Cedar Key Aquaculture Workshop
CLAMMRS Project

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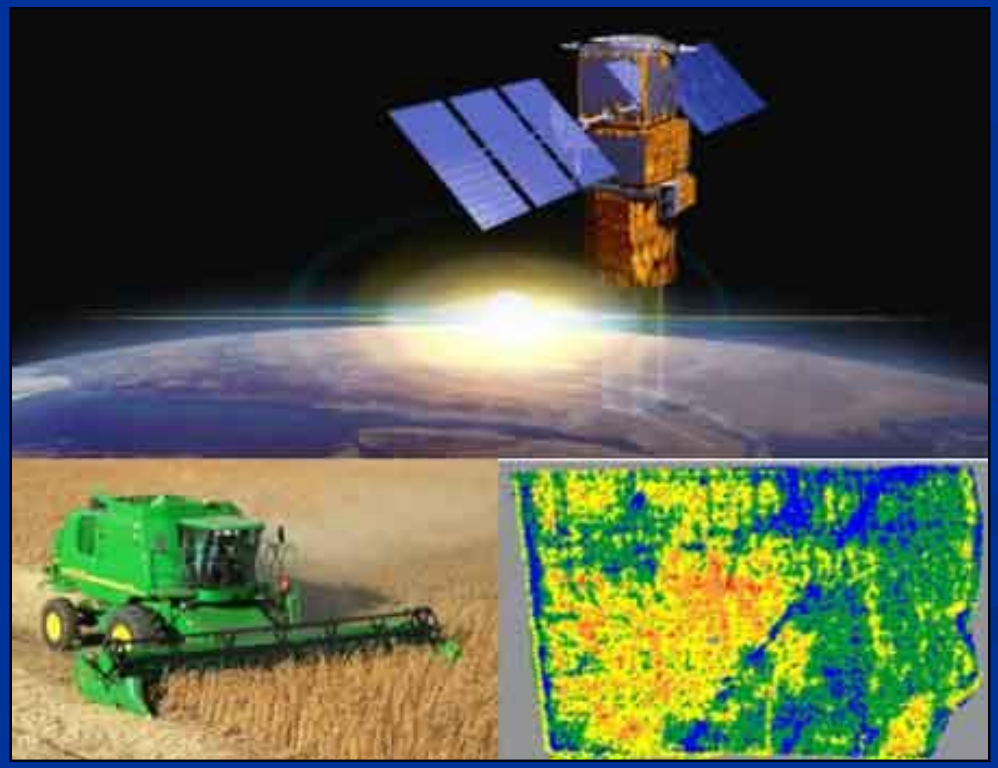
Initiative for Future Agriculture and Food Systems

Long-term goal

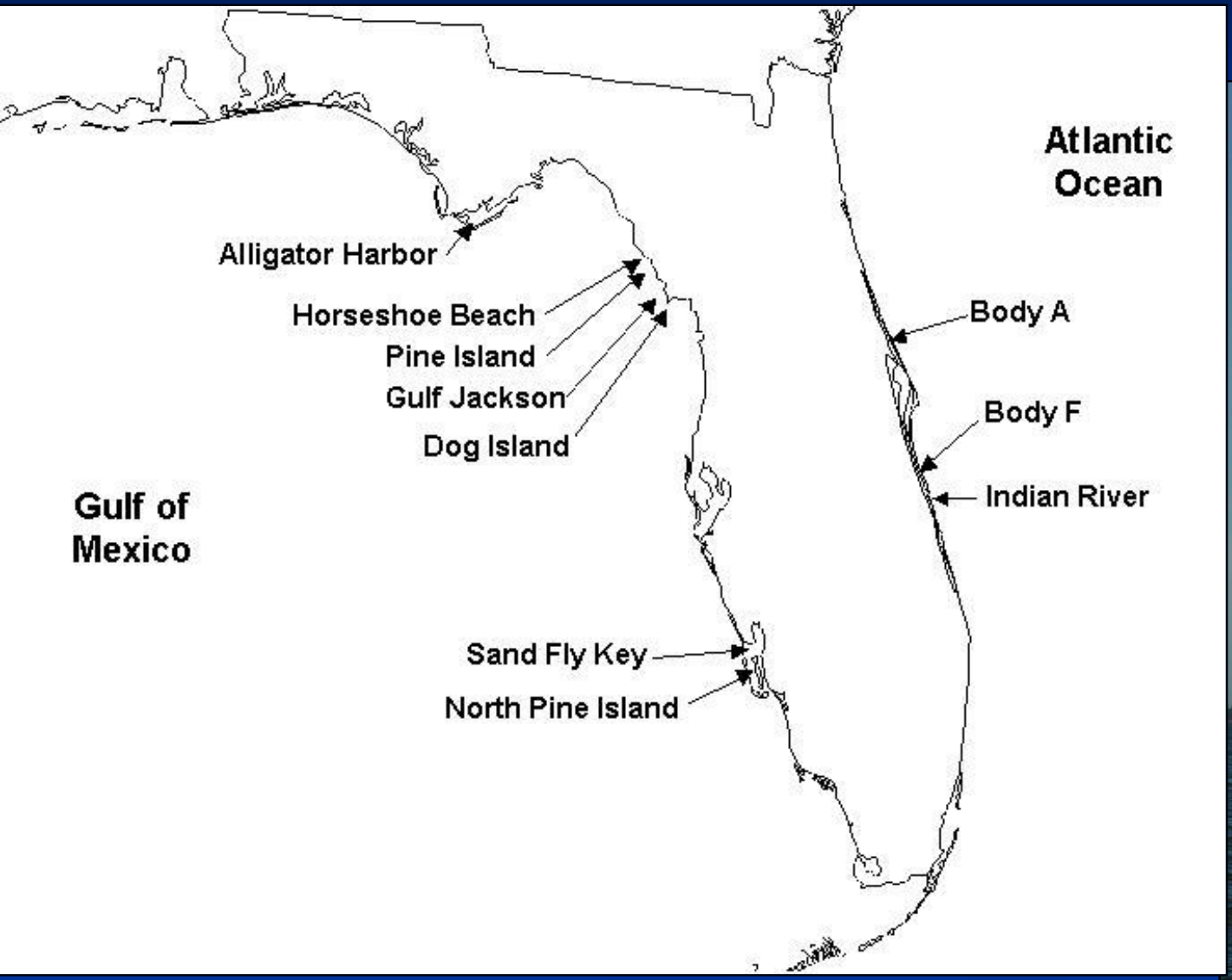
- Enhance sustainable development of open-water clam farming through adoption of remote sensing technologies

