Request for Information – 11/25/2019

• How much money was available to the MES Dept for shellfish propagation
• How much oyster and quahog seed was purchased (or a breakdown of how the money was spent in terms of seed vs equipment etc)
• What month seed was field planted and at approximately what size
• How many were field planted in each pond (oysters and quahogs)
• Estimates of mortality
• Growth variation in the different growing areas
2015-2019 Shellfish Seed Volumes & Costs

### Shellfish Seed Volumes

<table>
<thead>
<tr>
<th></th>
<th>Oysters</th>
<th>Quahogs</th>
<th>Bay Scallops</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>1,800,000</td>
<td>Unknown</td>
<td>0</td>
</tr>
<tr>
<td>2016</td>
<td>2,500,000</td>
<td>1,111,000</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>2,953,000</td>
<td>1,584,600</td>
<td>100,000</td>
</tr>
<tr>
<td>2018</td>
<td>1,500,000</td>
<td>1,990,000</td>
<td>100,000</td>
</tr>
<tr>
<td>2019</td>
<td>750,000</td>
<td>1,770,000*</td>
<td>205,000</td>
</tr>
</tbody>
</table>

*purchase of a shellfish seed sorter

### Shellfish Seed Costs

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oysters</td>
<td>Unknown</td>
<td>Unknown</td>
<td>$32,249.80</td>
<td>$18,486.75</td>
<td>$9,562.50</td>
</tr>
<tr>
<td>Quahogs</td>
<td>Unknown</td>
<td>Unknown</td>
<td>$17,016.00</td>
<td>$16,500.00</td>
<td>$18,750.00</td>
</tr>
<tr>
<td>Bay Scallops</td>
<td>N/A</td>
<td>N/A</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$2,750.00</td>
</tr>
</tbody>
</table>

Annual Shellfish Propagation Budget of $62,500.00
2015
2015 Quahog Seed

• All quahog seed ordered and received (1,111,000) in 2015 was seeded in West Falmouth and Green Pond in Fall 2016.
2015 Little Pond Quahog Relay

• In cooperation from the Barnstable County Sheriff’s Department, the Town of Falmouth Marine and Environmental Services Department conducted a wild hard clam shellfish relay out of Little Pond (SC-10) between the dates of October 19th and October 22nd, 2015.

• Approximately 7,900 hard clams/26.5 bushels (53 half-bushel bags) of quahogs were dug out of Little Pond, with approximately 150 quahogs filling a half-bushel bag. Clams relayed ranged in size from 1 to 3 inches.

• Approximately 3,900 clams (13 bushels, 26 half-bushel bags) were relayed into Green Pond (SC-12), off of Vineyard Street (Green Pond southwest corner)

• Approximately 4,000 clams (13.5 bushels, 27 half-bushel bags) were relayed into West Falmouth Harbor (BB-54).
2016 Quahog Seed

• All quahog seed ordered and received in 2016 was seeded in West Falmouth and Green Pond in Fall 2016.
2016 Little Pond Quahog Relay

- In cooperation from the Barnstable County Sheriff’s Department, the Town of Falmouth Marine and Environmental Services Department conducted a wild hard clam shellfish relay out of Little Pond (SC-10) between the dates of November 7th and November 18th, 2016.

- Approximately 11,300 quahogs (37.6 bushels) were dug out of Little Pond, with approximately 150 quahogs filling a half-bushel bag. Clams relayed ranged in size from 1 to 3 inches.

- Approximately 2,400 quahogs (2 full totes, ~8 bushels) were relayed into Green Pond (SC-12), off of Vineyard Street on Tuesday, November 8th.

- Approximately 4,200 quahogs (3.5 full totes, ~14 bushels) were relayed into Green Pond (SC-12), off of Vineyard Street on Wednesday, November 9th.

- Approximately 4,700 quahogs (3.8 full totes, ~15.6 bushels) were relayed into West Falmouth harbor (BB-54), on the closed sand flat on Tuesday, November 15th.
## 2016 Little Pond Oyster Relays

