

SEM TIDINGS

VOLUME 7 ISSUE 1

SOUTHEASTERN
MASSACHUSETTS
AQUACULTURE
CENTER

FALL 2016

Board of Directors

Michael Maguire, Co-chair
Cape Cod Cooperative Extension
Dr. Judith McDowell
Woods Hole Sea Grant (alternate)

Rick Karney, Co-chair
Martha's Vineyard Shellfish Group
Dave Grunden (alternate)

Chris Sherman
MA Aquaculture Association

Ed Baker
Finfish Culturist
Dr. Wayne Miller (alternate)
Keith Wilda (alternate)

Dale Leavitt
Roger Williams University

Scott Lindell
Marine Biological Laboratory

Conrad Caia
Shellfish Constable, Yarmouth

Richard Kraus
Aquacultural Research Corporation

Andrew Cummings, Wellfleet
Shellfish Culturist
Joel Fox (alternate)

Chris Gargiulo, Cotuit
Shellfish Culturist

Gregg Morris, Duxbury
Shellfish Culturist
John Brawley (alternate)

Jennifer Mullin, Barnstable
Shellfish Culturist

MARKET NEWS

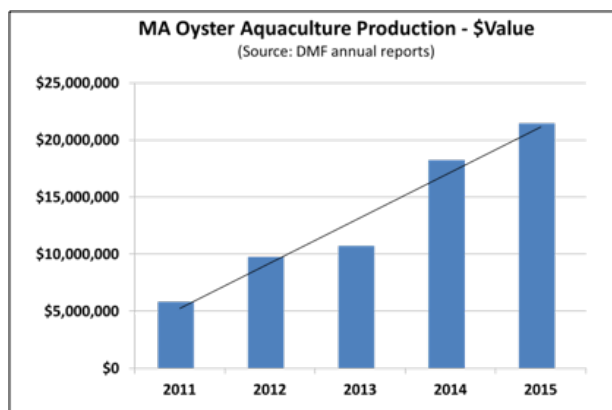
Aquaculture is Still Growing in Southeastern Massachusetts!

- In Massachusetts, there are 363+ shellfish farms
- In Southeastern MA, there are more than 323 individual growers
- In Massachusetts there are 1,106+ acres in shellfish aquaculture production
 - o 990 of those acres are in South - eastern MA
- 11.45+ million pounds of oysters and quahogs were landed in in 2014 and were valued at \$23.15+ million



In 2015, the University of Massachusetts Dartmouth, Center for Marketing Research prepared a report for SEMAC titled, "Massachusetts Shellfish Aquaculture Economic Impact Study". From the report:

- For every dollar of output generated by the industry, an estimated total of \$1.79 worth of economic activity is generated in Massachusetts.
- Every \$1 spent by the industry generated \$0.93 in wages in Massachusetts.
- Shellfish farmers were responsible for approximately 769 direct jobs in 2013.
- Shellfish farmers also generated an additional 140 jobs through indirect and induced activity in 2013.



Using the economic multiplier (1.79X), the approximately \$25.4+ million value of shellfish aquaculture in Massachusetts in 2013 generated ~\$45.5 million in the Massachusetts economy.

The full report can be found at the link below:

