



Community Sustainable Fisheries Initiative

Poor water quality in the proposed project areas largely results from the addition of harmful nutrients; specifically nitrogen and phosphorus that drain into Northport Harbor from municipal and urban stormwater runoff. High levels of nutrients within Northport Harbor have fueled the growth of algal blooms (some of which are toxic) and increased bacterial loadings. The proposed project involves a multifaceted approach utilizing lobster trap gear that has either been abandoned or lost in the Long Island Sound (LIS) lobster fishery, and shellfish culturing for bio-filtration. Modified lobster traps will be developed as a means to culture shellfish that is directed toward improving water quality and habitat through nitrogen removal, habitat improvement and shoreline erosion protection.

The ribbed mussel *Geukensia demissa* will be utilized as a biomediator to reduce nitrogen and other nutrients within Northport Harbor. The presence of dense ribbed mussel beds are known to increase water quality and reduce the turbidity through physical accumulation and stabilization of substantial quantities of suspended particles (Bertness and Grosholz, 1985). Ribbed mussels have the ability to exploit a wide variety of food sources through suspension feeding including detrital cellulose from vascular plants, small sized bacteria, heterotrophic protists, microphytobenthos, cyanobacteria and phytoplankton (Pales et al, 2008). The byssal threads of ribbed mussels have also shown to bind sediments and prevent erosion and physical disturbance of the shoreline (Bertness, 1984). Smooth cordgrass *Spartina Alterniflora* will also be utilized as a recruitment site for both aquacultured and wild stock ribbed mussel seed. The relationship between cordgrass and ribbed mussels appears to represent a facultative mutualism that leads to increased net primary production, community structure and overall ecosystem stability (Bertness, 1984). Specific project field-related work and monitoring maintenance details will include:

- water quality testing of the site throughout the grow out phase (e.g. temperature, salinity, nitrogen, phosphorus, dissolved oxygen)
- testing of the shellfish crop for red tide toxins during the bloom on close intervals and throughout the growout (to be conducted by NYSDEC)
- recording growth rates of shellfish
- lobster trap modifications up to approximately 150 traps
- Shellfish cultivation monitoring, and maintenance
- Taylor floated lobster cages (TFLC) containment fabrication up to four systems
- TFLC maintenance and monitoring and shellfish culling
- Biofouling maintenance on TFLC and ribbed mussel beds

The proposed project will be conducted in New York State (NYS), within Northport Harbor. Northport Village Harbor will be the central location for the lobster trap buy-back program and

lobster trap modification activities, as well the ribbed mussel mariculture activities, TFLC fabrication and maintenance.

PROJECT NOTE – Projects that were funded by National Fish and Wildlife Foundation and National Oceanic and Atmospheric Administration allowed CCE to establish a precedent-setting partnership to address the LIS derelict gear problem. The projects developed an assessment/removal program improving the LIS ecosystem that can be applied to other coastal communities. The projects accurately characterized the extent and distribution of derelict lobster gear in the New York waters of the LIS. Identified gear was removed from the study site by employing the experience and expertise of commercial lobstermen from the area. The condition of the retrieved gear, lobsters and other ensnared bycatch were recorded and released, and then the collected derelict gear was recycled. The lobster traps were identified as excellent, moderate, and poor in condition. This project proposes to utilize only excellent traps for shellfish mariculture.

One important project finding was that 22% of the collected traps were either in excellent or moderate condition. It was apparent that these traps were reusable but of little value because of reduced lobster fishing effort. We began to consider other uses for these traps that would provide a community and individual benefit to those most affected by the collapse of the LIS lobster fishery. Consultations were conducted with community leaders, lobstermen, regional fisheries and mariculture specialists, and NYS and Suffolk County fishery managers to help identify productive uses for this gear. The consensus was that shellfish culture was possible using the cages as containment. Based on this view, this project's working hypothesis is that collected, non-usable lobster traps (because of overfishing in the lobster fishery) that are in excellent condition, may be modified and reused/recycled in shellfish culture programs.