<table>
<thead>
<tr>
<th>Size Class of Relayed Oysters</th>
<th>Approx. Count of Relayed Oysters</th>
<th># Totes Relayed</th>
<th>Estimated Bushels</th>
<th>Relayed To</th>
<th>Relay Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>mixed: average 29mm (1&quot;)</td>
<td>100,000</td>
<td>2</td>
<td>3</td>
<td>Bournes Pond (BP Relay Area II - 58 Crowell Ave)</td>
<td>9/22/2016</td>
</tr>
<tr>
<td>mixed: average 18mm (0.7&quot;)</td>
<td>100,000</td>
<td>1</td>
<td>2</td>
<td>Bournes Pond (BP Relay Area III - 229 Central Ave)</td>
<td>10/17/2016</td>
</tr>
<tr>
<td>mixed: average 18mm (0.7&quot;)</td>
<td>300,000</td>
<td>3</td>
<td>6</td>
<td>Green Pond (GP Relay Area I - Misty Harbor Way)</td>
<td>10/17/2016</td>
</tr>
<tr>
<td>mixed: average 18mm (0.7&quot;)</td>
<td>100,000</td>
<td>2</td>
<td>4</td>
<td>West Falmouth Harbor (WF Relay Area I - Off Associates Rd)</td>
<td>10/17/2016</td>
</tr>
<tr>
<td>mixed: average 46mm (1.8&quot;)</td>
<td>600,000</td>
<td>141</td>
<td>282</td>
<td>West Falmouth Harbor (WF Relay Area II - Sandflat)</td>
<td>10/29/2016</td>
</tr>
<tr>
<td>mixed: average 30mm (1&quot;)</td>
<td>200,000</td>
<td>31</td>
<td>62</td>
<td>Green Pond (GP Relay Area II - North of Menahaunt Rd)</td>
<td>11/5/2016</td>
</tr>
<tr>
<td>mixed: average 44mm (1.7&quot;)</td>
<td>300,000</td>
<td>55</td>
<td>110</td>
<td>Green Pond (GP Relay Area III - Vineyard St)</td>
<td>11/5/2016</td>
</tr>
<tr>
<td>mixed: average 41mm (1.6&quot;)</td>
<td>450,000</td>
<td>102</td>
<td>204</td>
<td>Bournes Pond (BP Relay Area I - Off Pachecho Path)</td>
<td>11/14/2016</td>
</tr>
</tbody>
</table>

**RELAYED:** 2,100,000  
**OVERWINTERED:** 300,000
<table>
<thead>
<tr>
<th>Hatchery</th>
<th>Muscongus Bay Aquaculture</th>
<th>Mook Sea Farm</th>
<th>Aquacultural Research Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date order placed</td>
<td>1/21/2016</td>
<td>1/22/2016</td>
<td>1/21/2016</td>
</tr>
<tr>
<td>Date order arrived</td>
<td>6/10/2016</td>
<td>6/16/2016</td>
<td>7/21/2016</td>
</tr>
<tr>
<td>Seed amount</td>
<td>1 million</td>
<td>1 million</td>
<td>500,000</td>
</tr>
<tr>
<td>Seed size</td>
<td>R2</td>
<td>R2</td>
<td>R2</td>
</tr>
<tr>
<td>Avg size at relay (mm)</td>
<td>49.548</td>
<td>49.5944</td>
<td>27.3448</td>
</tr>
</tbody>
</table>
2016 Little Pond Oyster Data Lessons Learned

• While all seed was ordered on the same date, ARC seed delivered 6 weeks later than first seed received, and ARC seed never caught up in size

• A “report card” was generated to give hatcheries feedback about how each hatchery’s seed performed on the same farm
2016 Little Pond oyster farm
2017
2017 Quahog Seed

• All quahog seed ordered and received (1,584,600) in 2017 was seeded in West Falmouth and Green Pond in Fall 2017.
2017 Little Pond Quahog Relay

• In cooperation from the Barnstable County Sheriff’s Department, the Town of Falmouth Marine and Environmental Services Department conducted a wild quahog relay out of Little Pond (SC-10) between the dates of October 6th and October 12th, 2017.

• Approximately 1,950 quahogs (6.5 bushels, 13 half-bushel bags) were dug out of Little Pond, with approximately 150 quahogs filling a half-bushel bag. Clams relayed ranged in size from 1 to 3 inches. These 6.5 bushels were relayed into West Falmouth Harbor (BB-54).

