Town of Chilmark

Shellfish Propagation Report

2007

Prepared by
Isaiah L. Scheffer
Shellfish Propagation Agent

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Introduction

In recent years the bay scallop fishery in Menemsha and Nashaquitsa Ponds has been extremely inconsistent. Bay scallops, noted for their distinct taste, can be a valuable winter resource for fishermen. The scallop season helps bridge the economic gap for fishermen during the less productive late fall and winter months. If this gap is not filled, many fishermen will continue to be driven from the industry. In years past the scallop season kept fisherman, shuckers and wholesale buyers busy. The increase in activity on the waterfront had a large economic impact for the community. Individuals not interested in commercial scalloping could fish recreationally to feed their families. Scallop stocks dwindling, fewer fishing days and continued cuts in quota controlled fisheries have hurt the industry. Chilmark has felt a responsibility to save what little fishing industry it has left.

In June of 2007 the Chilmark Selectman approved the hiring of a Shellfish Propagation Agent for the sole purpose of rehabilitating the ponds. Despite a late start for the 2007 growing season the selectmen and shellfish advisory committee made great strides to begin this new program. The 2007 season involved many experimental ideas to identify which methods will be most effective in increasing the bay scallop population. Different materials were tried for each site to understand the complexities of Menemsha and Nashaquitsa ponds. The purpose of these experiments was not only to determine if a shellfish restoration project was feasible but also to determine which materials would give the program a solid start. Sites used to conduct experiments were based on historical information from past and current fishermen along with advice from the shellfish constable. These sites were identified as the most viable areas to yield larger sized scallops. A scallop that has a large shell and meat is a good indicator of its overall health. Good health in a certain area proves a proper amount of food and oxygen is available increasing fecundity. The visual impact of aquaculture related gear was also realized and organized accordingly.

Bay Scallop Restoration Project-A multi faceted approach

Increase Broodstock (Natural Spat Collection)

It is import to increase broodstock within a pond and not rely on hatchery-raised scallops. Creating a more diverse genetic code improves heterosis within a population group. Two hundred spat collectors of three styles were deployed throughout the ponds this season. The collectors were focused on four sites; Schuer's Dock, Chockers West Flat in Menemsha Pond, Lovey's Cove, Muddy Cove in Nashaquitsa Pond (Spat collection strings for each site are indicated by red lines on Maps 2&3). Bags were checked at weekly

intervals throughout the summer to detect setting scallops or setting crabs. Crabs can set in collectors like scallops and can quickly prey on the vulnerable small shellfish. Scallops spawn when the water temperature is around 20° C and food is abundant. The spawning can vary yearly, but usually begins to occur in Chilmark in early July and continues for several weeks. All three types of spat collectors were deployed between the dates of 6/16/07-6/25/07. Spat collectors need to be put in the water prior to spawning. This allows a small amount of fouling to occur, which increases surface area making setting scallops attach.

Collectors

1) Spat Bags filled with Netron

When spat change from the swimming to sinking stage in their development, they settle in spat bags. Spat bags are made commercially from a strong, thin, woven plastic material that comes in a variety of sizes. The spat bags are filled with a ridged plastic material, called Netron, which prevents the bags from flattening. Netron provides a good substrate for spat to attach and gives setting scallops more room to spread out. Netron and spat bags are neutrally buoyant, so a small rock is placed in each bag to hold the bottom end down. Bags sit within the top two feet of the water column and should stay off the bottom to prevent crabs from tearing them open. Scallops attach themselves to eelgrass or spat bags to keep away from strong tides, predators, and sediments that can clog gills. The juvenile scallops then grow inside the bags until large enough to be divided into stage 2 growout.

2) ADPI Growout Bag with Fiberglass Mesh

The second type of spat collector was designed by Stanley Larsen. Stanley's spat collectors are typical 3/8" growout bags filled with fiberglass window screening and foam floats on one end for buoyancy. Bags sit horizontally, with one end floating and the other end 18" down in the water. Bags are then placed on strings and positioned perpendicular to tidal currents. This collector enables the fiberglass mesh to trap spat by slowing water flow, and the surrounding plastic mesh protects scallops as they develop. The fiberglass mesh also gives scallops a larger surface area to attach. This style of collector should be set just prior to scallop spawning.

3) Burlap Sheet

In hatcheries small scallops are set on pieces of burlap before they are distributed to vendors. Scallops like burlap material and tend to attach to it immediately. A burlap 25' x 3'sheet was suspended from floats with weights placed on the other end. Each side of the sheet was anchored to prevent movement. The burlap sheet was positioned perpendicular to the tidal currents and was located on the West Side of Chockers Flat indicated by the red line on Map 2. The sheet covers a larger range of the water column but does not provide protection from predators. This style of collector should be set no more then seven days prior to spawning.

Results

1) Spat Bags filled with Netron

Spat bags come in a variety of mesh sizes (.75mm, 1.5mm and 3.0mm). Several of each size spat bag were deployed at the four sites. Bags became exceedingly fouled with seaweed and sea squirts within the first four weeks. The first sign of collection occurred in the second week in August, when seed in bags appeared to be approximately 1mm. Scallops covering the outside of the spat bags grew faster due to more water flow than those found inside. Water flow for spat bags on each string was tested weekly by visual appearance and the time it took for the water to empty after being raised. Almost all scallops attached to the outside of the bags eventually dropped off. The 3mm spat bags collected the most scallops at each site. Three (3.0)mm bags contained two times as many scallops as 1.5mm bags and four times as many as .75 mm bags. The growth for scallops inside 3mm bags also doubled compared to smaller mesh bags. This was clearly due to bio-fouling which clogged the smaller sized holes on spat bags. 1.5mm and .75mm bags simply did not allow enough flow inside bags to support a large number of setting scallops.

Menemsha Pond

Schuer's Dock

Three (3.0)mm bags around Schuer's Dock had an average of 500 per bag. 1.5mm bags had 200 per bag, and .75mm 100per bag. Scallops inside these bags were also larger than scallops at the other four sites which could indicate an earlier set or better food.

West Flat of Chockers

Three (3.0)mm spat bags in this area contained on average 300 scallops per bag. Scallops were slightly smaller than Schuer's Dock but second largest overall. 1.5mm bags contained 100 per bag, and .75mm bags contained 50.

Nashaquitsa

Lovey's Cove

Lovey's Cove produced the second highest number of seed but appeared seven days later than spat bags in Menemsha Pond. This could be due to a later set or less favorable water conditions. Three (3.0) mm bags contained on average 400 scallops per bag, 1.5 mm bags 200, and .75mm bags 50. The extra week before seed was visible could result from bio-fouling on bags that slowed down scallop growth.

Muddy Cove

Muddy Cove spat bags had the least number of seed and the lowest growth. Bags in this area were excessively fouled which may have contributed to setting numbers. This was a surprise because the natural seed set on the bottom in this area was the highest compared to all other areas in Menemsha or Nashaquitsa Ponds. Three (3.0)mm spat bags contained 100, 1.5mm bags 20, and .75mm none. This area also produced the smallest seed. Fouled bags could not allow enough water flow for scallops to grow.

2) ADPI Growout Bag with Fiberglass Mesh
Stanley's spat collectors were set on two sites Lovey's Cove and Muddy Cove inside Nashaquitsa.

Lovey's Cove
Stanley's collectors in Lovey's Cove contained on average 150 scallops with a wide range of sizes from 5mm on the outside of fiberglass mesh to 1mm on the inside of fiberglass mesh. There was also a fair amount of dead scallop shell which appeared to be crushed open by mud crabs that either set or crawled inside bags. 3/8" ADPI bags will keep large predators out but do not keep small predators out, like mud crabs. Stanley's collectors contained fewer scallops than spat bags, but were larger on the outside mesh. Fiberglass mesh was unfolded and one (1.0)mm scallops were disbursed throughout the bags.

Muddy Cove
Stanley's spat collectors in this area contained very little seed. Fouling on the outside of collectors was too excessive for scallops to survive. Sea Squirts and Seaweed covered almost all openings; and when seed was found later in the summer, it was very small.

3) Burlap Sheet
Burlap sheet was set on one site (West side of Chockers) in Menemsha Pond.
The burlap sheet was the least effective at catching spat. If spat did set on the burlap sheet, it never stayed attached long enough to be visible at any of the weekly checks. The burlap sheet experiment was not an effective method for collecting spat but may be useful when stuffed inside spat bags.

Conclusions

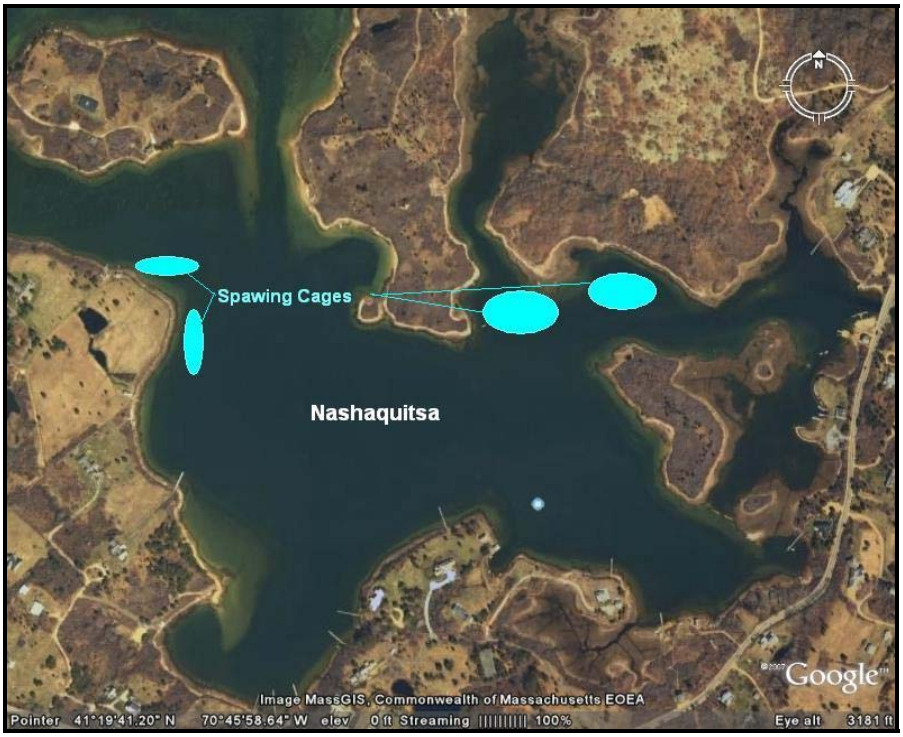
An estimated 40,000 seed were collected throughout the summer. Thirty percent of the natural spat collected this year was transferred into stage 2 growout, to increase size before being field planted. The best collectors proved to be 3mm spat bags. Scallops grew bigger, and faster in these bags and produced more quantity. Scallops in these bags did not need to be divided as early, due to the larger mesh. For the amount of effort and efficiency for retrieving seed, I can only suggest 1.5mm spat bags or higher for collection. All the same sites in 2008 will be used, and spat bags will be deployed at the same time. More collectors will be focused in the areas that had the most success in 2007. Those areas that caused the most fouling on collectors will be deployed one week later than in 2007.