www.capecodextension.org/marine-programs/aquaculture-semac/outreach-marketing/

TECH TALK

Shellfish Habitat Assessment Project – A Brief Summary of 2015 Results

By way of Abigail Archer

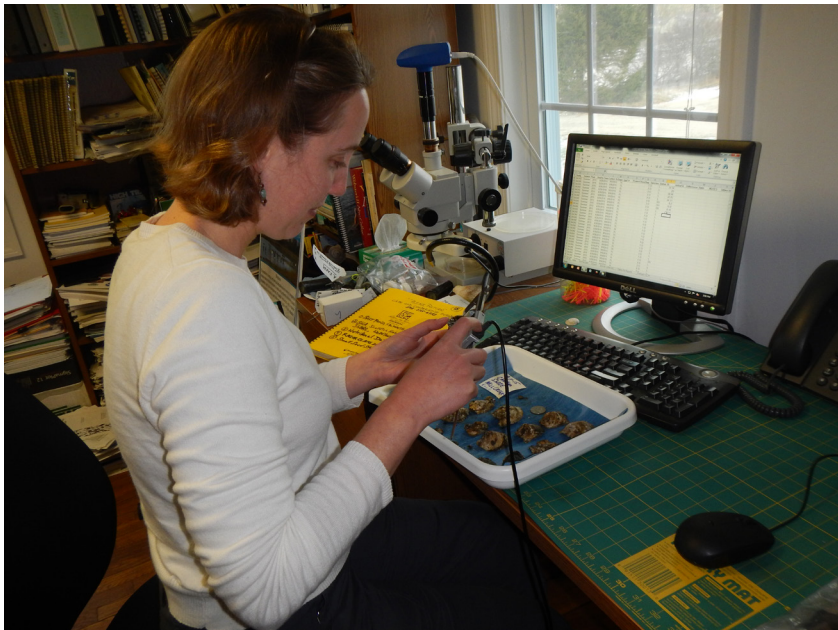
We all know that shellfish growth and survival varies from year to year. But how much of that variability is due to growing methods, and how much is due to the general environment? From year to year do all growing areas across Cape Cod perform the same? Although exact answers will never be known, the Cape Cod Cooperative Extension (CCCE) Marine Program has been working to shed some light on the topic. Since 2003 CCCE Marine Program staff, with funding from SEMAC, have conducted a shellfish habitat assessment study in four embayments on Cape Cod: Pleasant Bay, Cape Cod Bay, Barnstable Harbor, and Wellfleet Harbor. The goal of this long term study is to provide growers and researchers with standardized data on site-specific shellfish survival and growth.

Our methods are fairly simple. The study period runs from July 1-September 1. All seed is purchased from the same source, is all from the same batch, and is treated exactly the same. For oysters, we place three vinyl-coated wire trays (0.5" x 0.25" mesh) at each site, and propped up on $\frac{3}{4}$ " PVC pipe with the intent to keep them above the sediment. Each tray is stocked with 25 seed oysters. Due to their small size, these oysters are initially enclosed in 3 mm mesh bags within the cages. After one month, the oysters are removed from the original bags and placed in ones with a larger mesh to allow greater flow of seawater.



Shellfish Habitat Assessment oyster racks and quahog pots.

For quahogs, at each site we place six plastic plant pots (10" diameter and 10" deep, or 0.55 ft²) in the substrate (flush with the bottom) and fill each with the removed sediment, including any infaunal organisms residing in the sediment. Each pot is stocked with 50 seed quahaugs. To test the effects of predators, half of these pots are protected from predation by securing predator-exclusion netting over the top of the pot with a rubber band.



Abigail Archer measuring oysters in the winter.

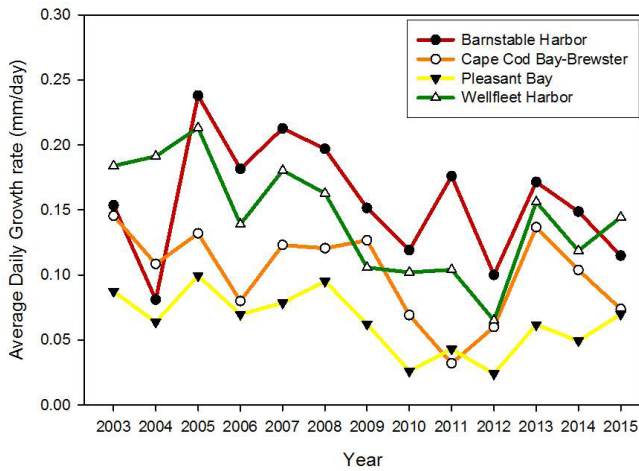
Collection takes place approximately 62 days after deployment. Surviving oysters are counted in each bag and any signs of predation are noted. Similarly, surviving quahaugs are retrieved by sieving the contents of each pot over 3 mm mesh screen. Survivors from each pot and any natural set of shellfish are counted and any signs of predation are noted. All shellfish are then taken back to the lab where length is measured and average growth rate in millimeters per day is calculated.

In 2015 the Shellfish Habitat Assessment (SHA) program measured quahog and oyster growth for the 13th year.

