

Town of Nantucket Natural Resources Department

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Update: Shellfish Restoration Initiative in Nantucket, MA

According to *Restoration Works* by the Nature Conservancy, “85 percent of oyster reefs have been overfished, dredged away, buried with sediment or made unproductive by pollution, diseases, and changes to river flows” (p. x). Due to this alarming population decline, many coastal states have established restoration initiatives to help restore natural oyster populations. In addition, these states have established shell-recycling programs in order to save a limiting, valuable resource. Shell is becoming more difficult to obtain due to many years of throwing it in landfills, using it for infrastructure, and not returning it to the ocean. Oyster restoration and shell recycling go hand in hand because cured oyster shell (cultch) is a suitable structure for oyster spat to settle on. Over time the spat grow and mature into spawning adults. As this process continues, oysters grow on the cultch as well as on one another to form oyster reefs. The native oyster population here on Nantucket has declined significantly, but some small populations can be found throughout the harbor. The Brant Point Propagation facility has established various shellfish stock enhancement programs for Nantucket waters and would like to include the production of oysters.

Oyster reefs provide many eco-benefits to both the marine and coastal environments. According to *Shellfish Reefs at Risk*, “As ‘ecosystem engineers’ shellfish influence the environment around them in ways that benefit other species, and in doing so benefit people and our economy. Shellfish remove suspended solids from surrounding waters, thereby increasing water clarity, enabling seagrass growth. This same filtration service can reduce the likelihood of harmful algal blooms. Shellfish can also help to remove excess nutrients from coastal bays through de-nitrification in surrounding sediments. Shellfish reefs also serve as natural coastal buffers, absorbing wave energy directed at shorelines and reducing erosion from boat wakes, sea level rise and storms” (The Nature Conservancy, p. 8). In addition, “90 % of commercial and recreational finfish species depend critically on reef structure/estuaries for food and shelter in the first two years. We have lost 90% of this habitat and it is a key reason fish stocks are having difficulty recovering. Oyster sanctuaries will allow the development of locally disease resistant stock, as the stock survives for more than 3 years and is subjected to local disease pressure. Survivors that become old and remain in the breeding stock are more robust than stock that has been “bred” for resistance in the lab. And without large standing populations and returning shell to the water, ocean buffering is being directly removed and reduced. Acidification negatively affects clam and oyster reproduction and

juvenile survival. The more shell and the larger the population, the more calcium carbonate and alkaline buffering which positively affect survival” (C. Felix, personal communication, June 7, 2014).

In 2014, the Natural Resources Department started a shell recycling pilot project in conjunction with the Town of Nantucket’s Shellfish Management Plan (Objective 3, Recommendation 2). Oyster and clamshells are collected from fourteen local restaurants and two raw bars. The goals for Nantucket’s shell recycling program and restoration initiative are to:

1. Institute a shell-recycling program where most, if not all, shells are returned to the harbors for pH buffering and settlement substrate purposes (Shellfish Management Plan).
2. Design and construct a small oyster reef using recycled shell in a Division of Marine Fisheries (DMF) restricted site (closed to taking of all shellfish) in order to use as an educational platform for the local community and visiting scientists.
3. Study the effects that a small-scale oyster reef will have on water quality in Nantucket waters.
4. Educate the public about the eco-benefits that oyster restoration and shell recycling provide.

Due to state shellfish laws, all restoration sites need to obtain certain permits, which take up to one year. The Division of Marine Fisheries’ *Shellfish Planting Guidelines* states that the DMF will have to conduct a dive survey of the proposed area to ensure that it is void of eelgrass and other types of shellfish. In addition, “The shellfish being planted must be tested by a pathologist recognized by *Marine Fisheries* and be found free of known shellfish disease or come from sources currently approved by *Marine Fisheries*” (Hickey, 2011). Additional permits have to be acquired by the United States Army Corp of Engineers, before cultch can be placed in the water for restoration purposes. The Nantucket Conservation Commission will file a notice of intent to review the impacts of the project on the state wetlands protection act as well as the Nantucket wetlands bylaw. The proposed restoration project will have to gain support by the Nantucket Harbor and

Shellfish Advisory Board before it is presented to the Board of Selectman for approval. At the town level, public hearings will be held for the community to voice any concerns regarding oyster restoration. If all agencies approve the project and the specific permits are obtained, then the oyster restoration portion of the program can begin. The amount of shell collected from the recycling program will dictate the scale of the restoration project. For the first year, the restoration site will be small (50’ x 50’) and if it is successful then we may add onto it in future years. The site will be marked with buoys as well as signs stating that shellfish harvesting is prohibited. The area will also be monitored by the town shellfish warden to ensure the public is adhering to the regulations.???

The Department of Natural Resources is aware of concerns that harbor users’ have about oyster restoration in Nantucket and would like to address them.

Concern #1. New disease being introduced into Nantucket waters by non-native oyster shell.