Spawning Cages

Spawning cages are used to increase broodstock. The inspiration behind cages is to keep many scallops in the same area to create a mass spawning, which increases the possibility that eggs become fertilized. Adult scallops too dispersed throughout the pond will have a decreased chance for reproducing. Eggs and sperm will not be in high enough concentrations to allow a significant amount of fertilized eggs. Cages placed in tidal

eddies help eggs and sperm remain in the pond which allows sufficient time to mix. If properly placed and conditions are good, spawning cages, can create millions of seed. Cages can be made into any shape, size, and from a variety of materials. The majority of cages used in 2007 were rectangular plastic-coated, wire lobster keepers. Floatation is attached to the outside so cages remain floating throughout the summer. There is very little to measure the success or failure from this part of the restoration program. If seed set within the pond becomes more frequent and harvest amounts increase, then this part of the program is working.

Many of the sites utilized for cages already had existing cages with some scallops ready for spawning. Ten (10) additional cages were built and set inside Nashaquitsa in 2007. Twenty-Five (25) cages were deployed with adult scallops ripe for spawning. Adult scallops were gathered from various parts of the pond in the first week of July. The majority of collected broodstock came from two areas: Schuer's Dock, dragged up by scallop dredge, and Nashaquitsa Bridge collected by diving. Scallops were then placed in cages and checked periodically to make sure there was no mortality. If mortality was present, those scallops were removed from cages. The gonad and overall visual appearance was checked to make sure they were healthy enough to spawn. . Cages were pulled out of the water every month and dried to reduce fouling. When cages were pulled out, all scallops were transferred to clean cages to allow proper water flow to keep scallops healthy. A healthier scallop will produce better quality eggs and sperm. Cage placement was chosen based on the amount of scallops that set within a specific area. The areas where scallops tend to set the heaviest is where water eddies, food and spat come together and produce good environments to set. Muddy Cove and Lovey's Cove historically have had larger numbers of reoccurring seed sets. See Map 1 for cage placement.



Map 1

For the 2008 season fourty spawning cages will be ready along with five additional cages to be used for cycling gear out. Cages similar to oyster growout cages will also be tried. These cages stack bags as a way to concentrate more scallops to a specific area. A stackable cage could concentrate six times as many spawning scallops in the same area.

Hatchery Spawned Scallops

The Martha's Vineyard Shellfish Group (MVSG) is an invaluable resource for the towns on the island. Chilmark benefits from millions of seed the hatchery produces each year and has access to Rick Carney, who has proved to be one of the Northeast's most experienced and knowledgeable biologists. He and his team work tirelessly to produce phenomenal amounts of seed for the towns to work with. The hatchery has limitations with space; therefore, towns receiving seed in varying sizes. The smaller the size the less chance shellfish have for survival. Small seed from MVSG are prone to factors like predators, which dramatically decrease their numbers. That is why it is important to supplement hatchery efforts by raising or ranching shellfish to a size that is more likely to survive. The more scallops that can be raised to the desired 30mm+, the more successful this program will become. When the ranched scallops sexually mature, they can spawn and potentially create millions of new seed. The goal is to create a cycle of spawning which will give consistency to the fishery. The added benefit of growing seed for spawning is that fishermen can catch the shellfish ranched by the shellfish propagation agent which adds to the overall harvest.

When scallops are received from the hatchery, they are set on small pieces of sterile handi-wipes or burlap. Scallops attach easily to both of these materials and make handling less difficult. The scallops are then wrapped in tissue paper and twist tied shut. Each packet contains a random number of scallops. Packets are then placed inside a small cooler and transported, by vehicle, to the desired location. This process takes anywhere from 45min to 105 min. depending on traffic and weather. The amount of time in transport did not significantly effect survival or growth. Seed was never out of the water long enough to make mortality a large factor, even though some scallops do die from this process. Each tissue bundle is then torn open and placed in a spat bag where it remains until large enough to be divided for stage 2 growout.

Stage 1 Growout

Stage 1 Growout Strings Outside of Chockers

.75mm Spat Bags are filled with netron to hold bags open and allow scallops more area to spread out. Each bag contains a rock 1" in diameter to hold bags down in the water. Bags are tied to a rope, called a string, which is anchored on both ends. Strings have buoys for floatation to keep bags off the bottom. See Figure 1.

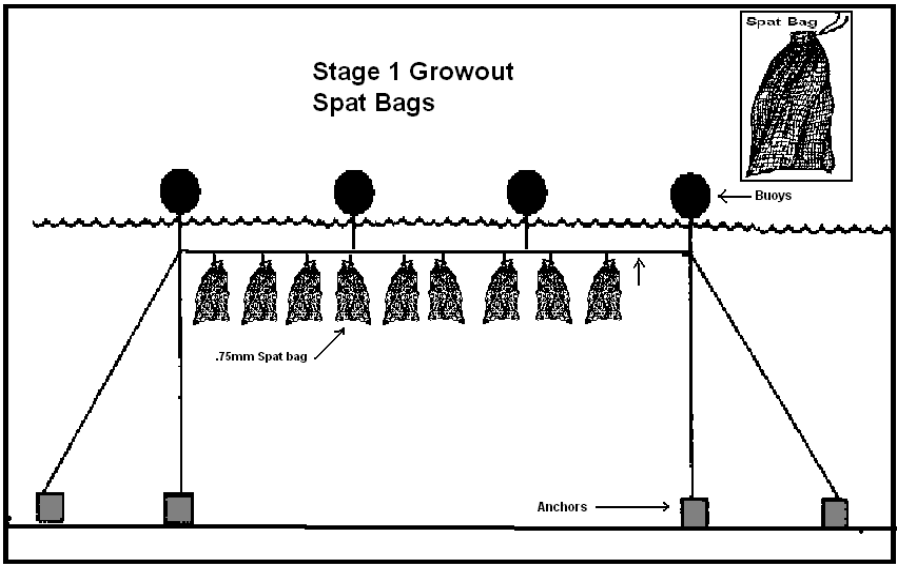


Figure 1

Stage 1 Growout takes place immediately after receiving hatchery seed below 3mm in size. Within two to three days of placing scallops inside the spat bags, they were checked. As you can see in table 1, seed received from the hatchery ranges in size from 120 micron to 4mm. The majority of seed must be placed in stage 1 media like .75 mm spat bags or on 500 micron mesh in the upweller. Seed can be smaller than media because many will attach to the bags and not go through the mesh. Often scallops at the smaller sizes migrate through spat bags and attach to the outside. Some seed uncontrollably travels through the bags and falls off. When this happens, the string must be over suitable scallop habitat to increase survival. Data on Table 1 below lists scallop seed received from the hatchery and where they were placed for stage 1 growout. Through hatchery estimates we received 3,000,000 seed scallops in 2007. The majority of scallops received were under 300 micron. That is less than half the size of the mesh bags used to hold the seed. Considerable numbers of scallops escaped. Scallops at sizes larger then .75mm were able to be contained for growout. Scallops at small sizes were very hard to handle. The use of sieves, brushes and running water makes seed handling easier at the hatchery. When scallops grow to 3mm or larger they become less vulnerable in the handling process. An upweller was also experimented with for stage 1 growout and will be discussed in the upweller portion of this report.

Most of the .75mm spat bag in 2007 had 2 packets of seed placed in them. In 2008 each spat bag will hold 1 packet of seed. Fewer scallops per bag should help increase growth and make dividing the seed into stage 2 media occur sooner. This should improve seed quality and size while allowing more of the stage1 area to be utilized for stage 2 growout. An attempt to collect scallops that migrate to the outside of spat bags may also be tried to further increase propagation efforts.