Project Design and Methodology:

Shellfish mariculture commonly use cages and plastic mesh bags during the growout period; particularly for oysters. We believe that this concept can be readily extended to other shellfish species such as the ribbed mussel as well. A CCE aquaculture specialist, on a proof of concept basis, has tested modified lobster traps as cage containment for oysters. Preliminary results indicate that lobster traps modified by eliminating escape vents perform well for caged shellfish culture; and also provided settlement structure for mussels that had naturally set on them. The principal advantages of using modified lobster traps are their ability to hold large quantities of shellfish seed, their handling efficiency and predator exclusion. Altered lobster traps will facilitate the frequent monitoring and maintenance required in caged shellfish culture. Additionally, the lobster trap usage will allow for extended growout periods within the Huntington Harbor site and associated water quality benefits.

Ribbed mussels will be spawned at the CCB hatchery located in Southold, New York. The process of shellfish spawning involves the manipulation of water parameters to mimic a natural spawning environment. Water temperature is raised to promote the release of gametes into the water of a holding tank. After fertilization occurs, shellfish undergo a series of free swimming larval stages. These stages are referred to as the trochophore, veliger and pediveliger. During this time the larval ribbed mussels will be fed a diet of algae to promote rapid growth. Within 14-20 days the pediveligers will settle to a hard surface at an approximate size of 300 micrometers. Once settled, the pediveligers will develop into juvenile shellfish

Ribbed mussel:

We will cultivate 2 million ribbed mussels in our hatchery at Southold. When juvenile ribbed mussels reach 0.5-5 mm, the first batch of 1.5 million will be directly seeded within Northport Harbor. The ribbed mussel growout will occur within Northport Harbor at a selected site within Northport Bay that is conducive to the establishment of ribbed mussel beds and in need of shoreside erosion protection. A proposed suitable site is the Centerport side of Northport Harbor. Existing cordgrass that has been undermined by erosion will be used to seed juvenile ribbed mussels onto the base of the cordgrass at low tide. Cordgrass is well suited for this project because it is a natural recruitment site for ribbed mussels. Cordgrass also has the ability to absorb nutrients as it grows, while preventing beach erosion and providing habitat for a large number of endemic intertidal species. In the absence of smooth cordgrass at these sites, coir erosion fiber mats will be used in places to help establish ribbed mussel beds that can provide further recruitment for cordgrass in the future.

A second batch of 500,000 ribbed mussels will be seeded onto coir logs or other suitable substrate at our hatchery for grow-out in the modified lobster cages. Each lobster trap will be stripped of its fishing components and the vent and entrance will be closed, effectively creating a cage. The modified cage will be attached to PVC Taylor float type system. The Taylor floats are designed to keep shellfish near the surface where the highest densities of algae and plankton are found. A designated amount of ribbed mussel that are attached to coir mats will be placed inside each lobster trap to grow. The PVC Taylor float system will be secured and located within Northport Harbor at a suitable location. The ribbed mussel in this project can be held in the modified cages for up to 6 months to continually filter water and remove nutrients through filtering and bio-deposits. After 6 months, the caged mussels will either be completely removed and destroyed for composting, or used for plantings (bottom or shoreline) in Northport Harbor if preferred. We have already identified a partner that is willing to utilize ground shellfish compost at the Schmitt Farms in Riverhead, NY if this removal approach is chosen. There are benefits of nitrogen removal from both approaches, but biodeposits and longer amounts of time spent in the water have the potential for greater nutrient removal as described by Newell et al. 2002 and 2004.

Weekly maintenance will be conducted to ensure the shellfish are feeding and growing at optimum levels. The effective mitigation of fouling organisms will be a primary source of the maintenance requirements. Biofouling is a major problem that can accumulate directly on the cultured shellfish and the infrastructure used for growth. Direct fouling can cause physical damage to shellfish, mechanical interference and biological competition for food. The Taylor Floated Lobster Cage (TFLC) system will require weekly maintenance to ensure the shellfish are receiving a sufficient flow of water. Juvenile ribbed mussels will be regularly checked and cleaned within the TFLC to promote steady population growth and extended habitation within Northport Harbor. The Taylor floated lobster cages will be routinely cleaned and returned into the water for further growout.