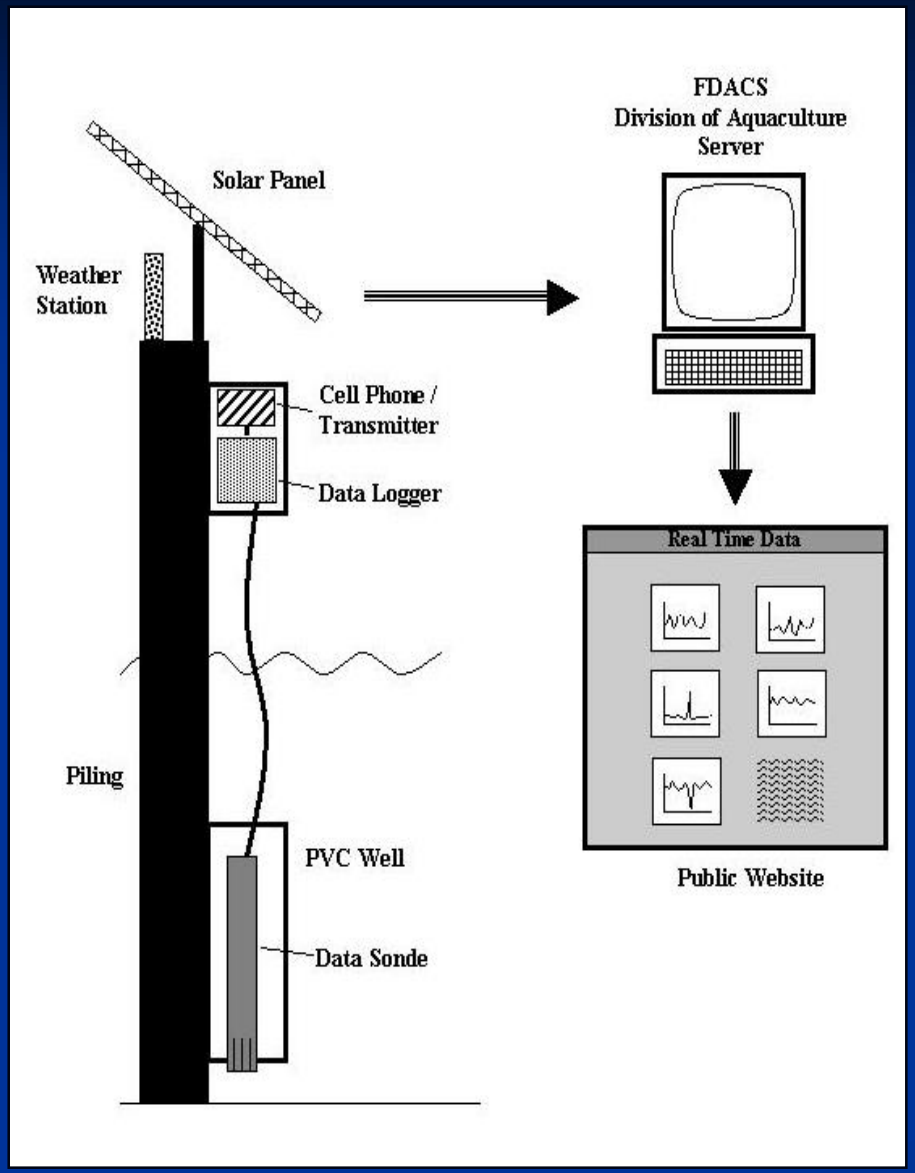


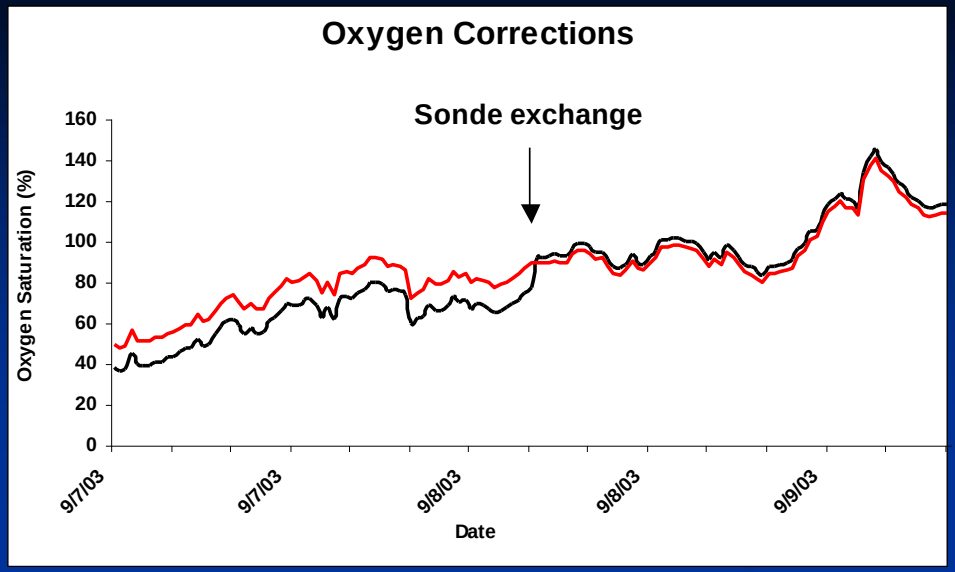
Objectives

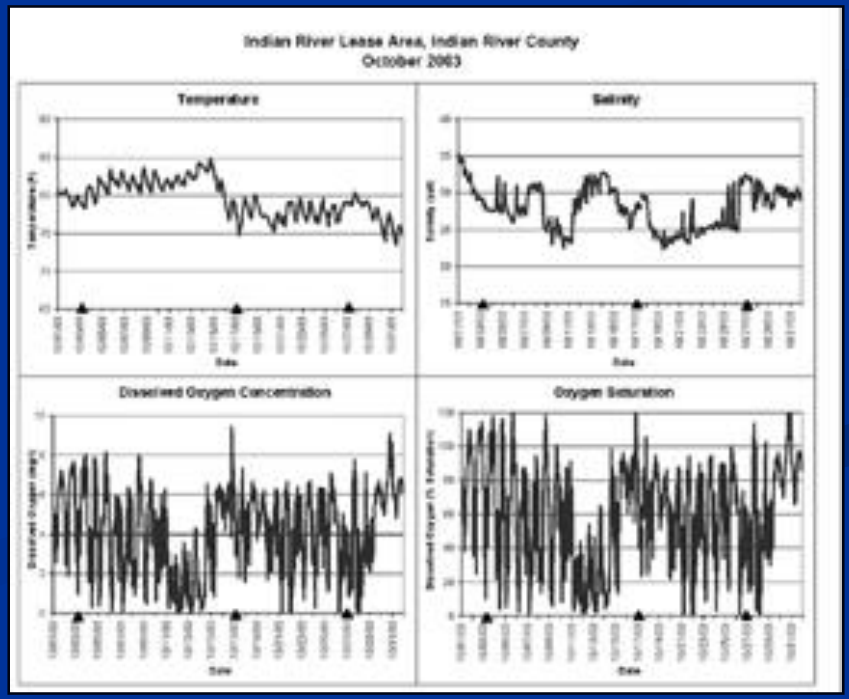
- Provide near real-time water-quality data
- Create database of water-quality conditions
- Determine impact of food resources on clam growth/survival