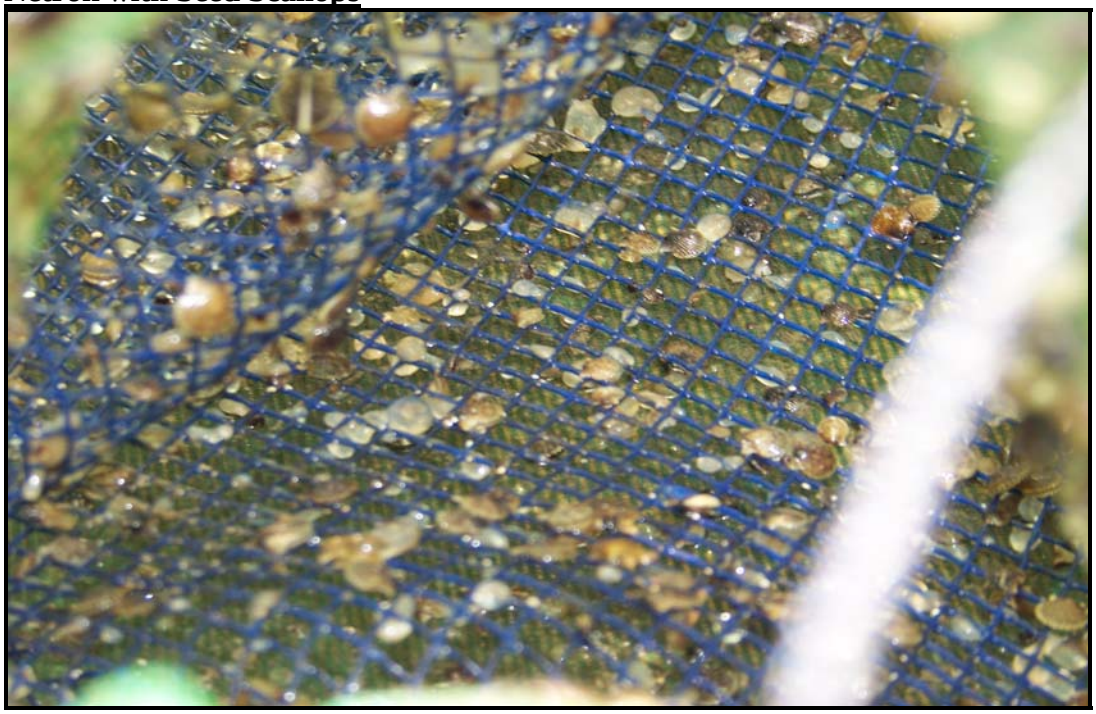
Table 1

Stage 1 Shellfish Growout

Batch #	Number of Packets	Species	Size	Transport Method	Time in Transit	Stage 1 Media	Location
Date+ Hatchery Designation	#	Bay Scallop, Quahog or Oyster	(microns or mm)		Minutes	Type and Size	
617MVSG	20	Bay Scallops	120 microns	car	45-60	.75mm Spat Bag	string1
617MVSG	20	Bay Scallops	120 microns	car	45-60	.75mm Spat Bag	string2
621MVSG	35	Bay Scallops	160 microns	car	45-60	.75mm Spat Bag	string3
625MVSG	40	Bay Scallops	200 microns	car	35-50	.75mm Spat Bag	string4
625MVSG	12	Bay Scallops	200 microns	car	35-50	3mm lantern	lantern
629MVSG	35	Bay Scallops	300 microns	car	45-60	.75mm Spat Bag	string5
629MVSG	55	Bay Scallops	500 microns	car	45-60	.75mm Spat Bag	strings 1&2
73MVSG	10	Bay Scallops	500 microns	car	45-60	.75mm Spat Bag	string5
73MVSG	40	Bay Scallops	1 mm	car	45-60	.75mm Spat Bag	string6
78MVSG	15	Bay Scallops	0.6-1mm	car	60-75	.75mm Spat Bag	string6
78MVSG	25	Bay Scallops	0.6-1 mm	car	60-75	500 micron mesh	upweller
712MVSG	40	Bay Scallops	0.5-1 mm	car	60-75	.75mm Spat Bag	string7
716MVSG	35	Bay Scallops	1mm	car	60-75	.75mm Spat Bag	string5
716MVSG	15	Bay Scallops	1mm	car	60-75	.75mm Spat Bag	string3
720MVSG	47	Bay Scallops	1.5-2 mm	car	45-60	.75mm Spat Bag	string8
720MVSG	20	Bay Scallops	1.5-2 mm	car	45-60	1.5mm Spat Bag	string8
729MVSG	40	Bay Scallops	2mm	car	45-60	1.5mm Spat Bag	STGO1
825MVSG	50	Bay Scallops	500 microns	car	45-60	.75mm Spat Bag	STGO4
831MVSG	100	Bay Scallops	500 microns	car	60-75	.75mm Spat Bag	string1&2
92MVSG	50	Bay Scallops	800 microns	car	60-75	.75mm Spat Bag	string4
94MVSG	100	Bay Scallops	500 microns	car	90-105	.75mm Spat Bag	STGO4
922MVSG	20,000ct	Bay Scallops	1-4mm	car	45	1.5 mm Spat Bag	string6

.75mm Spat Bag

Netron with Seed Scallops



Seed Ready for Stage 2 Growout

Spat Bags on Strings

Stage 2 Growout

Stage 2 Growout maximized scallop growth and helped estimate scallop health and amounts. Five different methods were used for stage 2 growout: Spat bags, Bottom bags, Lantern nets, Cut .75mm spat bags and the upweller (upweller growout will be discussed in upweller portion of report). When hatchery seed outgrew stage1 media, it was transferred or divided into media with larger mesh, allowing for sufficient flow. Water flow and growing space proved to be the most significant variables. If scallops were not divided from stage1 media the result would create high mortality. .75mm spat bags have very small openings that slow down water flow considerably. Fouling on bags can suffocate seed by eliminating proper water flow. This is why it is very important to divide scallops. 1.5mm and 3.0mm spat bags were the most common media used during the stage 2 growth periods. The process of dividing is the most time consuming part of the 2007 propagation effort.

3 mm Spat Bags

Growout strings with 3mm spat bags were buoyed and anchored just like stage 1 bags in Figure 1. In most instances, .75mm spat bags containing scallops over 3mm were divided between 3 or 4 other bags. Each new bag was set up similar to stage1 with netron and a 1" diameter rock in the bottom. The bags were transferred to longer growout lines designated STGO1, STGO2, STGO3 and STGO4. When scallops were divided at a smaller size like 3-10mm they had an easier time reattaching to bags and spreading out. Larger 10mm seed would sit on the bottom of the bag and not grow as much. To help scallops spread out, bags were tied onto their side (hung horizontally) for a period of three to five days. When bags were cut and hung in the vertical position, scallops stayed spread out, which gave them ample room to grow. The result was better growth and lower mortality. After the bags were divided, scallops were checked periodically. If scallops outgrew stage 2 media, they were divided again or field planted. Spat bags are inexpensive and the easiest type of growout material used in 2007. They

are fast to deal with, take up little room and can be checked with very little effort. The biggest mistake we had when dealing with spat bags was not changing netron from .75mm bags to 3mm bags. Sea squirts growing on stage 1 netron transferred to stage 2 spat bags became extremely fouled. This created competition between the invasive organism and scallops for food and oxygen. Almost all scallops made it to the desirable 30mm. More could have grown larger; but space dwindled on growout strings, while space among the other stage1 strings was used for stage 2 growout. Blue crabs caused the most mortality for this method. Because blue crabs can swim, they had no problem getting up to the bags on the surface and tearing them open. The scallops have very little defense against the crabs through the thin plastic bags. Crabs tend to be more attracted to the bags with the largest scallops. In 2008 we will use 3mm spat bags again for stage 2 growout but, create a barrier of rigid plastic mesh a rigid between crabs and scallops.

Bottom Bags

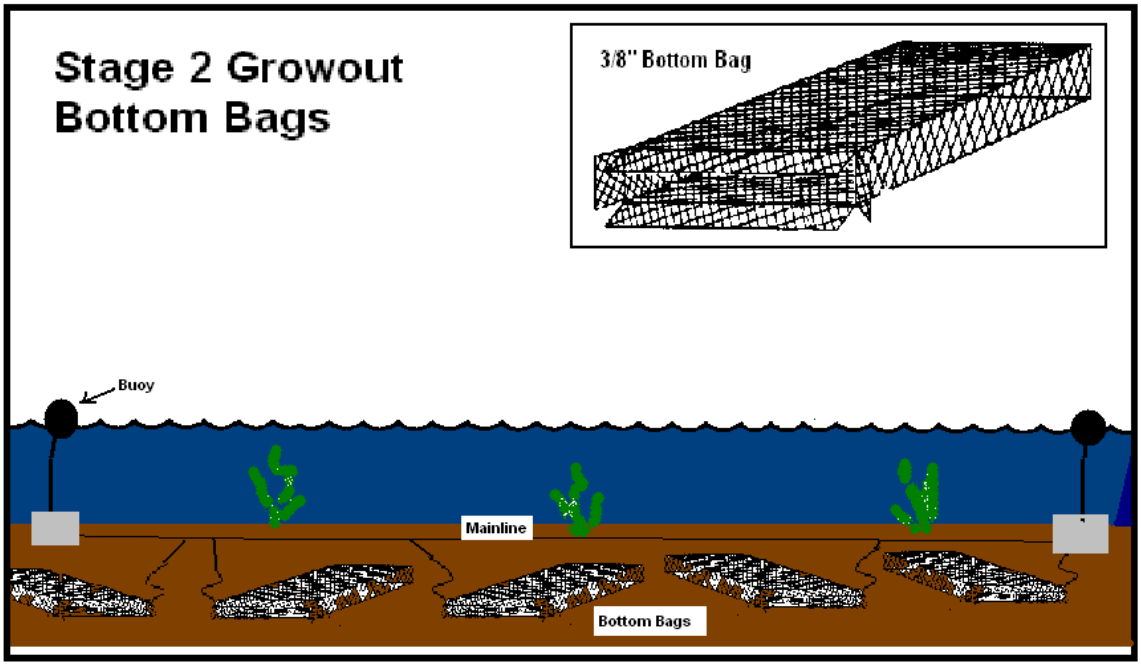


Figure 2

Bottom bags were the second easiest method used for stage 2 growout and created the largest seed (see Figure 2). This could have been attributed to the area where bottom bags were placed. When scallops are ready to harvest, Chockers can have the largest scallops in the pond. Tidal water flow in this area is much more extreme than other areas used for growout. Scallops were also divided into these bags at a larger size, 3/8" and up. Some bags had scallops at 50mm by field plant size. This is very good for reducing the effect of predators on seed. Bags on the bottom are easily covered with algae, but this can be controlled by a simple flipping of bags every one to two weeks. Each bottom bag can grow twice as many scallops as spat bags and four times as many as 3mm lantern nets. The bags cannot be seen from the top of the water and only require two end buoys. The only thing that limits this method is tides. If tides are too high it can make flipping or retrieving bags difficult. Bags may also be filled with adults for spawning if

necessary. This method of stage 2 growout will be the focus for 2008, with new experimental areas.

Lantern Nets

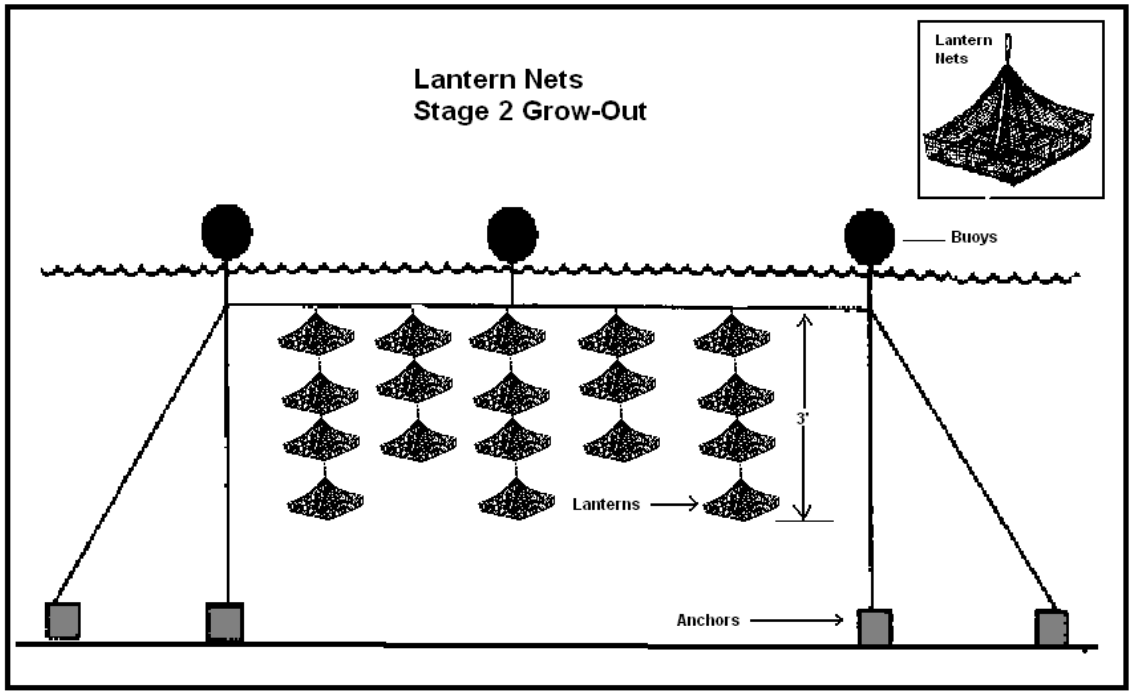


Figure 3

Approximately 90, 3mm lantern nets were used in 2007. Lantern nets are very good for scallops that are 10mm and above because of the flat area they have for scallops to sit. Scallops inside lanterns grew quickly when they were kept clean on a regular basis. Nets foul more quickly than other methods and require more periodic cleaning. This is probably due to the material from which lantern nets are made. The mesh is like a woven cloth fabric with 3mm holes. The fabric appears to trap seaweed, so it can never be fully cleaned. The result is faster turn around of growth between cleanings. Cleaning the nets becomes very labor intensive and time consuming. Lanterns take four times as much labor to maintain as bottom bags and can only grow one quarter of the quantity. One benefit is that lantern nets stack, requiring fewer strings to grow. However scallops grown in lanterns did not grow fast enough to receive a second batch of scallops from the hatchery. The number of lanterns will not increase in 2008. Lanterns will be used to grow oysters in The Great Pond or to supplement Stage 2 growout of scallops.