• Approximately 8,250 quahogs (27.5 bushels, 55 half-bushel bags) plus approximately 1,800 quahogs (3 half-filled fish totes), for a grand total of approximately 10,050 (33.5 bushels) quahogs dug out of Little Pond, with approximately 150 quahogs filling a half-bushel bag. Clams relayed ranged in size from 1 to 3 inches. These 33.5 bushels were relayed into West Falmouth Harbor (BB-54).
# 2017 Little Pond Oyster Relays

<table>
<thead>
<tr>
<th>Approx. Count of Relayed Oysters</th>
<th># Totes Relayed</th>
<th>Estimated Bushels</th>
<th>Relayed To</th>
<th>Relay Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>mixed: average 39mm (1.5&quot;)</td>
<td>600,000</td>
<td>60</td>
<td>120</td>
<td>Green Pond Southeast Corner</td>
</tr>
<tr>
<td></td>
<td>450,000</td>
<td>68</td>
<td>136</td>
<td>West Falmouth Family Area</td>
</tr>
<tr>
<td></td>
<td>1,000,000</td>
<td>112</td>
<td>224</td>
<td>West Falmouth Center Flat</td>
</tr>
<tr>
<td></td>
<td>300,000</td>
<td>20</td>
<td>40</td>
<td>Great Pond, from Massasoit Street to Pocasset Street</td>
</tr>
<tr>
<td><strong>RELAYED:</strong></td>
<td><strong>2,350,000</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OVERWINTERED:</strong></td>
<td><strong>500,000</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2017 Falmouth MES Weekly Relative (Not Real Time) Oyster Seed Growth
Mook Sea Farm (which only produces oysters) has oyster seed available earlier in the season and can be advantageous to some growers
  - While “Mook Early Batch” (arrived 5/18/2017) seed size was initially smaller, seed caught up in size relative to other seed cohorts and performed well

2017 seed cohorts arrived at various times (more inconsistent than in previous years), however this was due to the high volume purchased

MES tends to prefer “Early seed” (June delivery) ordering strategies as opposed to “Late seed” (July delivery)

Staggered seed deliveries can be very advantageous to spread out the “growth pops” and allow for easier workflow
2018
2018 Quahog Seed

- Trials conducted in bottom grow-out cages in Little Pond, with varying stocking volumes
  - 2,500
  - 5,000
  - 10,000
  - 15,000
- Weight of all estimated quahogs from Little Pond bottom cages: 781.43 kg
- All quahogs grown in Little Pond bottom cages relayed to Green Pond in October 2018
- ~141,500 quahogs runts relayed from Green Pond upweller

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Quahogs</th>
<th>Location</th>
<th>Growth Stats (shell height)</th>
</tr>
</thead>
<tbody>
<tr>
<td>31.27</td>
<td>12,500</td>
<td>Relayed to Great Pond</td>
<td>MINIMUM SIZE 6.9 mm</td>
</tr>
<tr>
<td>23.18</td>
<td>90,000</td>
<td>Relayed to Family Area Bournes Pond</td>
<td>MAXIMUM SIZE 16.1 mm</td>
</tr>
<tr>
<td>34.07</td>
<td>14,000</td>
<td>Relayed to Great Pond</td>
<td>MEDIAN SIZE 9.25 mm</td>
</tr>
<tr>
<td>30.44</td>
<td>12,000</td>
<td>Relayed to Green Pond</td>
<td>AVERAGE SIZE 9.424 mm</td>
</tr>
<tr>
<td>33.09</td>
<td>13,000</td>
<td>Relayed to Family Area Bournes Pond</td>
<td></td>
</tr>
<tr>
<td>152.05</td>
<td>141,500</td>
<td>Total quahogs relayed from Green Pond upweller</td>
<td></td>
</tr>
</tbody>
</table>
2018 Little Pond Quahogs Stocking Trials

- **Green Pond (ARC)**
  - 3 cages each stocked at 2,500 quahogs = 7,500 total
  - 6 cages each stocked at 15,000 quahogs = 90,000 total
  - 6 cages each stocked at 10,000 quahogs = 60,000 total
  - 12 cages each stocked at 10,000 quahogs = 120,000 total
  - 6 cages each stocked at 10,000 quahogs = 60,000 total
  - 6 cages each stocked at 15,000 quahogs = 90,000 total
  - 3 cages each stocked at 2,500 quahogs = 7,500 total

- **West Falmouth (Muscongus)**
  - 12 cages each stocked at 10,000 quahogs = 120,000 total
  - 12 cages each stocked at 5,000 quahogs = 60,000 total
  - 12 cages each stocked at 5,000 quahogs = 60,000 total
  - 6 cages each stocked at 10,000 quahogs = 60,000 total
  - 6 cages each stocked at 5,000 quahogs = 30,000 total
  - 12 cages each stocked at 10,000 quahogs = 120,000 total
  - 6 cages each stocked at 10,000 quahogs = 60,000 total
  - 6 cages each stocked at 5,000 quahogs = 30,000 total

