Sound School Reef Ball Project

Progress Summary and Future Plans

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What are Reef Balls?

Reef Balls are artificial reef modules placed in the ocean to provide habitat structure for reef growth. Reef Balls™ have been placed in 62+ countries and projects have a global reach of 70+ countries. Reef Balls are being used for designing and growing artificial reefs, coral propagation and planting systems, estuary restoration, red mangrove plantings, oyster reef restoration, erosion control (often beach erosion), and expert collaboration on a variety of oceanic issues.

Reef Balls come in variety of designs and sizes and can be additionally customized to suit project needs and restoration goals. Reef Ball modules are designed to mimic natural reefs. These basic modules and related adaptations using Reef Ball technology are the most-used and recognized designed reef structure in the world. Reef Balls are ideally suited for a wide-range of aquatic habitats even when used in engineering applications. Reef Balls are the world's leading designed artificial reef modules because they are simply the most effective way to create sustainable aquatic habitat and achieve it in a safe, long term, environmentally compatible way.[i]

Project Goal

The primary goal of this project is to evaluate the effectiveness of Reef Ball structures on the development and growth of an artificial oyster reef in New Haven harbor as a means of providing habitat structure and promoting biodiversity of local marine species. Our project is multi-faceted and includes high levels of student involvement through our school's vocational programs primarily Environmental Science and Natural Resources and Scuba Dive Directed Lab. This will allow students to be involved in ground breaking research and marine restoration efforts in our state. Students are involved in every phase and aspect of this project including the acquisition of materials, construction of Reef Balls, deployment, monitoring, and development of future research projects.

Partners and Donors

- The Reef Ball Foundation
  - Provided instruction on construction of Reef Balls
  - Donations: Mini-Bay Ball Mold, Tool Kit consisting of everything needed for construction (over $5,000 in total value)
- Larry Beggs and Reef Innovations
  - Provided guidance and feedback on the build process
  - Invited students to Florida to see industry work and participate in a build
  - Donations: AdvaFlow ($50 value)
- L. Suzio Concrete Company:
  - Donations: Microsilica (cement additive to improve structural integrity)
- Connecticut SCUBA Academy
  - Industry divers volunteered to train students divers and supported deployment of Reef Balls in New Haven Harbor

    - Donations: 30 100lbs bags of Portland Type II/III Cement (over $300 value)
- Timothy Visel- Aquaculture Coordinator at the Sound School
    - Donations: Cement Mixer ($400 value)
- Stuart Mattison, John Roy, and The Sound School Aquaculture Lab
    - Provided oyster seed and support in setting oysters on 3 of the Reef Balls in the lab prior to deployment in the harbor
    - Investigated use of specifically constructed Reef Ball for juvenile lobster habitat

Summary: Fall 2016-Summer 2018

This project began in the fall of 2016 with the researching Reef Balls and possible sources for a mold. At that time we also established contact with the CT DEEP regarding any permitting issues. After hearing about the nature of our project and our educational goals the Reef Ball Foundation generously agreed to donate a Mini-bay Ball mold and all the required tools. These were received in the spring of 2017. The next fall three students (Samuel Greenvall, Louis Laudano, and Kelly Roper) took over primary responsibility of the Reef Ball work as their Senior Capstone, a year-long project designed for students to pursue their interests and further develop career skills. At that time we received permission to proceed from the CT DEEP with the temporary (2-3yrs) deployment of Reef Balls under their general permit as long as they did not create any navigational hazards. Ultimately, the New Haven Harbor master was briefed on our intended deployment site to ensure that the final Reef Ball site was safe.

During the fall students solicited donations and advice on Reef Ball construction. Through online sources and guidance from Larry Beggs of Reef Innovations the students began to experiment with the construction of Reef Balls, learning how to use the mold and tools and determining how to prepare the best concrete mixture for their goal. The students chose to use oyster shells as an aggregate in order to use more natural materials and support the attachment of the oyster seed during their set. While their first two attempts failed, the students continued to refine their procedure and ultimately successfully built five mini-bay Reef Balls. The three students also supported the research of a University of New Haven student by helping her build a custom Reef Ball specifically designed for use by juvenile lobsters. The three students also conducted training sessions for underclassmen, teaching them how to build Reef Balls so they would be able to take over the work after the seniors graduated. They also had the opportunity to show their work and demonstrate part of a Reef Ball build to Congresswoman Rosa DeLauro during her visit to the Sound School.

In May 2018, three of the Reef Balls were placed in a set tank with oyster seed in the school aquaculture lab. The oyster seed had been generated by the work of other students who had successfully bred oysters in the lab. The set was extremely successful to the extent where there was not enough algae available in the lab to feed the oysters. Once conditions allowed students surveyed potential deployment sites checking depth

and the firmness of the bottom to make sure the Reef Balls would not sink or shift. The final site is easily accessible for diving from the Sound School campus, approximately 200ft from shore surrounding an old piling. On June 4th students and their teacher, supported by industry divers from the Connecticut Scuba Academy deployed all five Reef Balls using lift bags and scuba diving equipment to float, swim, and safely sink the Reef Balls from shore to their final location.

Outcomes and Accomplishments

- Acquired Reef Ball Mold and Toolkit (Spring 2017)
- Received permission for temporary deployment from CT DEEP (11/23/2017)
- All supplies and needed tools were obtained through donation or at discounted cost
- Students built 5 Reef Balls using oyster shell as aggregate in the concrete mixture.
- 3 Reef Balls were covered by a set of oyster seed in the school aquaculture lab
- Students became internationally certified scuba divers and deployed Reef Balls
- Successful deployment of the first fully submerged artificial reef in Connecticut!

Next Steps

- Students will develop and execute a rigorous monitoring protocol to evaluate growth on Reef Balls and species biodiversity
- Construction of five additional Reef Balls during the 2018-19 school year
- Students will design and conduct research projects centered around Reef Balls and their potential uses/impacts
- Further exploration of different construction methods targeting juvenile lobster use
- Installation of data loggers and/or remote cameras and monitoring equipment

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[i] The Reef Ball Foundation-Designed Artificial Reefs. (n.d.). Retrieved August 14, 2018, from http://www.Reef Ball.org/