Cut .75 Spat Bags

Splitting or cutting spat bags down the side is an easy way of increasing water flow to seed. If fouling becomes a problem and clogs mesh, a cut down the side of the bag will allow scallops to spread out and continue growing. Scallops will climb to the outside of the bag and eventually fall off. This method was used for two of the eight original stage 1 strings. Cutting bags did help some scallop grow, but others stayed inside the bags and grew very slowly. Scallops that did make it to the outside of bags were vulnerable to

predators. This method will not be used in 2008, because there is no way to account for scallops that grew on the outside of the bags and fell off. Scallops that stayed inside of the bags grew slowly and did not reach good field planting size, unless they were moved to some other media. Cutting bags also destroys the bag so it can not be recycled for next year. Bags will only be split if the amount of seed that survives is greater then the potential loss. This method should only be used as a last resort for growout.

Seed Distribution

The majority of seed field planted in 2007 had outgrown stage 2 media. They needed to be emptied to allow space for scallops still waiting to be divided from stage1 media. At times, seed began to pile up at the bottom, from dropping off the sides of 3mm spat bags, creating overcrowding. Overcrowding is a problem for scallops that compete for food and oxygen, causing stunting or death. Stunting of growth can be seen on the outside of shells as a growth ring similar to the growth ring on a second year adult scallop. Scallops need to be as healthy as possible so they can survive the winter and reproduce next summer. A scallop that did not store enough glycogen in the abductor muscle will spend more time trying to get healthy in the summer than producing healthy spawn. If stunted scallops do spawn the eggs are usually not as viable and/or cause defects, especially in the shell.

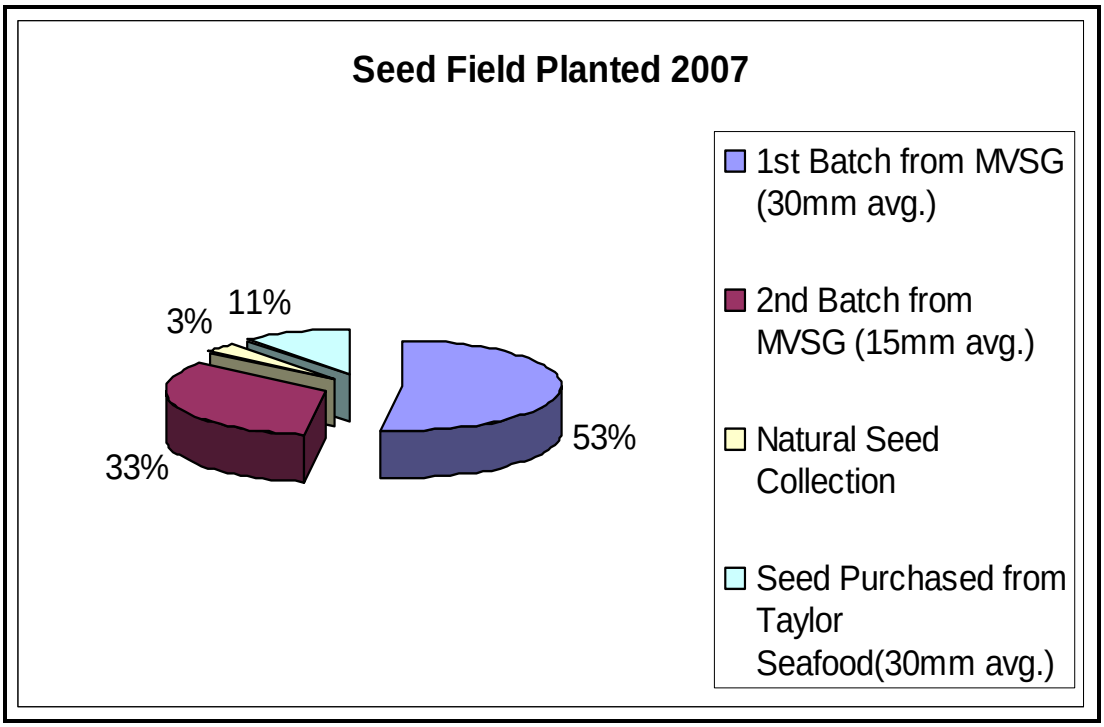
Experienced fishermen were interviewed to help determine areas for seed distribution. Some of the sites that were originally chosen had to change because natural seed sets were strong in those areas. Most of Nashaquitsa was covered with seed, so more ranched scallops were field-planted in Menemsha Pond. Seed in Menemsha Pond is exposed to many more predators and weather conditions, but usually produces the best scallops for harvesting. The main area of Menemsha Pond that was chosen to distribute seed was still open to fishing for the 2007 season. Because Nashaquitsa was closed to fishing, it would have been hard to shut down more then one major fishing area to protect seed. The fishermen also gave feedback on where scallops had moved and helped with predator control by dragging up crabs and starfish. In 2008 several buoyed-off closures or sanctuaries, over good eelgrass will be established to increase survival of seed. Fishing with drags can crush seed and remove eelgrass, making scallops more vulnerable to predators. Small seed can also be buried by sand and become stressed by constat removal from the water. The sanctuaries will be on good growing areas, where fewer adult scallops exist, so the closures will not impact fishermen. If sanctuaries cannot be established because of too many adult scallops, then seed will be spread over the best growing areas similar to 2007.

Graph 1 shows seed field planted by percent

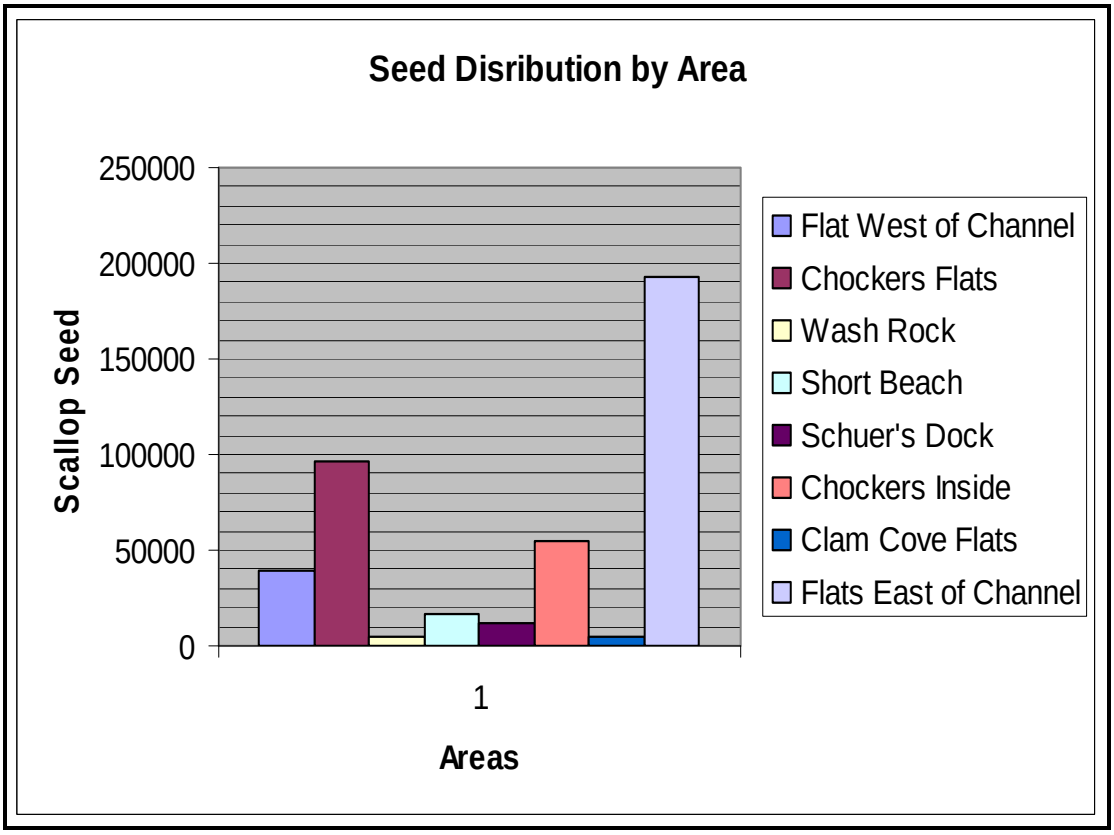
Graph 2 breaks down areas by number of seed planted.

Table 2 lists: time, amount and location of seed distributed over the 2007 growing season.)

Map 2&3 distribution areas and named locations.



Graph 1



Graph 2

During summer months when the water is warm, the likelihood that scallops will swim from field planted areas increases. One monitoring station was set up on the east flat in Menemsha Pond over a good bed of eelgrass. A peep-sight was used to monitor scallops on the bottom from a boat above. After distributing 2000 scallops, the buoyed off area was monitored for one hour. Many scallops were hard to see because of their ability to blend in with the eelgrass, but those that were visible did not show much swimming movement. This was a good overall observation because that meant conditions were favorable for the seed to stay on the flat. The following day seed was checked again, but less seed was visible than the day before. A scallop drag was towed behind the boat through the area to retrieve scallops and monitor transplant health. Only 30 scallop seed were retrieved during the test tow, largely because the amount of eelgrass would not allow the drag to fish properly. All scallops appeared alive and healthy. More swimming movement may have taken place during the nighttime hours that were not monitored. When the commercial season started, fishermen reported no significant amount of seed in the area that was monitored. They did report scallop seed further toward the front of the pond, almost 300 yards from where it was originally placed. This means scallops over the warmer months swim with tides to other locations. A second monitoring period was tried when water temperatures dropped below 45° F. Seed was planted and monitored for one hour daily, in the same buoyed off area as the first monitoring period. This time the 2000 seeds were planted and stayed in area until fishermen towed through and moved the seed during the commercial season. A monitoring period of four (4) days was recorded without movement, other than by the fishermen. A large quantity of seed was reported all over the flat, when the seaweed was cleared off by the first strong wind storm. The best planting period is when water temperatures cool off and are around 45° F. This will keep scallops from moving away from field planting areas and potentially swimming into vulnerable areas. Next year we will attempt to hold all ranched scallops until water temperature drops below 45° F.

On September 17th Chilmark received 50,000 hatchery-raised scallops from Taylor seafood. Scallops averaged approximately 25 mm in size, which was smaller than the expected 30mm. The scallops were transported by boat from Fairhaven to Menemsha and broadcast spread in three areas of Menemsha Pond: Flats East of Channel, Chockers West Flat and Short Beach. 90% of Taylor scallops were orange in color.

