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Pemaquid Oyster Company: Working to fill a Thriving Market

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SUSTAINABILITY briefing

University of New Hampshire
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Pemaquid Oyster raises oysters in the Damariscotta River in Maine.

History

Pemaquid Oyster was founded in 1986. Dr. Chris Davis and Jeff McKeen are two of three business partners who run Pemaquid. Dr. Davis is also a researcher and part time professor at the University of Maine. He now spends most of his time with the Maine Aquaculture Innovation Center, where he researches issues facing the aquaculture industry. Jeff is most involved with the current oyster production at Pemaquid. The third business partner is Dr. Carter Newell, who runs a mussel business and conducts research in addition to working on the oyster farm.

Production

Pemaquid sources all of its seeds from hatcheries within Maine, and usually starts the season with about 1.5 million oysters. Approximately ½ to ¾ of those oysters will go to market.

Pemaquid Oyster sells more than half of its oysters in Maine through wholesale accounts, local restaurants, and a few direct sales. The rest is sold to distributors, who sell to restaurants ranging from Philadelphia to Toronto.

Climate Impacts Seen

The farmers at Pemaquid keep records of water temperature, and the last 5 years have been considerably warmer. “It has been a warm decade. There is no doubt about it,” says Chris.

Pemaquid has leased area on the Damariscotta River to grow oysters since it began in 1986.

What do warmer water temperatures mean for oyster growers? American Oysters need water temperature of at least 74° to spawn. When Pemaquid first began farming oysters on the river, they did not spawn, but in the last 15 years Jeff notices that the oysters are beginning to spawn and reproduce. This isn’t a huge problem for the farmers, but oysters are not as palatable when they are spawning. This means that in order to collect a higher quality product, farmers may have to shift the harvest schedule in order to harvest before the oysters spawn. Jeff is also seeing more wild oysters, a population that has been very small historically

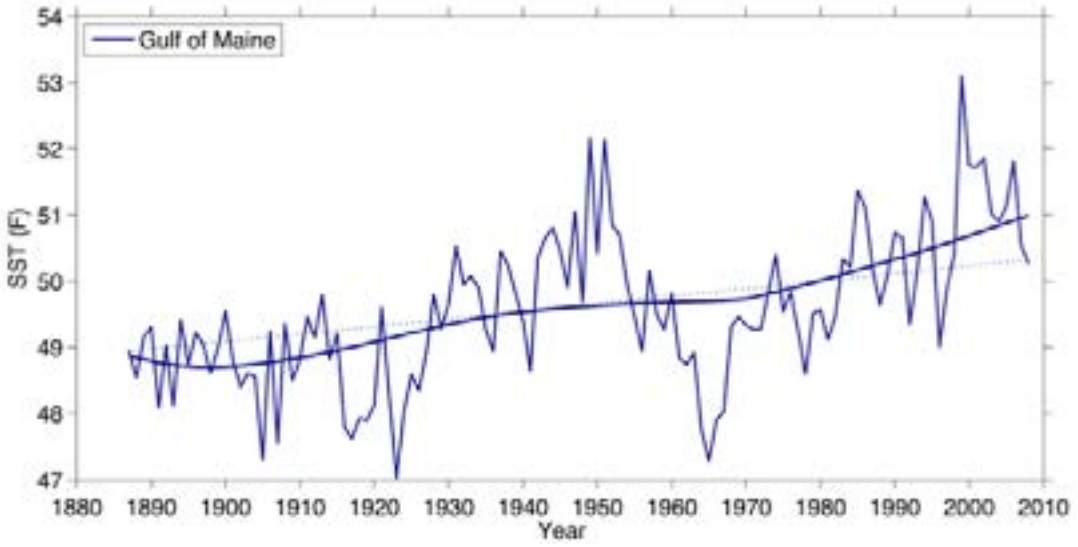

Figure 13. Mean annual sea surface temperature (°F) in the Gulf of Maine, 1887-2008. Data from the National Oceanic and Atmospheric Administration Extended Reconstructed Sea Surface Temperature (ERSST) V3b ship and buoy observational gridded dataset using grids centered on 290E x 42N, 290E x 42N, and 292E x 44N Figure from Wake et al., (2011); data from Smith et al., (2008)

but appears to be growing. He has been able to take advantage of this by harvesting and selling some of the more expensive wild species.

Another climate related change that oyster farmers are experiencing is shifting species ranges and an influx of invasives. Green crabs are one example; this invasive species has been in Maine for over a century, but in recent years the population has increased dramatically.[1] The increase in the Maine green crab population has coincided with rising ocean temperatures.[1] Green crabs feed on shellfish, and are responsible for a significant loss of oyster seed at Pemaquid. Interestingly, Jeff notices that this year after the cold 2013 winter, the green crab population seems to be about half of what it was the previous year.

In New England, commercial mollusk production represents an industry of over $35 million yearly in product sold.[7] In Maine, there are over 60 leases for standard shellfish aquaculture, covering over 650 acres of water.[8] The majority of Maine oysters are grown in the Damariscotta River; total farmed oysters brought to market from the river alone often exceed 2 million.[8]

Threats to Oysters

Green crabs are not the only threat to oysters. Polydora is a type of marine polychaete worm that bores through oyster shells,[2] causing them to gather mud and waste. This doesn't kill the oysters, but ultimately reduces their marketability. Chris notes how this warm water species is now being found in parts of Maine where it was previously unseen.