- Fill gaps in knowledge of Florida clam physiology and response to stressors
- Simulate farmed clam growth and survival

Water quality monitoring



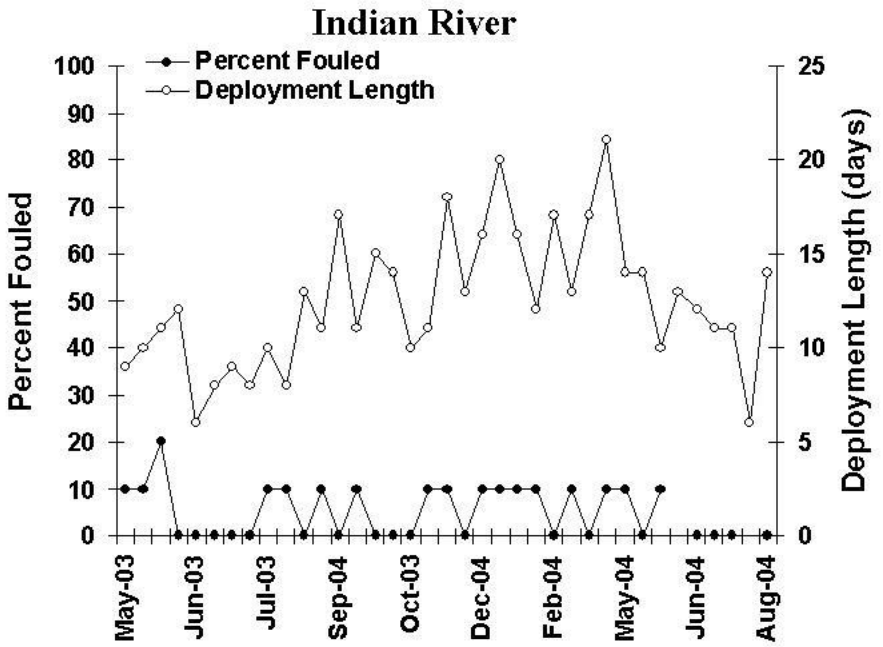

FDACS
Division of Aquaculture
Server
Solar Panel
Weather
Station
Cell Phone /
Transmitter
Data Logger
Real Time Data
Piling
PVC Well
Data Sonde
Public Website