Table 2 Release Dates and Quantity

Scallop Distribution

Menemsha Pond

Flat East of Channel

	Date	Amount
	27-Aug	3,000
	28-Aug	4,000
	31-Aug	5,000
	4-Sep	5,000
	5-Sep	5,000
	11-Sep	4,000
*	17-Sep	20,000
	17-Sep	1,500
	19-Sep	10,000
	24-Sep	2,500
	2-Oct	2,000
	9-Oct	3,000
	15-Oct	6,000
	19-Oct	5,000
	31-Oct	1,000
	2-Nov	3,000
	5-Nov	5,000
	15-Nov	8,000
	19-Nov	30,000
	20-Nov	14,500
	11-Dec	5,500
	12-Dec	10,000
	14-Dec	10,000
	19-Dec	10,000
	24-Dec	9,000
	26-Dec	11,200
		193,200

Flat West of Channel

Date	Amount
30-Aug	5,000
5-Sep	5,000
28-Sep	2,000
12-Oct	2,000
11-Oct	7,000
18-Oct	5,000
3-Dec	13,000
	39,000

Short Beach

	Date	Amount
*	17-Sep	10,000
	10-Oct	6,500
		16,500

Schuer's Dock

Date	Amount
3-Oct	2,000
4-Oct	10,500
	12,500

Chockers Flats

	Date	Amount
	31-Aug	10,000
*	17-Sep	20,000
	20-Sep	3,000
	25-Sep	2,000
	26-Sep	4,000
	1-Oct	3,000
	18-Oct	5,000
	29-Nov	35,000
	30-Nov	15,000
		97,000

Wash Rock

Date	Amount
12-Sep	5,000
	5,000

NashaQuitsa Pond

Chockers Inside

Date	Amount
6-Sep	4,000
13-Sep	4,000
3-Oct	3,000
11-Oct	7,000
25-Oct	2,000
28-Nov	35,000
	55,000

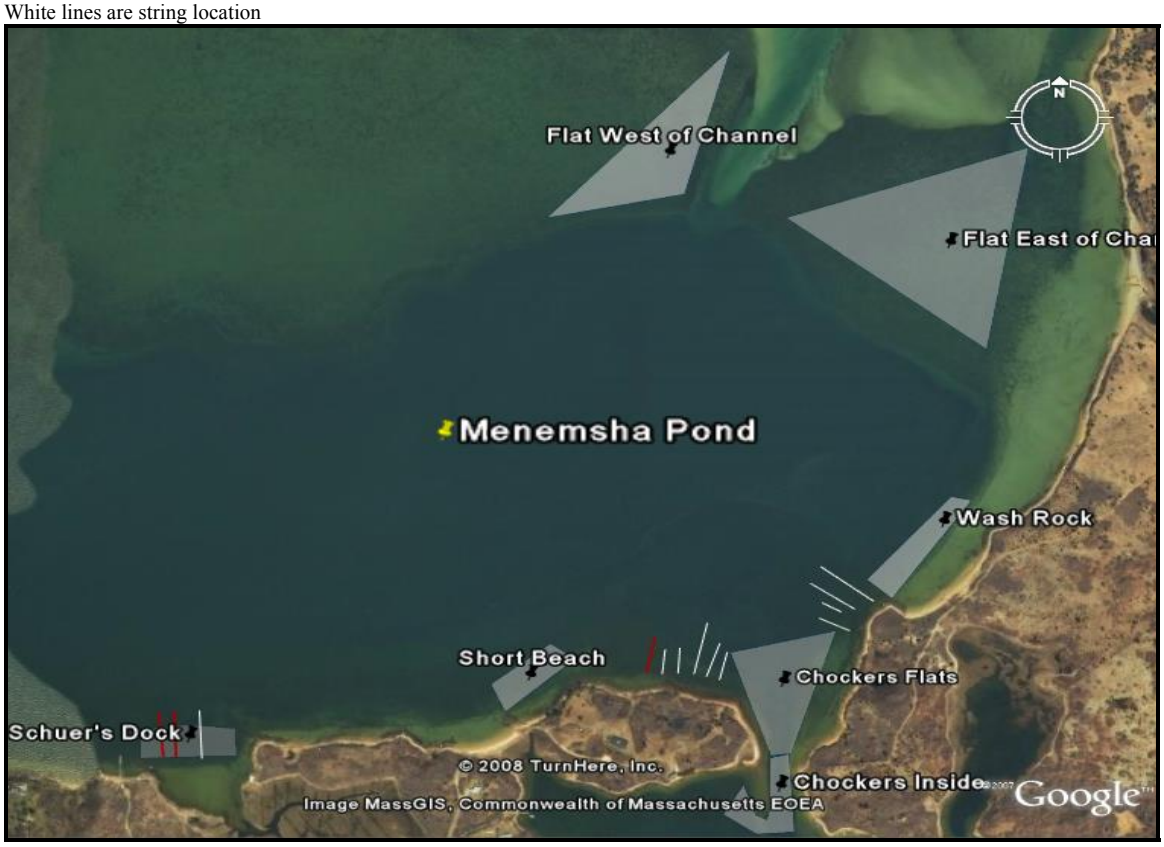
Clam Cove Flats

Date	Amount
31-Aug	5,000
	5,000

Total Estimated = 418,200

* Taylor seafood scallops

Menemsha Pond
Light blue color indicates area where seed was planted.
Red lines are spat collectors.
White lines are string location



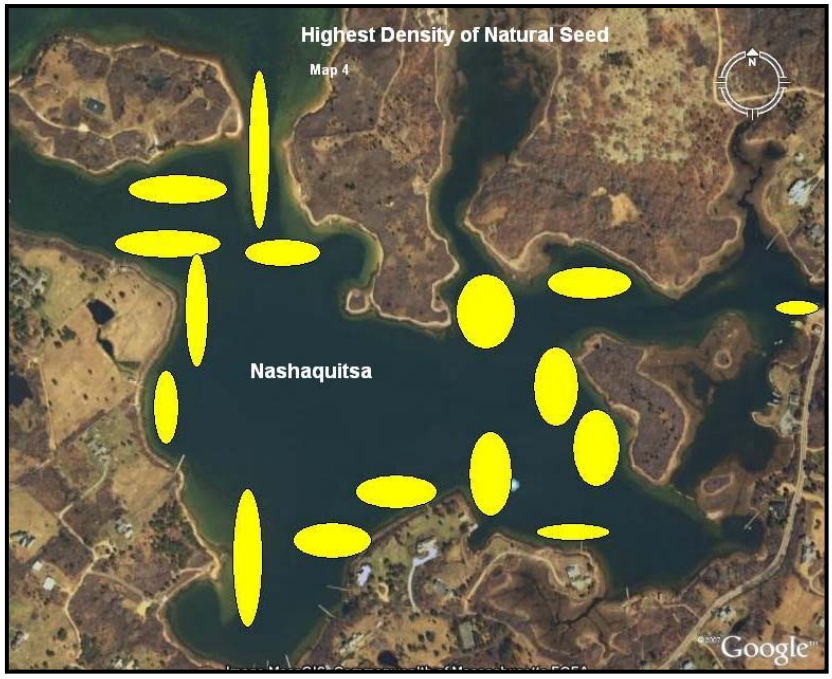
Map 2

Nashaquitsa and Stonewall Pond
Light blue color indicates areas were seed was planted.
Red lines are spat collectors.
White lines are string locations

Map 3

Natural Scallop Seed Set

The natural seed set this year could be attributed to an increase of propagation effort. It is hard to single out what influences might cause seed to set in this quantity, but it has not happened like this in decades. When harvest numbers increase consistently, we will know that natural sets are working. Map 4 below, in yellow, shows major seed set areas. Some of these areas have seed so dense that relaying to other sites in Menemsha Pond was necessary. Relaying seed will increase health and create new areas for people to fish. Scallops were relayed from the high density areas by volunteer fishermen and the shellfish propagation agent. Scallops were dragged by scallop dredges and moved by boat to areas shown in Map 5. Natural seed ranges in size from 2-25mm. One hundred bushels are expected to be moved from Nashaquitsa to the areas shaded in turquoise on Map 5. The seed relay also helps monitor scallops over winter months for changes in health.