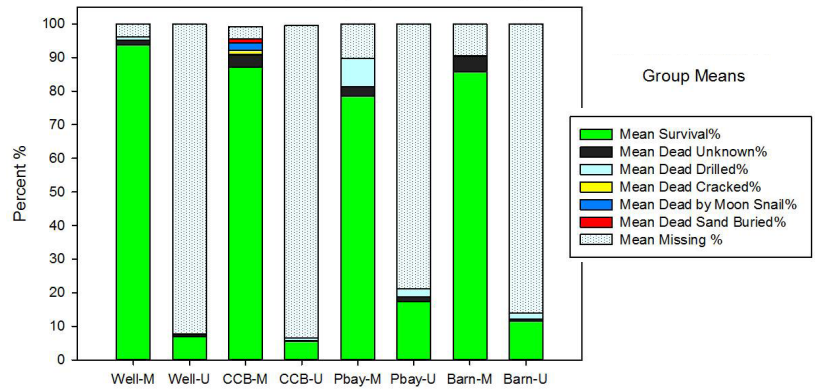
Quahogs

For quahogs, results for this year were similar to prior years in terms of two general trends:

2003-2015 Average Quahog Daily Growth Rate



2003-2015 Quahog Cumulative Mean Survival and Mortality Comparison of Meshed (M) and Unmeshed (U) Plots



- Average quahog survival was statistically higher in meshed plots than un-meshed plots. This trend has been seen in every year since the program started in 2003, and indicates the importance of protection from predators. In 2015 individual plots with mesh survival ranged from 69 to 99%. In unmeshed plots survival ranged from 0 to 14%.

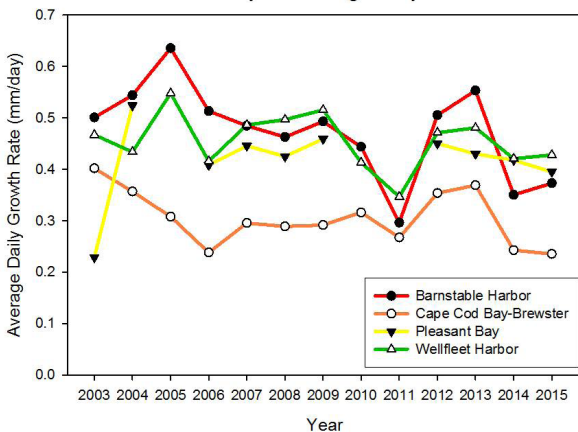
- In the meshed plots – average daily growth rate of quahogs in 2015 was higher in Wellfleet Harbor and Barnstable Harbor than in Cape Cod Bay and Pleasant Bay. This trend has been seen in every year of the project except 2004, when average quahog growth in Cape Cod Bay was faster than Barnstable Harbor, and overall growth was relatively slow in all embayments.

At Barnstable Harbor and Cape Cod Bay, average daily growth rate of quahogs in 2015 was statistically lower than it was in 2014. The opposite was observed at Wellfleet Harbor and Pleasant Bay - the average daily growth rate of quahogs in 2015 was statistically higher than it was in 2014.

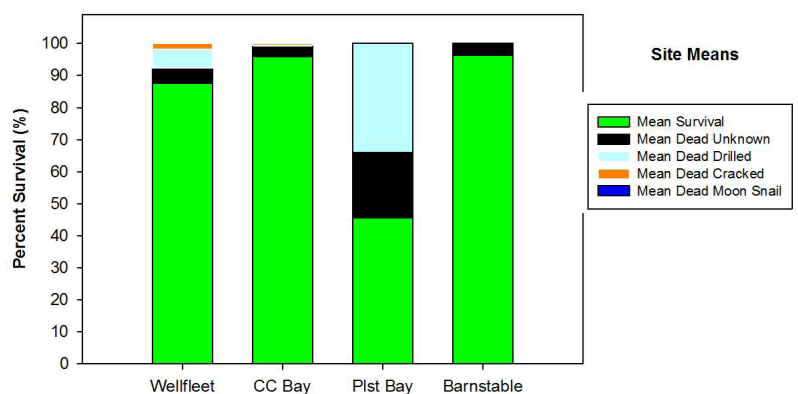
Oysters

Overall, 2015 average oyster survival was moderately low at all sites ranging from 49.3% (Pleasant Bay) to 79.3% (Barnstable). The cause of mortality at all four sites was mostly unknown, but drilled oysters were observed at Cape Cod Bay and Orleans, and oysters with chipping on the shell in Wellfleet.

2003-2015 Oyster Average Daily Growth Rate



2003-2015 Oyster Cumulative Mean Survival and Mortality



Average growth rate (mm/day) was highest in Wellfleet (0.43, SD 0.05) followed by Orleans (0.40, SD 0.09), and then Barnstable (0.37, SD 0.08) and Brewster (0.24, SD 0.06).

