Survival and Growth of Cultured Hard Clam Seed Planted in Spring, Summer and Fall in Long Island, New York Waters

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Some Background

- 87% decline in ‘wild’ hard clam landings in New York since 1976
- Decline of bay scallop, lobster and inshore fisheries due to brown tide, disease and regulation has put additional pressure on hard clam fishery
- Twelve of the thirteen L.I. towns have hard clam resource enhancement programs; there are three public hatcheries
- Harvest returns of notata variety clams in local harvests have generally been erratic; in some cases, the recovery of overall hard clam populations has not seemed to meet with community expectations.

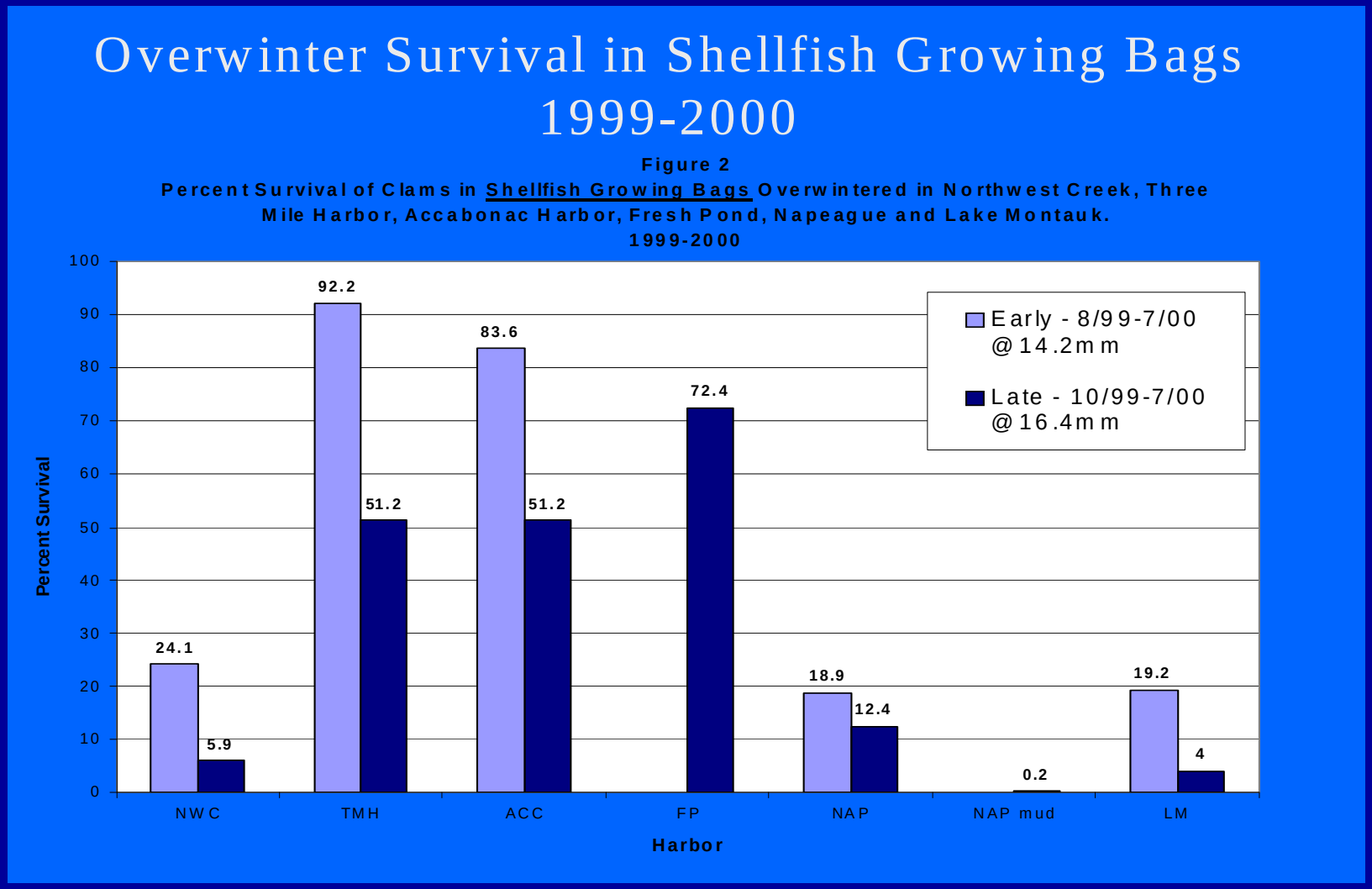
Typical Practices

- A town's own or purchased seed is grown through one season at high density in protected grow out systems
- At best, seed averages ~15mm shell length in a NY season
- Seed is distributed into uncultivated public bottom in fall, often favoring traditionally productive sites
- In some cases, seeding begins earlier to thin growing systems
- Little overwintering is done, due to effort required

Research Has Shown - But

- Seed density and size influences predation
  - But, the public expects concentrated harvests and seed size immune to predation can’t be achieved in one season in NY
- Large sediment grain sizes offer some protection from predators
  - But, many traditionally productive areas exhibit other characteristics
- Overwinter survival of protected seed, planted in the fall, showed good survival over a range of sizes
  - But, the public expects the enhancement of ‘natural habitats’, precluding concentrated protected plantings
  - And…

Overwinter Survival of Smaller Seed Planted Earlier Seemed Greater Than That of Larger Seed Planted Later

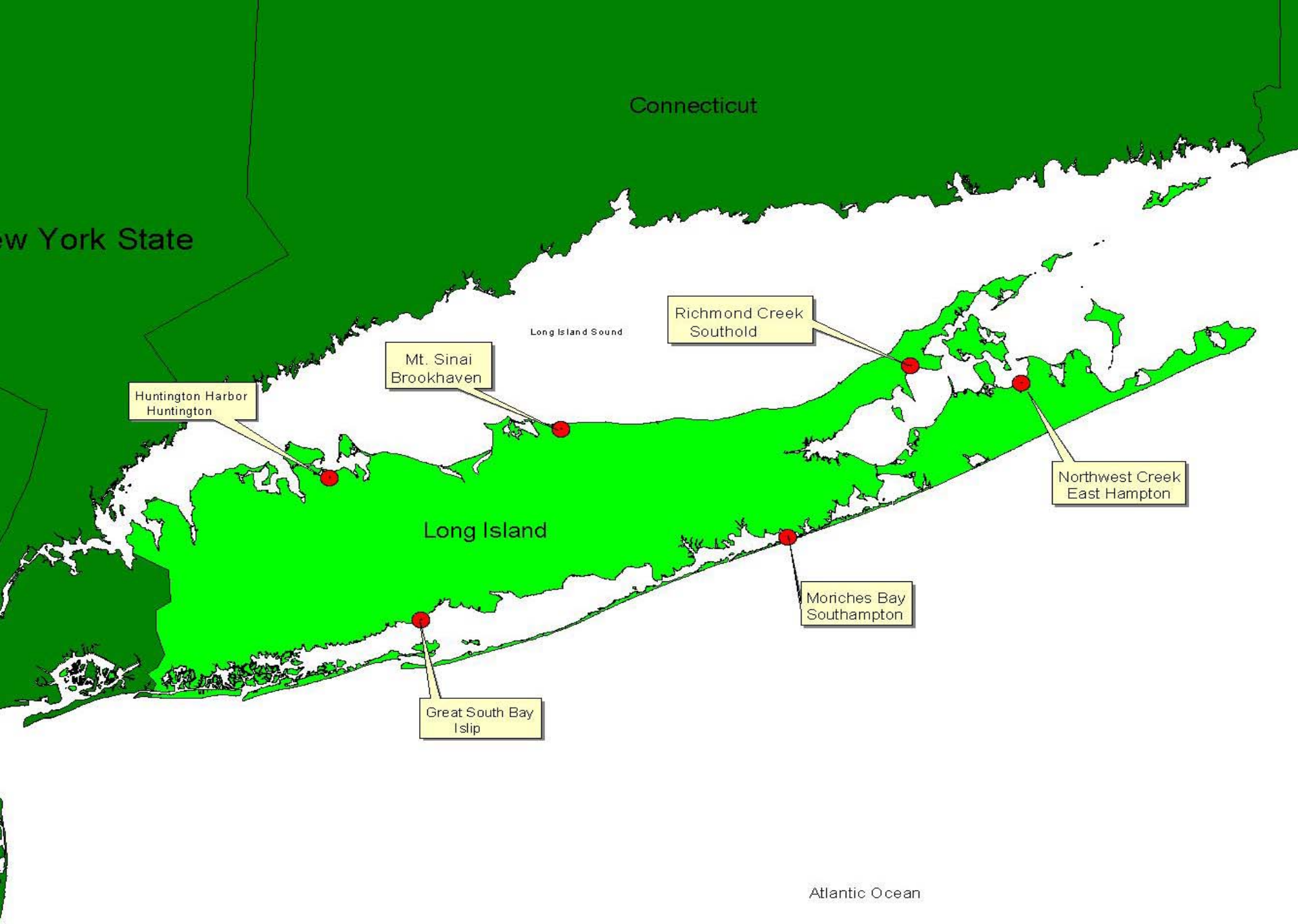


Objectives

- Determine relative survival of hatchery produced clam seed field planted through the growing season using seed typically available at the time
- Test the overall hypothesis that seed size and planting time will not significantly affect overall survival into the next growing season
- If so, earlier distribution of smaller seed will be a viable management strategy, allowing for more seed production in finite culture space, resulting in an overall increase of recruitment into the fishery