Map 4 Highest Density of Natural Seed

Map 5 Seed relay areas

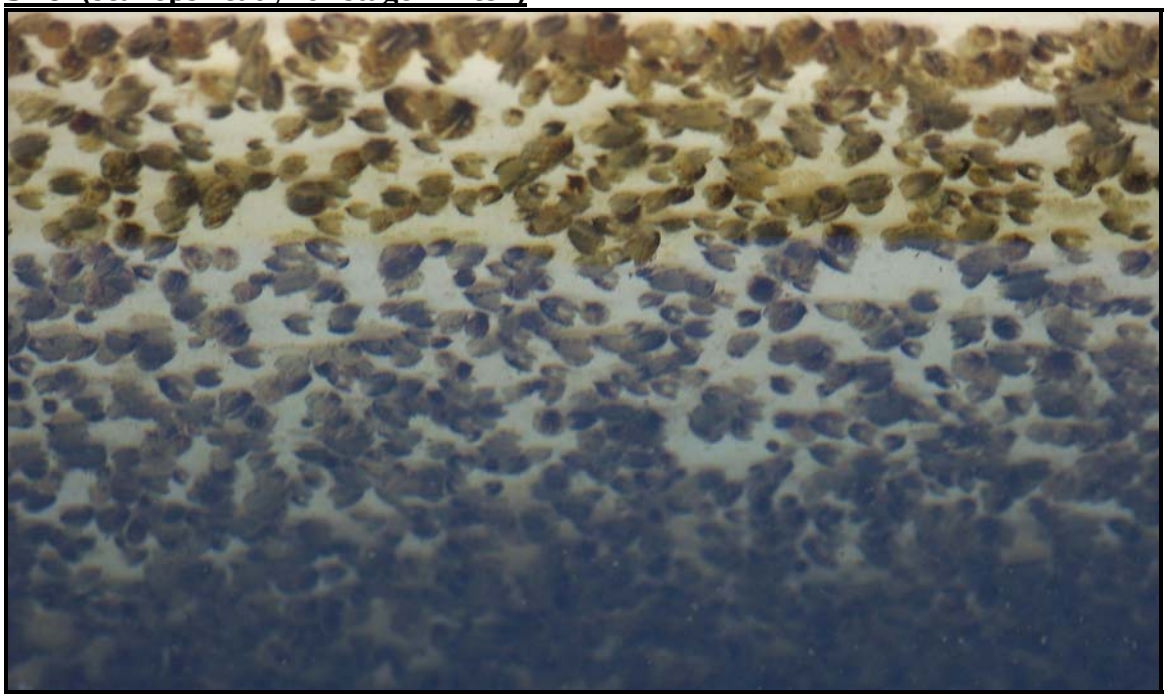
Upweller

In early July 2007 the Town of Chilmark purchased a floating electric powered upweller termed "Flupsy". Flupsy is a dual purpose dock/upweller that can be installed in many locations that tidal upwellers can not. The upweller was placed at the end of the transient dock in Menemsha Harbor. Flupsy is powered by a 3/4 HP electric submersible motor that pulls water through a center trough subsequently making water rise in silos. The motor draws water through silos which continually feed seed shellfish. Silos are outfitted with different size mesh so different size scallops can be separated. Separating fast growing scallops from runts or slow growing scallops helps keep competition low. If seed scallops of different sizes were left together, faster growers would dominate and prevent runts from developing. The flupsy has eight silos used for growing shellfish and one center trough for propulsion. The company literature on flupsy states that if all eight silos are running to full capacity it could be capable of starting one million 1 mm seed. Conditions and species can make flupsy site specific. Approximately 40,000 seed at 1mm were started in flupsy in 2007. 20,000 scallop seed were split between the first two silos and 20,000 divided between 4 spat bags with netron. Spat bags were then placed in four of the six remaining silos. Two silos were left open for dividing at a later date. Once scallops in spat bags were large enough (5mm) they were divided into four silos with netron. Netron was left in silos to allow scallops more area to spread out. It was apparent from the beginning that seed grew twice as fast in the upweller than in other stage 1 media. Around the beginning part of August growth began to slow considerably for both the pond and upweller. This time period is when all seed was divided. Flupsy is a great tool for starting scallops but does not have enough room to support scallops at larger sizes. An estimated total of 40,000 scallops could be grown in the flupsy from start to 30mm. There is no other method for stage 1 and stage 2 growout that can grow seed in an area as small as the upweller. The upweller does require a fair amount of maintenance at weekly and sometimes biweekly intervals. Maintenance includes clearing scallops away from exhaust screens, moving seaweed out from around silos, and clearing away amphipods or brine shrimp from intakes and exhausts. The upweller also requires a complete pressure washing to remove seaweed from silo screens once a week. The motor needs to be checked at the beginning and end of every day to make sure it is running. If the motor stops, then seed would start to die relatively quickly. If the pump does stop, all scallops must be emptied out of upweller immediately. A total of about 10 man hours per week are devoted to the upweller.

Upweller (center trough and 8 silos)

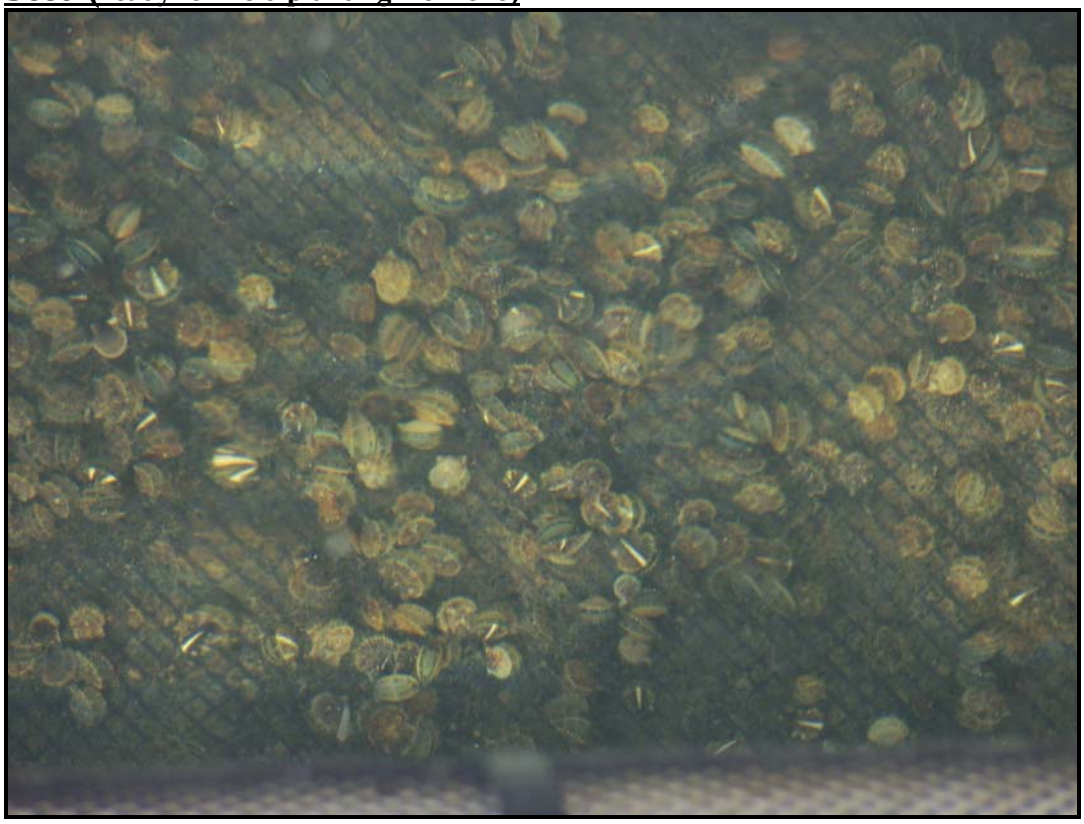
Stage 1 (silo with spat bags inside)

Silo (scallops ready for stage 2 mesh)



Seed (from upweller ready to be separated by size)

Seed (ready for field planting from silo)



Conclusion

Seed grown at stage 1 in the upweller outgrew scallops in any other type of media inside the ponds at one time. The upweller is particularly effective when seed is first distributed from the hatchery in late June. Receiving seed earlier in the growing season, when water temperatures are lower, and food has not become as abundant, is not ideal. Increasing growth slightly during this slow period can make a big difference for the survival of seed. If all space inside flupsy is maximized, 800,000 seed could be grown from a 300 micron size until ready for stage 2 grow-out. This would be possible if Chilmark received seed similar to the 2007 distribution from MVSG. The upweller, used as stage 2 growout, is also capable of growing approximately 50,000 seed scallops to 30mm.

During the 2008 growing season, bins, similar to those on tidal upwellers, will be constructed with 120 micron mesh to raise hatchery seed that cannot survive or stay in spat bags. If the majority of seed from the hatchery is 120-500 micron maybe more scallops could be grown by containing them. The center trough will also be utilized to increase output of stage 2 growout.

Predator Control 2007

Major predators of the bay scallop include: Green Crabs (Carcinus Maenus, Rock Crabs(Cancer Irroratus), Spider Crabs(Libinia spp.),Black Claw Mud Crabs and Blue Crabs. Seventy, green crab traps were fished in Menemsha and Nashquitsa Ponds in 2007. Traps were checked weekly from the end of June 2007 to the end of January. Traps were moved as concentrations in certain areas increased. The largest concentration came from the flats on either side of the channel in Menemsha Pond. Bait was a big factor for catching crabs over the summer. When traps were baited heavily, it seemed to attract more crabs. Crabs also like fresh fish more then salted fish for bait. Fresh fish worked better then all other bait but was not always available. When fish was sparse mussels were dragged up, crushed and placed in the traps loosely. Crushing larger mussels for smell and placing smaller mussels whole worked best. Crabs would immediately be attracted to larger crushed mussels and when the bait had been devoured they would crush the smaller mussels, so the smell would continually attract more crabs.

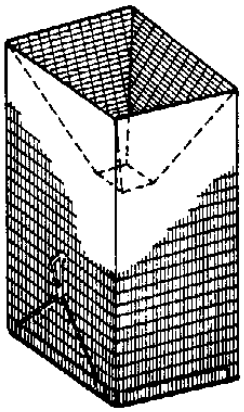
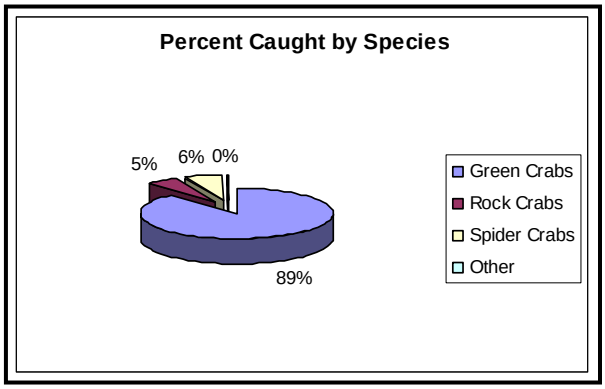


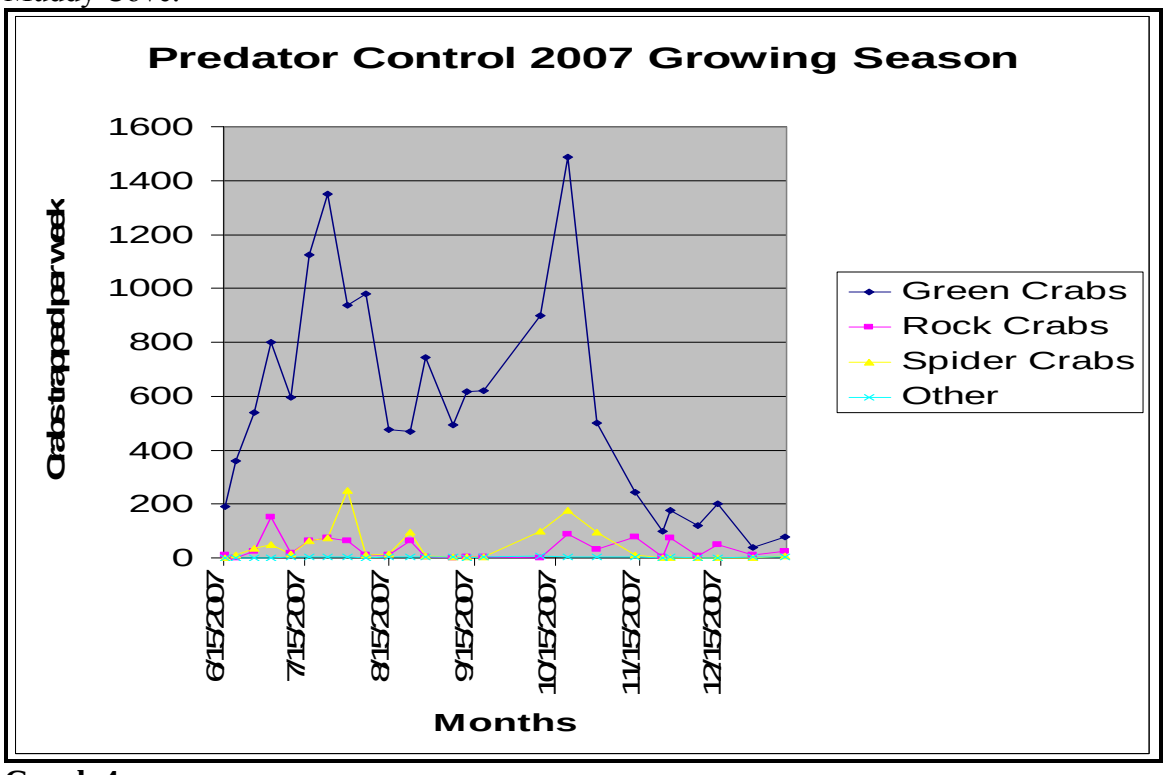
Table 3

Date		Green Crabs	Rock Crabs	Spider Crabs	Other
6/15/2007		190	10	0	0
6/19/2007		360	0	12	0
6/26/2007		540	24	36	0
7/2/2007		800	150	50	0
7/9/2007		594	18	13	2
7/16/2007		1125	63	63	2
7/23/2007		1350	75	75	3
7/30/2007		938	63	250	5
8/6/2007		980	10	10	0
8/14/2007		475	10	15	2
8/22/2007		469	63	94	2
8/28/2007		743	2	8	2
9/7/2007		495	0	5	3
9/12/2007		618	5	5	1
9/18/2007		619	3	3	2
10/9/2007		900	0	100	8
10/19/2007		1488	88	175	2
10/30/2007		500	31	94	2
11/13/2007		242	77	12	4
11/23/2007		98	2	0	1
11/26/2007		175	75	0	3
12/6/2007		119	6	0	1
12/13/2007		200	50	0	0
12/26/2007		40	10	0	2
1/7/2008		77	24	8	2
Totals		**14135**	**859**	**1028**	**49**

