

The Nature Conservancy



Protecting nature. Preserving life.™

Can we restore hard clams to
Great South Bay after 30
years of decline ?

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Clams are a foundation species in Great South Bay



In high numbers they: filter water, facilitate seagrass, create food and habitat, add stability and resiliency to the ecosystem



The Bluepoints Bottomlands Council

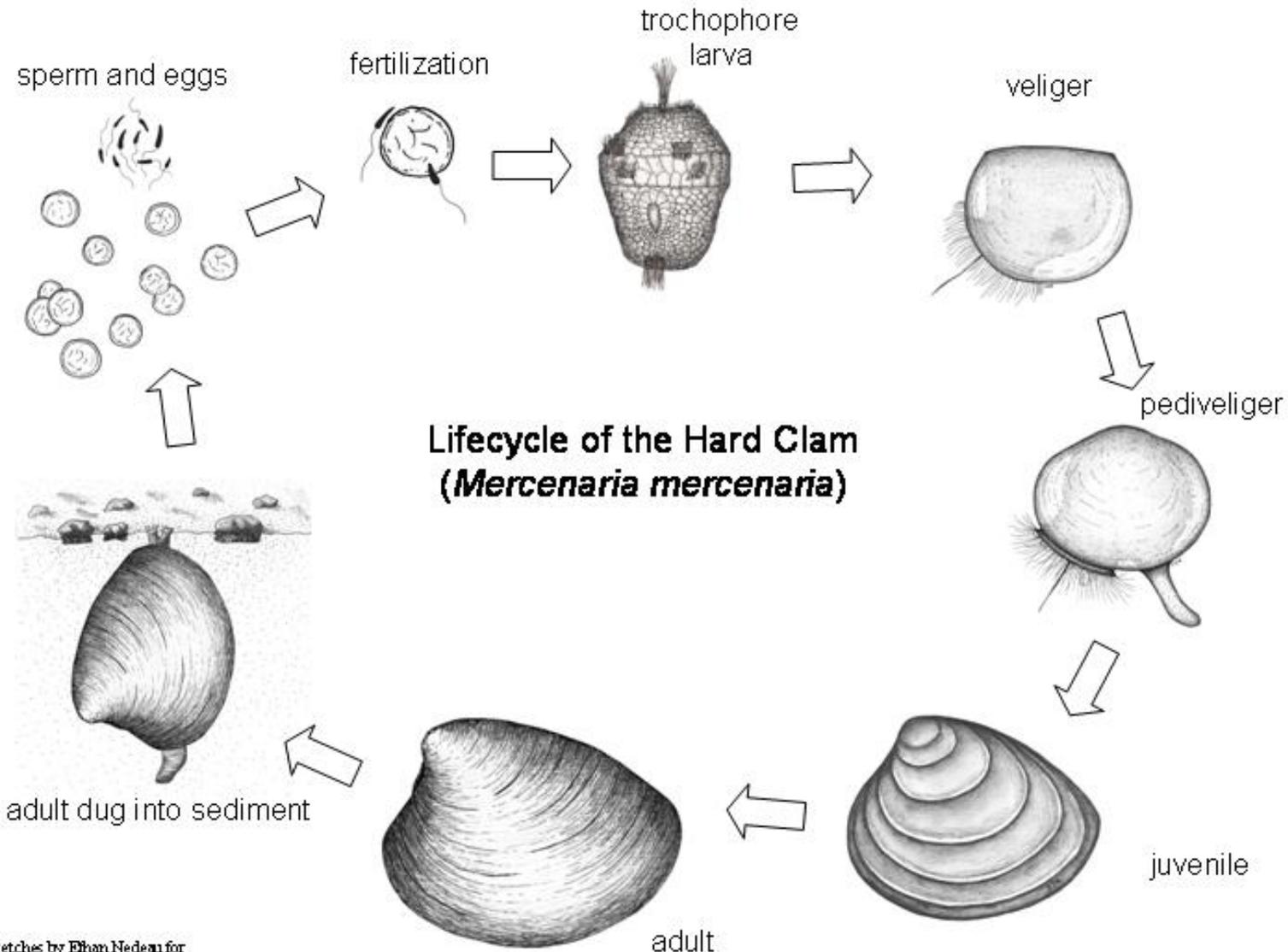
“Restore Great South Bay to a thriving, healthy, naturally productive, self-sustaining ecosystem...”





Hard Clam Lifecycle

- Filter feeder**
- Separate sexes**
- External fertilization**
- Planktonic larvae**
- Long lived**

