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Efforts to mitigate climate change repercussions: eastern oyster, *Crassostrea virginica*, recruitment via aquaculture and associated biodiversity

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The Eastern oyster, *Crassostrea virginica*, is a keystone species with the well-documented ability to provide ecological services, environmental enrichment, and commercial value. Oyster reefs provide valuable habitat for many ecologically and economically important species, as well as stabilizing benthic and intertidal habitats. Their bioactivity and structure creation lead to a greater abundance and diversity of other aquatic species. Oyster restoration efforts are increasingly challenged by anthropogenic influences such as run-off, sedimentation, sea level rise, decreased salinity and pH, and other factors. Populations of Eastern oysters, *Crassostrea virginica*, along the Atlantic coast of U.S. are only 1-3% of historic population levels and further declines would be catastrophic. Oysters are essential as a keystone species that provides habitat and spawning substrate, stabilize sediments, and a natural filtration system to clarify waters. Depth, salinity, and turbidity greatly affect oyster populations and their associated fauna and frequent flooding, and coastal storms disturb their habitat and make them vulnerable to those changes (sedimentation, freshwater runoff etc.). Last few decades, ecological effects of Eastern oysters raised with commercial aquaculture gears have been research focus to move the oyster aquaculture where it deserves and allow industry to move away from a wild fishery harvest in order to meet consumer demands. Years of research efforts to measure biodiversity in and around the oyster gears is one of the significant ways to evaluate the impact of these culture operations on the ecosystem fully. In an attempt to enhance oyster populations and improve water quality conditions in Delaware, an oyster gardening restoration program initiated in 2003. Similar to other shellfish culturing efforts, aquaculture equipment used by the volunteer oyster gardeners in Delaware Inland Bays has provided venue to educate the public and increase public awareness for water quality and estuarine health. 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. Shellfish aquaculture has become a new hope for the coastal community in Delaware, with the approval of new regulation allowing commercial oyster aquaculture practices in the Delaware Inland Bays. The use of cost-effective culture techniques to culture oysters for restoration has developed into an integral part of the ecological restoration efforts for the bays. A variety of culturing techniques including sub-tidal modified rack and bag aquaculture, oyster cages with stocked up trays, Taylor floats with two baskets enclosures, and created oyster reefs have been used, considering sedimentation issue, to investigate ecological and biological impacts of these efforts. Oyster survival looked promising, ranging from 70% to 99% survival. Natural recruitment of oysters has been observed on oysters in floats and nearby riprap, which may be a promising sign that oysters in the gardening program are reproducing within the Delaware Inland Bays (DIBs). Like oyster gardening practices, commercial aquaculture practices are expected to bring further viability and stability to the bays by allowing oysters to contribute ecosystem health. This small program has slowly been raising environmental awareness at the community level, yet many concerns will need to be addressed before allowing large-scale commercial aquaculture businesses in the DIBs. Developing our understanding of the ecological services shellfish provide and successfully promoting of this information to the public is critical for the future of oyster aquaculture and enhancement efforts.

Biography

Gulnihal Ozbay is a Research Assistant Professor in the Agriculture and Natural Resources Department at Delaware State University since 2003. Her research focus is on habitat restoration and water quality issues. She studies water quality driven toxicity in harmful algae, shellfish-algae dynamics, nutrient management, aquaculture and mariculture regards to water quality management, aquatic ecology. She established the Marine Recirculating Laboratory and Algal Culture Facility, which is capable of detail phytoplankton cell analyses including Flow Cytometry. She actively promotes the establishment of the Global Seminar Program at Delaware State University. She is currently assigned to join the delegates of the U.S. Saudi Arabia Global Women's Trade Mission to enrich the bilateral history of both Unites States and Saudi Arabia.

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