DOWNEAST INSTITUTE
FOR APPLIED MARINE RESEARCH & EDUCATION

Menu

2014 Field Trials

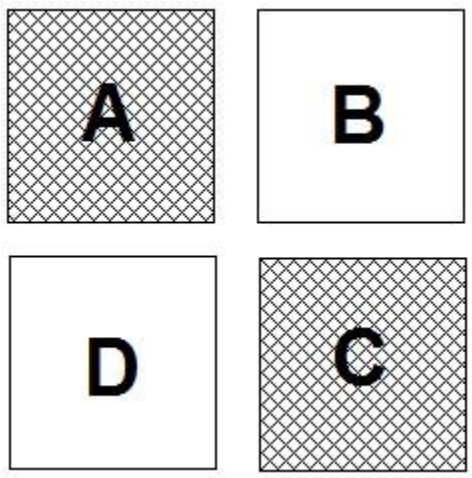
With lessons learned about routine monitoring and maintenance of field plots, and the necessity to hire skilled labor, we devised a six-pronged project to investigate green crabs and their effects on soft-shell clams. The brochure that is linked to this page was developed by Sara Randall, local coordinator for the Freeport Project, and explains each of the six independent field projects.

In 2014, funding for field work has come from three sources: $200,000 from the Maine Economic Improvement Fund (Small Campus Initiative) - 2 yrs, $348,767 from the National Marine Fisheries Service (Saltonstall-Kennedy fund) - 2 yrs, and $28,000 from Sea Pact - 1 yr. Several newspaper articles have appeared that discuss the 2014 field trials. One is from the Brunswick Times Record. Another is from the Portland Press Herald (and a video, but, the subtitle erroneously reads: The University of Maine spearheads a

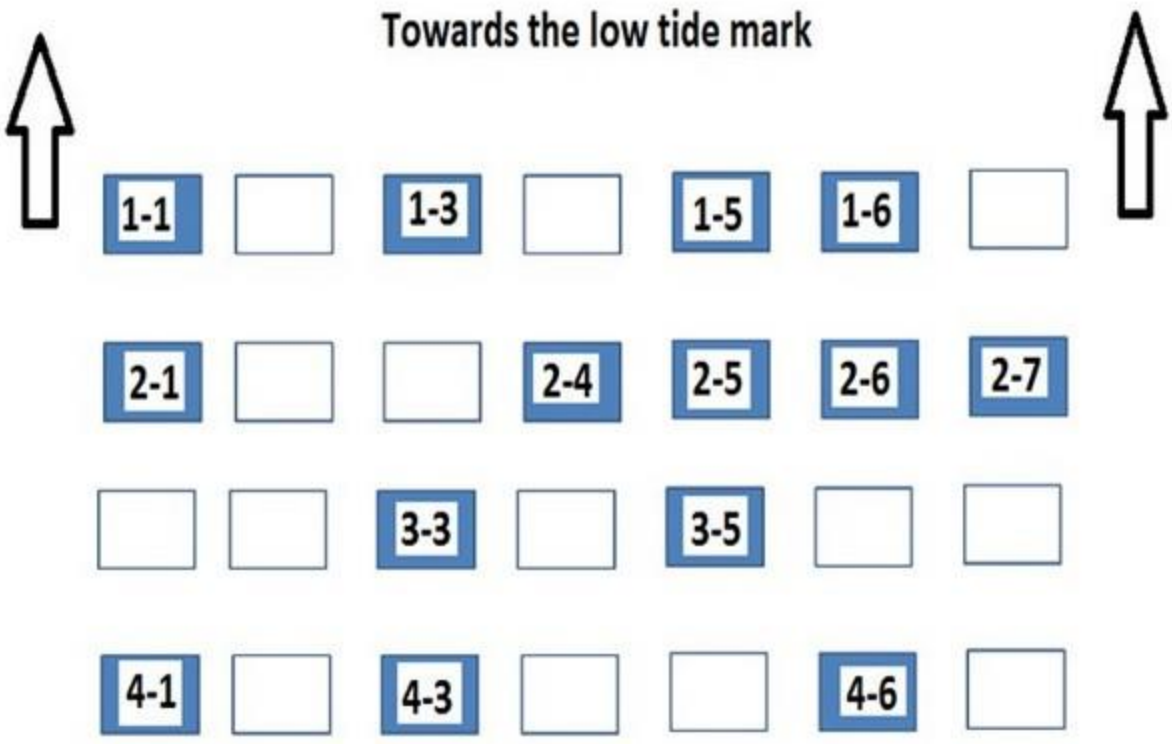
research effort on the green crab population in Freeport. The name of the institution is the University of Maine at Machias and the Downeast Institute). And, another is from the Bangor Daily News.