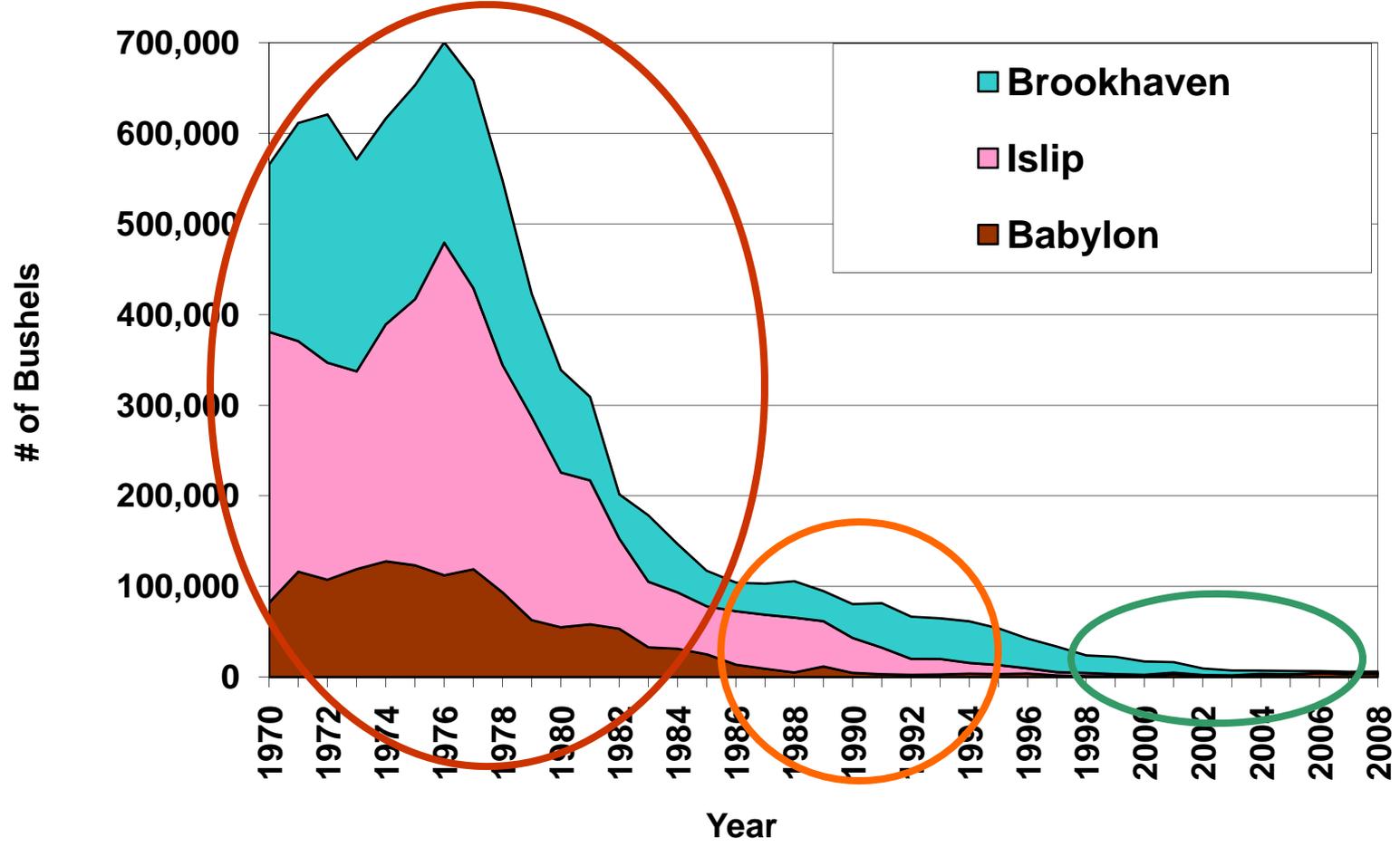


Sketches by Ehan Nedeau for The Nature Conservancy



Why did GSB hard clams decline?

Annual Reported Commercial Landings of Hard Clams from Great South Bay
Data from NYS DEC



Top 4 obstacles for clam recovery

Sub-optimal food quality (small form algae) including chronic harmful algal blooms (brown tide)