Hypotheses Tested

- Small seed planted early will be larger and in better condition than larger seed planted late, exhibiting better overwinter survival
- Small, early planted seed is expected to suffer higher predation losses than large, late planted seed, but predator related mortality will be large for all plantings, rendering size specific differences unimportant
- Better condition of small seed will counterbalance increased predation; survival of different plantings into the next season will be similar


Connecticut
ew York State
Long Island Sound
Richmond Creek
Southold
Mt. Sinai
Brookhaven
Huntington Harbor
Huntington
Northwest Creek
East Hampton
Long Island
Moriches Bay
Southampton
Great South Bay
Islip
Atlantic Ocean

Research Plan

- Plant the same cohort three times: June, August, October at 25 clams/m^2
- Six locations, different conditions, no site preparation
- Triplicate, large scale plantings (900m^2) plus netted control boxes
- At each planting look for clams from previous plantings (4, one square meter quadrats per plot)
- Exhaustively sample all 54 plots during the following summer (120, one square meter quadrats per plot)

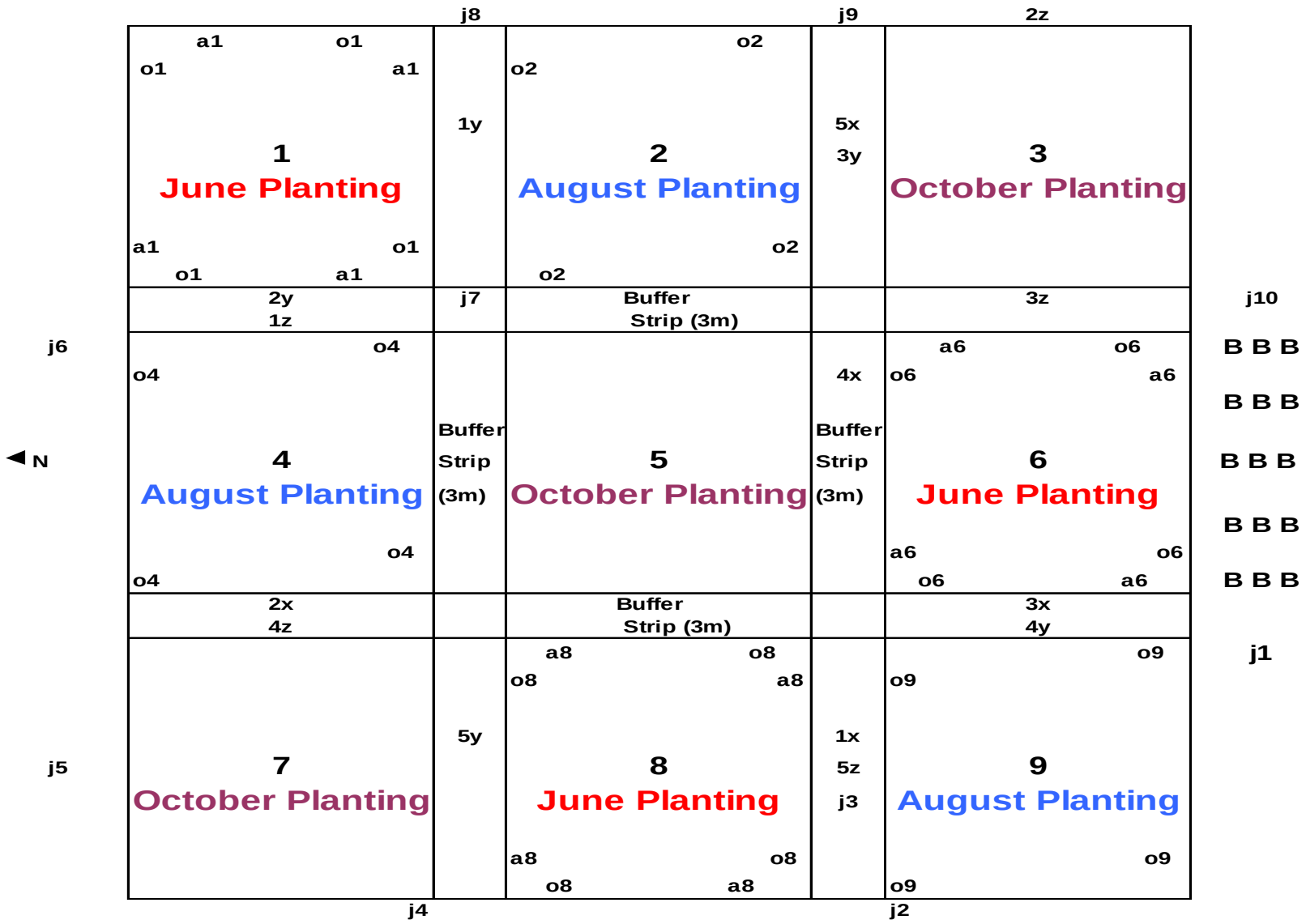
Research Plan

- Perform predator surveys using five methods (Green, Blue crab traps, shell bags, suction dredge, diver observation)
- Sediment grain size analyses
- Initial and final clam condition indices
- Temperature recorders at each site
- Monitor sites for presence of harmful algae (Suffolk County Dept. Health Services)
- Mark corners of each plot with earth anchors, GPS points and buried rebar (216 total)

Pre-test retrieval of clam seed and colored stone by suction dredge after ± 6 hours (30mx30m plot)

	#Seeded/m²	#Retrieved/m²	% return
2001 notata	33	20.7(sd=9.4)	**62.2**
2001 stone	33	24.9(sd=15.3)	**72.3**
2002 notata	25	15.9(sd=6.1)	**63.6**
2002 stone	25	19.1(sd=7.7)	**76.4**