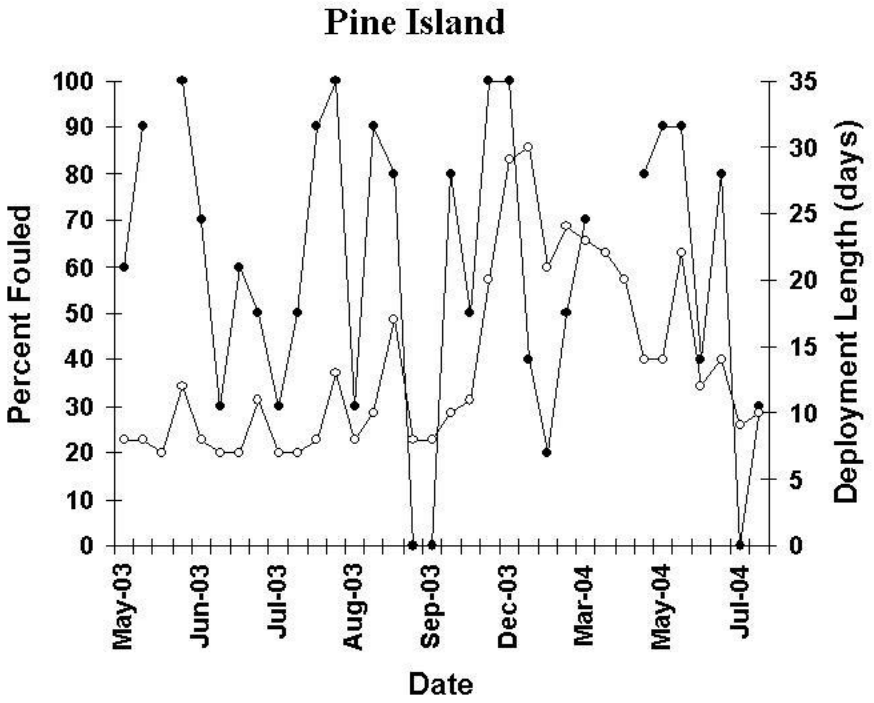

Oxygen Corrections
Sonde exchange
Oxygen Saturation (%)
160
140
120
100
80
60
40
20
0
9/7/03
9/7/03
9/8/03
9/8/03
9/9/03
Date

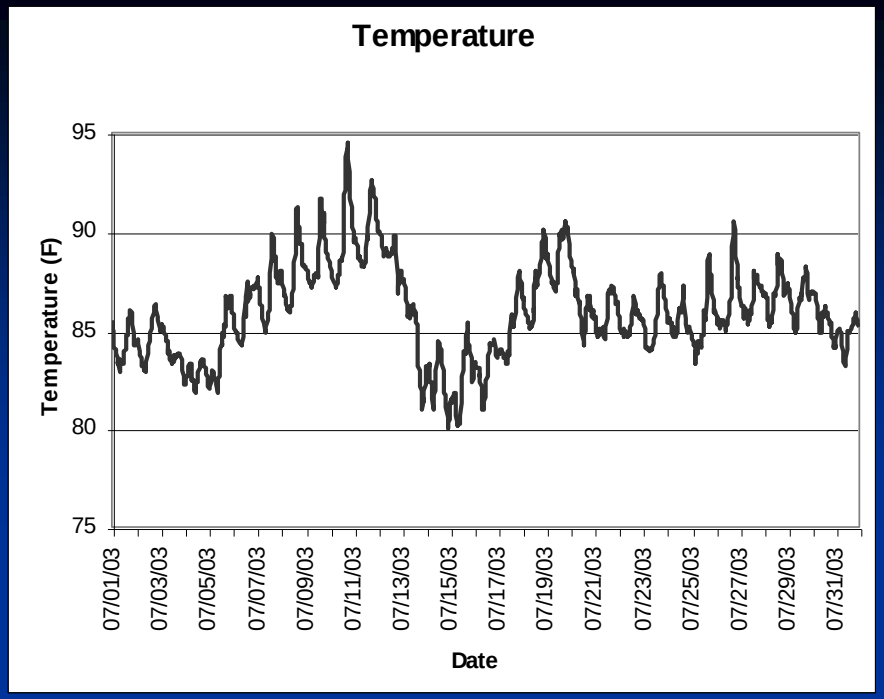

Indian River Lease Area, Indian River County
October 2003
Temperature
Salinity
Dissolved Oxygen Concentration
Oxygen Saturation