The Division of Marine Fisheries' *Shellfish Planting Guidelines* states "Oyster, quahog and softshell clam shell used as cultch shall be aged on land for a minimum of one year... All issues regarding approved shell cultch must be addressed by Marine Fisheries prior to placement into coastal waters" (Hickey, 2011). Furthermore, *Decontamination of Shells Used for Habitat Restoration* by the National Oceanic and Atmospheric Association recommends the following decontamination treatment, "The most common method of treatment is to dry the shells in piles on land, away from the reach of the tides. Many organisms are capable of surviving long periods out of the water, especially in cool, humid conditions... For high risk areas or those with cool, wet periods a drying time of one year may be desired, as this duration would include a winter period that may reduce the viability of any organisms or disease associated with the shell. Following the drying period, all shells should be thoroughly washed prior to transplant" (NOAA, 2013). According to a pathologist that I have corresponded with, "Using shell to form new reefs will not transmit disease if the shell is aged correctly and shell reefs are an excellent base for oysters to set on. I suggest spreading the shell out in relatively thin layers and turning over often. The key is that no tissue remains on the shell" (R. Smolowitz, personal communication, June 5, 2014).

Currently, the reserved shell is stored at the Department of Public Waste (DPW) to meet these regulations. When the shells are collected, they are spread out in a thin layer so curing can start immediately. At the end of the month, the shells are put in separate piles according to the month they were collected. This ensures that the appropriate shell will be cured for a full year before it may be placed back in the water. Shell collected in May 2014 cannot be used until May 2015. Once a month, the shell piles are turned over so the shell in the middle will have a chance to cure. Also, the shells will be power-washed before they are used for restoration purposes.

Concern #2. If cured oyster shell (cultch) is placed back in the water it may cause an infestation of boring sponge.

The Natural Resources Department has been in contact with many oyster restoration scientists to find out if boring sponge is a problem at any of their restoration sites. Many of the restoration sites that have used cultch to establish oyster reefs, do not have boring sponge problems including Wellfleet, MA. Dr. Anamarija Frankic who is working with the Town of Wellfleet's shellfish constable have placed 900 tons of cultch in a portion of Wellfleet harbor and in one year the site has established 4 million oysters and 3,500 pounds of nitrogen is sunk every year (UMass Boston, 2014). According to Dr. Frankic, "The cultch was processed as directed by the DMF and spread all over the intertidal area where there is muck or sand, but we have natural oyster habitats and aquaculture grants throughout the harbor that provide natural spat settlement on the cultch. In my knowledge there was never an issue with boring sponge and no one in the aquaculture industry questioned cultching, which has been going on for decades. Boring sponge is not an issue; and we need more oysters and reefs to establish healthy populations, high biodiversity that

increased 100% on our pilot site, and improved water quality at the site area by 70% sink of nutrients. Healthy harbors were supported by shellfish populations throughout history and today 85% of natural oyster reefs are gone” (A. Frankic, personal communication, August 6, 2014).

Boring sponge naturally occurs in the ocean and bores into oyster shell as well as scallop and mussel shell. “The boring sponge *Clionoa celata* occurs in the Atlantic and a number of mud worm species in the genus *Polydora* infest the shells of oyster populations on both the Atlantic and Gulf coasts. Many of these infestations are natural associations and in general, most oysters survive. Thus, these associations do not seem to be having an effect at the population level” (NOAA, 2007). Therefore, boring sponge and mud worms are not the sole reason oyster populations are declining around the world. Additionally, the abundance of boring sponge is directly related to eutrophication (excess nutrients in the water). As nutrient levels increase boring sponge abundance increases as well (Puglisi, 2008). A professor from Virginia Institute of Marine Science made a valid point “When you add prime substrate to an open marine system, you start a competition experiment for that substrate among everything that likes to live on or in your substrate. This is the end point of tens of millions of years of evolution and you are not going to stop it. You will have barnacles, worms, bryozoans, sponge, and of course oysters. But then consider that oysters have done quite well over the millennia in the ongoing competition. If they become well established they will out compete the sponges, but you will not and effectively cannot eliminate sponge that is already present in the water” (R. Mann, personal communication, June 21, 2014). Here on Nantucket, boring sponge is already present in the water and it may be found on the perspective oyster reef in addition to oysters, juvenile fish, mud crabs, etc. By establishing an oyster reef, it may decrease the abundance of boring sponge because through their filtration process, oysters extract excess nutrients, which would decrease the chance of eutrophication, which can cause harmful algal blooms.

In order to monitor potential boring sponge on the prospective oyster reef the Natural Resources Department will conduct a number of dive surveys. In addition to the DMF surveys, we will do a pre-survey to observe if boring sponge is present at the location before cured shell is added. Once the cultch and oyster spat are placed in the water we will conduct surveys twice a month to monitor boring sponge. The surveys will also gather information about water quality and biodiversity around the oyster reef.

The proposed restoration site will be away from any aquaculture grants and meet the DMF shellfish planting standards. The shell will be cured for at least one year to insure any disease/boring sponge is dead before it is used for spat to settle on. The Natural Resources Department will be holding several informational sessions as we move forward to address any concerns with this initiative. If you have any other concerns or comments please don't hesitate to contact us; we would like to hear your input.

Sincerely,
Leah Cabral
Town Of Nantucket
Assistant Biologist
Lead Investigator

Appendix I: Literature Cited

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