30mx30m Plot Set-up
Latin Square Configuration

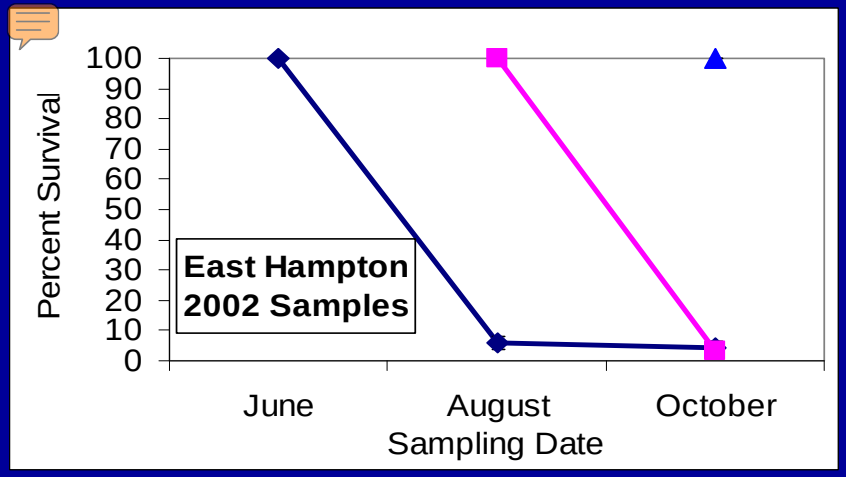


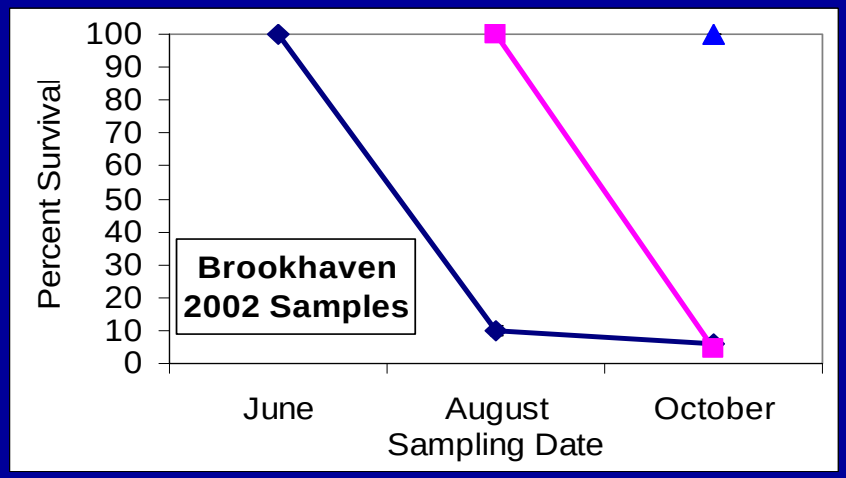
Key

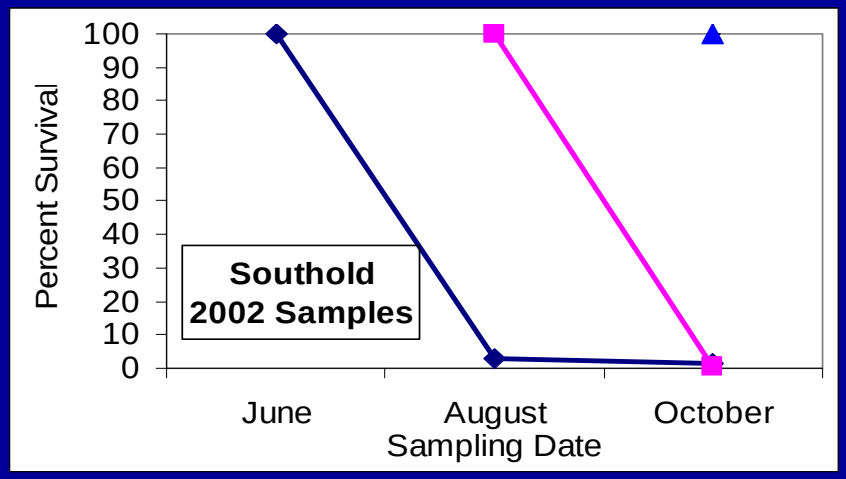
traps (green, blue, shell bag	suction dredging	B= boxes(June, August, October)
x= June	j= June (10 for predators)	
y= August	a= August (12 for predators+seed)	
z= October	o= October (12 for predators+seed)	

