

Martha's Vineyard Shellfish Group, Inc. Healthy Ecosystems for Coastal Resilience

Martha's Vineyard Shellfish Group is a public nonprofit located on Martha's Vineyard Island in Massachusetts.

History

The Group was founded over thirty years ago in order to help the six towns on the island manage shellfish resources. The board of directors consists of representatives from each town. Richard Karney is a shellfish biologist, as well as the acting director.

Production

The Group's main activity is production of shellfish seed. They grow bay scallops, quahogs, and oysters. The species are spawned and cultured first at the Group's shellfish hatchery (where they also grow algae as feed) and then are transferred for further growth to the Group's nursery. When they reach an adequate size, the shellfish are distributed to the six towns on the Vineyard for eventual planting in public beds.

Climate Impacts Seen

Rick Karney has lived on the Vineyard since 1976, and definitely notices changing trends in weather. In particular, the winters are milder. He notes that the ponds all used to freeze over, which rarely happens anymore. This has an indirect effect on the bay scallop populations living in those ponds; without the protective ice cover, eider ducks that usually feed offshore move into the ponds and devour bay scallop seeds.



Martha's Vineyard Shellfish Group focuses on seed production for bay scallops, quahogs, and oysters; three commercially important species.

There are also numerous challenges facing shellfish communities from warmer water and air temperatures. In general, bacteria are more prolific as it gets warmer. At the shellfish hatchery, larvae are more difficult to grow when the temperature is above 25 degrees Celsius because of the bacteria proliferation at higher temperatures. Currently, there are perhaps a couple of days in the summer when the outside temperature reaches 25°C, but Rick notes that if days get much warmer it would be problematic for the hatcheries. Climate models predict that by the end of the century, there may be as many as 30 to 60 more days per year of extreme heat (over 90° Fahrenheit) in Massachusetts.¹

Another impact noticed by the scientists is that when the climate is hotter more people come to the Vineyard. This is good for tourism, but can add pressure to shellfish populations. It is always a challenge to strike a balance between development and preserving healthy ecosystems. For example, greater human populations can lead to increased nitrogen in the water, mostly flowing out of septic systems. This can cause eutrophication, a process that creates acidic, anaerobic conditions in the muds where shellfish settle down. Acidic muds can dissolve shells of seed shellfish and kill the animals. Rick worries that this is mirroring what may eventually be seen at a larger scale as a result of ocean acidification from increased carbon dioxide in the atmosphere.

Aquaculture is a growing sector of the New England economy. In New England there are over 350 farms involved in some type of aquaculture, with over 200 of those farms focusing on Mollusk production.⁷ Within the region, Massachusetts has the largest number of shellfish farms, with an estimated yearly market value of over \$15 million in products sold.⁷ Oysters account for the largest portion of the market.⁶

Threats to Shellfish

Those at the Shellfish Group notice that they are seeing several oyster diseases previously unseen in the area, and increased populations of predators. This could be because ocean surface temperatures have been rising as well as ambient temperatures. Data from Woods Hole, MA shows that since 1970 average annual sea surface temperatures have been increasing by 0.04°C per year.¹ This means that many predators, diseases, and invasive species are moving north, surviving, and proliferating.

Vibrio in particular is a problem for oyster farmers, and is a direct result of warmer temperatures. Vibrios are bacteria that occur naturally in warm coastal areas, and can cause serious infection if consumed (think raw oysters). About a dozen species of this bacteria are known to cause disease

in humans, mostly gastrointestinal. They account for an estimated 80,000 illnesses each year in the U.S.² Last year, in 2013, there was a month long shutdown of oyster operations on the Vineyard due to an outbreak in several areas along the Northeast Atlantic Coast; this was a huge economic loss for these businesses.

Dermo (also known as Perkinsus) is a parasite that causes high mortality in infected oysters. "Dermo has always been considered a southern disease," says Rick. Evidence shows that a cold winter will knock back the parasite and help control infections. "We just don't have those [cold winters] anymore."