Great South Bay, 6/08



Loading

Mainland derived nitrogen to GSB

Atm. deposition (on land) 22%

Wastewater (septic systems) 68%

Fertilizer (lawns, golf courses, ag.) 10%

Mixing

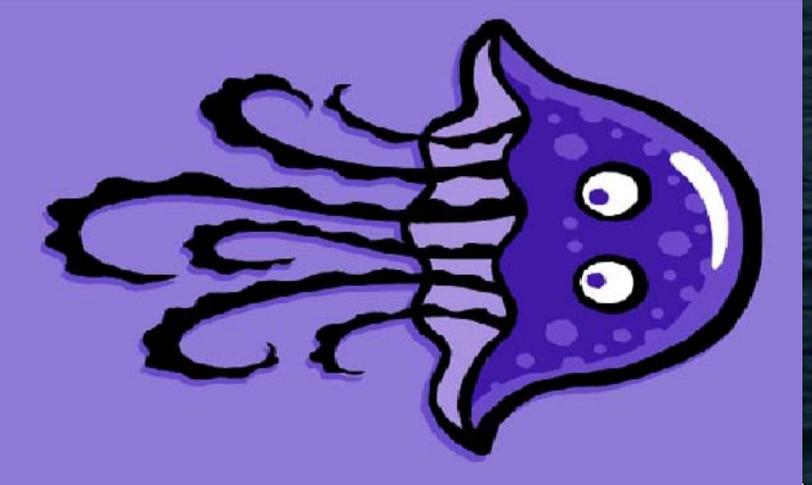
Trophic cycling





Top 4 obstacles for clam recovery

Predation rates at all life stages



Top 4 obstacles for clam recovery

Removal of clams through harvest



Harvest rates are lower today than in past

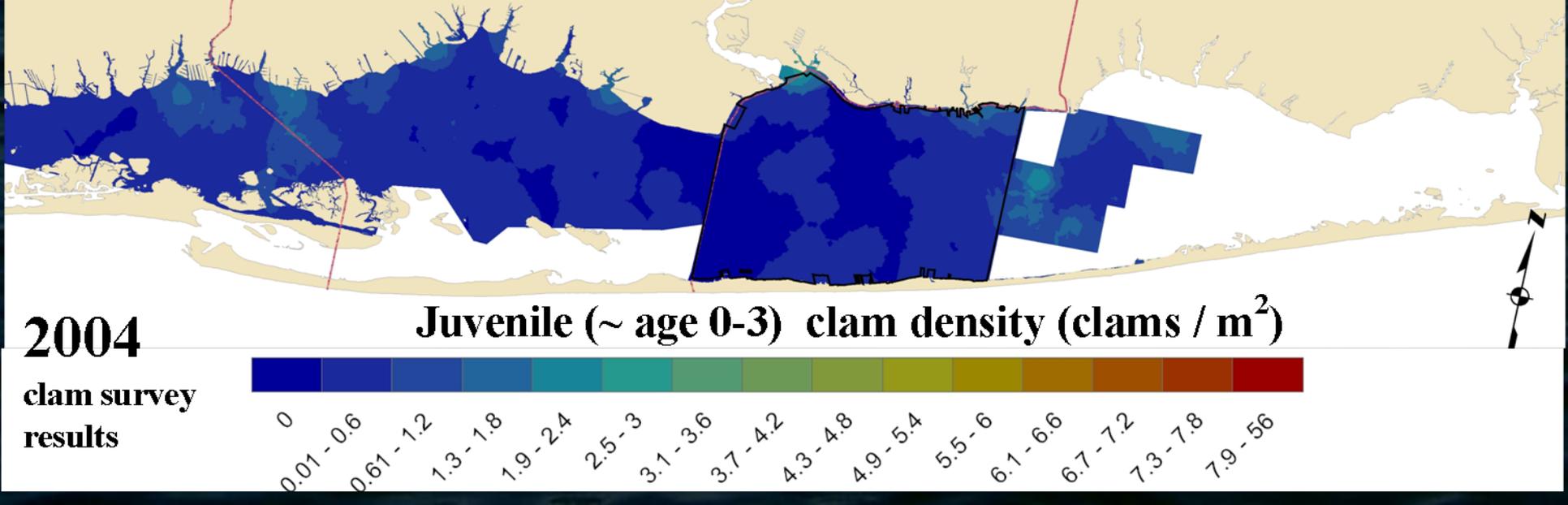
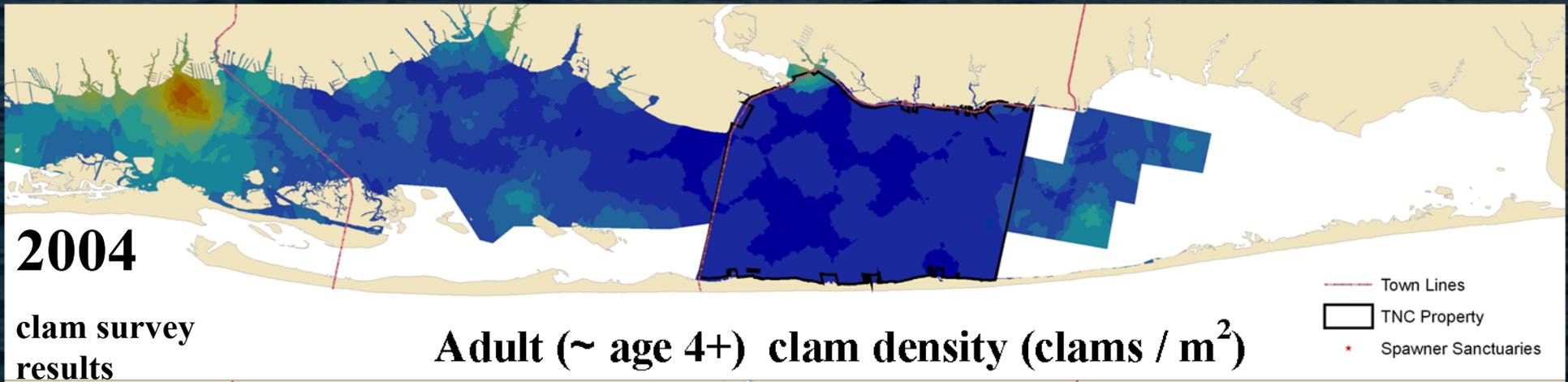
Towns taking steps to develop and implement sustainable management