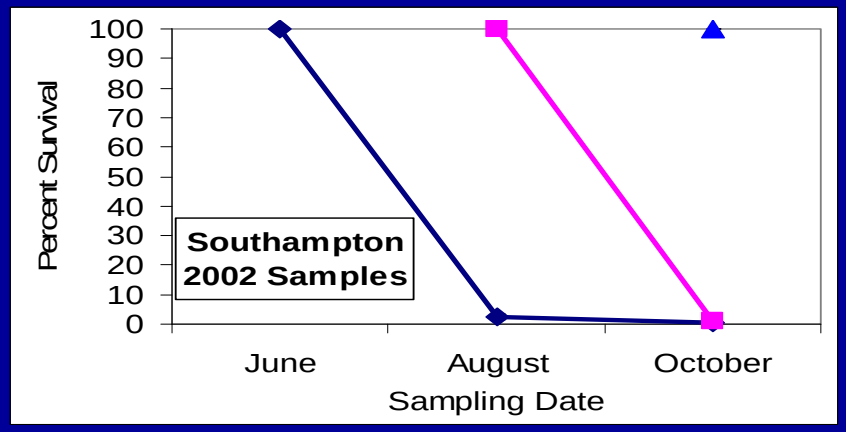
Laying out plots

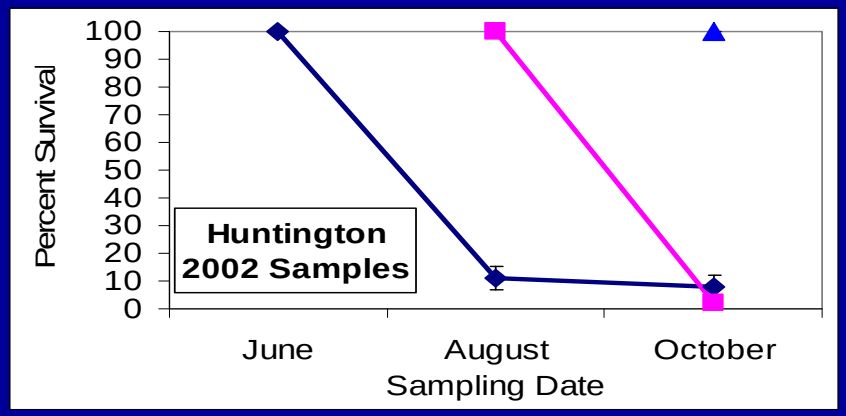
Earth Anchor & Ice

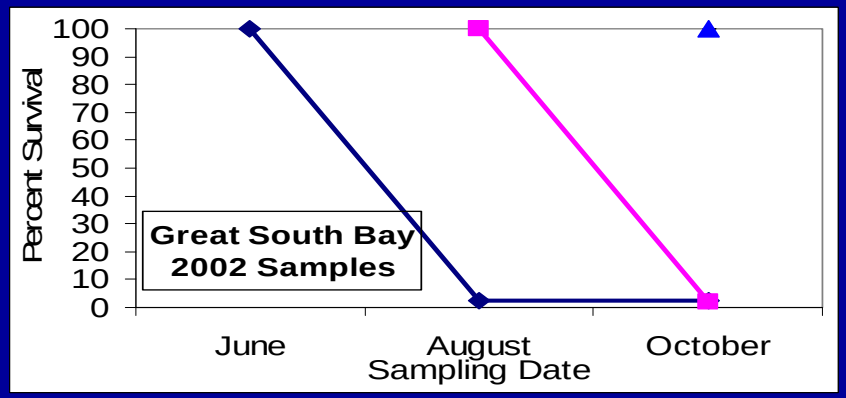




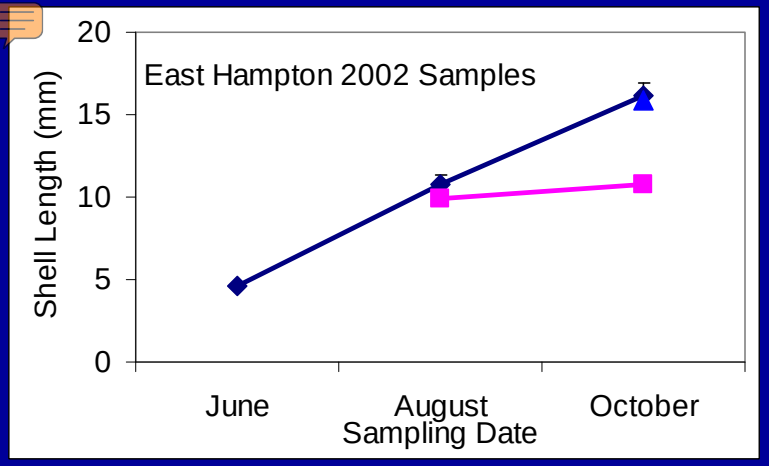


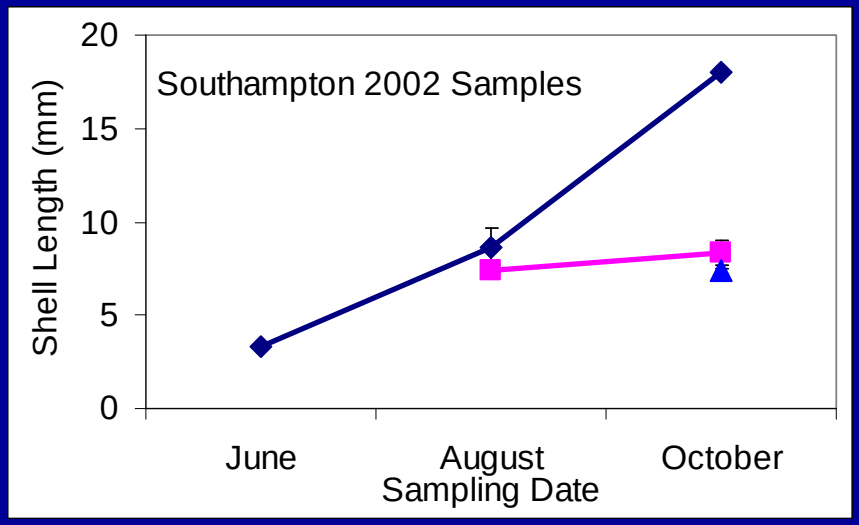


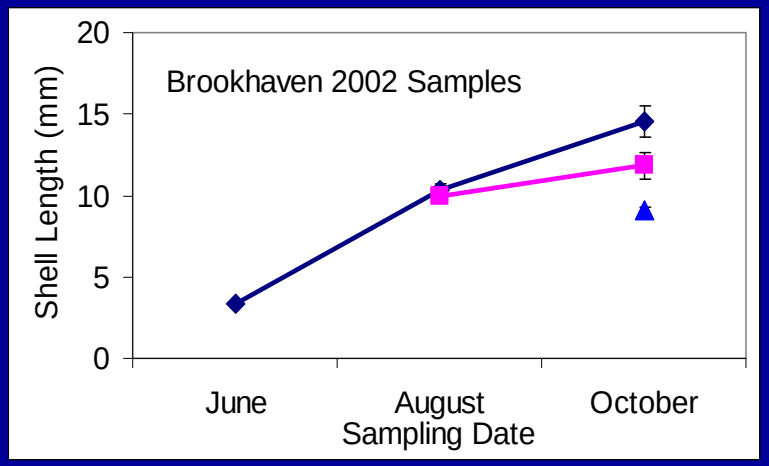


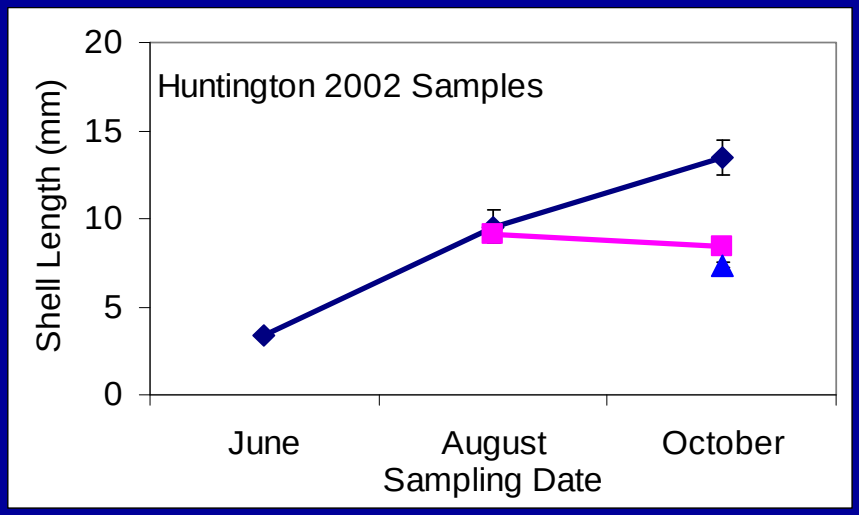


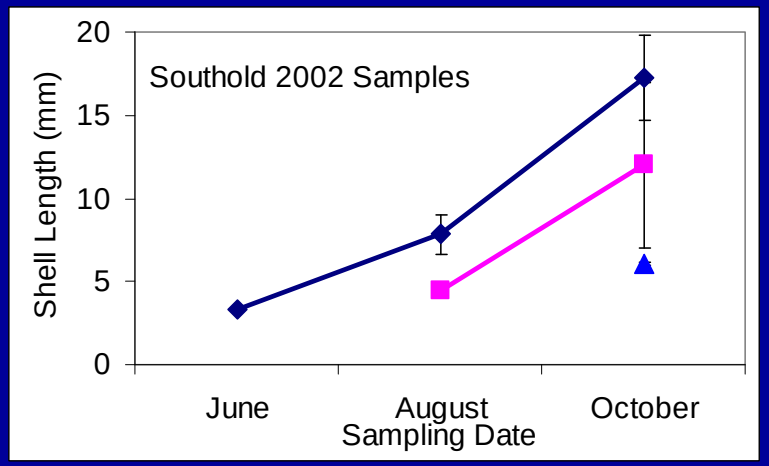
2002 Large Plot Interim Suction Samples – Survival











Great South Bay not yet available

2002 Large Plot Interim Suction Samples – Shell Length

Mid-winter Ice

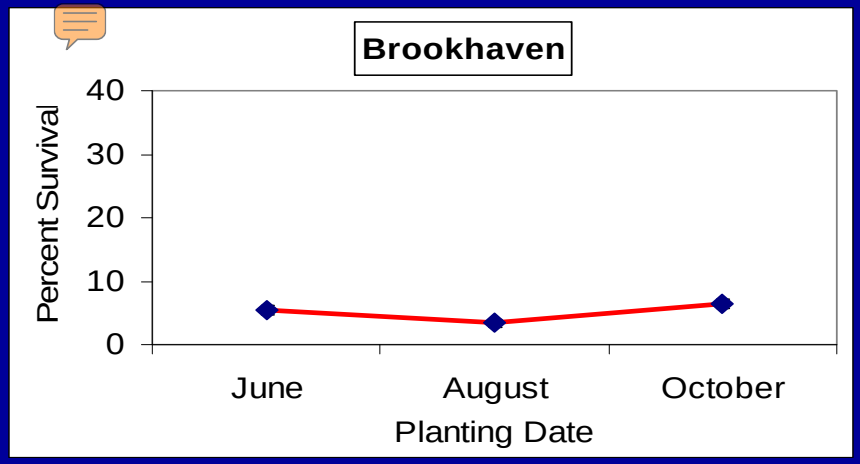
Suction Dredge Rig

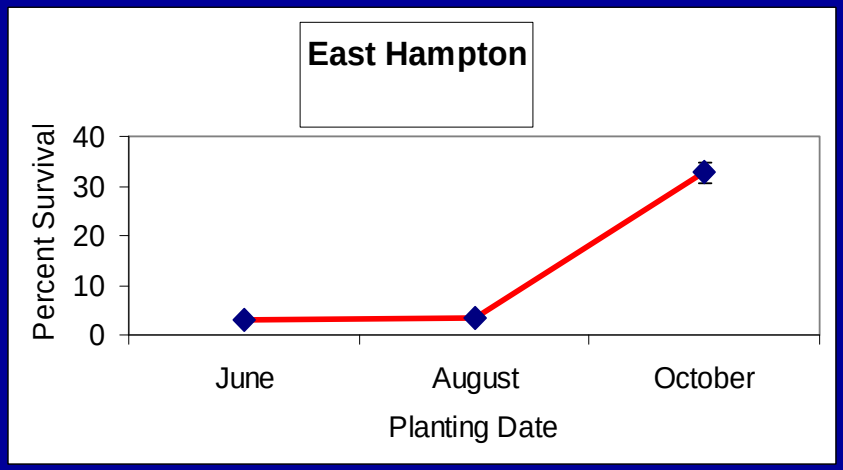
Suction sampling in shallow water

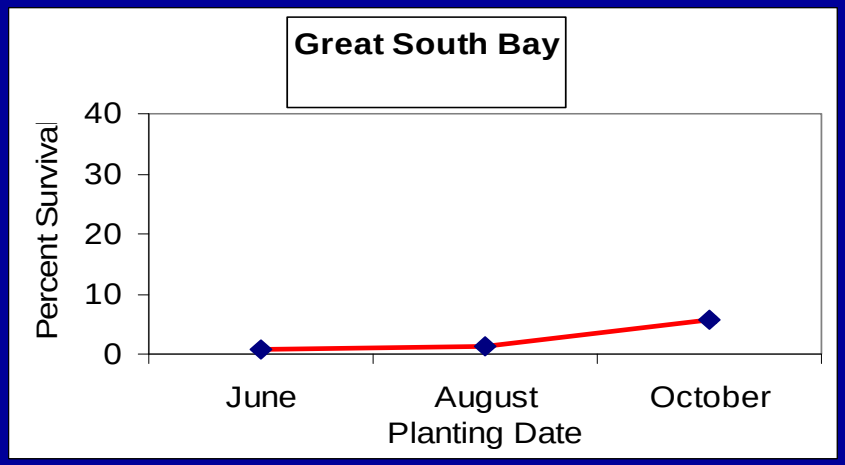
Samplers working through quadrat markers