Sea Squirts are invasive species that cover oyster cages, and seem to be getting worse, as noticed by one of the staff at the Shellfish Group. Sea squirts are a fouling organism; they cover surfaces in the hanging oyster cages until the oysters can no longer feed or breathe. At that point, someone has to pull up the cages, let them air dry, and power wash them. "Some species have always been here, but in recent years there are many new invasive species." Water temperatures below 4°C can help control the spread of certain species of sea squirts (Didemnum), but the water has not been getting that cold.

Like many other coastal areas, Martha's Vineyard is dealing with the green crab invasion. These European crabs eat clams, oysters, and scallops, and have already had large impacts on shellfish populations along the Atlantic Coast.³ In the past cold winters have helped control populations.

Response

Work practices: Oyster farmers are changing the way they work, particularly in response to the FDA's new regulations regarding vibrio control. Levels of dangerous vibrio rise quickly with increasing air and water temperatures,⁴ so oyster farmers now have to work under shade and follow strict guidelines for icing oysters and controlling temperature. For example, harvesters must record the exact date and time of oyster harvest, and ensure that the animals are iced immediately.⁴ During transportation to the dealer or wholesaler, the oysters may not be exposed to sunlight.⁴ These regulations mean that many farmers and dealers have to invest in new infrastructure.

Prevention and Control: As far as disease and predators there are control methods, such as being careful not to bring an infected animal into a new



Public waters on Martha's Vineyard are planted with seeds from the Shellfish Group

population; for example dermo easily spreads from oyster to oyster.⁴ However, the best strategy for shellfish growers is selectively breeding resistant species. A lot of this research is happening at universities, says Rick. Heat and disease resistant stock are key, as well as developing better ways to deal with predators.

Research: The Martha's Vineyard Shellfish Group is mostly a production facility, but they are involved in some research. The group recently received a grant to experiment with ribbed mussels, which may play an important role in salt marsh protection and restoration (and ultimately help mitigate some of the impacts of sea level rise).



Research is an important component in understanding disease, relationships between species and environment within the coastal ecosystem, and how to best combat changes in climate.

Recommendations

“There has to be a paradigm shift,” says Rick. There has to be enough outreach and education to get people moving on these issues. In other words, science is only part of the solution in dealing with climate driven challenges. There must also be sufficient community awareness, support, and a priority placed on solving these problems. In many cases, culture and communication remain obstacles to dealing with climate change.

Despite the challenges, shellfish aquaculture is a growing and very profitable business in Massachusetts. The majority of this comes from oysters.⁶ “Right now there is demand for oysters, and the prices are good,” says Rick. Hopefully this means there will be sufficient interest and resources to maintain healthy coastal ecosystems.

Martha's Vineyard Shellfish Group, Inc. Healthy ecosystems for coastal resilience (Continued)

Resources:

- The website for Martha's Vineyard Shellfish Group has detailed information about aquaculture in the area: <http://mvshellfishgroup.org>
- Shellfish aquaculture has potential to help mitigate the effects of climate change and can help restore ocean ecosystems. These two resources highlight initiatives in sustainable and restorative aquaculture: <http://www.greenwave.org> and <http://www.thimbleislandoysters.com/1379-2/>
- Selective breeding and genetics research contribute to development of disease resistant oysters. This article give a brief introduction to the field of Genetic Improvement in Oysters: https://agresearch.umd.edu/sites/default/files/_docs/210-1993%20Genetic%20Improvement%20Oysters.pdf

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Climate Change and the New England Food System Case Study Series

This case study was researched and written by UNHSI's 2014 Thomas W. Haas Climate Fellow, Ruby Woodside. Ruby's fellowship focused on documenting and communicating climate impacts and adaptation strategies for New England farmers and fishermen. Ruby is currently working on a Masters of Environmental Science and Policy as well as an MBA in Sustainability at Clark University. The fellowship is based at the UNH Sustainability Institute, and hosted in collaboration with Food Solutions New England (FSNE). FSNE is a regional, collaborative network organized around a single goal: to transform the New England food system into a resilient driver of healthy food, sustainable farming and fishing, and thriving communities. Learn more at www.foodsolutionsne.org.