Monitoring challenges

- Maintenance
- QA/QC process

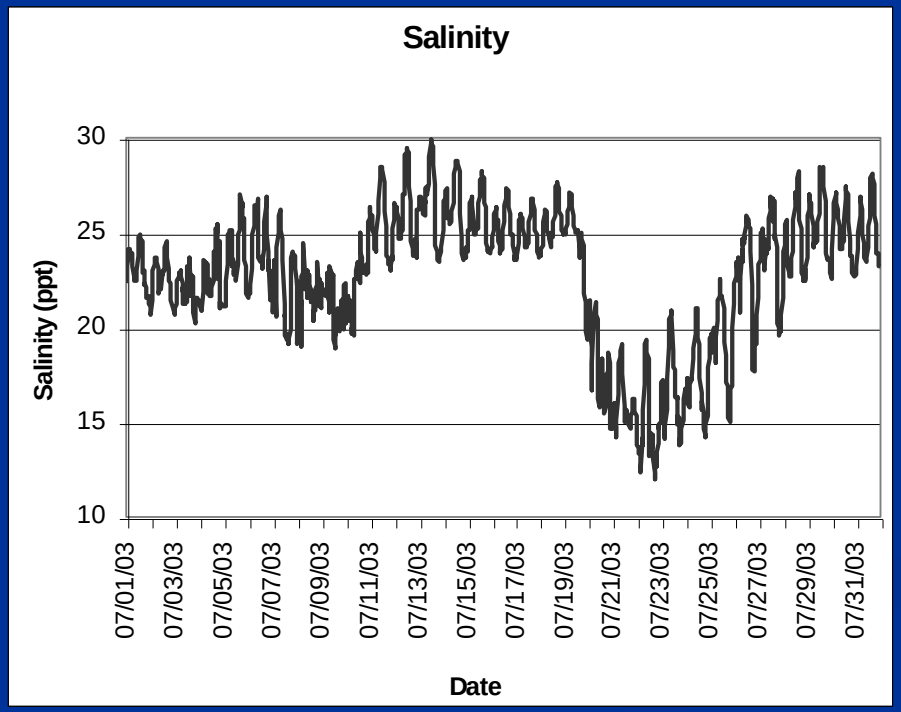


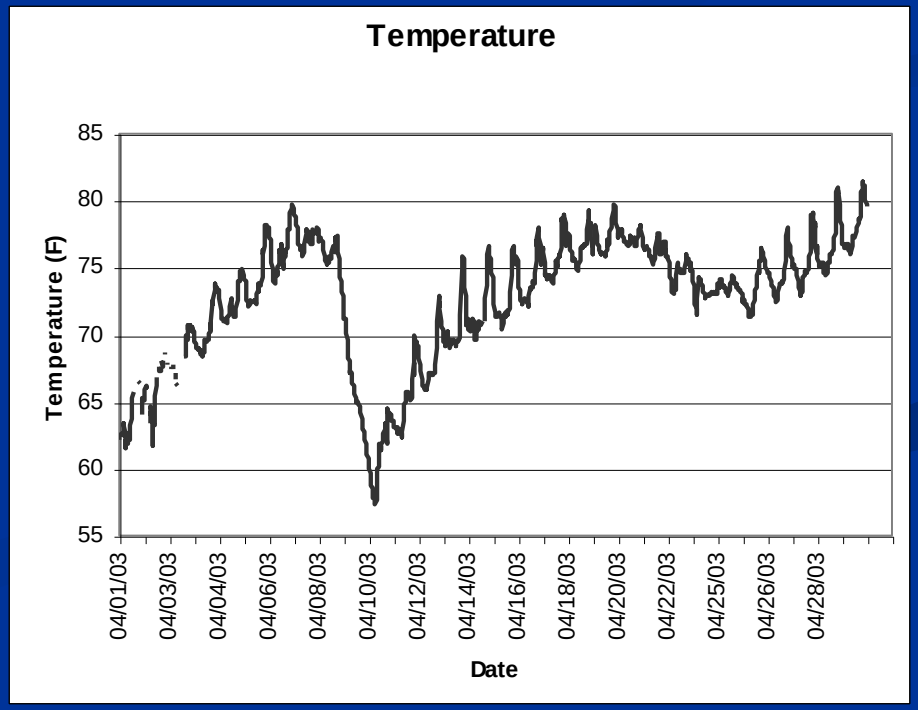




Database

- > 1.2 M data points
- Details of variability

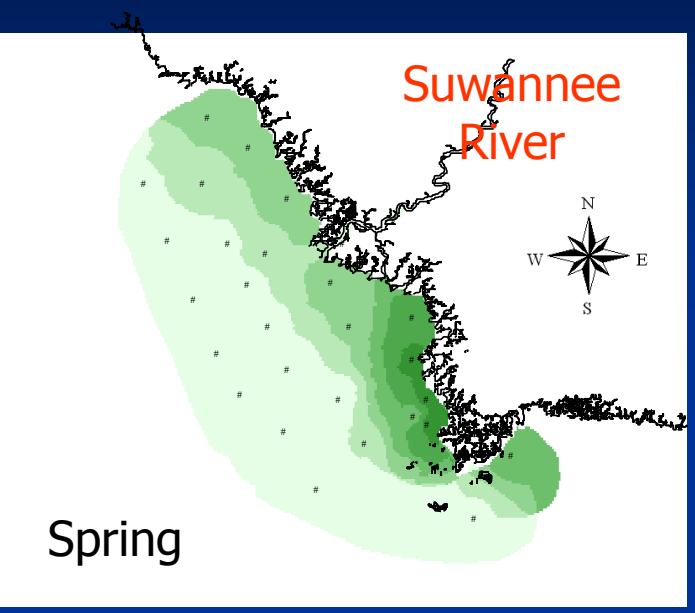