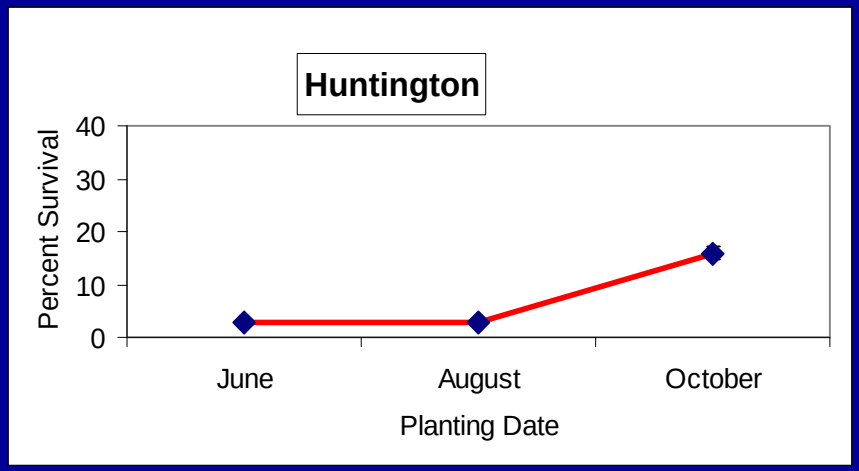
Sample from shell hash bottom

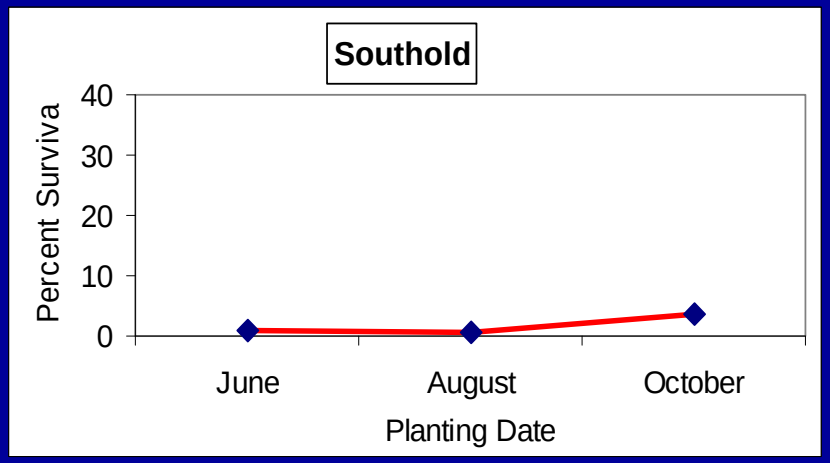
Retrieved seed





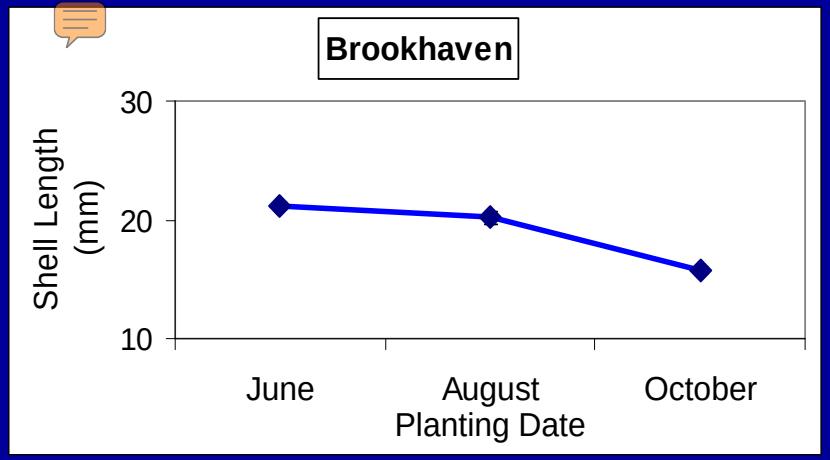


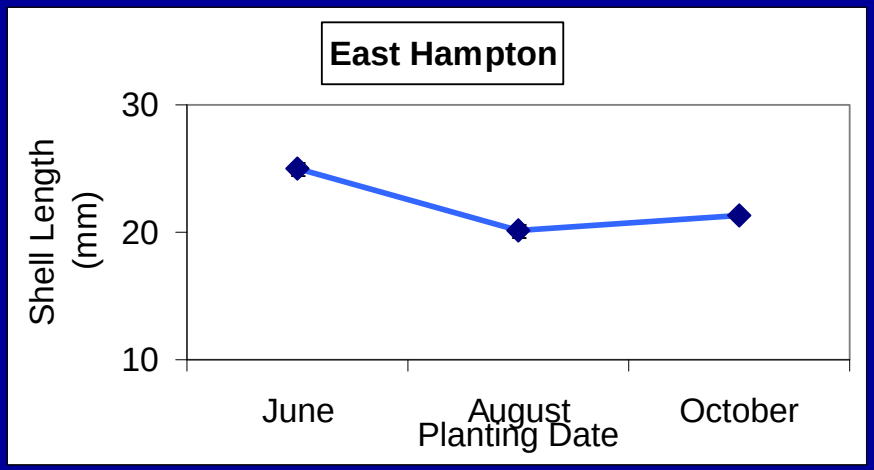


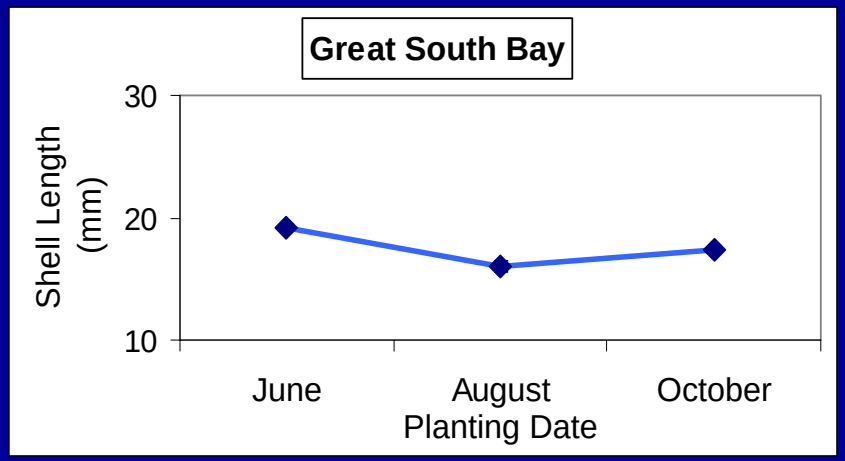


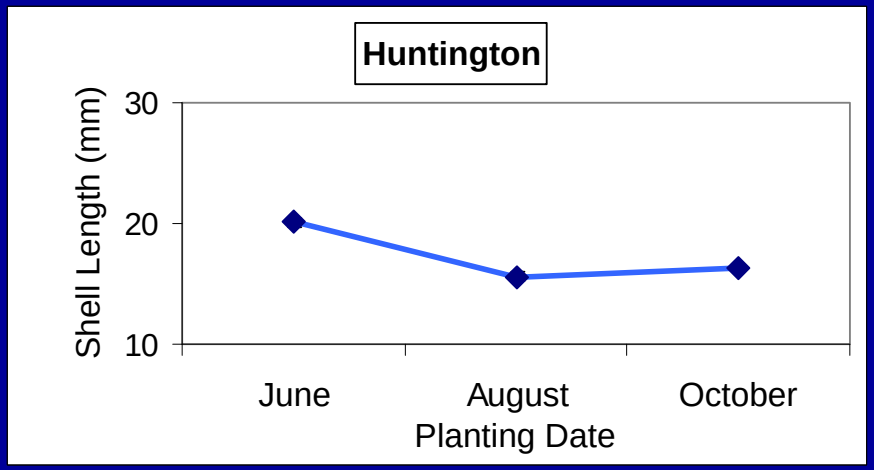
Southampton plot markers lost to ice

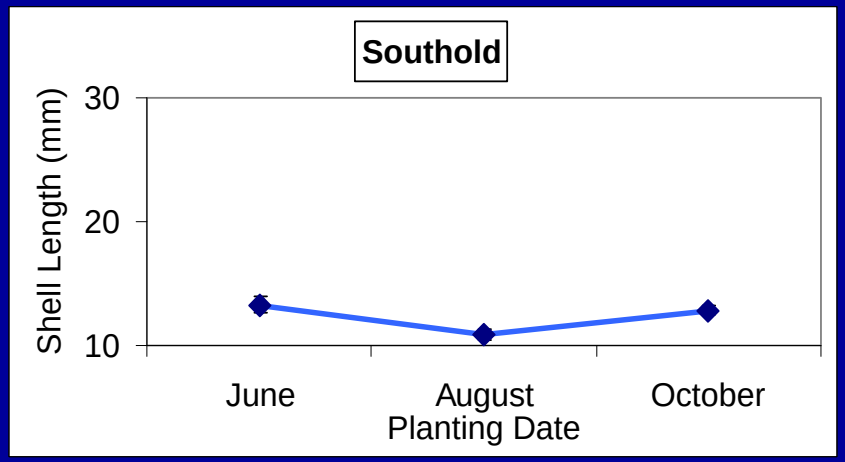
2003 Large Plot Suction Samples- Survival





