Butter Clams: the Culture
Juvenile Surf Clams
Surf Clams (*Spisula solidissima*) aka “butter clams”

- Shellfish aquaculture in NE growing at rapid pace
- MA farm gate value for shellfish exceeds $27 million (DMF)
  - oyster aquaculture accounts for >90%
- Monocultures risky
  - alternative species to augment hard clam & oyster crops
- Continued interest in growing surf clams at “butter clam” size
  - goal of a 1-year product
Early Local Research

- Karl Rask (Resource, Inc. Orleans, MA) 1996 intertidal study
- 4-5mm locally-produced seed placed in nursery cages during summer ‘96
- By Oct. ‘96 seed was 40mm average size – planted on bottom and bags
- Clams grew to average size 50mm the following year, demonstrating a market size product, produced intertidally in 1-year in New England
- 1998 SEMAC Mini-Grant: *Raising Surf Clams on the Brewster Flats*

![Graph showing average shell length over time](image)

- Seed planted March ‘98 vs June ‘98
- August 1998

\[
y = 0.1032x - 3693.9 \\
R^2 = 0.9107
\]
Local Research

• Mid 1990’s Karl Rask

• SEMAC Mini-Grants (1998 – 2011)
  1998 Raising Surf Clams on the Brewster Flats
  1998 Raising Surf Clams in Barnstable Harbor
  1998 Growing Butter Clams in P-Town Harbor
  1999 Sub-tidal Aquaculture of Spisula solidissima
  2004 Research of Yearling Surf Clams in P-Town
  2007 Experimental Nursery & Marketing of Spisula solidissima on Lower Cape Cod
  2007 Development of Experimental Technology in the Aquaculture of Yearling Surf
    Clams in P-town & Truro
  2011 Experimental Shellfish Growth Rate Assessment

• ARC
Wholesale Seafood Dealer Survey* Results – ‘butter clams’

- *Customer* interest in purchasing butter clams? 47% interested

*Survey (2014) conducted for SEMAC by: UMass, Center for Marketing Research, Dartmouth*
Wholesale Seafood Dealer Survey Results – ‘butter clams’

- *Wholesale dealer* interest in selling butter clams? 43% interested
- Dealer concerns, “Illegal...legal size minimum”
- Prices paid in 2013 ranged $.18 – $.50/piece

*Survey (2014) conducted for SEMAC by: UMass, Center for Marketing Research, Dartmouth*
Current Research

• 2015 local hatchery (ARC) spawn of surf clams
• 50,000 – 60,000 4-6mm seed were available

Goals:
1) Deploy seed at several sites
2) Monitor growth & survival
3) Gain insight into the needs of this species for aquaculture
   o Water & sediment conditions
   o Temperature
   o Handling
   o Gear
   o Planting density
   o Predation
Study Sites

- 2 primary Cape Cod sites – Barnstable Harbor and Wellfleet
Wellfleet Surf Clams

• Nursey boxes to quahog runs
• Late Fall 2015

Planted at 6 – 8mm in June 2015 into nursery boxes
Wellfleet Surf Clams – Growth

• Doubled in size from August ‘15 to January ‘16
  • a little over 5 months or 23 weeks
• Tripled in size from August ‘15 to July ‘16

\[ y = 0.0859x - 3607 \]
\[ R^2 = 0.9513 \]
Barnstable Surf Clams – 5 Sites

- 4 sites with Tenex mesh nets (14’ x 20’)
  - low intertidal
- 1 site with small wire mesh cages
  - high intertidal
Growth – All Cape Cod Sites

Surf Clam Growth 2015 - 2016

~75 – 80% survival
### Annual Growth Comparison – Atlantic Coast

Table 1: Annual growth rates of surf clams at different locations along the Atlantic Coast of the United States (Goldberg and Walker 1990).