North

Green Pond (ARC)        West Falmouth (Muscongus)
2018 Little Pond Oyster Relays

- Contaminated oyster relays from Little Pond to Green Pond were conducted between November 4th and November 5th, 2018.
- 298 bags of oysters (2,566.33 kg / 5,657.78 lbs of shellfish) were moved on 11/4/2018.
- 352 bags of oysters (1,115.34 kg / 2,458.90 lbs of shellfish) were moved on 11/5/2018.
- Quantities in bushels were not estimated due to the shellfish being of sublegal market size. All shellfish relayed from Little Pond were transported by hand from the water to shore, loaded onto Town of Falmouth MES department vehicles, and driven to Green Pond, where totes of shellfish were loaded onto a department vessel. The sublegal shellfish were relayed to the closed and well-marked southwest corner of Green Pond by vessel.
2018 Falmouth Shellfish Seed Growth

Oyster - Quahog - Bay Scallop

Upweller → Grow Out Gear
2018 Shellfish Data Lessons Learned

• This was the first year MES had experimented with growing multiple species in the same farm area in Little Pond
  • Yielded growth data about multiple species in similar growing environment

• Oysters
  • Oyster growth was consistent with growth rates and sizes observed in previous years
  • Growing fewer oysters allowed MES to focus on growth trials of quahogs and bay scallops

• Quahogs
  • Minimal quahog growth following deployment to grow-out gear
  • While no statistically significant findings, quahogs observed to be larger in cages stocked at 5,000 and 10,000 vs. 2,500 and 15,000 animals

• Bay Scallops
  • Scallops have a tremendous spike in growth following deployment to grow-out gear, even more rapid growth than oysters
  • Little Pond can grow bay scallops!
2018 Bournes Pond Farms

- SMAST and Dr. Howes contracted by the Water Quality Management committee to conduct work relative to nutrient uptake in shellfish
- 3 farms in Bournes Pond containing second year oysters
  - Oyster growth and weight was tracked, and heat maps depicting heaviest bags were generated
Bournes Pond Farm #3 with heat map showing heaviest oyster bags
## 2018 Bournes Pond Farms – Initial Data

<table>
<thead>
<tr>
<th></th>
<th>Farm #1</th>
<th>Farm #2</th>
<th>Farm #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overwintering</strong></td>
<td>Overwintered in Water</td>
<td>Overwintered in Pit</td>
<td>Overwintered in Pit</td>
</tr>
<tr>
<td><strong>% Survival</strong></td>
<td>95.46261909</td>
<td>98.245614</td>
<td>97.8357108</td>
</tr>
<tr>
<td><strong>% Mortality</strong></td>
<td>4.537380914</td>
<td>1.754386</td>
<td>2.16428923</td>
</tr>
<tr>
<td><strong>Avg Wet Weight (g)</strong></td>
<td>8.142857143</td>
<td>15.204</td>
<td>13.5712</td>
</tr>
<tr>
<td><strong>Avg Shell Height</strong></td>
<td>42.85657143</td>
<td>56.9624</td>
<td>49.064</td>
</tr>
</tbody>
</table>

*Due to overwintering*
# 2018 Bournes Pond Farms – Relay Data

<table>
<thead>
<tr>
<th></th>
<th>Farm #1</th>
<th>Farm #2</th>
<th>Farm #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Weight (kg)</td>
<td>15,067.90</td>
<td>4,208.85</td>
<td>1,896.13</td>
</tr>
<tr>
<td>Total Weight (lbs)</td>
<td>33,218.99</td>
<td>9,278.91</td>
<td>4,180.25</td>
</tr>
<tr>
<td>Min. Bag Weight (kg)*</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Max. Bag Weight (kg)</td>
<td>27.15</td>
<td>21.5</td>
<td>22.4</td>
</tr>
<tr>
<td>Med. Bag Weight (kg)</td>
<td>15.6</td>
<td>14.2</td>
<td>15.375</td>
</tr>
<tr>
<td>Avg. Bag Weight (kg)</td>
<td>15.427593</td>
<td>14.076421</td>
<td>14.813516</td>
</tr>
<tr>
<td>Total Bushels Relayed</td>
<td>672.67411</td>
<td>187.89509</td>
<td>84.648661</td>
</tr>
</tbody>
</table>

*Due to gear breaking and oysters falling out of bags
2018 Bournes Pond Data Lessons Learned