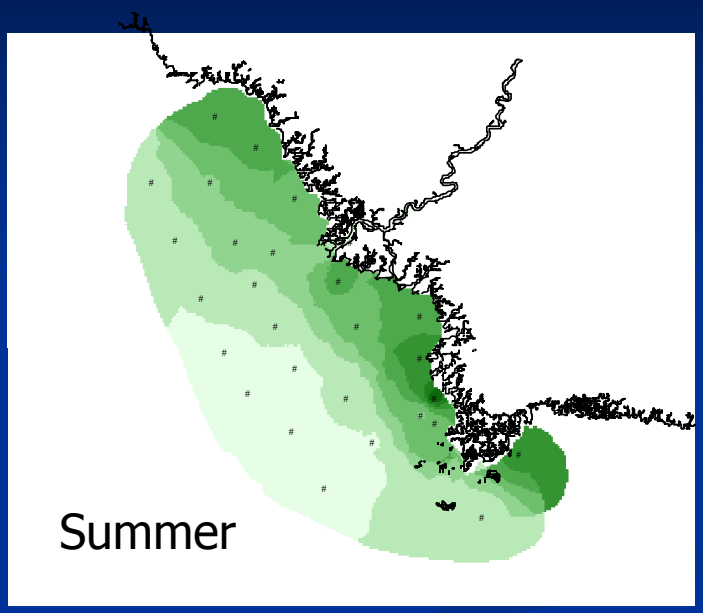


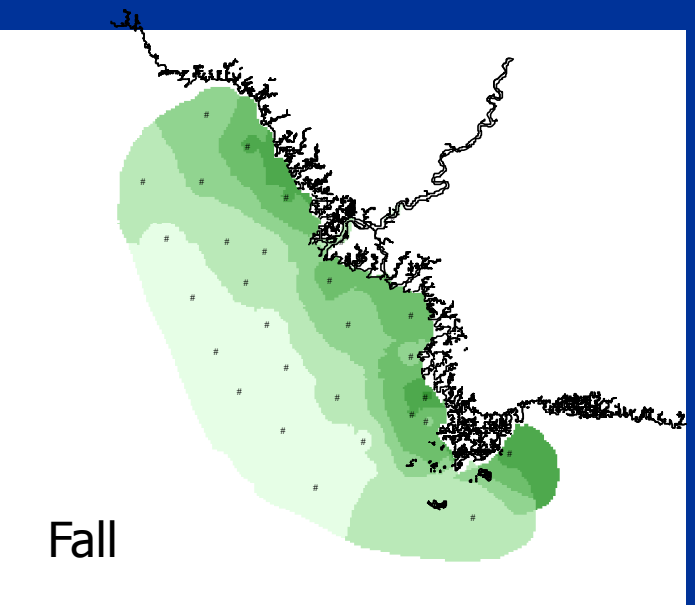
Database

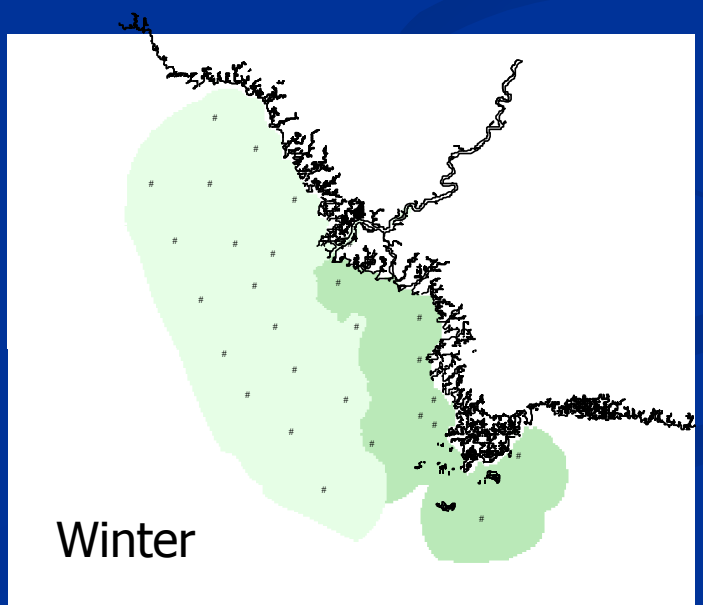
- 2003-2005
- Cause of Loss: Oxygen depletion and salinity
  - $2.0 M of $3.2 M total indemnity