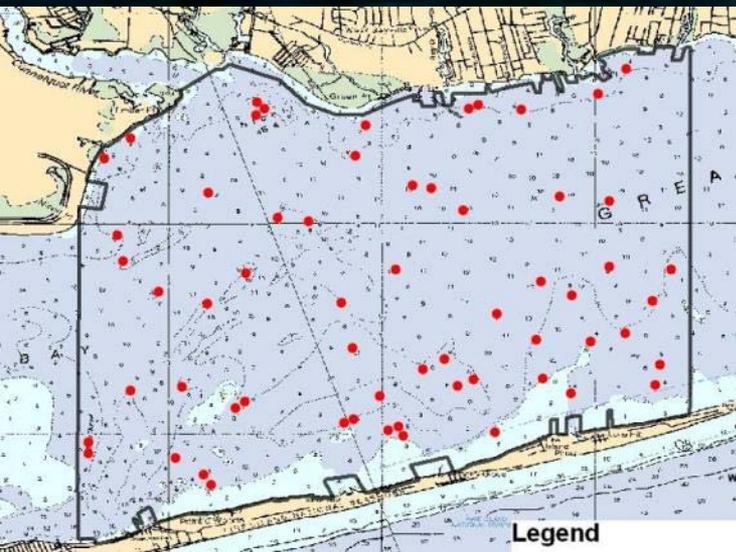
Top 4 obstacles for clam recovery

Recruitment limitation



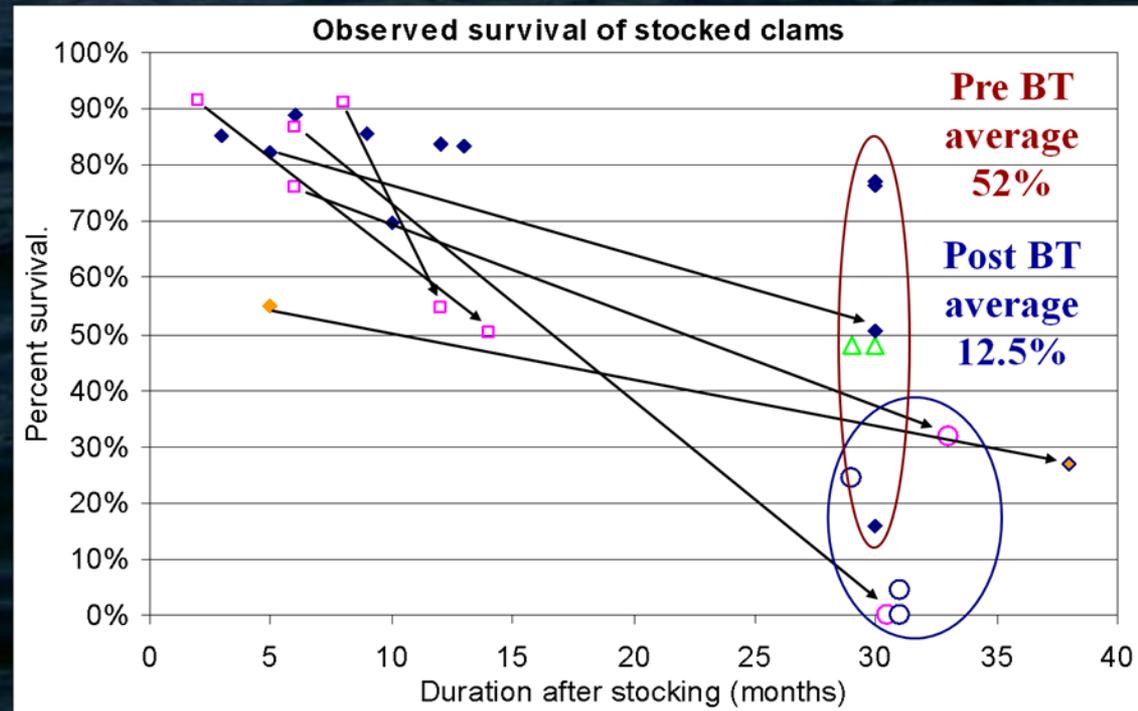
Addressing recruitment limitation

- Since 2004 over 3.7 million adult clams stocked on a network of 60 sanctuaries on TNC property
- We're simultaneously monitoring: 1) survival of stocked clams, 2) spawning, 3) larvae, 4) clam food quantity and quality, 5) recruitment, 6) survival growth of recruits, 7) ecosystem effects
- We're adapting approaches with monitoring results



Survival of transplanted clams

- **Transplanted clams survive multiple years**
- **Cherrystone and chowder less subjected to whelk predation than little necks**
- **Survival varies widely among transplant locations**
- **Mortality was higher the winter after the 2008 brown tide**