Study #1: Green Crab Predator Exclusion Fencing

Beginning in early February, we applied for an Army Corps of Engineers permit to undertake a fencing project at Staples Cove (lower Harraseeket River). The objectives were to determine the efficacy of fencing and netting (as intended at Little River Flat in 2013) and whether cultured soft-shell clam seed would grow and survive better in fenced plots, under netting, or in plots that were completely accessible by predators. The experimental design includes a total of twenty-eight 30-ft x 30-ft plots. Fourteen plots are surrounded by wooden fencing (see photos below), and fourteen plots have no fencing. Within each plot (regardless whether it has fencing or not) are four 12-ft x 12-ft subplots that are arrayed as such:

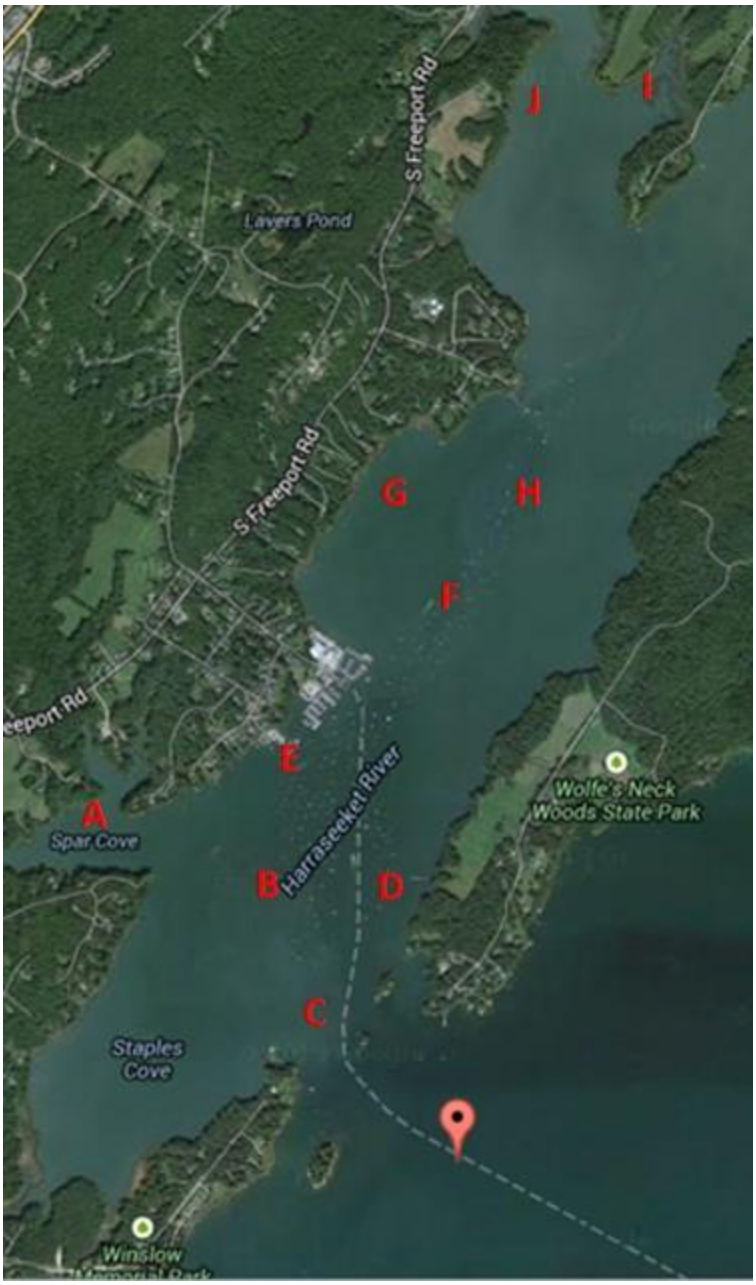


Bottom samples will be taken from each subplot within each of the 30-ft x 30-ft plots in November 2014. Samples will be washed through a fine mesh sieve (1 mm) to determine number and sizes of 0-year class soft-shell clams (this year's spat) as well as number and size of cultured clams (in subplots B & C). The information should enable us to determine the relative efficacy of fencing vs. netting.