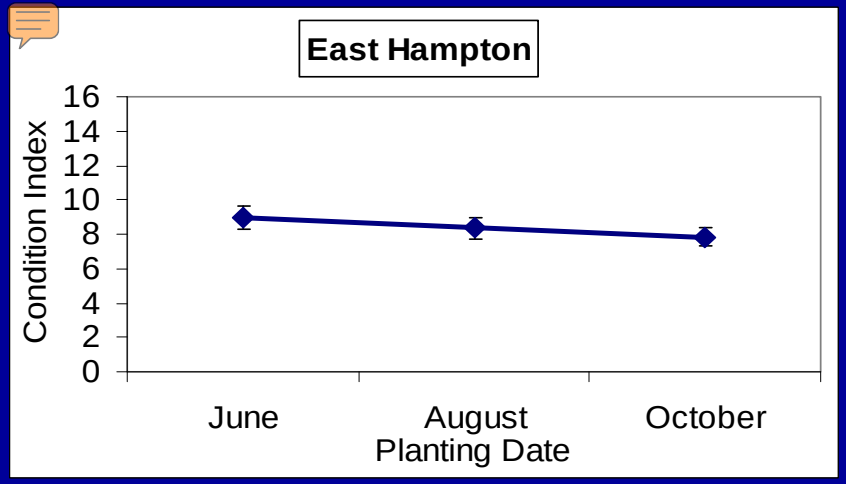


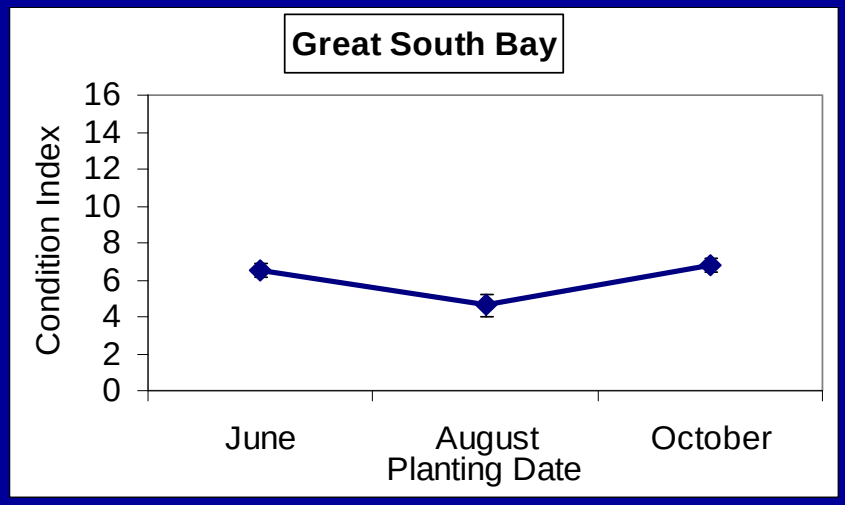


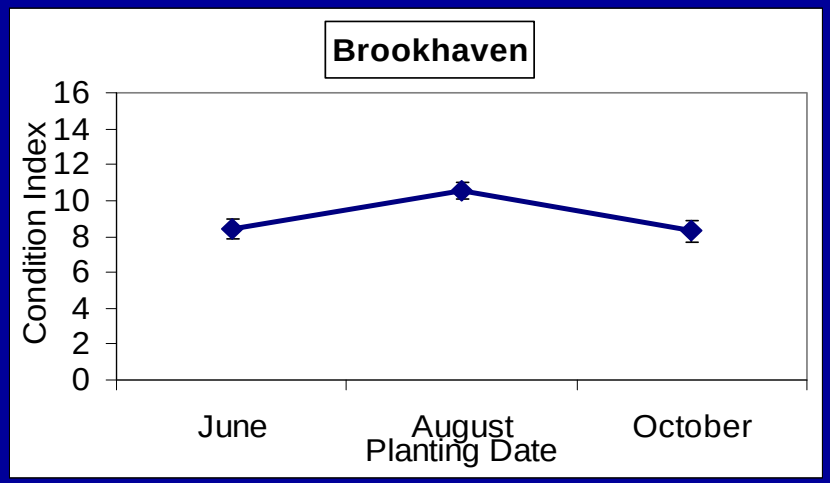


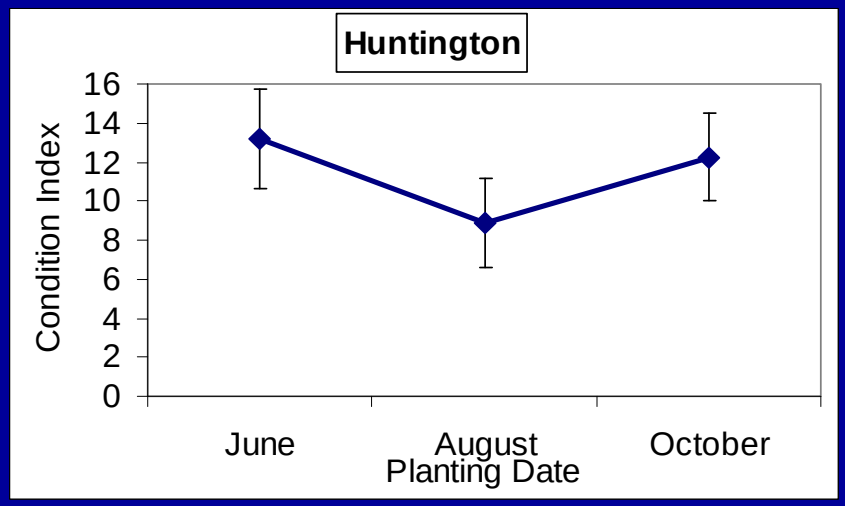
Southampton plot markers lost to ice

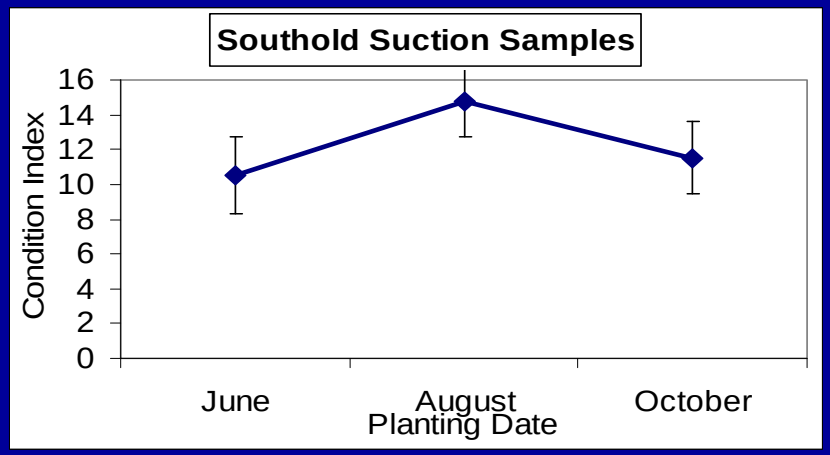
2003 Large Plot Suction Samples- Shell Length