Condition and spawning in adult clams

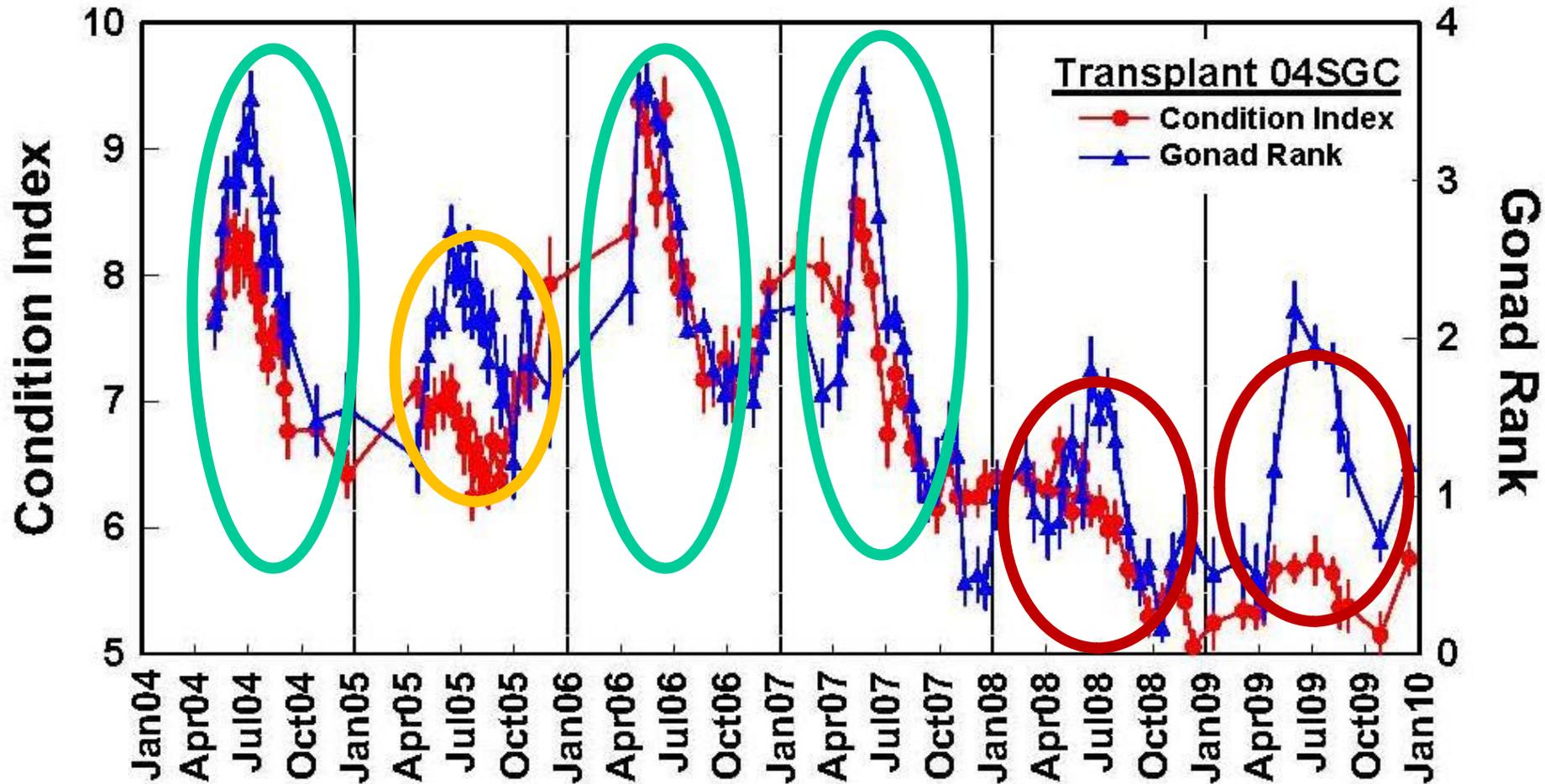
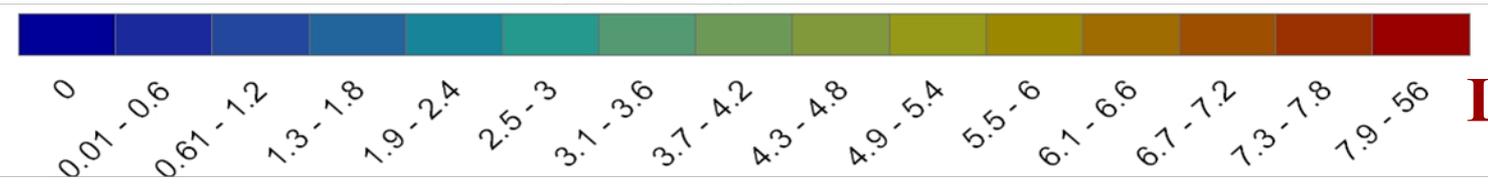
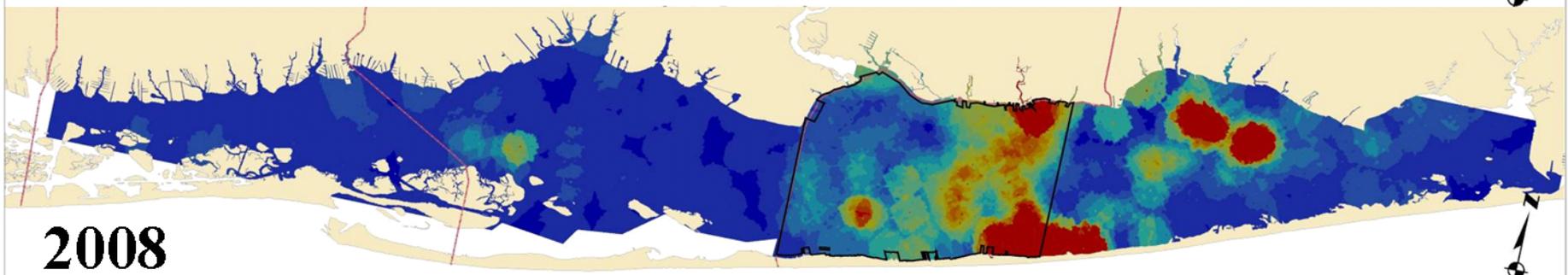
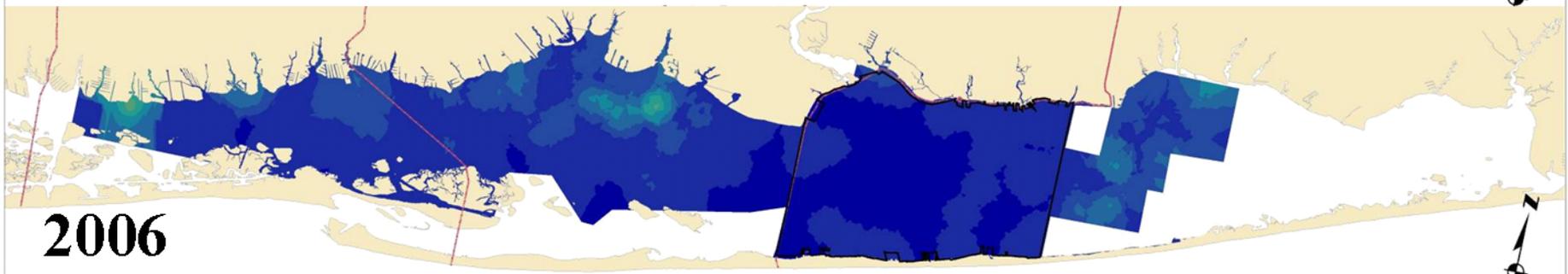
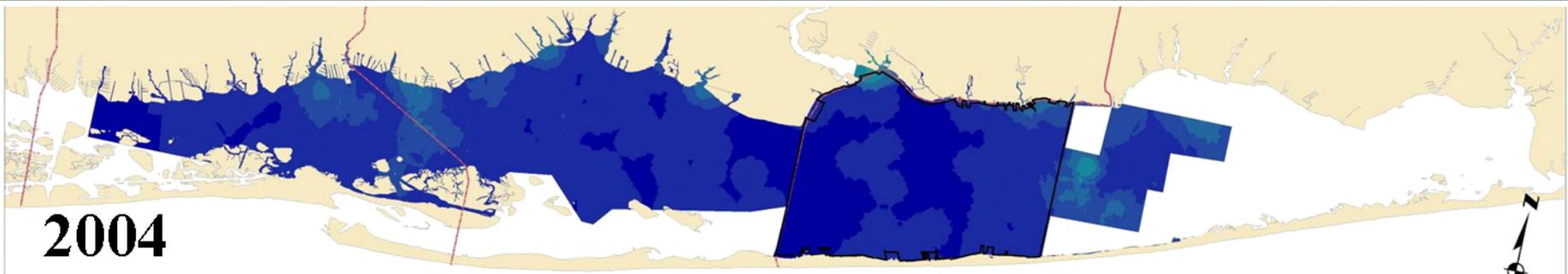


Figure 15. Patterns of condition index and gonad ripeness through time, from April 2004 through December 2009, for transplant population 04SGC (Site A). Points are mean condition index (red circles) and mean gonad rank (blue triangles), error bars are standard errors, $n = \sim 20$ on each sample date. CI and GR are significantly correlated (see Deall et al. 2008).