• Relayed a total of 21,172.88 kg (46,678.15 lbs) of oysters; approx. 945 bushels
• Overwintering processes used resulted in minimal mortality, with pits having even less mortality (1-2%) than in-water overwintering (4%)
• Oysters on all three farms grew similarly
• 2nd-year oysters grow very quickly, and need to be handled carefully as gear is more likely to break under sustained weights
• Large 2nd-year farms are difficult to manage due to size and location
  • These farms needed to be accessed by boat
  • Bottom suitability made placing these farms very challenging
  • Farm maintenance was difficult due to tides and farm placement
  • Farm location resulted in additional support structures being placed to combat high winds
2018 NERRS Grant Oyster Growth Data

- 2nd Year Bottom
- 2nd Year Mid-Water
- 2nd Year Floating
- 1st Year Bottom
- 1st Year Mid-Water
- 1st Year Floating
2019 Little Pond Quahog Growth Trials
2019 Little Pond Quahog Growth Trials
2019 Little Pond Quahog Growth Trials
2019 Little Pond Quahog Growth Trials
### Plot Survey Findings

<table>
<thead>
<tr>
<th>Control #1</th>
<th>Weight (kg)</th>
<th>Quahog Count</th>
<th>Quahog Volume (mL)</th>
<th>Plot Survey Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.00</td>
<td>395</td>
<td>2750</td>
<td></td>
<td>5 dead quahogs; softshell debris</td>
</tr>
<tr>
<td>Control #2</td>
<td>4.00</td>
<td>641</td>
<td>2500</td>
<td>1 dead quahog; softshell debris, razor clam debris</td>
</tr>
<tr>
<td>Control #3</td>
<td>4.00</td>
<td>375</td>
<td>2500</td>
<td>2 live quahogs, 2 dead quahogs; softshell debris</td>
</tr>
<tr>
<td>Control #4</td>
<td>4.00</td>
<td>457</td>
<td>2600</td>
<td>6 live quahogs, 2 dead quahogs; softshell debris, spider crab</td>
</tr>
</tbody>
</table>

**Total Weight (kg):**

- **Control #1:** 4.00
- **Control #2:** 4.00
- **Control #3:** 4.00
- **Control #4:** 4.00

**Quahog Count:**

- **Control #1:** 395
- **Control #2:** 641
- **Control #3:** 375
- **Control #4:** 457

**Quahog Volume (mL):**

- **Control #1:** 2750
- **Control #2:** 2500
- **Control #3:** 2500
- **Control #4:** 2600

---

<table>
<thead>
<tr>
<th>Mesh #1</th>
<th>Weight (kg)</th>
<th>Quahog Count</th>
<th>Quahog Volume (mL)</th>
<th>Plot Survey Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.00</td>
<td>588</td>
<td>-</td>
<td></td>
<td>1 live quahog</td>
</tr>
<tr>
<td>Mesh #2</td>
<td>4.00</td>
<td>365</td>
<td>-</td>
<td>2 dead quahogs</td>
</tr>
<tr>
<td>Mesh #3</td>
<td>4.00</td>
<td>329</td>
<td>-</td>
<td>4 dead quahogs; softshell debris</td>
</tr>
<tr>
<td>Mesh #4</td>
<td>4.00</td>
<td>387</td>
<td>-</td>
<td>2 live quahogs, 1 dead quahog, softshell debris</td>
</tr>
</tbody>
</table>