Looking at the growth rate in recent years, Orleans's has been consistent from 2013-2015. In Brewster and Barnstable a drop in growth rate was observed from 2013 to 2014, but the 2015 rate increased slightly over the previous year. And in Wellfleet the growth rate was higher in 2013 than the next two years, and 2014 & 2015 were statistically the same.

Work on this long term shellfish growth and survival project will continue. Samples were deployed and collected during the 2016 growing season and the data will be analyzed this winter. For more information about the project please contact Diane Murphy at dmurphy@barnstablecounty.org

Project Update: Managing Oyster Seed Without an Upweller

By way of Joshua Reitsma

Small oyster seed is generally considered difficult to handle, and as such survival will be poor unless you have use of an upweller. That said, some folks have demonstrated excellent survival from oyster seed as small as 2mm in length in standard gear without the use of an upweller for nursery culture. These growers have indicated stocking density and handling practices are key to success with small oyster seed. Small oyster seed is also cheaper - 2-3mm oyster seed is about half the price of 5-8mm seed. Significant savings could be attained by buying smaller seed and also avoiding the costs associated with running an upweller. In addition, smaller seed sizes are often more readily available from the hatchery as there is greater risk in the supply of larger seed sizes, especially those that have to be overwintered. For these reasons SEMAC decided to do some trials with smaller oyster seed over the last 2 growing seasons. The project is ongoing but results seem promising enough that some general recommendations can be made about working with smaller oysters in the absence of an upweller. So far we've started with both 2-3mm and 3-4mm seed, several gear configurations and densities, as well as several sites with at least 1-2 upwellers for comparison. The results are still being analyzed but it appears that upwellers may have a slight and brief 2-4 week growth advantage, though the oysters grown in bags quickly catch up to those without bags, usually with comparable survival close to 100%. If siting an upweller is a challenge, or you want to diversify seed systems, look for more information on this project soon or feel free to contact us in the meantime.



Town of Yarmouth Shellfish Constable Conrad Caia with oysters that were grown in the experiment.



Josh Reitsma and Bourne grower Patrick Ross prepare to set out an oyster cage that contains small seed.



