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Application of oyster (*Crassostrea virginica)* aquaculture to restore habitat and enhance species diversity

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Abstract

The Eastern Oyster, *Crassostrea virginica*, is a keystone species and abundant populations of Eastern oysters provide ecological, environmental, and commercial values to the surrounding area. Ecosystem services provided by oysters have been well studied, including such services are oyster production, water filtration and benthic-pelagic coupling, habitat creation for other species, carbon sequestering, stabilizing of benthic and intertidal habitat, mitigation of fisheries, increasing of landscape diversity, and increasing aquatic species abundance and diversity. With the ever-increasing development along our coastlines, the dramatic decline of oyster population in the Mid-Atlantic and along the Gulf Coast of the United States since the late 1800s has been well documented as results of overharvesting, habitat degradation, reduced water quality, and increased mortality from Dermo and MSX diseases. This causes a cascading effect on the local estuarine environment when these ecosystem services are lost. Oyster reefs provide important habitat for fish and mobile crustaceans. The culture of the Eastern oyster in containment gear has become a viable component of restoration programs in many states on the East coasts of the United States and these aquaculture operations provide many of the same ecological services as natural or restored reefs. Oysters grown in aquaculture gears are restoring habitat for a variety of species before they are planted for restoration in the bays. This presentation provides progression of oysters' life from spat in the remote set tank, to juvenile oysters in floating aquaculture gear, to adult oysters planted throughout the bays using various aquaculture techniques. The use of community volunteers to help rear oysters for restoration has become common practice throughout the Mid-Atlantic region. In response to the detrimental decline, conservation organizations developed community involvement programs commonly referred to as "oyster gardening" to help restore the oyster population, while instilling within the community a strong sense of stewardship for their bays. As enhancement and restoration efforts of this species move forward, it is important to understand the contributions and impacts of oyster aquaculture. Research focusing on the ecological effects of oysters raised with commercial aquaculture equipment is becoming more prolific as the industry moves away from a wild harvest fishery to a cultivated product. Previous studies show positive correlation between oyster aquaculture and increase macro-faunal activities. Clearly, oyster aquaculture supports additional populations of ecologically and economically important macro-fauna. Previous research resulted in 49 species of fishes and invertebrates and 8 species of macro-algae collected from floating oyster aquaculture floats including 9 commercial or recreational fishery species, many of which are likely habitat limited. Of the 17 species found in the cages only 8 of these were also found on the artificial reef, confirming outcomes of earlier studies, species richness is greater in oyster cages than in a sea bed and on an area of open seafloor. Off-bottom oyster aquaculture operations in the mid-Atlantic United States seem to be beneficial addition to host estuaries and associated natural communities.

Biography

Ozbay is a Professor in the Department of Agriculture and Natural Resources in Delaware State University. She is appointed primarily for research and her research interests are in the area of habitat restoration and water quality issues, specifically water quality driven toxicity in harmful algae, shellfish-algae dynamics, nutrient and water quality management, heavy metal contaminants, aquatic ecology and bacterial monitoring. She received her Ph.D. in Fisheries and Allied Aquacultures at Auburn University, Auburn, Alabama in 2002. She conducted research leading to the development of aquaculture effluent water quality standards for the U.S. Environmental Protection Agency as her Ph.D. project. Dr. Ozbay has advised 17 graduate and over 50 undergraduate students and has served on 18 additional graduate students' committees. She has received several outstanding researcher awards at the national, regional and institutional levels. She serves as an Editorial Board Member for the five different journals and former Executive Board Member for Atlantic Estuarine Research Society. She also serves in the Research Advisory Committee for NOAA-LMRCSC and Technical Advisory Committee for the Northeast Aquaculture Center, currently as co-chair. She has also been honored by an appointment from the Secretary of the Delaware Department of Natural Resources and Environmental Control as a member of the Delaware Climate Change Vulnerability Assessment Steering Committee for the State of Delaware.