**Total Weight (kg):**

- **Mesh #1:** 4.00
- **Mesh #2:** 4.00
- **Mesh #3:** 4.00
- **Mesh #4:** 4.00

**Quahog Count:**

- **Mesh #1:** 588
- **Mesh #2:** 365
- **Mesh #3:** 329
- **Mesh #4:** 387

**Quahog Volume (mL):**

- **Mesh #1:** -
- **Mesh #2:** -
- **Mesh #3:** -
- **Mesh #4:** -

---

**Control plots installed 5/21/2019**

**Mesh plots installed 5/14/2019**
### Plot Survey Findings

<table>
<thead>
<tr>
<th>Plot</th>
<th>Total Weight (kg)</th>
<th>Quahog Count</th>
<th>Quahog Volume (mL)</th>
<th>Plot Survey Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Florida Bag #1</strong></td>
<td>4.00</td>
<td>453</td>
<td>2400</td>
<td>Scallop debris</td>
</tr>
<tr>
<td><strong>Florida Bag #2</strong></td>
<td>4.00</td>
<td>502</td>
<td>2750</td>
<td>5 live quahogs, 1 dead quahog</td>
</tr>
<tr>
<td><strong>Florida Bag #3</strong></td>
<td>4.00</td>
<td>409</td>
<td>2400</td>
<td>20 live quahogs, 8 dead quahogs</td>
</tr>
<tr>
<td><strong>Florida Bag #4</strong></td>
<td>4.00</td>
<td>645</td>
<td>2250</td>
<td>Only substrate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plot</th>
<th>Total Weight (kg)</th>
<th>Quahog Count</th>
<th>Quahog Volume (mL)</th>
<th>Plot Survey Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SBS #1</strong></td>
<td>4.00</td>
<td>547</td>
<td>2750</td>
<td>2 live quahogs, 1 dead quahog</td>
</tr>
<tr>
<td><strong>SBS #2</strong></td>
<td>4.00</td>
<td>461</td>
<td>2000</td>
<td>4 live quahogs, 1 dead quahog</td>
</tr>
<tr>
<td><strong>SBS #3</strong></td>
<td>4.00</td>
<td>546</td>
<td>2300</td>
<td>3 live quahogs</td>
</tr>
<tr>
<td><strong>SBS #4</strong></td>
<td>4.00</td>
<td>407</td>
<td>2600</td>
<td>Spider crab</td>
</tr>
</tbody>
</table>

Florida Bag plots installed 5/21/2019
Side-by-side oyster bag plots installed 5/21/2019
## 2019 Little Pond Quahog Growth Trials

<table>
<thead>
<tr>
<th></th>
<th>Starting Weight (kg)</th>
<th>Starting Count</th>
<th>Removed Live Weight (kg)</th>
<th>Removed Live Count</th>
<th>Count Change</th>
<th>Living Biomass Change (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control #1</td>
<td>4.00</td>
<td>395</td>
<td>4.08</td>
<td>235</td>
<td>-160</td>
<td>0.08</td>
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<tr>
<td>Control #2</td>
<td>4.00</td>
<td>641</td>
<td>4.98</td>
<td>347</td>
<td>-294</td>
<td>0.98</td>
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<tr>
<td>Control #3</td>
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<td>375</td>
<td>6.06</td>
<td>304</td>
<td>-69</td>
<td>2.06</td>
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<tr>
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<td>457</td>
<td>3.3</td>
<td>202</td>
<td>-255</td>
<td>-0.70</td>
</tr>
<tr>
<td>Mesh #1</td>
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<td>588</td>
<td>3.55</td>
<td>358</td>
<td>-230</td>
<td>-0.45</td>
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<tr>
<td>Mesh #2</td>
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<td>365</td>
<td>4.01</td>
<td>284</td>
<td>-81</td>
<td>0.01</td>
</tr>
<tr>
<td>Mesh #3</td>
<td>4.00</td>
<td>329</td>
<td>6.06</td>
<td>395</td>
<td>66</td>
<td>2.06</td>
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<tr>
<td>Mesh #4</td>
<td>4.00</td>
<td>387</td>
<td>4.81</td>
<td>319</td>
<td>-68</td>
<td>0.81</td>
</tr>
<tr>
<td>Florida Bag #1</td>
<td>4.00</td>
<td>453</td>
<td>8.33</td>
<td>408</td>
<td>-45</td>
<td>4.33</td>
</tr>
<tr>
<td>Florida Bag #2</td>
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<td>502</td>
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<td>441</td>
<td>-61</td>
<td>2.70</td>
</tr>
<tr>
<td>Florida Bag #3</td>
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<td>409</td>
<td>6.26</td>
<td>353</td>
<td>-56</td>
<td>2.26</td>
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<tr>
<td>Florida Bag #4</td>
<td>4.00</td>
<td>645</td>
<td>6.61</td>
<td>469</td>
<td>-176</td>
<td>2.61</td>
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<tr>
<td>SBS #1</td>
<td>4.00</td>
<td>547</td>
<td>9.2</td>
<td>557</td>
<td>10</td>
<td>5.20</td>
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<td>420</td>
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<td>2.69</td>
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<td>546</td>
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<td>502</td>
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<td>2.59</td>
</tr>
<tr>
<td>SBS #4</td>
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<td>407</td>
<td>5.96</td>
<td>374</td>
<td>-33</td>
<td>1.96</td>
</tr>
</tbody>
</table>
2019 Little Pond Quahog Growth Trial Results

• Plots in High Velocity area experienced more biomass gain than plots in lower velocity area
• Enclosed gear types (Florida Bag and Side by Side bags) experienced less animal loss
• Plots with Firm substrate experienced more biomass gain than plots with Soft substrate
• Plots with Firm substrate experienced less animal loss than plots with Soft substrate
2019 Quahogs