Tiny Oysters



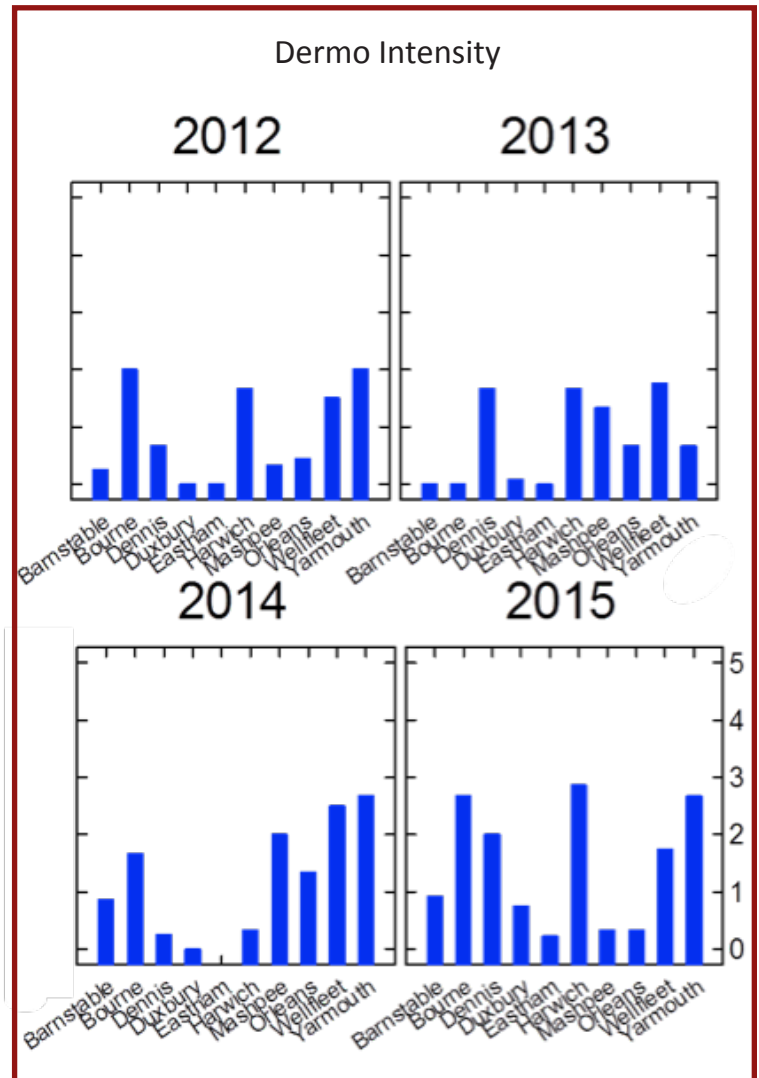
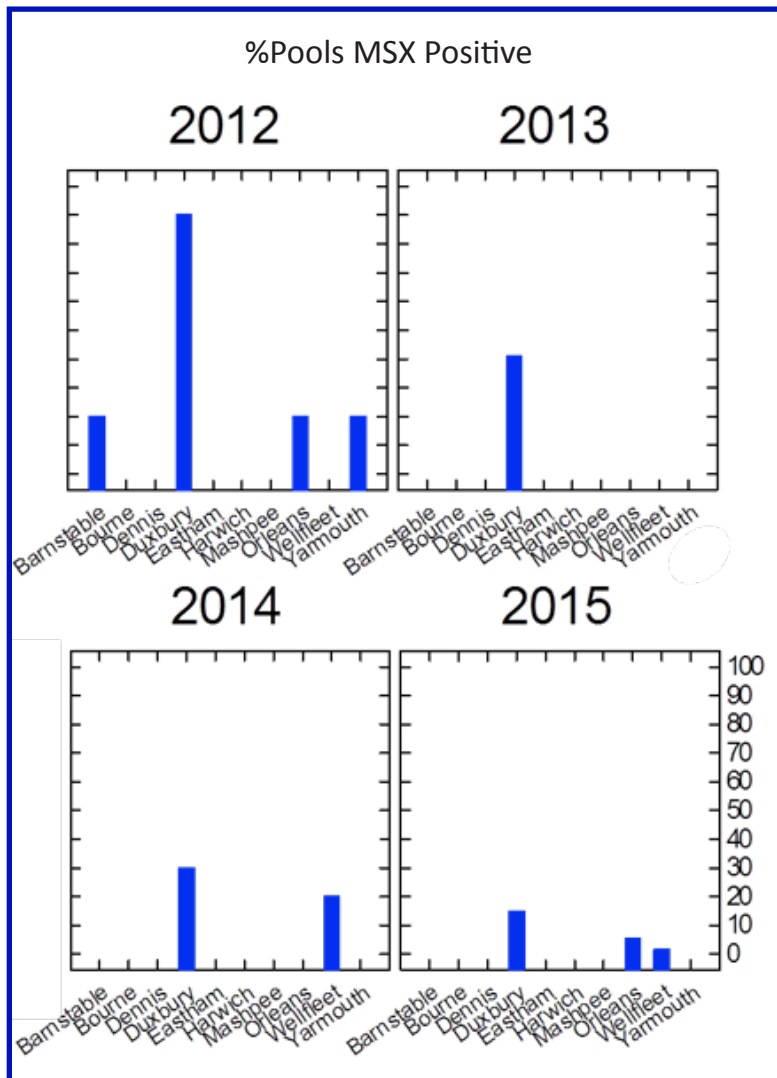
Diane Murphy measuring seed using the volumetric method.

SEMAC Disease Research Network Update

By way of Diane Murphy

Shellfish diseases can be a significant factor affecting farm profitability and viability. To gather baseline data on major oyster diseases SEMAC initiated a network of region-wide disease monitoring stations. The Disease Research Network (DRN) is designed to collect information on disease occurrence, prevalence, intensity, and seasonality throughout the SEMAC region. The goal of this monitoring is to provide better understanding of disease dynamics in the region and help identify pending outbreaks, giving shellfish growers an opportunity to make better-informed management decisions about their standing crop. Monitoring results also help explain mortality events and attribution to specific diseases. Three or more growers per site (growing area) participate and contribute 30 oysters per sampling event. They receive confidential diagnostic reports on their shellfish but all results are pooled and reported anonymously as a growing area, rather than individually. The funds SEMAC receives for this program directly support disease testing services, supplemented with additional funding from Cape Cod Cooperative Extension/Woods Hole Sea Grant. Currently, there are 26 sites that are monitored and include 4 wild oyster sites. More than 900 oysters are collected and analyzed each year. To our knowledge, there are no other long-term shellfish disease monitoring programs in the region, or the state.

