CSI Oyster: Engaging Citizen Scientists to Investigate How Water Quality Impacts Oyster Growth in Chesapeake Bay

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The Eastern oyster (*Crassostrea virginica*) is an iconic species throughout the Chesapeake Bay region for both its ecological and economic significance. The reefs formed by this species provide habitat for other species to live and feed within, such as blue crab and small juvenile fish. The oysters themselves act to filter water within the bay, with each adult oyster filtering upwards of 50 gallons of water per day. These ecological roles are of great importance to the health of Chesapeake Bay as they serve to maintain a balanced ecosystem with greater species diversity.

Beyond these roles, oysters are a key part of the rapidly growing aquaculture industry throughout the Mid-Atlantic Region. As demands have increased for more local and sustainable seafood, local hatcheries and shellfish growers have expanded their operations to meet demand. However, increased eutrophication in coastal systems along with increased absorption of atmospheric carbon dioxide is altering the pH of coastal waters. This change in acidity, or ocean acidification, threatens oyster recruitment and survival across the Mid-Atlantic. As local water conditions change, oyster growers could experience problems meeting demand or delivering oysters with the desired regional flavors. Restoration efforts could also be hindered as juvenile oysters are more susceptible to acidification than adults. With the increasing threat of coastal and ocean acidification, scientists are investigating the processes that drive changes in water chemistry while searching for solutions to protect species that are crucial to both the health of the ecosystems they inhabit and the economic vitality of the region.

One such effort is the Civic Science Initiative: Oyster project (CSI Oyster), led by Dr. Emily Rivest from the Virginia Institute of Marine Science (VIMS). This project engages local high school students in collecting oyster growth rates and water quality data at different sites around Chesapeake Bay. Dr. Rivest's group deploys young juvenile oysters in mesh bags at each site, which are then monitored by students for the duration of the school year. Students receive training on techniques to monitor growth rates and learn how to measure water quality using a handheld meter. Under the guidance of their teachers, they measure the shell length of each oyster every two weeks. Students also record temperature, salinity, dissolved oxygen, and pH at the same intervals. Furthermore, water samples are collected and sent back to the lab to determine total alkalinity (TA). By measuring both pH and TA at each sampling site, Dr. Rivest's team is able to calculate the full suite of carbonate chemistry parameters necessary to track ocean acidification patterns in the region.

Students place juvenile oysters into mesh bag at the beginning of the experiment. Photo Credit: Dominion Energy

Following two years of data collection, preliminary analysis shows that ideal water conditions for oyster growth is not as straightforward as an optimal temperature or salinity level. Rather, there is a complex interplay of environmental conditions, many combinations of which may be beneficial for oyster growth.

Now in its third year, Dr. Rivest hopes that this citizen science project, will continue to expand, reaching more schools and new regions in the bay.

"I hope students will take away a better appreciation for how water conditions can affect oysters and an empowerment that they can play a role in developing solutions for mitigating impacts of climate change on Chesapeake Bay."

Not only has CSI Oyster project demonstrated the potential for involving a new generation of eager young scientists in future monitoring efforts, but also it is helping to fill data gaps and provide researchers with a better understanding of ocean acidification in the Mid-Atlantic.