• Deployed estimated ~750,000 quahogs from upwellers to bottom cages at Deacon’s Ave (October 2019)

• Remaining quahogs (estimated ~ 1.2 million) grown in bottom cages in Little Pond (from upwellers) and later approx. evenly distributed to edges of Bournes Pond, Bournes Pond Family Area, West Falmouth Center Flat, West Falmouth Family Area, and Great Pond, from Brockton St to Boston Street (estimated 240,000 to each area).
2019 Bay Scallops

2019 Little Pond Scallop Growth Data

- West Falmouth 1 - Tray (9/9/2019)
- West Falmouth 2 - Tray (9/9/2019)
- Ward Aquafarms 1 - Bag (9/9/2019)
- Ward Aquafarms 2 - Tray (9/20/2019)
2019 Bay Scallops

- Used various types of scallop grow-out gear (scallop bag, modified floating quahog trays, lantern net) and four scallop seed cohorts to look for a difference in farm growth with early vs late deployment dates and differing initial stocking size
- Later deployment of scallop seed to farm gear resulted in consistently greater scallop growth
- Developed a seawater circulating tank for seeding scallops, which proved immensely helpful in scallop survival during seeding
<table>
<thead>
<tr>
<th>Farm</th>
<th>Oysters</th>
<th>Price per Bag</th>
<th>Bags</th>
<th>Total Oysters</th>
</tr>
</thead>
<tbody>
<tr>
<td>#2</td>
<td>Oysters</td>
<td>400/bag</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>Oysters</td>
<td>400/bag</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td>Oysters</td>
<td>400/bag</td>
<td>645/bag</td>
<td>(248,525)</td>
</tr>
</tbody>
</table>

22 strings are 4-mm bags

Farm #2 – Oysters
400/bag

10 rows of 14 = 140 bags
(1 of the rows of 14 only has 6 bags of 1st year oysters; 8 bags are 2nd year oysters)
8 rows of 13 = 104 bags
12 rows of 12 = 144 bags
**TOTAL 388 BAGS (155,200 OYSTERS)**

Farm #3 – Oysters
400/bag

4 rows of 13 = 52 bags
24 rows of 14 = 336 bags
3 rows of 15 = 45 bags
**TOTAL 433 BAGS (173,200 OYSTERS)**

Farm #4 – Oysters
400/bag
645/bag

18 rows of 14 = 252 bags
11 rows of 13 = 143 bags
1 row of 15 = 15 bags
**TOTAL 410 BAGS (248,525 OYSTERS)**

345 bags at 645/bag; 65 bags at 400/bag

All are 6-mm bags

All are 6-mm bags

2019 Little Pond Oyster Farm Schematic
Rev. 8/27/19
2019 Waquoit Bay Farms
2019 Waquoit Bay
2nd-Year Oysters Shell Growth

Average Oyster Shell Height (mm)

Sampling Date:
- 5/30/2019
- 6/13/2019
- 6/26/2019
- 7/9/2019
- 7/23/2019
- 8/8/2019
- 8/27/2019
- 10/9/2019

Bottom: 71.108
Floating: 87.677
Midwater: 81.076

2019 Waquoit Bay
2nd-Year Oysters Weight

Average Oyster Weight (g)

Sampling Date:
- 5/30/2019
- 6/13/2019
- 6/26/2019
- 7/9/2019
- 7/23/2019
- 8/8/2019
- 8/27/2019
- 10/9/2019

Bottom: 35.405
Floating: 47.253
Midwater: 58.297

### Average Oyster Shell Height (mm)

**2019 Waquoit Bay 1st-Year Oysters Shell Growth**

- **Bottom**: 46.68 mm
- **Floating**: 45.16 mm
- **Midwater**: 44.50666667 mm

### Average Oyster Weight (g)

**2019 Waquoit Bay 1st-Year Oysters Weight**

- **Bottom**: 11.944 g
- **Floating**: 8.804 g
- **Midwater**: 8.764 g
2019 Oyster Relays (Grown in 2018)

- Oysters in overwintered in pits in December 2018
- Seeded approx. 30,000 oysters (319.7529 kg) in Green Pond Family Area (Vineyard St) in March 2019
- Seeded approx. 69,000 (692.68 kg) in West Falmouth Family Area in March 2019
2019 Oyster Relays (Grown in 2019)

