, water filtration, and habitat provision) and performance data, the Soundview Park site had best overall development patterns indicating the best prospects for successful restoration efforts utilizing similar reef construction techniques. While this does not mean that the other sites have no potential for further restoration efforts, Soundview showed the most potential. These studies also revealed several issues that must be, and can be, addressed in designing future efforts. The Oyster Restoration Research Partnership will continue to work to develop techniques for reducing the transport of spat on shell by waves and tidal energy in the high energy environments typical of NY/NJ Harbor. Another important message of the Phase I project is that future efforts must maintain an adaptive approach, reacting as necessary to findings that may emerge from monitoring.