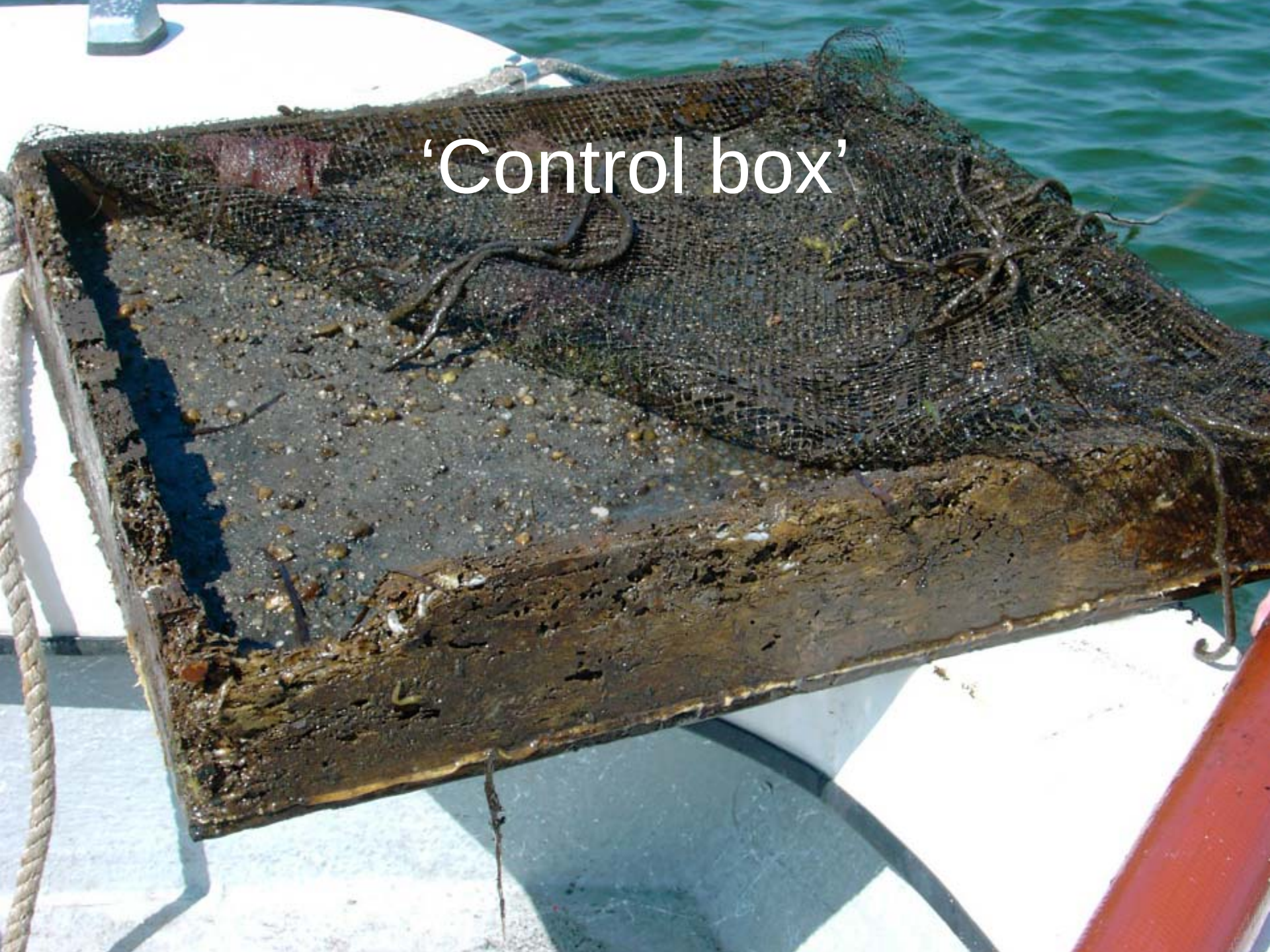


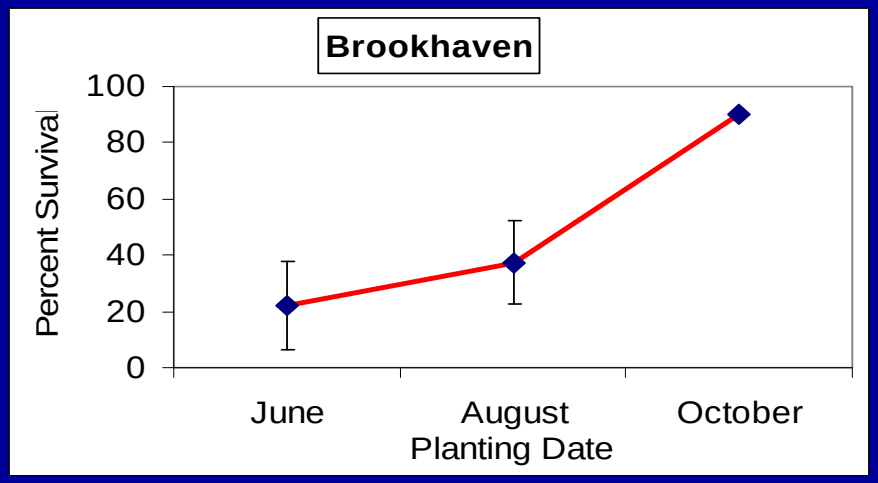


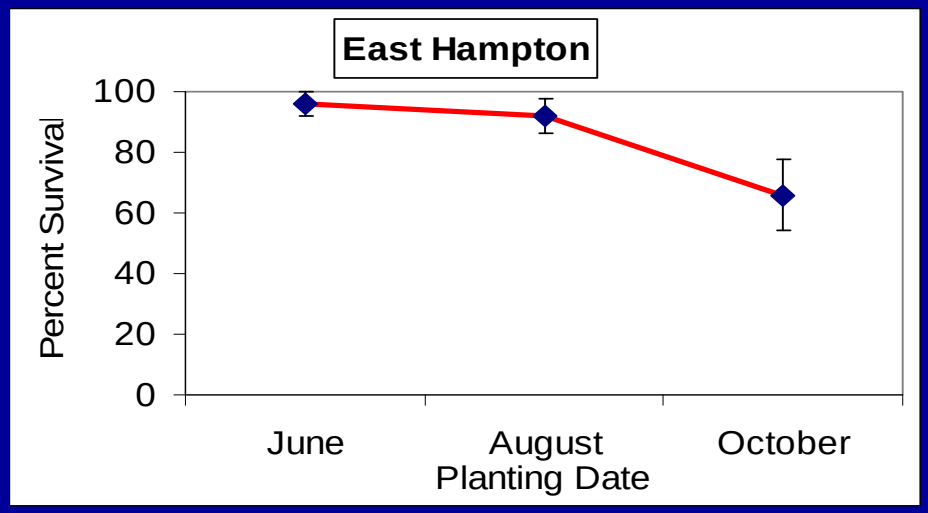


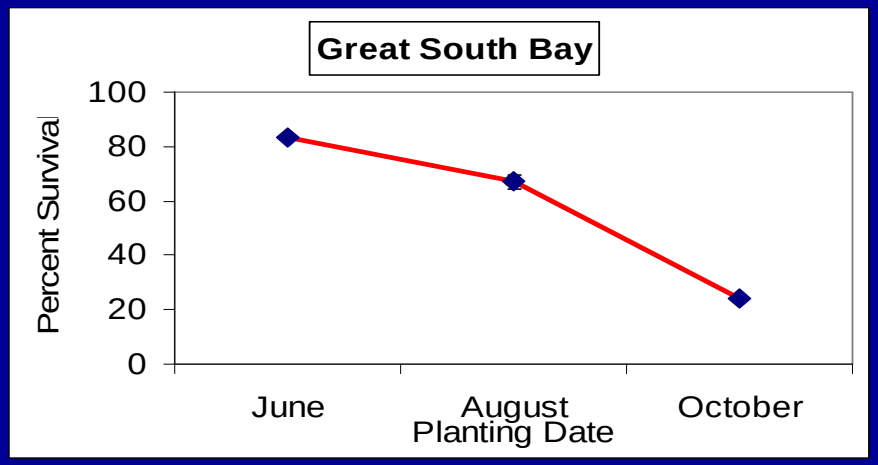
Southampton samples lost to ice

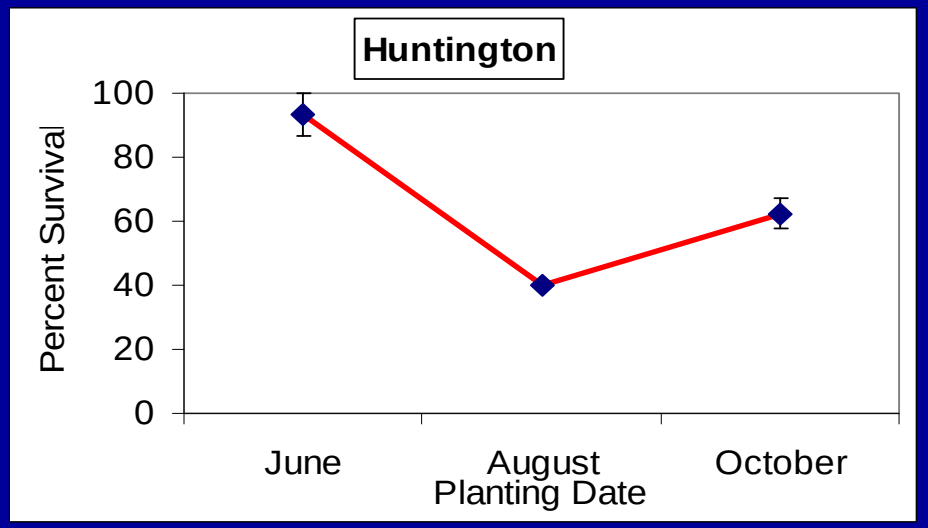
2003 Large Plot Suction Samples – Condition Index

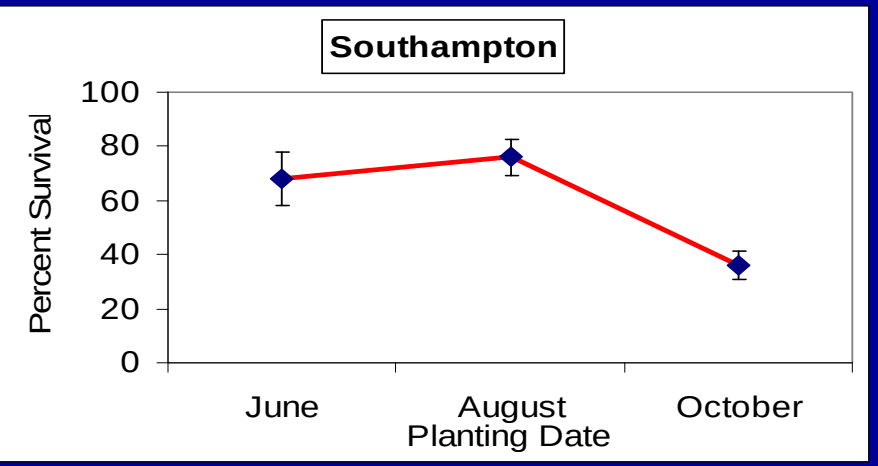

‘Control box’