The security of all involved aquaculture equipment will be ensured at all times. All TFLC systems will be secured using plastic clamps. The benefit of ribbed mussel culture is that they are inedible to humans and thus not likely to be stolen or manipulated. Other projects have recently utilized ribbed mussels for this same purpose to improve water quality and have been successfully demonstrated in the Bronx River (Long Island Sound Study Biennial Report 2012). CCE will implement best management practices on all shellfish related growout structures to ensure aesthetic issues are properly addressed.

We propose to adapt up to 150 lobster traps from the buy-back program (in excellent condition) for the public shellfish culture initiative. A new dimension to be explored is the added benefit of the shellfish's ability to act as a biomediator through their natural process of filter feeding. This project will involve the grow out 2,000,000 ribbed mussels seeded and cultivated in Northport Harbor. This project will provide a water quality and habitat enhancement component with proven water quality benefits associated with shellfish habitation and shoreside erosion protection.

The Atlantic States Marine Fisheries Commission's (ASMFC) American Lobster Management Board approved a closed season for lobster in Lobster Management Area 6 (LMA 6). The current closure is in the timeframe of September – December. All lobster traps need to be removed from the LIS during this closure. A voluntary buy-back program will be conducted to collect lobster traps during the proposed closure requiring lobstermen to remove all lobster traps. From the lobster trap recall, only those traps in excellent condition with NYS tags and collected by owners will be used.

Measure of Success:

- 1,000 active/abandoned/ghost or nonusable commercial lobster traps will be removed from the LIS. This removal will have the benefit of habitat restoration mainly by

removing the threat they propose to vital endemic species and the water quality benefits of removing marine debris.

- The successful adaptation and use of lobster traps as shellfish aquaculture methodology for public/private mariculture programs.
- Water quality improvements in Northport Harbor related to public shellfish mariculture activity will result in nitrogen reduction, water quality improvement, habitat improvement and public education.
- At a rate of approximately 10 gallons/day per mussel, 2,000,000 ribbed mussels will have the capability to filter 20 million gallons of water every day from Northport Harbor.
- Prevention of shoreline erosion through natural processes.
- The shellfish species being used are natural bioindicators of water quality, thus the monitoring of ribbed mussel will yield information concerning the success of improved water quality.

Education and Outreach:

This project will be actively marketed to the public and coastal communities of Northport Harbor. During the field project, information will be posted in Northport Harbor at a suitable waterfront location. Outreach will include project displays and informational flyers to be posted at the project location. Education to the general public will be accomplished through CCE presentations at community events and to community leaders as well as CCE's website and Facebook page. We will also generate local and regional press coverage of the project and results through establish CCE press contacts. At the conclusion of the project an informational fact sheet will be produced and targeted to this coastal fishing community of Suffolk County containing detailed results and suggested practices that can be adopted to enhance water quality and living shorelines. Additionally, the results of the modification of lobster traps for usage as an alternative method for mariculture of ribbed mussels for both public and private application will be reported and disseminated to the public. Public participation will be encouraged through the involvement of local school students and community harbor advocacy groups.

Literature Cited

- Bertness, Mark D. "Ribbed Mussels and *Spartina Alterniflora* Production in a New England Salt Marsh." *Ecology*. 65.6 (1984): 1794-1807. Print.
- Bertness, Mark D, and Edwin Grosholz. "Population Dynamics of the Ribbed Mussel, *Geukensia Demissa*: the Costs and Benefits of an Aggregated Distribution." *Oecologia*. 67.2 (1985): 192-204. Print.
- Long Island Sound Study Biennial Report 2012. Protection and Progress. 23pp.
- Newell, R., Jeffrey C. Cornwell, and Michael S. Owens. Abstracts Influence of simulated bivalve biodeposition and microphytobenthos on sediment nitrogen dynamics: A laboratory study *Limnol. Oceanogr.*, (2002): 47(5), 1367-1379
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- Pales, Espinosa E, Bassem Allam, and Susan E. Ford. "Particle Selection in the Ribbed Mussel *Geukensia Demissa* and the Eastern Oyster *Crassostrea Virginica*: Effect of Microalgae Growth Stage." *Estuarine, Coastal and Shelf Science*. 79.1 (2008): 1-6. Print.