The following graphs illustrate yearly disease monitoring results for MSX and Dermo from 2012 to 2015. During that time period MSX was not identified at all sites and when it co-occurred with Dermo heavier mortality events were observed. Dermo intensity (1-5) describes the severity of the disease in oysters and higher intensities are often associated with mortality as well.



“Spit and Chatter”—Growers’ Column

Daniel Ward, PhD

Ward Aquafarms, LLC

Farming is, and always will be a risky business. Whether the particular challenge on the farm is primarily predators, flow, disease, theft, storms, or a mix of all of the above; it takes a constant vigilance to keep the product growing and getting a consistent supply to market. In the northeast, for the last 10 years, and increasingly in the last 5 years, we have a new threat to add to the list:

Cochlodinium polykrikoides, or the causative microalgae behind the recent “rust tides”. While *C. polykrikoides* has been causing large biological and economic losses to the aquaculture industry in South Korea for decades, it’s emergence as a threat on the east coast of the US is a relatively recent phenomenon. The harmful algae was found in the Chesapeake a decade ago, and is annually prevalent in Long Island Sound, though it was never a big issue on Cape Cod until the past several years.

C. polykrikoides shows up in mid-summer when the water temperatures are the warmest, and typically doesn’t completely disappear until the water temperature declines below 20°C in the fall. While recent research has documented the impact on commercially important shellfish species, the dynamics surrounding bloom formation and dissipation are still largely unknown. While it tends to bloom the strongest in areas of low flow, high nutrients and high temperatures, it also thrives in large bloom patches within Buzzards Bay and Vineyard Sound. As a dinoflagellate, it thrives at the water surface where the light energy is greatest, though the bloom patches also make diurnal migrations, and it does perfectly fine at the bottom in 30 feet of water. This leads to perplexing questions on how to plan for an increasingly annual summer bloom, and how best to mitigate the harmful algae’s impacts.

We do know that *C. polykrikoides* is not harmful to humans, but can be quite harmful to shellfish and finfish. We also know that the impacts to shellfish have to do with the combination of four factors: shellfish size, shellfish species, bloom intensity (number of algae cells per milliliter), and bloom duration. Bay scallops are the most sensitive, followed by oysters and then quahogs; and larger shellfish fare better than smaller ones. All shellfish do fine, albeit with slower growth, provided the cell count is below 2,000 cells/ml, and the duration is only for a few days. The longer the bloom, the higher

the density of the algae, the most severe the impacts will be. If the shellfish are in a nursery system, and the bloom exceeds 2,000 cells/ml for longer than a couple of days, survival of oysters and bay scallops <10mm will decline precipitously, and often the majority of shellfish below 10mm will stay stunted and will not grow again.

What can we do about this nuisance? In general, get your shellfish away from areas where the water turns orange. When you can see the water color turn noticeably orange, you are generally in a bloom with cell densities over 2,000 cells/

ml, and the bloom will have a significant impact on your shellfish if it continues in that area. Move the smallest shellfish to areas with the greatest flow, and in deeper water. While *C. polykrikoides* will make diurnal migrations, the time spent in deeper areas of the water column is less than at the surface, and typically at much lower densities. *C. polykrikoides* is dependent on higher temperatures and plenty of nutrients (ie. nitrogen), so if you can move your shellfish to areas with greater flushing, the bloom is less likely to reach densities that will have significant negative impacts. Research on mitigation strategies are ongoing, and it appears that moving forward, this will be one more aspect to consider when managing for long-term success of your farm in New England.



SEMAC Mini Grant Program Evaluation

By way of Abigail Archer

One of the first goals of the SEMAC Board of Directors back in 1996 was to support applied research in the aquaculture industry. In 1998 the, "Mini Grant" program was born and growers were invited to submit proposals for projects that would:

- Encourage industry development and diversification
- Promote environmentally responsible aquaculture projects
- Identify and/or develop best management practices
- Develop alternative aquaculture technologies and species
- Encourage private/public collaborations.
- Advance innovative marketing approaches for aquacultured products.