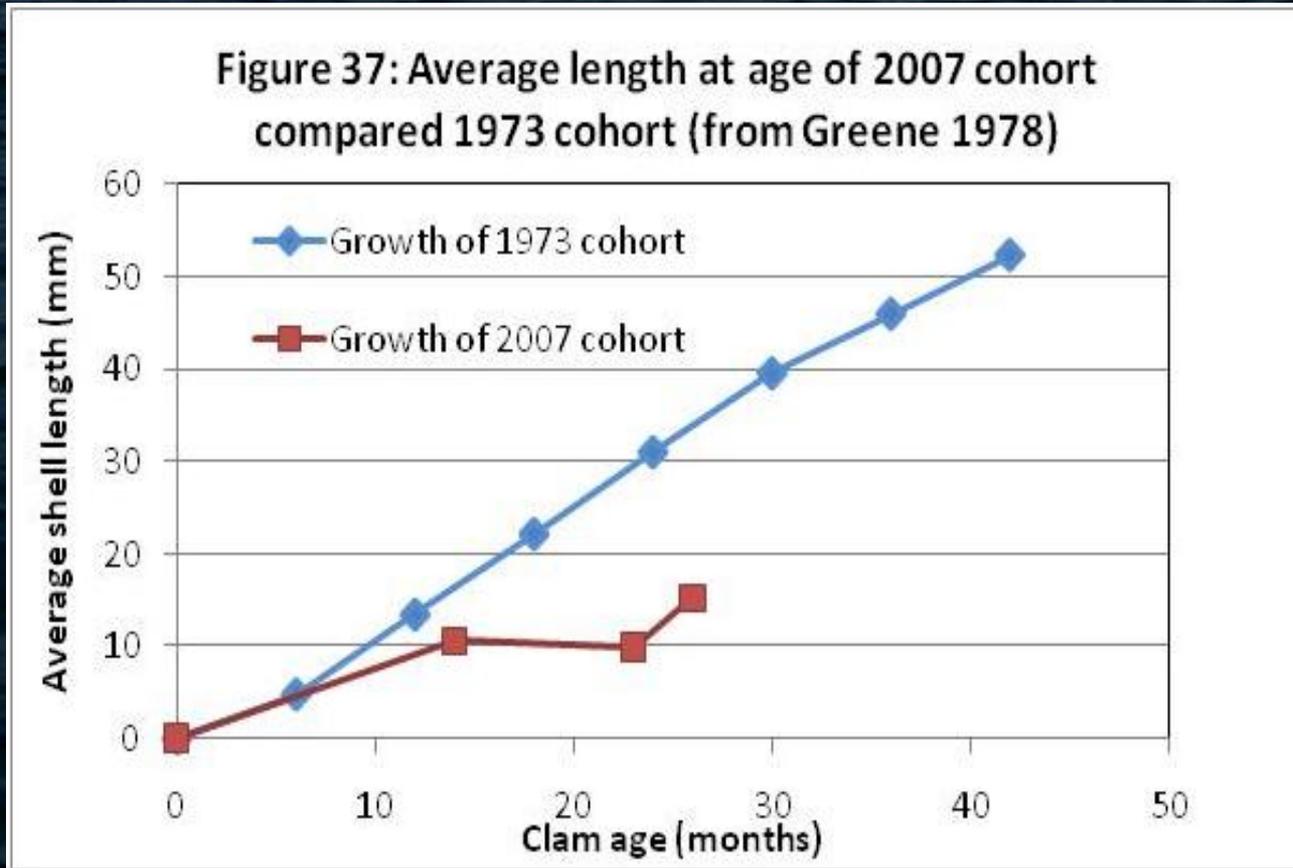
Recruitment indices: Juvenile clam distribution 2004, 2006, 2008





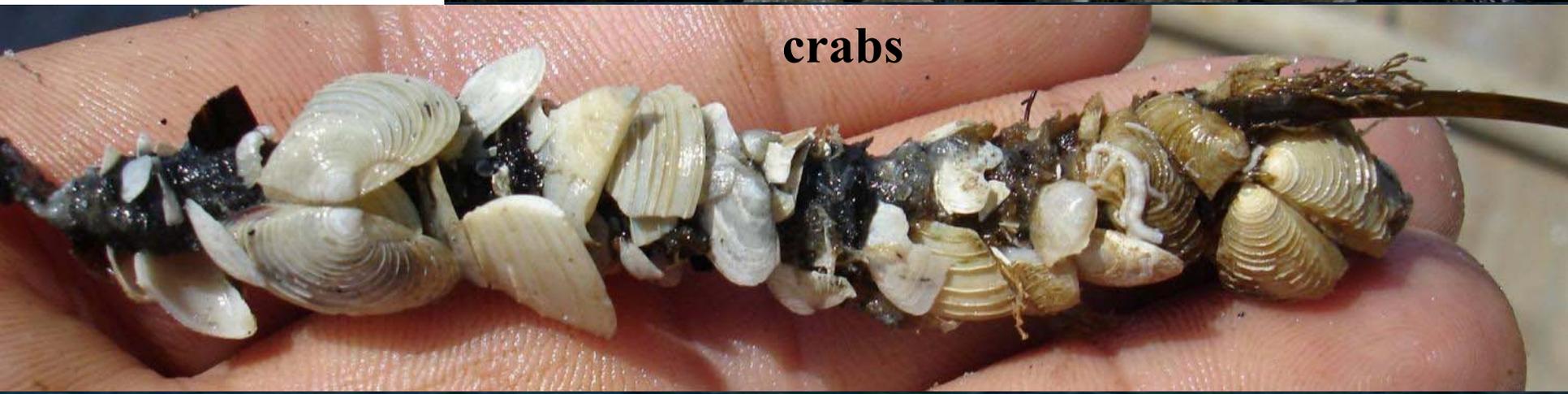
Growth of 2007 cohort was impacted by poor plankton conditions

