

# Preliminary Investigations into Quantifying Scallop Enhancement:

*The costs and benefits of  
noninvasive methods.*

Yvonne Vaillancourt  
Director, Nantucket Field Station

---

School for the Environment

---



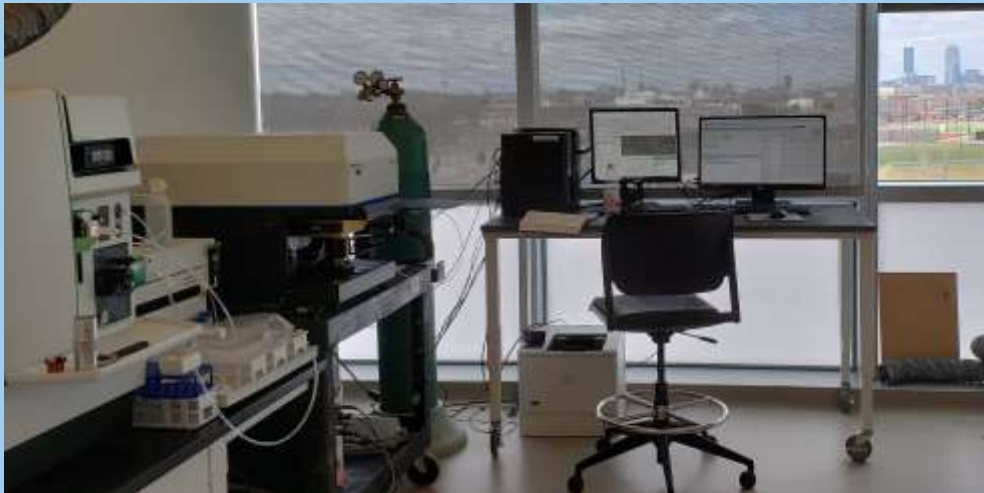
# Nantucket Field Station

University of Massachusetts Boston  
School for the Environment





# Environmental Analytical Facility UMass Boston



# Urban Harbors Institute

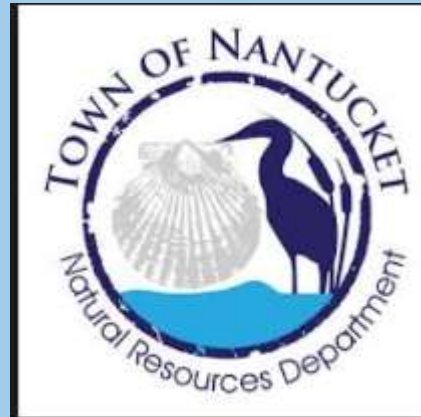
Advances Ocean and Coastal management through collaborative research and planning

## Shellfish Management Plan

- ▶ Jack Wiggin
- ▶ Kristin Uiterwyk, Director
- ▶ Kimberly Starbuck, Research Associate
- ▶ Allison Novelly, JD, MMA Research Analyst

## What effect is enhancement having on the Nantucket Bay Scallop Population?

- ▶ Survival rate?
- ▶ Reproductive contribution?
- ▶ Catch?
- ▶ Can we tag them?
- ▶ What type of tags exist?



# Tag Requirements

- ▶ unambiguous identification
- ▶ cannot affect growth, survival, mortality rates or behavior of marked individuals
- ▶ be non-toxic,
- ▶ be invisible to predators
- ▶ be cheap enough to mark large quantities of larvae
- ▶ retained until the time of detection (2 years)

## Choices

- ▶ Genetic shell pattern
  - ▶ Easy to see and score at any age and condition
  - ▶ Different population source, differed from the characteristic look
- ▶ Genetic tracking
  - ▶ A lot of time and money
- ▶ Dyes or additives
  - ▶ Calcein, Oxytetracycline, Rare elements
    - ▶ Introduce a change to the rearing
    - ▶ Confounding effects
    - ▶ Concern associated with additions to diet
    - ▶ Community reaction
- ▶ Schlerochronology- Elemental fingerprinting- no need for interruption of spawning and rearing (Thorrold, 2002, Levin 2006)