Food Resources





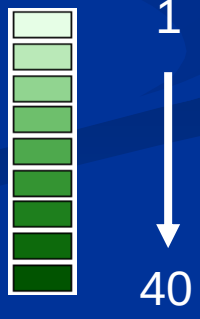




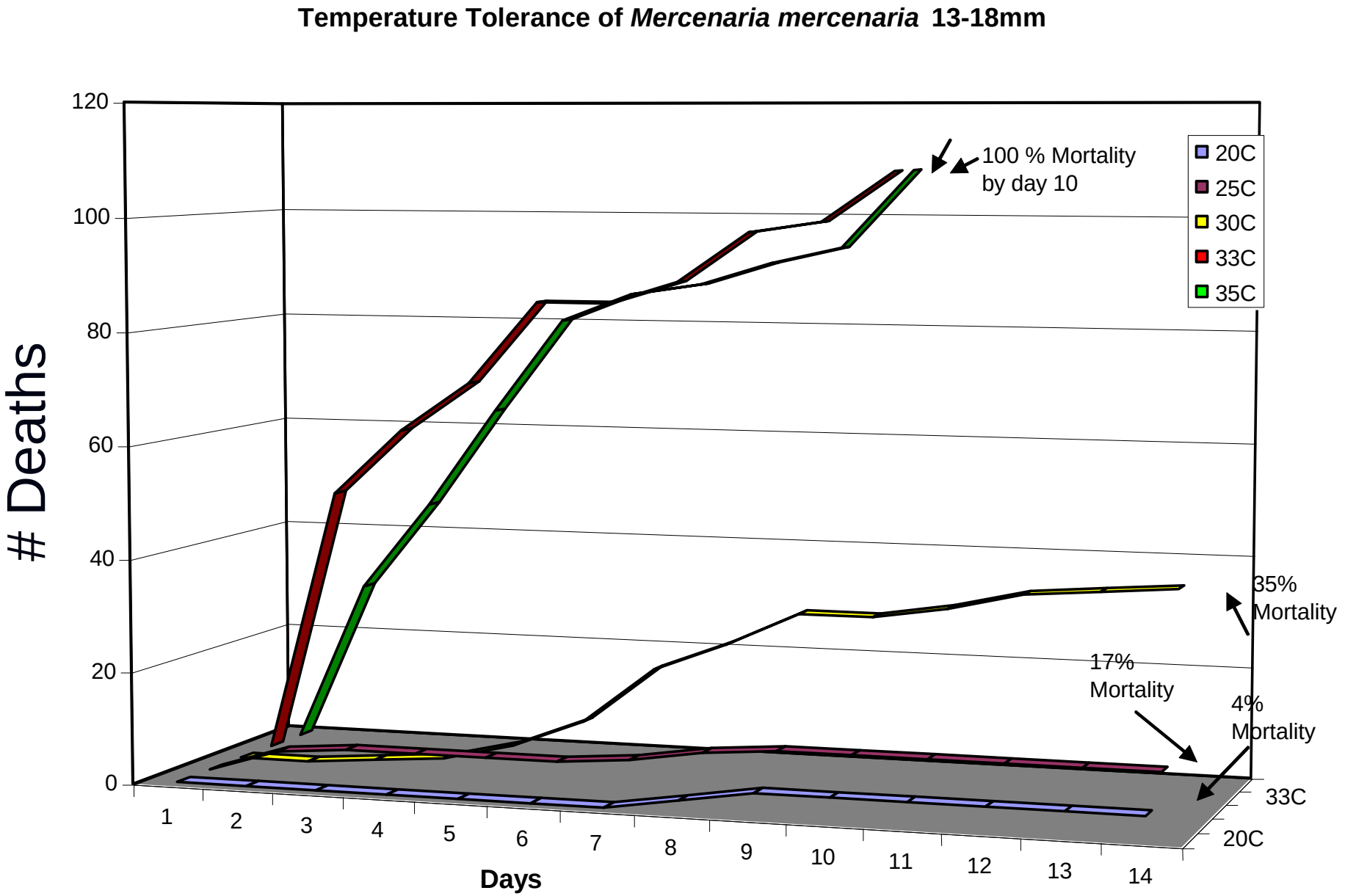
Cedar Key area

- Monthly sampling stations

Chlorophyll Concentration
µg chl L^{-1}

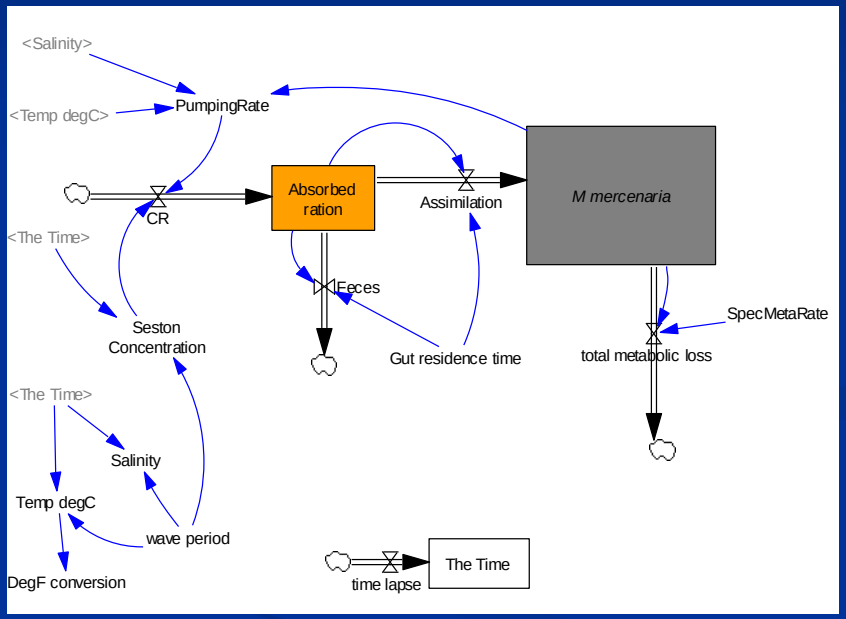


Physiological response to stress



Simulation of Farmed Clam Growth and Survival

- Model inadequate
  - Knowledge of clams under farmed conditions inadequate
- Info needed:
  - Response of clams to crowding
  - Effects of clams on microenvironment
  - Long-term simultaneous records of harvest and environmental data

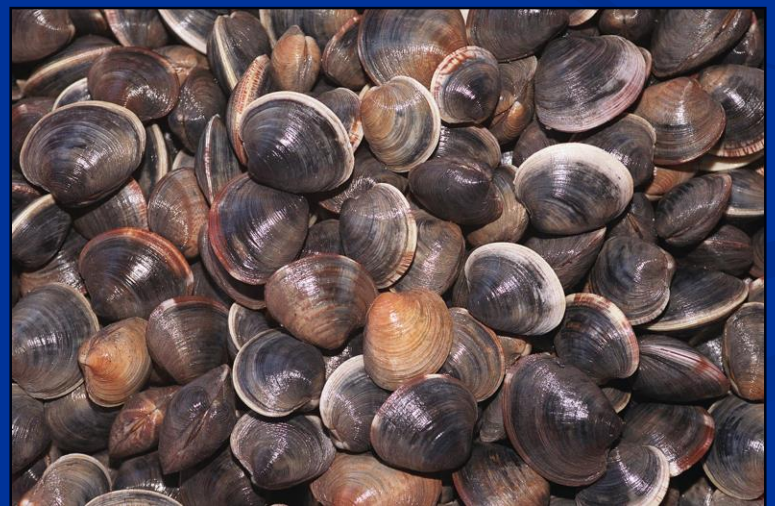


Simulation: Experiments

- Field experiments of farming methods on actual leases
- Tank experiments simulating lease conditions
  - Better control, more precise monitoring, faster results than field
- Laboratory experiments
  - Best control, soonest results, may require field verification
- Model useful for field verification of lab results

Simulation: Harvest monitoring

- Experimental planting on leases
  - Plant on leases set aside for this purpose rather than by scrutinizing activities on randomly chosen leases
- Voluntary cooperation and interviews may give misleading results