Study #2: Green Crab Trapping

Green crab trapping studies began the first week of May. Traps similar to those used in 2013 are being used in 2014. Traps are being fished in ten locations within the Harraseeket River. At each location, five traps are set approximately 100-feet apart from each other. Five locations are in the Upper portion of the river (above the town dock), and five locations are in the Lower portion of the river. In the Lower river, three locations are intertidal (Spar Cove = A; Staples Cove = B; and Wolfe's Neck = D) and two are subtidal (Mouth of River = C; Yacht Club = E). In the Upper river, three locations are intertidal (Collins Cove = G; Pettengill = I; Sandy Beach = J) and two are subtidal (the Channel = F; Weston Point = H).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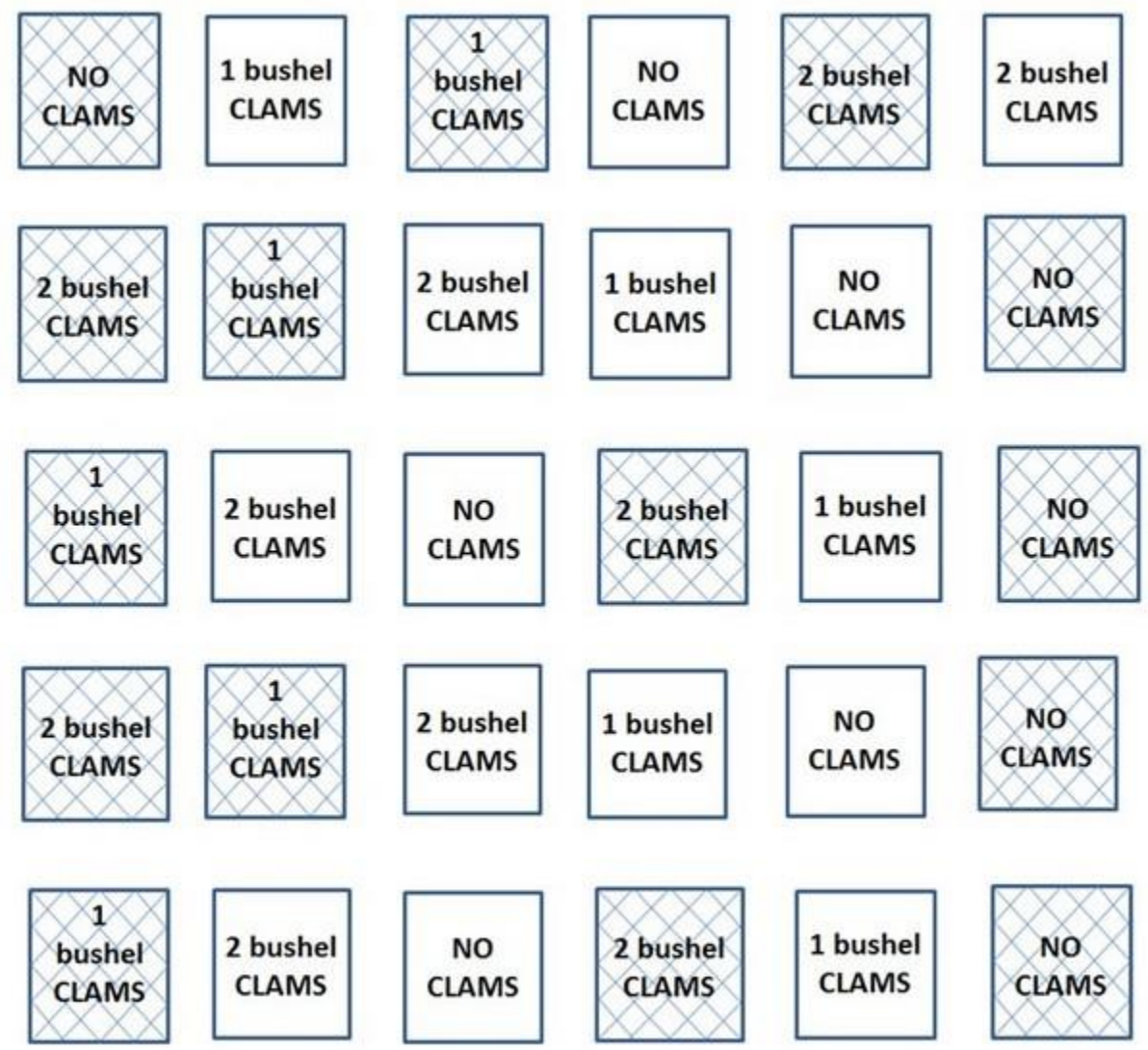
Harraseeket River
Wolfe's Neck
Woods State Park
B
D
C
Staples
Cove
Winslow