Total Crabs Trapped 2007=16071

As you can see from Graph 3, as water temperatures began to rise in July, so did crab activity. After peaking in the last week of July, crab numbers began to decline until mid-October, when crabs began feeding heavily to store energy to survive winter months. The decline over August and September could be attributed to an algae bloom that takes place every year during this time. Algae can cover the entrance to traps and make it difficult for crabs to enter. The second highest concentrations of crabs were around Wash Rock and Chockers. When crabs concentrations increased in certain areas, so did our efforts. Fallowing the crabs was the best way decrease the overall numbers. Crab traps that did not have center tubes for entrances caught more spider crabs. More Spider Crabs could be caught if we used different style traps. During the 2008 growing season Chilmark will increase crab-trapping efforts considerably. The town will hire an individual for the soul purpose of trapping crabs. Two hundred crab traps will be checked once or twice a week, to see if a massive program could reduce numbers even more. If numbers do start to decrease over a 3-year period, then there are a set number of crabs for every area. If numbers do not decrease, then it can be presumed that no matter how large the effort, crabs will not be stopped from entering the pond. In addition to crabs trapped during this past season, an estimated 10,000 Black Claw Mud Crabs were caught. These crabs were caught while taking old propagation gear from water around Muddy Cove.





Graph 4

Major Predators

Green Crab

Photo by Lee Shepard

Black Claw Mud Crab

Photos by Isaiah Scheffer

Atlantic Rock Crab

Photos by Isaiah Scheffer

Spider Crab Photos by Isaiah Scheffer

Asian Shore Crab (new invasive species)

Oyster Drill Photos by Isaiah Scheffer

Starfish Photos by Isaiah Scheffer

Monitoring Climate and Scallop Habitat

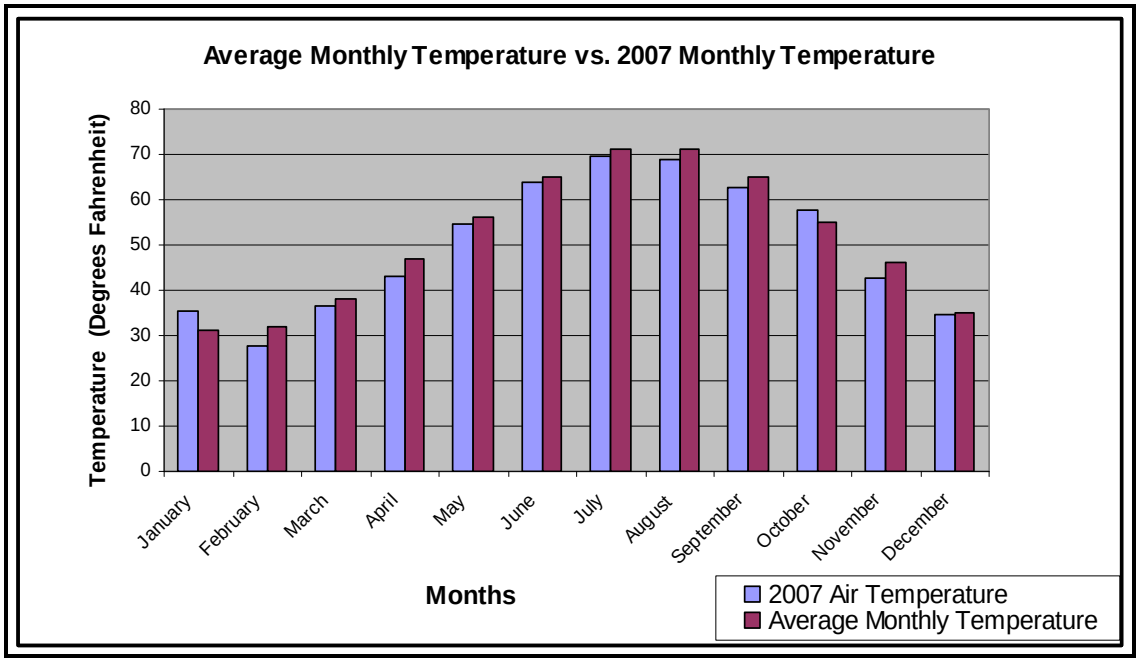
Monitoring the climatic conditions each year and graphing against the next year's harvests, will determine what scallops need to produce productive harvests**.** The data that is kept will be included in this yearly report and is recorded to produce an historical record of Menemsha and Nashaquitsa Ponds. Table 4 and Graph 5 show the average air temperatures for 2007 and historic averages. This year was slightly cooler than the average, which may have contributed to the extremely large seed set within the Nashaquitsa Pond. A long term comparison will be made for each variable when records become longer and more complete.

Table 4 (Data supplied by http://www.erh.noaa.gov/box/dailystns.shtml)

Average Monthly Air Temperature **2007 Average Monthly Air Temperature**

Month	Temperature (Degrees Fahrenheit)
January	31
February	32
March	38
April	47
May	56
June	65
July	71
August	71
September	65
October	55
November	46
December	35

Month	Temperature (Degrees Fahrenheit)
January	35.4
February	27.8
March	36.7
April	43.2
May	54.8
June	63.9
July	69.8
August	68.7
September	62.6
October	57.8
November	42.8
December	34.5



Graph 5

The average monthly precipitation for 2007 was lower during the peak spawning and growing months. See Graph. Many scientists believe that pollution is the biggest factor degrading both scallop habitat and reproductive cycles. Clouds can carry many pollutants from across the country and fall through precipitation on the east coast. Many theorize that this could attribute to the decline of bay scallops. One of the easiest hypothesize can link precipitation to low seed sets within each water body. That is not to say that large seed sets cannot happen during years with heavy summer rainfall, but overall less productive harvest years following heavy precipitation years. The seed set in Nashaquitsa Pond does support this theory, but no conclusion can be drawn from a single year. The validity of this theory will be discovered over a longer period of data.

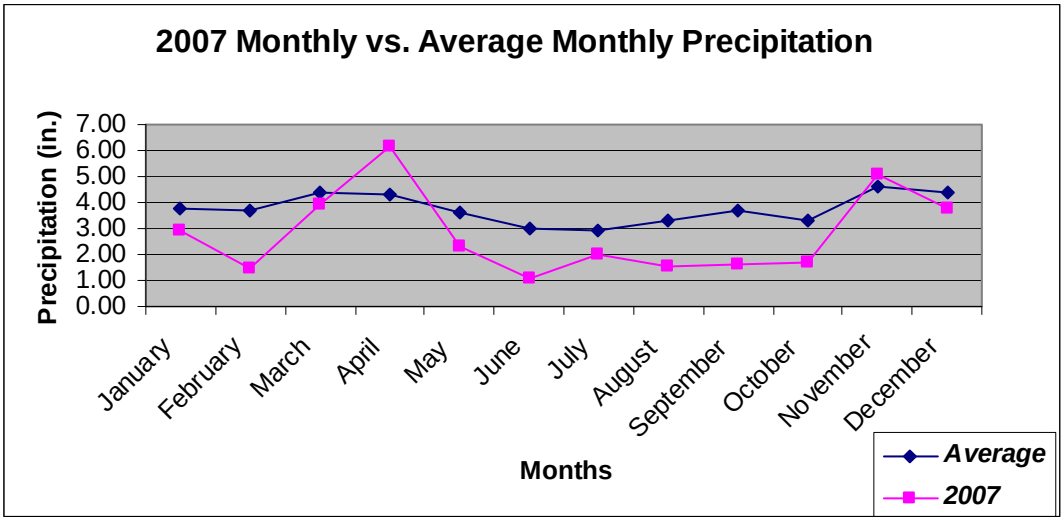
Table 5 (Data supplied by http://www.erh.noaa.gov/box/dailystns.shtml)

Average Monthly Precipitation

Month	Precipitation (Inches)
January	3.80
February	3.70
March	4.40
April	4.30
May	3.60
June	3.00
July	2.90
August	3.30
September	3.70
October	3.30
November	4.60
December	4.40

2007 Monthly Precipitation

Month	Precipitation (Inches)
January	2.91
February	1.48
March	3.95
April	6.12
May	2.28
June	1.04
July	1.97
August	1.53
September	1.59
October	1.67
November	5.11
December	3.76



Graph 6

Water Temperature

(Data supplied by http://www.nodc.noaa.gov/dsdt/cwtg/natl.html)