Preliminary assessment- shell aging incomplete





Causes of mortality of 2007 clam cohort



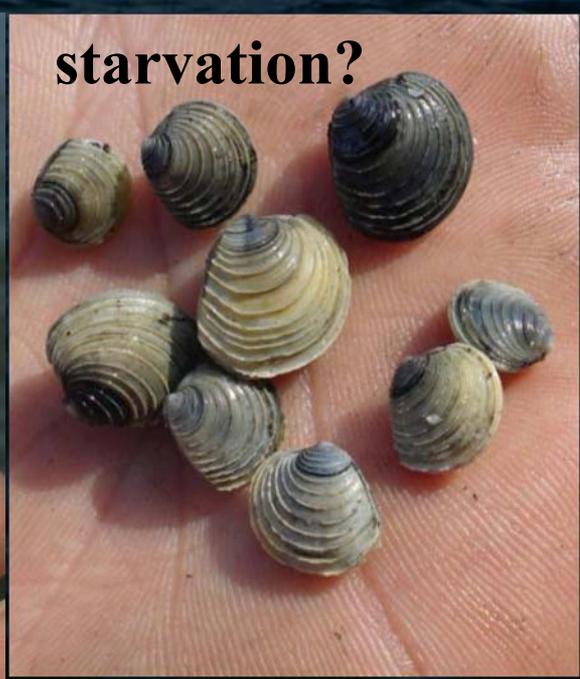
crabs



**moon
snails**



whelk

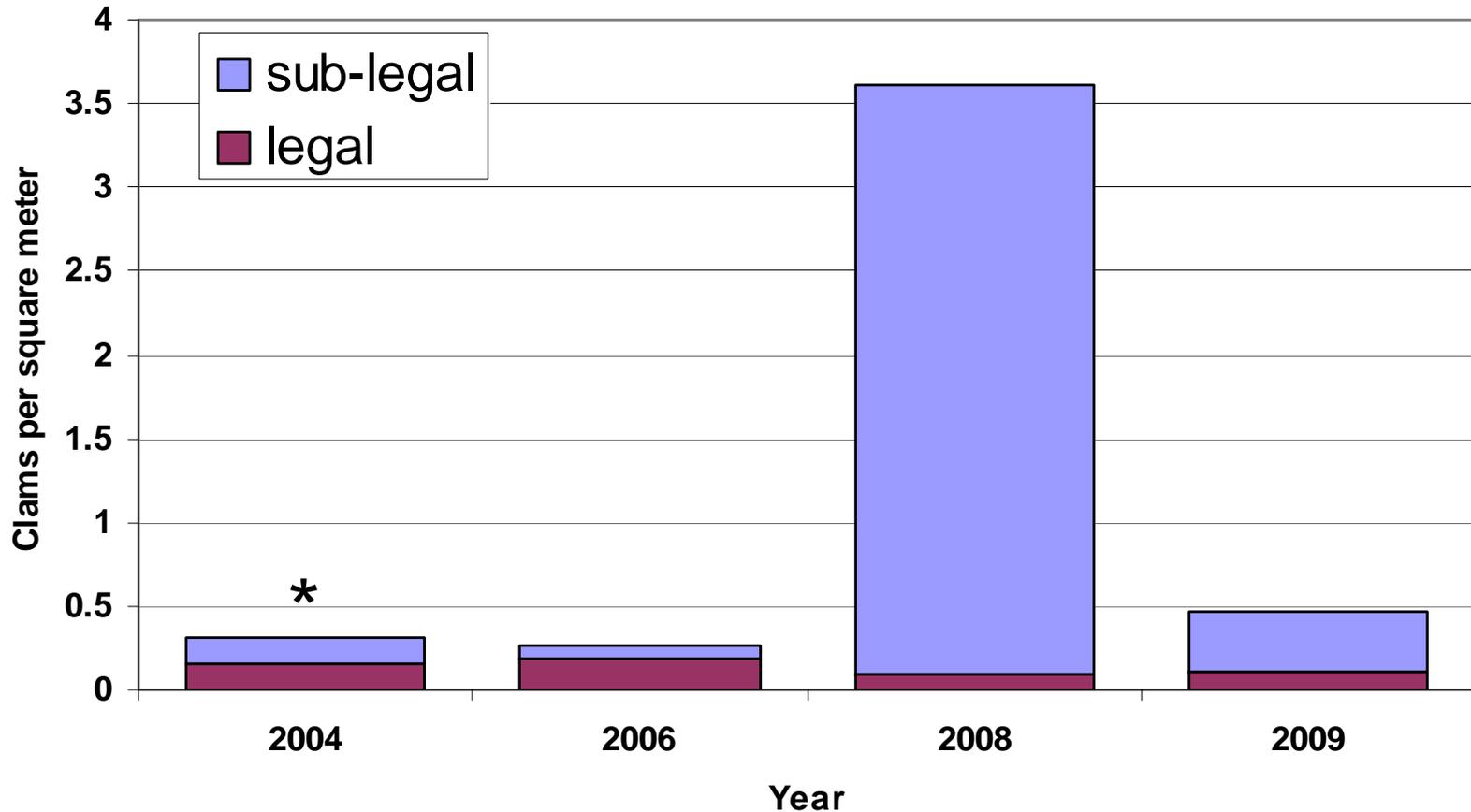


starvation?



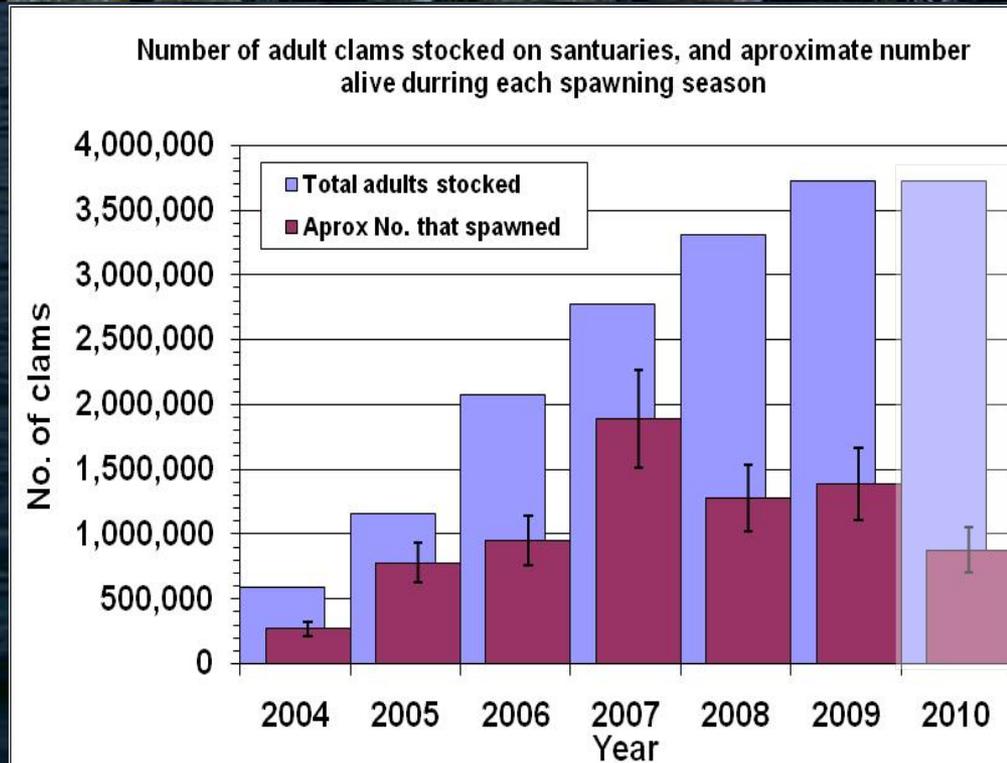
Average clam density in central GSB over time

Average clam density in central GSB from TNC survey (arithmetic mean of standard stations)



Lessons learned so far...