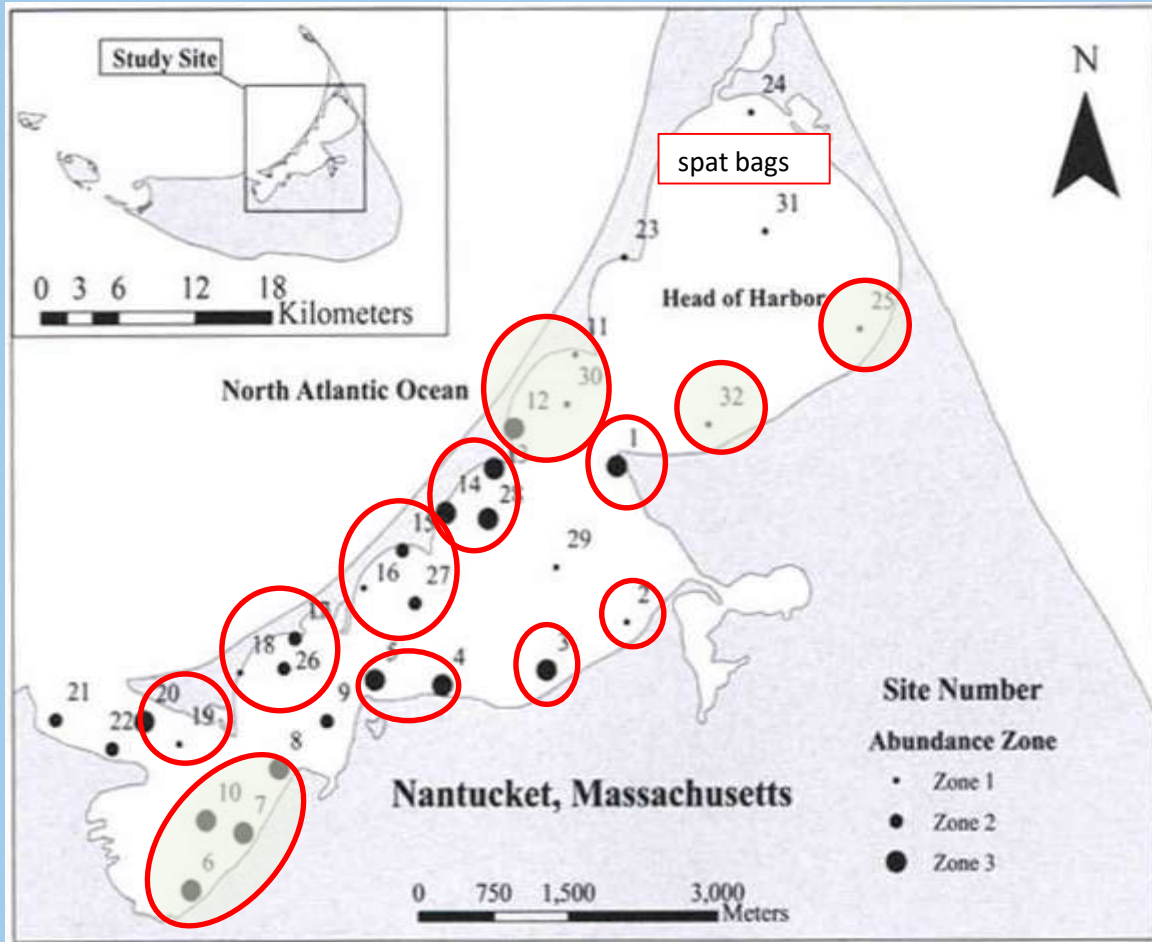
# Sclerochronology

- ▶ physical and chemical variations in the shell
- ▶ temporal context in which they formed
- ▶ instrumentation and expertise
- ▶ hatchery has consistent conditions and food source
- ▶ long term climate studies

*Salinity*

*Food Source*

*Temperature*



([Broadaway](#) & [Hannigan](#), 2012).

- ▶ Laser Ablation Inductively Couple Plasma Mass Spectroscopy. (LA-ICP-MS)
  - ▶ Extremely high temperature to vaporize and ionize atoms (+)

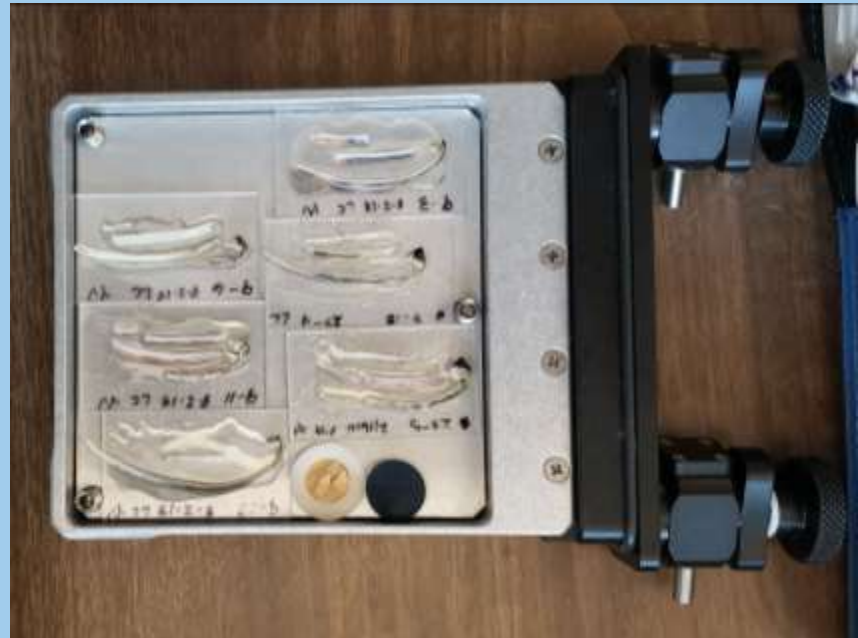
Takes a lot of time

- ▶ Collection
- ▶ Cleaning
- ▶ Sawing shell
- ▶ Mounting and polishing
- ▶ Processing on LA-ICP-MS
- ▶ Processing data output
- ▶ Statistical processing



Sawing shells takes 30 minutes to one hour, sometimes shells fracture and you need to reset the saw.