Proposed Budget

	Units	Costs Per Unit	Total
Salaries			
Principal Investigator (hours)	40	\$55.00	\$2,200.00
Project Researchers (hours)	200	\$35.00	\$7,000.00
Fisheries Technicians (hours)	1800	\$25.00	\$45,000.00
Administrative Assistant (hours) Data Entry	80	\$16.00	\$1,280.00
Data Analysis (hours)	40	\$35.00	\$1,400.00
Aquaculture Specialist	200	\$35.00	\$7,000.00
Workers Comp./Unemployment			\$1,829.00
Total Salaries			\$65,709.00
Contractual Services			
Voluntary Lobster Trap Buy Back Program	1,000	\$20.00	\$20,000.00
Trap Modification	1,000	\$10.00	\$10,000.00
Ribbed Mussel Seed	2,000,000	\$0.0132	\$19,800.00
Total Contractual Services			\$49,800.00
Supplies and Materials			
Shellfish Culture Supplies (Coconut Fiber, etc.)	1500	\$5.00	\$7,500.00
All-Weather Writing Paper (boxes)	5	\$30.00	\$150.00
Foul Weather Gear (Grundens, Gloves, Boots)	5	\$100.00	\$500.00
Total Supplies and Materials			\$9,500.00
Printing			
Fact Sheet	500	\$0.10	\$50.00
Total Printing			\$50.00
Permit Requirements			
State, County, Town Permits			\$1,000.00
Total Permits			\$1,000.00
Travel			
Mileage	2,500	\$0.51	\$2,550.00
Total Travel			\$2,550.00
Project Cost			\$128,609.00
Direct Administrative Cost			\$19,291.00
Total Project Cost			\$147,900.00

Matching Contributions

Amount:	\$28,971.00
Type:	In-kind
Status:	Pledged
Source:	Cornell Cooperative Extension of
Source Type:	Suffolk County
Description:	Non-Federal
	Matching contribution is fringe
	Benefits on salaries (44.09%)
Amount:	\$24,000.00
Type:	In-kind
Status:	Pledged
Source:	Long Island Sound Lobstermen's Assoc.
Source Type:	Non-Federal
Description:	20 vessel charter trips to tend to gear @
	\$1,200 per trip.
Amount:	\$7,200.00
Type:	In-kind
Status:	Pledged
Source:	Commercial Lobsterman (Northport)-
	George Doll
Source Type:	Non-Federal
Description:	6 vessel charter trips to tend to gear @
	\$1,200 per trip.
Amount:	\$21,000.00
Type:	In-kind
Status:	Pledged
Source:	Cornell Cooperative Extension of Suffolk
	County
Source Type:	Non-Federal
Description:	Shellfish Growout & Shoreline shellfish
	planning, planting and monitoring
Amount:	\$10,680.00
Type:	In-kind
Status:	Pledged
Source:	Cornell Cooperative Extension

Source Type:	Non-Federal
Description:	SPAT program volunteers assist in nursery culture of ribbed mussel and building gear. Volunteer hours = 500 hrs @ \$21.36/hr
Amount:	\$1,750.00
Type:	In-kind
Status:	Pledged
Source:	Cornell Cooperative Extension
Source Type:	Non-Federal
Description:	CCE Aquaculture Specialist – volunteer time to modify and test lobster traps Volunteer hours = 50 hrs @ 35/hr
Amount:	\$55,000.00
Type:	In-kind
Status:	Pledged
Source:	Cornell Cooperative Extension Lobster Trap Buyback Program
Source Type:	Non-Federal
Description:	Lobster traps will be bought from commercial lobstermen for \$20 per trap. The cost of a new lobster trap is \$75 per trap. 1,000 lobster traps @ \$75/trap = \$75,000 1,000 lobster traps @ \$20/trap = \$20,000 Lobstermen will be donating \$55,000 worth of lobster traps to the project. (The CCE lobster trap buyback program will be conducted in the event that CCE's derelict lobster trap program does not fulfill the requirements needed for this project. If CCE donates all of the lobster traps from their program they will donate \$75,000 worth of lobster traps for this project).
Total Amount of Matching Contributions	\$148,601.00