Traps are being fished on a 1-day, 2-day, and 4-day soak using crushed soft-shell clams as bait. As in 2013, we are pooling the information from the five traps at each location on each haul, and taking a weight measurement. In addition, we are taking subsamples to examine how size-frequency and gender vary both spatially and temporally. Finally, on the 1-day soak, we are taking a subsample of individual crabs to examine their gut contents.

Study #3: Adult Clams Used to Enhance Wild Clam Recruitment

Many marine invertebrates settle gregariously near their own kind, especially adults. This has been shown in barnacles, ascidians (sea squirts), tubeworms, oysters and other bivalves, but has not been shown definitively in soft-shell clams. In early May 2014, we set out a manipulative experiment at two intertidal locations in Freeport: immediately outside the trestles across Staples Cove, and at Recompence Flat. At both sites, five replicates of each of six treatments were distributed randomly in 10-ft x 10-ft plots within a 6 x 5 matrix (20-ft between rows and columns). The six treatments were as follows: 1) Plots with no clams; 2) Plots with no clams plus netting (flexible, 4.2 mm aperture) to discourage predators; 3) Plots with 1 bushel of live, commercial size clams that were hand-planted throughout the

100-square foot plot; 4) Plots with 1 bushel of commercial size clams plus netting; 5) Plots with 2 bushels of commercial size clams; and 6) Plots with 2 bushels of commercial size clams plus netting. The layout was similar to the schematic below.



In November, samples will be taken from each of the 30 plots at both sites to determine whether adult clams attract 0-year class individuals (spat). The experiment is also testing the possibility that wild spat are not gregarious, but can be enhanced using netting to deter predators such as green crabs.

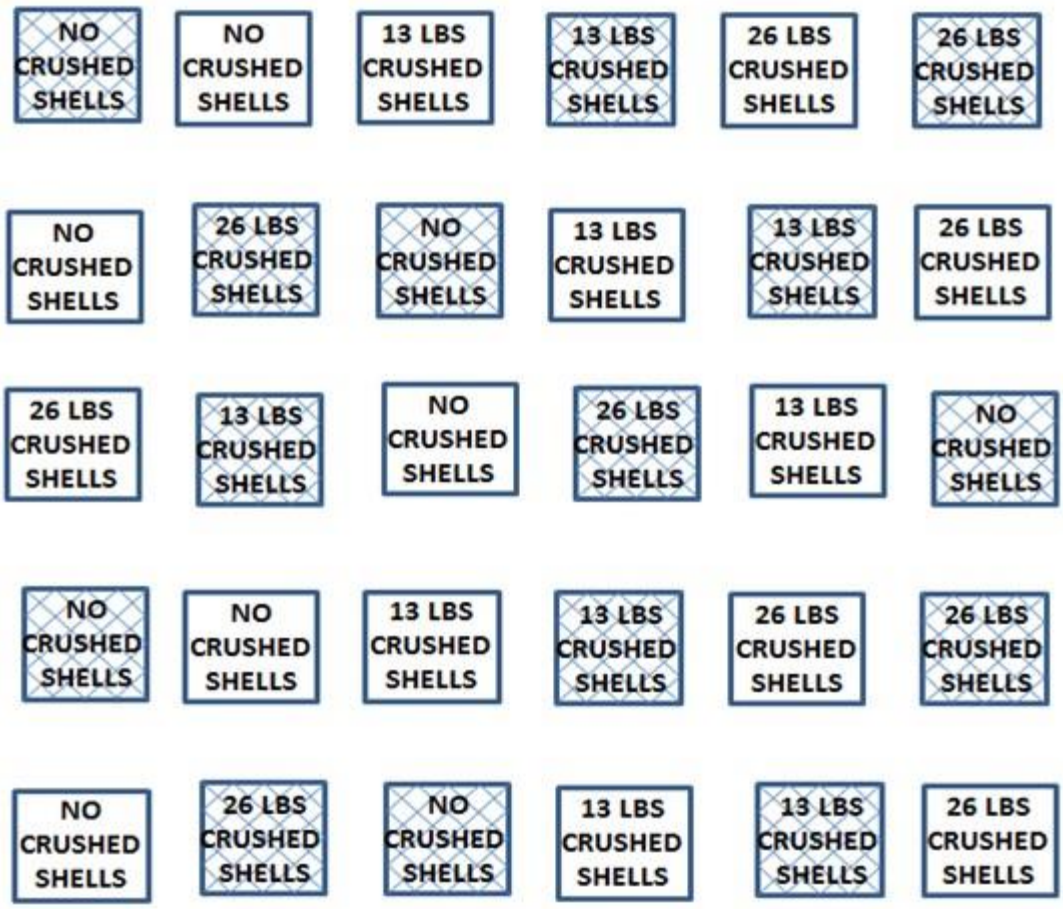
Study #4: Sediment Buffering for Coastal Acidification