- Total harvest record may be useful if complete

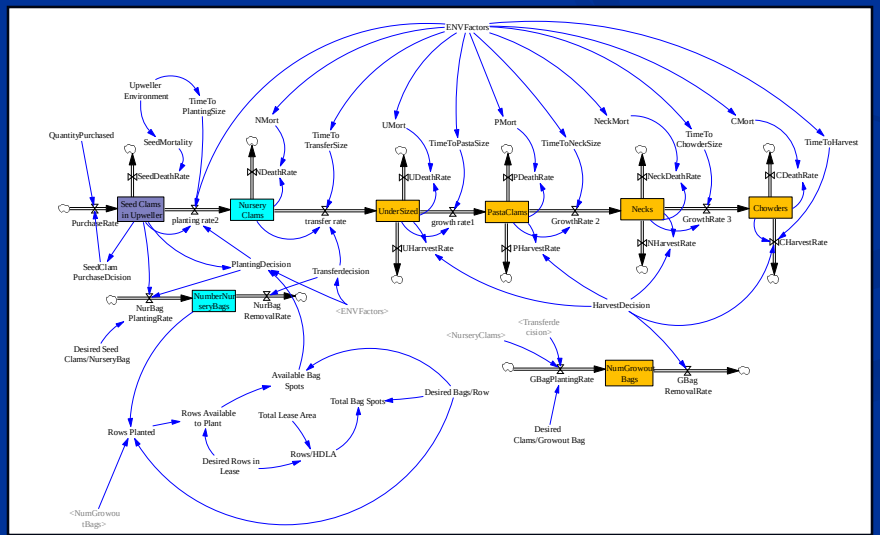


Model process converges over the long term

- Model illustrates capability of current knowledge to successfully predict
- Most common outcome is failure to predict what is already known to be true
- Process always identifies specific information gaps that must be filled
- Model-directed experiments and field data are required
- Model is then modified to incorporate the new information
- Validation: model harvest must ultimately be compared to real harvest
- Eventually the process converges – more reliable predictions are produced

Simulation: Summary

- Results of model-directed experiments will benefit the entire clam farming community as the process converges
- The benefit of the modeling process may exceed the benefits achieved from the model itself as long as the process continues



Work in Progress

- “Crunch” > 1.2 M numbers
- Complete analyses of phytoplankton biomass/composition and clam growth/survival
- Continue model-building process
- Continue to fill gaps in clam physiology/ecology
- Continued monitoring…