Growers across southeastern Massachusetts definitely responded! Between 1998 and 2012 a total of 85 people received funding to work on their ideas. Last winter SEMAC staff sorted through the body of work and found that 144 projects were completed on a wide variety of topics from predator control to culture of alternative species.

What impact has the SEMAC Mini Grant program had on the aquaculture industry in southeastern Massachusetts? Are the original goals of the program being met? Do any changes need to be made to continue assisting growers with testing out their ideas?

SEMAC staff would like to find out, so we have begun an evaluation project. For the first phase, Bill Burt, retired Marine Resource Specialist with Cape Cod Cooperative Extension, has been contracted to conduct a dozen interviews with Mini Grant recipients. So far he has met with 8 growers and all have offered a range of insights and ideas that will help craft the future of the program. We'll share these Phase I results in the next newsletter.

SEMAC Mini Grants by the Numbers

Total Projects: 144

Years Grants have been awarded: 15

Towns projects were completed in: 30

Projects on Surf Clams: 8

Projects on Anti Fouling and Gear Cleaning Methods: 6

Projects on Oyster Growing Methods & Gear: 22

Projects on Predator Control: 14

Projects on Species other than Bivalves: 12

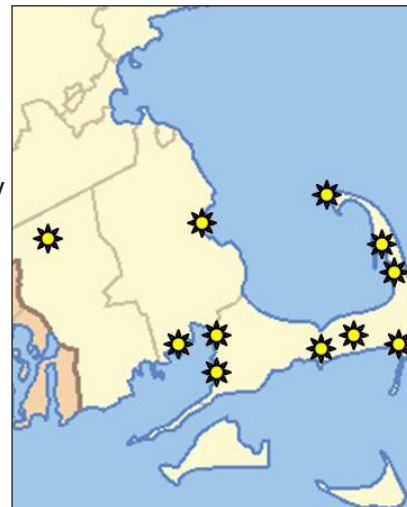
Did you participate in the SEMAC Mini Grant Program sometime between 1998-2012? If you are interested in being interviewed about your experience, please contact Abigail Archer at aarcher@barnstablecounty.org

THE CLASS OF 2016

Fundamentals of Shellfish Farming: Practical Tools, Tips & Techniques

SEMAC, with assistance from Cape Cod Cooperative Extension/Woods Hole Sea Grant marine program staff and Henry Lind taught their popular 8-week course on the fundamentals of shellfish farming. This year's course was taught on Monday nights from March 7 to May 9, 2016 and included several weekend field trips to local oyster farms, Chatham's municipal hatchery, as well as a tour of the newly rebuilt shellfish hatchery, ARC. The course covered basic concepts of shellfish aquaculture from biology to hatchery & nursery techniques, followed by grow-out methods for both clams and oysters. Additional topics included BMP's, farm safety, management of pests, predators, and disease, as well as business management, marketing, and permitting. Lectures also included guest speakers representing the aquaculture industry, state agencies, and scientists.

37 students were enrolled in the course which included 6 very enthusiastic AmeriCorps volunteers. Students from diverse backgrounds and experience travelled from many southeastern MA locations to attend classes in Barnstable Village (see map). Upon successful completion of a challenging final exam, they were awarded certificates which provide evidence of their commitment to learning the fundamentals of shellfish farming.



2017 Upcoming Events

January 11-12, 2017

Northeast Aquaculture Conference and
Exposition & the Milford Aquaculture
Seminar
Providence, RI

TBD January/February, 2017

MA Aquaculture Association Annual Meet-
ing
Woods Hole, MA

Feb 19, 2017 - Feb 22, 2017

Aquaculture America 2017
San Antonio, Texas

March 26 – 30, 2017

National Shellfisheries Association 109th
Annual Meeting
Knoxville, TN

June 26 – 30, 2017

World Aquaculture 2017
Cape Town, South Africa



FoSF 2016 students listen intently to Wellfleet oyster grower describing his farming techniques.



Weekend class field trip to Chatham's municipal upwellers.

SEMAC Contact Info:
PO Box 367 (mailing)
Deeds & Probate Building
1 Railroad Avenue (shipping)
Barnstable, MA 02637 USA

Diane Murphy
Technical Coordinator
508-375-6953
dmurphy@barnstablecounty.org

Joshua Reitsma
Research Associate
508-375-6950
jreitsma@barnstablecounty.org

Abigail Archer
Administrative Coordinator
508-375-6702
aarcher@barnstablecounty.org