• Entirety of oysters grown on 2019 Little Pond Farms (approx. 642,000) in overwintered in pits in December 2019
  • To be seeded in March 2020 and available for harvest in October 2020
• All second-year oysters grown on 2019 SMAST Bournes Pond farm (approx. 25,000 oysters) were relayed to the West Falmouth Family Area in December 2019
• First-year oysters grown on 2019 Waquoit Bay NERRS Grant Project farm (approx. 108,000) were relayed to Green Pond southeast corner
• Second-year oysters grown on 2019 Waquoit Bay NERRS Grant Project farm (approx. 61,000) were relayed to West Falmouth Harbor Family Area
# Volunteer Service Hours

<table>
<thead>
<tr>
<th>Month</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>229</td>
<td>304</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>31</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>288</td>
<td>136</td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>351</td>
<td>204</td>
<td>403.5</td>
</tr>
<tr>
<td>May</td>
<td>299.5</td>
<td>404.5</td>
<td>398.5</td>
</tr>
<tr>
<td>June</td>
<td>129</td>
<td>143</td>
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<tr>
<td>July</td>
<td>200</td>
<td>334.5</td>
<td>600</td>
</tr>
<tr>
<td>August</td>
<td>218.5</td>
<td>171</td>
<td>320.5</td>
</tr>
<tr>
<td>September</td>
<td>128</td>
<td>176</td>
<td>456.5</td>
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<tr>
<td>October</td>
<td>494.5</td>
<td>1079.5</td>
<td>481.75</td>
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<tr>
<td>November</td>
<td>203.5</td>
<td>287.5</td>
<td>241.75</td>
</tr>
<tr>
<td>December</td>
<td>0</td>
<td>1376.5</td>
<td>464</td>
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</table>

<table>
<thead>
<tr>
<th>Project</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shellfish bag building</td>
<td>237</td>
<td>431</td>
<td>413</td>
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<tr>
<td>Overwintering work</td>
<td>203.5</td>
<td>656</td>
<td>303</td>
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<tr>
<td>Upweller care</td>
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<td>134.5</td>
</tr>
<tr>
<td>SMAST project</td>
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</tr>
<tr>
<td>Bay scallops propagation</td>
<td>120</td>
<td>124.5</td>
<td>288.5</td>
</tr>
<tr>
<td>Little Pond maintenance</td>
<td>143.5</td>
<td>110.5</td>
<td>306</td>
</tr>
<tr>
<td>Oyster relays</td>
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<td>844</td>
<td>783</td>
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<tr>
<td>Quahog relays</td>
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<td>165</td>
<td>261</td>
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<tr>
<td>Other projects</td>
<td>562.5</td>
<td>1251.5</td>
<td>1686.5</td>
</tr>
</tbody>
</table>

**TOTAL** 2024 3582.5 4175.5
2020 MES Shellfish Internship

• Produced a professional video for marketing internship opportunities to students at New England colleges/universities and high schools

• MES is able to offer a very unique learning experience for students interested in natural resource management, marine science, shellfish aquaculture and husbandry

• Targeted 52 schools, sending application materials and a copy of internship video to department head contacts

• Application deadline for preference of February 14, 2020

• Interns will start in late spring/summer 2020
Targeted Schools for 2020 Intern Candidates

Tabor Academy
Upper Cape Tech
Cape Cod Regional Tech
Falmouth High School
Minuteman High School
The Sound School
Massachusetts Academy of Math and Science at WPI
Advanced Math and Science Academy
Landmark School
Falmouth Academy
Cape Cod Academy
Bourne High School
Barnstable High School
Sandwich High School
Trinity Christian Academy of Cape Cod
Dennis-Yarmouth Regional High School
Sturgis Charter Public School East
Sturgis Charter Public School West
Monomoy Regional High School
St. John Paul II High School
Martha’s Vineyard Regional High School
Sacred Heart School
Greater New Bedford Regional Vocational Technical High School
Norfolk County Agricultural High School

Boston College
Northeastern University
University of Massachusetts Amherst
Simmons College
Lesley University
Suffolk University
UMass Boston
Stonehill College
Wheaton College
Endicott College
Cape Cod Community College
Massachusetts Maritime Academy
UMass Dartmouth
Roger Williams University
Salve Regina University
University of Maine at Orono
Bristol Community College
University of New England
Colby-Sawyer College
Central Connecticut State University
Saint Anselm College
Unity College
Bowdoin
Bates
University of Rhode Island
University of Southern Maine
Massasoit Community College