<table>
<thead>
<tr>
<th>Location</th>
<th>Initial Length (mm)</th>
<th>Final Length (mm)</th>
<th>Length Increase (mm/yr)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milford, CT (Long Island Sound)</td>
<td>15.7</td>
<td>47.3</td>
<td>31.6</td>
<td>Goldberg 1989</td>
</tr>
<tr>
<td>Point Pleasant, NJ</td>
<td>38.0</td>
<td>62.0</td>
<td>24.0</td>
<td>Jones et al. 1978</td>
</tr>
<tr>
<td>Barnegat Bay, NJ</td>
<td>34.0</td>
<td>56.0</td>
<td>22.0</td>
<td>Chang et al. 1976</td>
</tr>
<tr>
<td>Ocean City, MD</td>
<td>39.0</td>
<td>57.0</td>
<td>18.0</td>
<td>Chang et al. 1976</td>
</tr>
<tr>
<td>Chincoteague Bay, VA</td>
<td>42.2</td>
<td>68.6</td>
<td>26.4</td>
<td>Ropes 1969</td>
</tr>
<tr>
<td>Wassaw Sound, GA</td>
<td>21.8</td>
<td>51.0</td>
<td>29.4</td>
<td>Goldberg &amp; Walker 1990</td>
</tr>
<tr>
<td>Barnstable, MA</td>
<td>18.4</td>
<td>46.7</td>
<td>28.3</td>
<td>Murphy &amp; Reitsma 2016</td>
</tr>
<tr>
<td>Wellfleet, MA</td>
<td>16.84</td>
<td>50.8</td>
<td>33.96</td>
<td>Murphy &amp; Reitsma 2016</td>
</tr>
</tbody>
</table>
1-Year Growth

• Growth 18.4mm to 46.7mm in one year (154% increase)

Barnstable Rendez-Vous Site

Valve Length (mm)

0 10 20 30 40 50 60


y = 0.0696x - 2918.5
R² = 0.963
Density Treatment

- Rendez-vous site, Barnstable, MA
- Mesh trays @ 3 densities
**Shelf Life**

- Keep cool
- Keep moist
- Best quality 8 days
- Use within 9 - 13

<table>
<thead>
<tr>
<th>Test #1</th>
<th>12 clams - Uncovered Bowl</th>
<th>Shelf Life Days</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>9 10 11 12 13 14</td>
</tr>
<tr>
<td>close when disturbed</td>
<td>12 12 10 10</td>
<td>9</td>
</tr>
<tr>
<td>slow to close</td>
<td>2 2</td>
<td>8 5</td>
</tr>
<tr>
<td>remain gaped open</td>
<td></td>
<td>3 4 7</td>
</tr>
<tr>
<td>odor?</td>
<td></td>
<td>X</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Test #2</th>
<th>15 clams - Unsealed Plastic Bag</th>
<th>Shelf Life Days</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>9 10 11 12 13 14</td>
</tr>
<tr>
<td>close when disturbed</td>
<td>15 15 15</td>
<td>15 15 15 12</td>
</tr>
<tr>
<td>slow to close</td>
<td></td>
<td></td>
</tr>
<tr>
<td>remain gaped open</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>odor?</td>
<td></td>
<td>X</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Test #3 A - Unsealed Plastic Bag</th>
<th>Shelf Life Days</th>
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<tbody>
<tr>
<td>B - Paper Cup</td>
<td>9 10 11 12 13 14</td>
</tr>
<tr>
<td>A - 16 clams</td>
<td></td>
</tr>
<tr>
<td>close when disturbed</td>
<td>16 16 16</td>
</tr>
<tr>
<td>slow to close</td>
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</tr>
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<td></td>
</tr>
<tr>
<td>odor?</td>
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</tr>
<tr>
<td>B - 12 clams</td>
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</tr>
<tr>
<td>close when disturbed</td>
<td>12 12 12</td>
</tr>
<tr>
<td>slow to close</td>
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Risks: Predation

• Moon snails and crabs
Next Steps

Goals of recent Saltonstall-Kennedy grant:

1. Determine best location and conditions to commercially grow out surf clam seed

2. Evaluate commercial feasibility to provide wholesale & retail markets with ‘new’ product
   - Evaluate best strategies (temperature, sediment type, tidal height, gear, predator control) for aquaculture of this species
   - Fine tune hatchery production of surf clam seed – demonstrate commercial-scale production capacity
   - Identify appropriate locations for surf clam culture
   - Determine effective grow out technologies
   - Document all costs associated with surf clam production
   - Initiate formulation of a marketing strategy