- At low abundance large recruitment events are unlikely
- **Significantly increasing spawning potential can increase recruitment**
- Stocking spawner sanctuaries is a lasting investment...



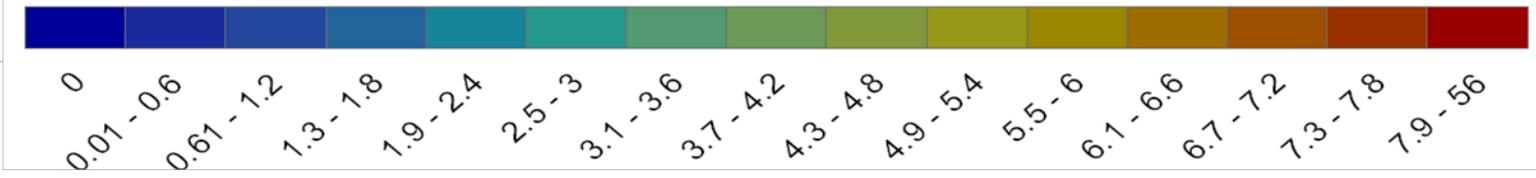
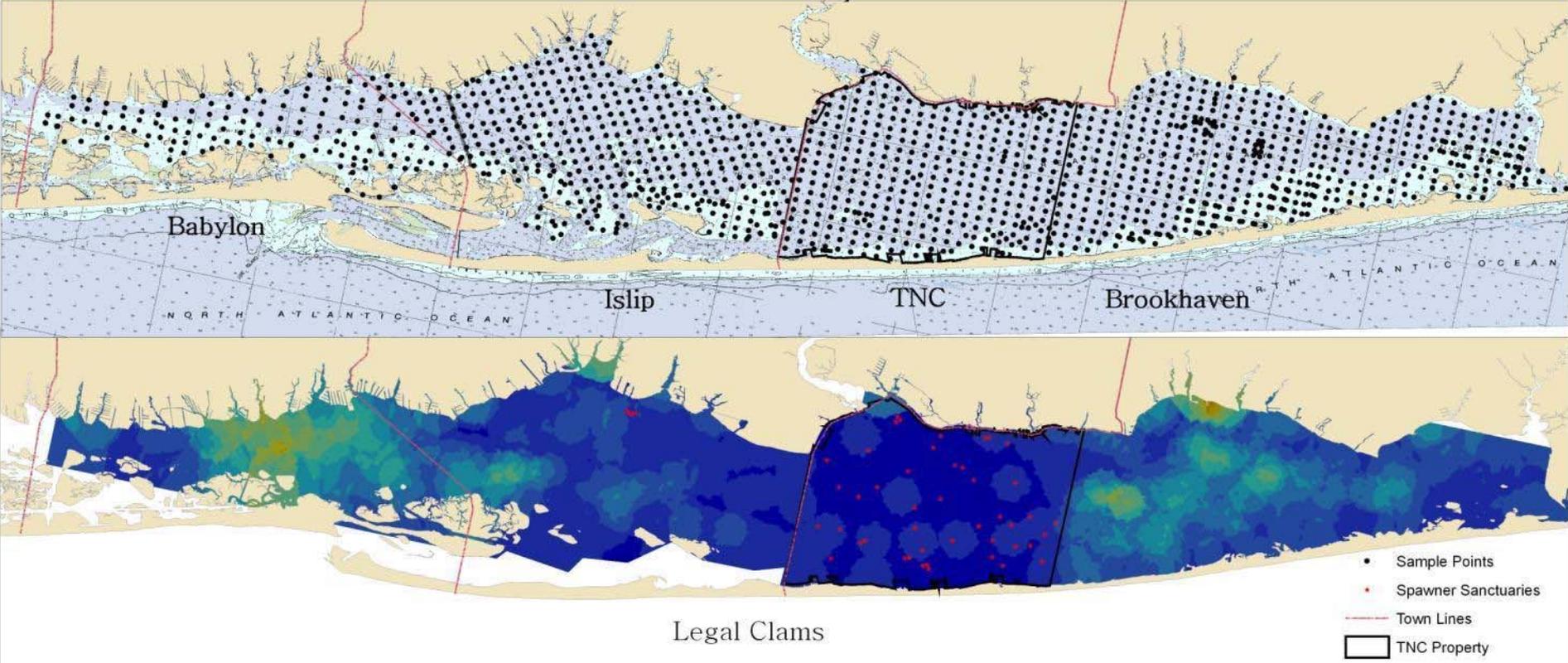
- **Restoration on protected area impacted both protected and adjacent areas**
- **Great South Bay is still capable of producing clams !**
- **More work is needed to address phytoplankton issues**



Bay-wide abundance of legal sized clams as of summer 2008

Spawning potential still very low

2008 Shellfish Surveys Combined



Can we restore hard clams to Great South Bay after 30 years of decline?

**YES
WE
CAN**

but it will be challenging,
and it will take time

- Restore of reproductive potential
- Take multiple coordinated actions aimed at improving water quality and plankton conditions

- Monitor and adapt
- Assure harvest is sustainable





Support Acknowledgements



- Suffolk County, NOAA Community-based Restoration Center,
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