Similar to other oyster growers throughout New England, those in Maine are concerned about Vibrio, bacteria that occur in warm coastal waters and can cause serious gastrointestinal illness and infection in humans if consumed.[3] Vibrio levels increase with warm water, and Chris worries that the FDA may implement regulations requiring oyster producers to kill the bacteria through heat or pressure treatment. This means they would no longer be able to sell live oysters, which is what their market is based on. "Having a plate of dead oysters is not the same as having a plate of live oysters," says Chris.

MSX, or Haplosporidium nelsoni, is a protozoan that is deadly to oysters in high numbers. This species has long been present in the warmer Chesapeake Bay area, but had only been seen in very small numbers in the Damariscotta River. However, in 2010 there was an outbreak in the river that wiped out 50-80% of oysters farmed there. Chris Davis believes that this outbreak may have been due to warmer waters.

Filter feeders, like tunicates or sea squirt species, also represent a challenge to oyster growers. These invasive species attach themselves to surfaces like

oyster cages, making the equipment heavier to handle and competing with the shellfish for food and space.[4]

Response

Fouling Organisms

To help control fouling organisms like tunicates, Jeff says that they try and maintain clean equipment. This means flipping bags and cages regularly, a practice that would likely be done anyways as it is healthful for the oysters.

Disease and Predation

Most of the strategies in dealing with diseases and predators focus on prevention. In many cases, once you have the disease, there is not much you can do, says Chris. Even when control measures exist, such as manually air-drying oysters to kill off worms, they are usually not feasible at a large scale. So the key is prevention. This means being sure not to introduce infected oysters into a new population. The partners at Pemaquid buy all seed from within Maine, which prevents new disease being brought into the state. Breeding disease resistant stock has also been very successful. For example, MSX is no longer a problem for oyster farmers in the Damariscotta, because a MSX resistant stock has been developed.

Because oysters are filter feeders and eat algae, they actually help keep the waters clean. Jeff says that heavy storms that wash nutrients into the water can be good for oyster farmers; more nutrients means more algae and more oyster food.

Oyster farmers used to use wooden frames for their equipment, but about 15 years ago had to switch to other materials because of the introduction of shipworms that devoured wood.

The research for this technology was carried out at Rutgers University and elsewhere; oyster farmers now pay royalties to the university in order to use the disease resistant stock.

As far as Vibrio, the oyster farmers feel that current measures to limit outbreaks are sufficient. Jeff describes how they test for Vibrio at various stages in the oyster growth process. Typically, before harvesting oysters, they will move them to colder, cleaner water to help purge some of the mud and improve taste. This step also has the benefit of eliminating vibrio; Jeff says that the oysters test negative for the bacteria when they harvest them, despite having higher levels during the earlier growth phase in warmer waters.

Other Challenges

"Marketing is not a challenge," says Chris. "We can sell every last oyster." With such a thriving market, the challenge for Pemaquid is keeping up with demand. "We could use some more leased area," he adds, but notes that the process for acquiring leased space for oyster production can be very long. Although Maine offers a few types of leases for aquaculture, the permitting process can be can be expensive and take up several years.[5] The Damariscotta River in

The oyster seeds are 2.5 mm in size when Pemaquid Oyster buys them. Jeff says that seed and labor are two of their biggest costs.

particular is a popular location for oyster farming as well as recreation, which can make the regulatory process even more cumbersome. Jeff says that one of their biggest challenges is the pressure from multi-use demand on the water.

Recommendations and Opportunities

Disease and challenges aside, oyster farming is still a viable business. "Very much so," says Chris, who notes that while climate change is certainly on the radar, the business of growing oysters has yet to be severely impacted.

Documentation of environmental conditions is vital in being able to record the physical changes that are going on, be it temperature, acidity, salinity, or other oceanographic parameters. To address this need, Chris describes a current project that is developing a low cost monitoring buoy; this buoy would help monitor environmental conditions in the water. While research and development projects are important, a large part of record keeping is the responsibility of the farmers; encouraging people to maintain good records is key. "If you don't have data, well, its all anecdotal," says Chris.

Research is also important in building up the resilience of the industry for future changes. In particular, research on shellfish disease prevention is needed. Similarly, ocean acidification is of concern as atmospheric carbon dioxide levels rise. Chris says that oceanographers have documented a pH drop from 8.2 to 8.15, indicating water conditions that are becoming more acidic in the Gulf of Maine. While farmers in Maine are not yet seeing a huge impact from this, the shellfish industry in the Pacific Northwest has been dealing with effects of ocean acidification for years. Continuing research is important as greater acidity changes are expected in the long term.

Diversification of crops and markets is a key resilience strategy for many land based farmers, and aquaculture is no different. Chris describes current work in developing a market for seaweed, which he sees as an opportunity for commercial lobstermen and fishermen to diversify. Some seaweed, such as sugar kelp, is a winter crop; in Maine it could be grown between November and May, and then harvested just as lobstermen are putting out their traps.[6] A seaweed industry would have many benefits other than the additional, off-season income it would provide for fishermen; seaweed is a carbon sink,[6] so has potential for climate change mitigation.

This machine filters the oysters based on their size.

Resources

• Ocean Approved is the nation's first commercial kelp producer. The website includes a manual on seaweed farming: http://www.oceanapproved.com

• Chris Davis is the Executive Director of the Maine Aquaculture Innovation Center: http://www.maineaquaculture.org/index.html

• Find out more about Pemaquid Oyster at: http://www.pemaquidoysters.com

• This time series shows the increasing sea surface temperatures for the Gulf of Maine:

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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.

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