Coastal and ocean acidification pose significant threats to soft-shell clams and other shellfish. Carbon and nitrogen inputs to the marine environment from anthropogenic

sources result in lower pH of seawater and coastal sediments. Soft-shell clam shells are comprised of two minerals of calcium carbonate: calcite and aragonite. Recently, Green et al. (2009) found that acids produced in the upper few millimeters of coastal sediments in southern Maine result in this region of sediments being the most corrosive to calcium carbonate. Soft-shell clams settle into the top layers of sediment on intertidal flats. It is likely that mortality of clams due to shell dissolution occurs. In fact, Green et al. (2013) performed a sediment buffering experiment in a small, sheltered intertidal mudflat off Portland Harbor in Portland, Maine. They buffered intertidal mudflat sediments with ground clam shells and measured settlement of soft-shell clams, *Mya arenaria*. Buffering of sediments increased clam recruitment by just over a factor of two.

We have attempted to extend these results on a larger scale. In May 2014, we worked with Mike Doan from the Friends of Casco Bay who took sediment pH samples at five intertidal mudflats around Freeport. These included Winslow Park, Staples Cove, Cove Road, Sandy Beach/Cushing Briggs, and Recompence Flat. Ten samples were taken at each flat, and the averages ranged from 7.10 at Staples Cove to 7.8 at Recompence Flat. To determine whether sediment buffering with crushed clam shells would result in an enhancement of wild soft-shell clam spat, we chose the flat with the lowest sediment pH - Staples Cove. Of the ten samples taken at that location, pH values ranged from 6.78 to 7.47. Beginning on 18 May, we established 30 plots (6.6 ft x 6.6 ft, or 2 m x 2 m). Six treatments (5 replicates/treatment) were used: 1) 13 lbs of crushed soft-shell clam shells per plot; 2) 26 lbs of crushed soft-shell clam shells per plot; 3) No shells were added to plots -- controls; 4) 13 lbs of crushed soft-shell clam shells plus plastic, flexible netting (4.2 mm aperture); 5) 26 lbs of crushed soft-shell clam shells plus netting; and 6) Control plots with netting.

We used aged, commercial-sized, clam shells from a shell pile in Beals, Maine.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Benthic core samples will be taken from each of the 30 plots in November 2014 to determine whether number of soft-shell clam spat (0-year class individuals ranging in size from 2-8 mm in length) are related to the shell material used for buffering the sediments, predator protection, a combination of the two factors, or whether numbers of soft-shell clam spat are independent of the treatments.

References

Green, M.A., G. Waldbusser, S. Reilly, K. Emerson, and S. O'Donnell. 2009. Death by dissolution: sediment saturation state as a mortality factor for juvenile bivalves. Limnology and Oceanography 54 (4): 1037–47.

Green, M.A., G. Waldbusser, L. Hubazc, E. Cathcart, J. Hall. 2013. Carbonate mineral saturation state as the recruitment cue for settling bivalves in marine muds. Estuaries and Coasts 36:18-27.

Study #5: Clam Enhancement Using Cultured Seed

In late April 2014, we established an experiment at two intertidal locations in the Upper Harraseeket River (Collins Cove, and directly across the river from Collins Cove along the Wolfe Neck shore) to determine the effects of planting density on growth and survival of cultured soft-shell clam seed under protected netting. Clams were seeded at one of two densities: 20 or 40 individuals per square foot.