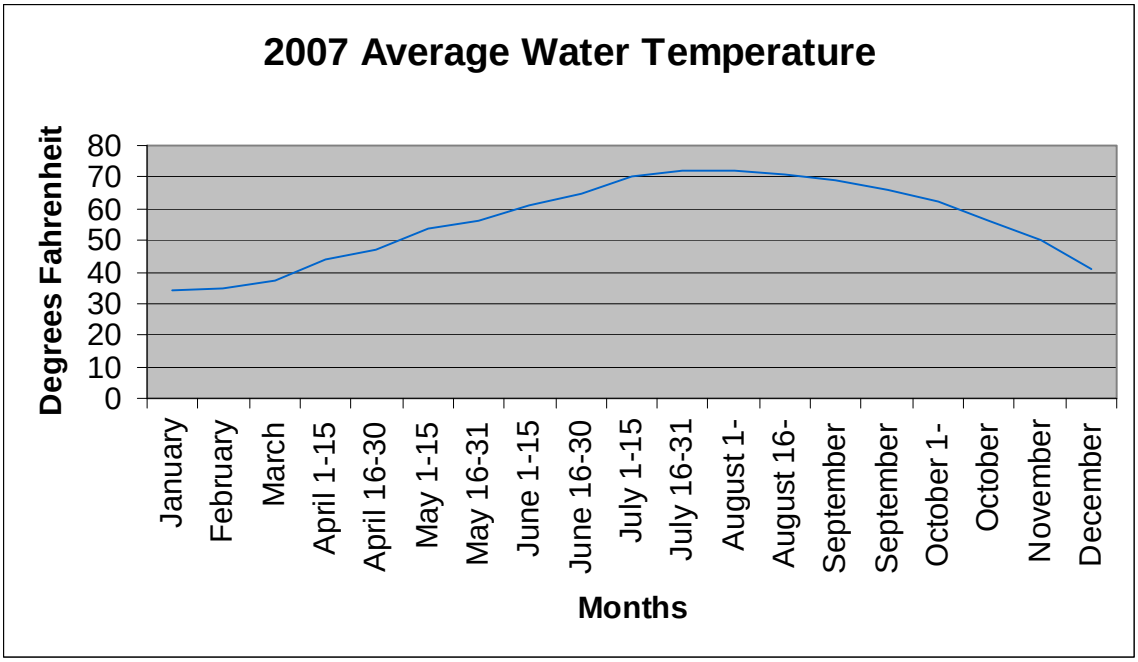
Water temperature plays a large role for the reproductive cycle of scallops. If water temperatures are warm early in the spring before algal blooms take place, not enough food would be available to support growing scallops. The results could be large mortality or a less productive spawning year. Water temperature can also cause scallops to spawn later than usual, causing a small seed which are less likely to survive the winter. The late spawning and seed set can cause what is called a "Nub Scallop". This scallop is very small and usually sets in the late summer to fall months. The adult nub scallop has a very small growth ring that cannot be harvested under the states guidelines of what is considered an adult scallop. The small size of the seed starting into the following spring causes nubs to exert more energy growing for survival rather than spawning. The small size of this scallop also makes them less sexually mature, so spawning is almost impossible. This population of scallops can

Table 6 (Data collected from Woods Hole)

2007 Average Water Temperature

Months	Temperature (Degrees Fahrenheit)
January	34
February	35
March	37
April 1-15	44
April 16-30	47
May 1-15	54
May 16-31	56
June 1-15	61
June 16-30	65
July 1-15	70
July 16-31	72
August 1-15	72
August 16-31	71
September 1-15	69
September 16-30	66
October 1-15	62
October 16-31	56
November	50
December	41

Graph 7



sometimes make up more then half the overall population of adult scallops. There is also a lot of controversy over the harvesting of these scallops because they do not contribute significantly to the overall population until the third summer in their life. In this third year they will spawn and add to the population, but usually die right after spawning because of their age. These scallops never get harvested even though they often times have the best yield during their second fall when the harvesting begins. Water temperatures and conditions could have been altered so much that nub scallops have become more prevalent, or there is a significant role for this population within the overall population.

Water temperature can tell alot about scallops' spawning periods so that spat bags can be deployed at the best possible times. The water temperature will be analyzed and compared to the size and quantity of seed sets over a long period of time to determine how scallop propagation efforts can be improved.

Oyster Enhancement 2007

Chilmark received 100,000 disease-resistant oyster seed from MVSG. 5,000 oyster seed were grown in the upweller until approximately 10mm in size. The 5,000 oysters were field planted on the flat in Hariph's Creek as an experimental area for recreational fishing. This area will be monitored over the 2008 growing season to examine if a small recreational fishery can be established. Oysters can clean water, improving quality, and giving family fishermen a new place to harvest shellfish. The other 95,000 oysters were placed in .75 mm spat bags in Great Pond. Bags were attached to a long line, anchored at each end. Floats were placed in the bags to keep them open and buoyant. Blue Crabs became a problem in 2007, tearing spat bags open to get to the oysters. Oysters were then transferred to ADPI growout bags to protect them from predators. Bags were tended partially by the Chilmark propagation agent but mostly by West Tisbury Shellfish Warden Tom Osmers. The lack of time and late start for this growing season caused West Tisbury and Chilmark to combine efforts to protect seed. After waters cooled this fall, oysters were placed in a safe area of the pond away from ice and wind. Oysters will be grown to a size of 30mm before being field planted. Oysters will be placed in an historically productive fishing area and closed until large enough to harvest. A more extensive oyster report with field planting data will be included in the 2008 Propagation Report.

Future Oyster Enhancement Projects 2008

1. Shell Reef

Shell reefs can be formed to provide oysters a place to set off of silty bottoms. Sedimentation can prevent oysters from surviving by clogging gills. Creating a reef is proven to help oysters reestablish in areas for wild harvests. Reefs also encourage oysters to set by giving spat a piece of shell to attach to. Shell, a natural material, is the favorite media for oysters to set. During the winter of 2008 broken ocean quahog shells can be shipped from off-island and manually distributed in the ponds to create reefs.

2. Oyster Relay

Oyster seed throughout Squibnocket pond is very abundant. Many of these oysters are never harvested do to the lack of salinity. The low salt hampers market price and demand because oysters have a flat taste. Squibnocket oysters also do not grow fast because of over population. If oysters could be transferred to an area of Menemsha Pond where they can gain flavor and size, then Chilmark residents could have a strong wintertime fishery. The process of moving seed could be a community effort, enlisting volunteers to help.

Quahog Enhancement Project 2007

Chilmark received 1,273,000 quahogs from MVSG during the 2007 season. Most quahogs were broadcast spread on areas of significant historical harvests. 147,000 quahogs were placed at Clam Cove under predator netting. Predator netting was anchored with cement blocks to keep crabs from crawling into the field planting area. Netting also prevents birds from getting to seed quahogs before they have sufficient time to dig into the sand. The remaining portion of quahogs was broadcast spread throughout the pond in areas where there is good sandy bottom and no eelgrass. The success of field-planting quahog seed, without any predator protection, will be determined in the 2008 growing season. Seed planted without protection has a very low rate of survival. Seeded areas can be seen on Map 6.

Map 6 (Seeded Quahog Areas)

Red - Seeded without predator netting.
Yellow - Seeded with predator netting.

Future Quahog Enhancement Projects

1. Quahog Rafts

For the 2008 season, six quahog rafts will be used to serve as intermediary growing media. The rafts are made from a 4'x8' sheet of plywood with 2x6 lumber edges which hold quahogs and sand inside. The rafts attaches to foam floats that suspend it approximately 3-4' from the waters surface. The center part of the raft is then filled with sand for hatchery spawned quahogs to grow. Each raft can produce 100,000 quahog seed to 10mm which has a much higher survival rate then 1mm seed. Edgartown uses rafts to protect their hatchery seed and have notably boosted their quahog fishery.

2. Quahog Relay

Adult quahogs with bacterial contamination can be purchased for a very low price. The contaminated quahogs are harvested from The Taunton River Estuaries and transported to Menemsha Pond for purging. Quahogs will clean themselves out over a three-month period, as long as they are planted in an area with good water quality. Fishing in the areas of transplant can occur as early as 2 months but is contingent on state testing of the shellfish.

Future Steamer Enhancement 2008

Steamers (Soft-shell Clams) are valuable during the summer months. Demand for these shellfish can create markets on and off-island. Every year more off-island waters become closed to shell fishing. If off-island waters continue to close from poor water quality, an opportunity exists for island fishermen to establish a strong market. Steamers unlike quahogs are more difficult to farm. Brittle shells can make steamer clams much more vulnerable to predators such as birds and crabs. The lack of farmed steamers keeps the market strong by not flooding it.

1. Steamer Tents

Steamer tents can be deployed in areas of historical softshell clamming. Commercially made tents can be purchased or made. See Figure 4. The frame holds predator netting up and protects theseed from birds trying to reach seed from above. The bottom of the tents are weighted

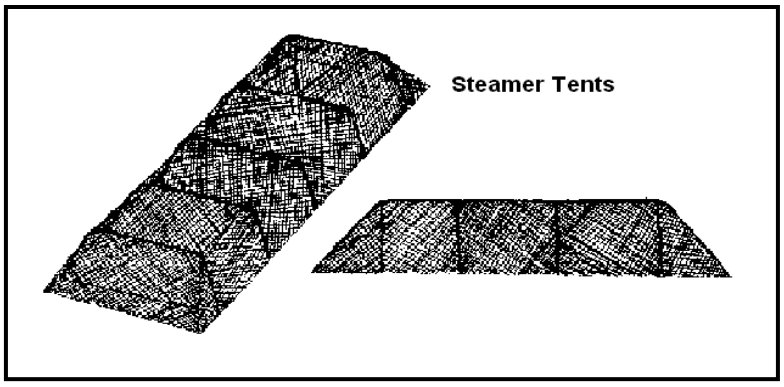


Figure 4

or staked down to prevent movement and to stop crabs from crawling in. Some experiments with tents have not required hatchery seed to be placed inside them. The extremely high number of eggs and sperm released by softshells allows seed to set under tents. It is crucial to deploy tents at the right time, so they do not become overly fouled. If seed does not set, hatchery-spawned seed will be purchased and placed under tents. Experiment results will be included in 2008 Propagation Report.

Conclusions

The majority of the propagation efforts for the 2007 growing season were dedicated to bay scallops. The results for the first-year trial proved that a restoration program is feasible. Seed sets throughout both ponds, along with ranched hatchery scallops should create the best scalloping season in a long time. The 2008 harvest season will be contingent on adult scallops growing well without experiencing large mortality.

In 2008 more effort will be put into growing steamers, quahogs and oysters. All four species of shellfish will need to be harvested, for young people to be attracted to fishing as a career. There will be special interest focused on creating areas for family-permit people to fish. Shellfish beds closer to access points around the pond will make family fishing easier.

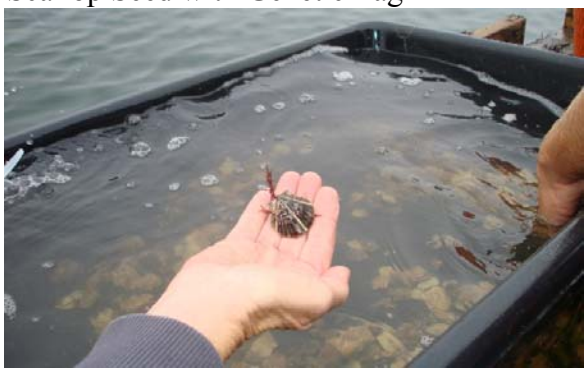
In addition to the propagation effort over the 2008 season, a water quality testing device (YSI 556) will be purchased and used to monitor the ponds health. Temperature, conductivity, salinity, dissolved oxygen, pH, and ORP can all be tested using this device. A long term analysis of water quality will help manage Chilmark's ponds and help with propagation.

Habitat restoration is very important to any quality restoration program. Without suitable habitat for seed to be sown, propagation efforts can be futile. Habitat restoration can be labor intensive, so community volunteerism is important.

Additional Photographs by Warren Doty

Natural Spat Collector

Scallop Seed with Genetic Tag



Stage 2 Growout (3mm Spat Bag)

Lantern Nets

Stage 1 Spat Bag

Field-Planting Scallop Seed