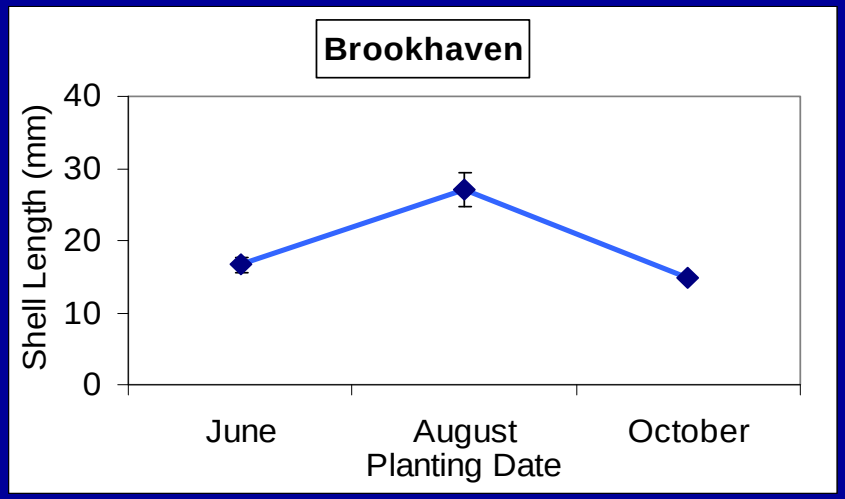


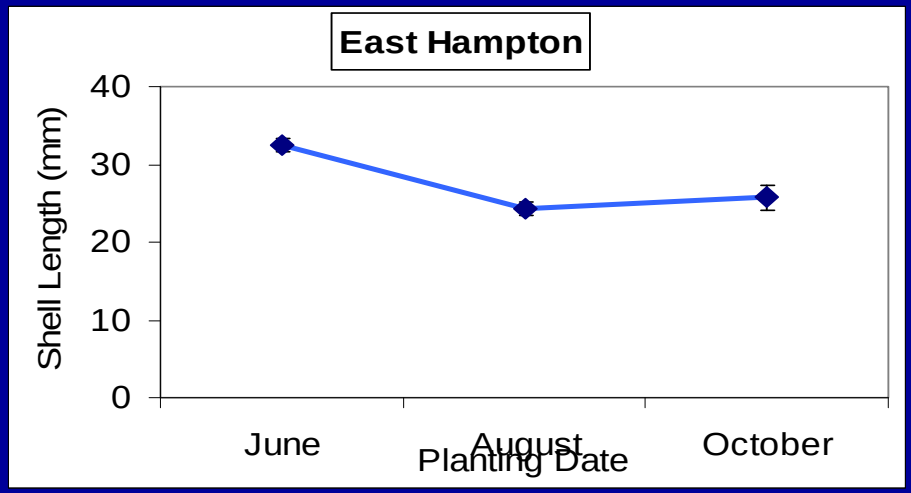


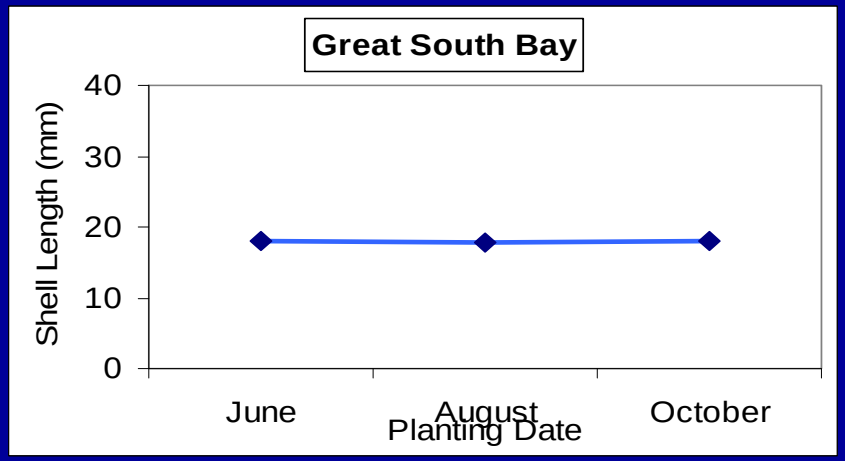


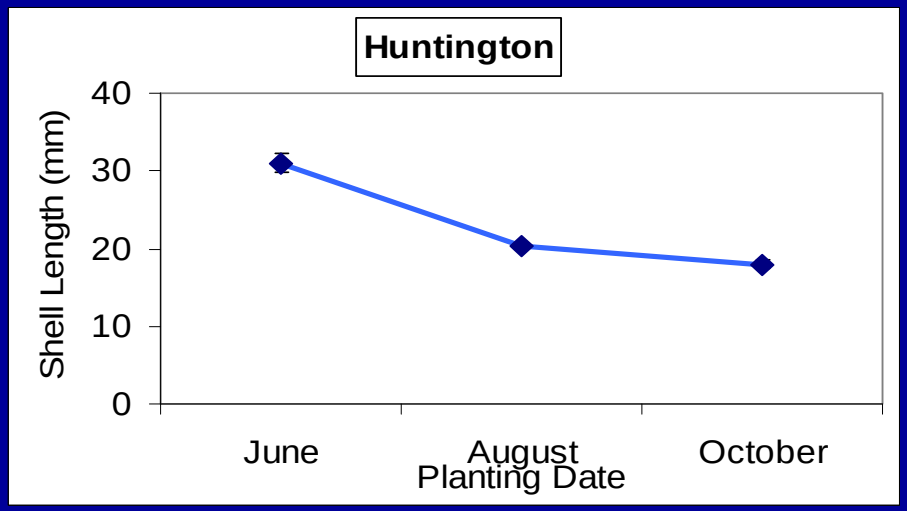
Southold samples not found

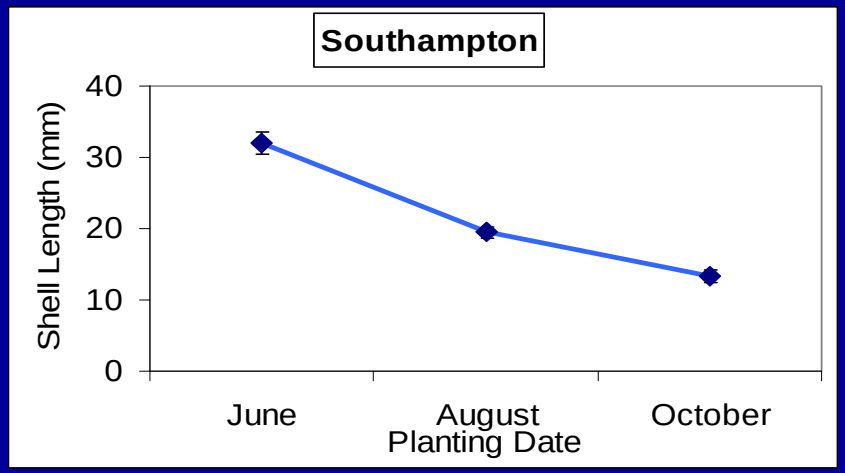
2003 Control Box Samples- Survival











Southold samples not found

2003 Control Box Samples- Shell Length

Preliminary Results

- Clams planted earlier grew larger than those planted later in both unprotected and protected plantings
- Best survival in unprotected plots was from October plantings
- June and August mortality in unprotected plots occurred soon after planting
- Best survival in boxes was from June plantings
- Predation major factor influencing survival
- In general, boxed clams were larger than plot clams
- No convincing evidence for differences in condition index after the winter

More to do

- All 2002 and 2003 ‘control box’ clam condition indices and comparisons
- Additional 2002 growth data
- Temperature data
- Predator analysis
- Sediment analysis
- More results-driven analysis within and among sites

Discussion

- Intensive vs. extensive plantings.
- Assess successful seedings, look for similarities.
- Increase overwintering efforts to yield larger seed?
- More consideration of field preparation and predator protection/reduction? Is this too much like aquaculture?

Acknowledgements

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- Town of Huntington
- Southold Town Trustees
- Southampton Town Trustees
- Town of Smithtown
- Town of Southold

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- Lily Leon
- Jackie Stent
- Soren Dahl
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- Anthony Pasquale
- Melanie Douglass
- Sarah Raynor
- Christopher Rice
- Tara Clark
- Mike Granieri
- Cindy Browning
- Bailey Larkin

FALL IS FOR PLANTING