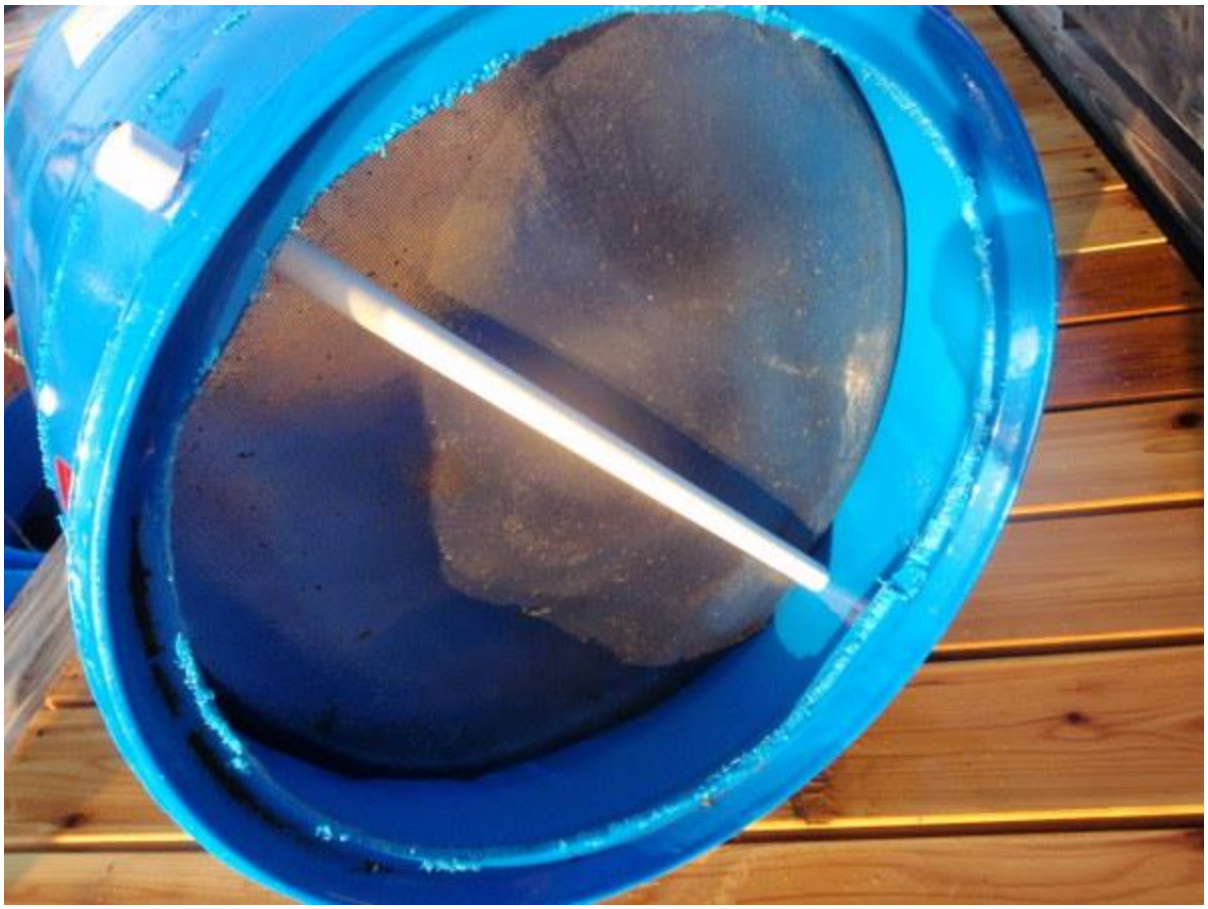
At each location, 40 nets (14-ft x 22-ft) were deployed and arranged in 10 groups of four nets each. A green crab trap was deployed alongside five of the groups and is being fished twice a week.

Study #6: Growing Cultured Clams to Transplantable Sizes Using an Upweller

Cultured clams are expensive, especially if a community purchases transplantable size clams (> 8 mm in shell length). However, it is possible for a community or individual to purchase small clams from a hatchery (1-2 mm in length), and to grow those clams in an upweller nursery. Because cultured soft-shell clam seed have never been grown in a nursery setting in Freeport, we wanted to see if it was possible. We began by having pieces of the upweller system built locally in Freeport.


Hudson


ALL TRASH

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