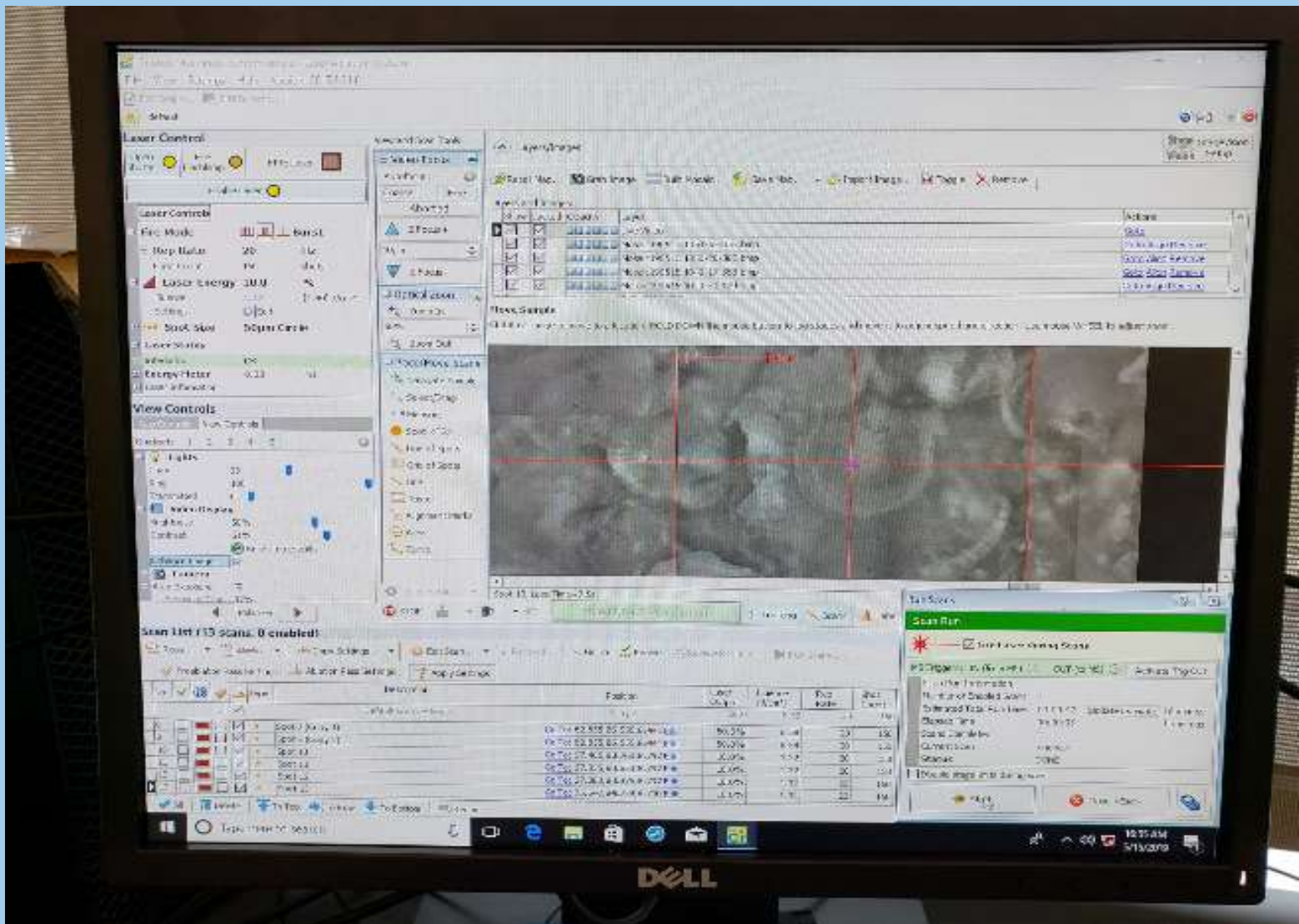






LA ICP MS chamber with 2 standards and 6 slides of samples of various specimens including one slide of juvenile large larval shells. (lower right)





Display while using LA ICP MS- view of larval shells.



# Data

- ▶ Process raw data
- ▶ Convert counts per second to micromoles in ratio to moles of calcium
- ▶ Statistics

# Thank you!

Nantucket Shellfish Association for funding this project



Tara Riley and the Nantucket Department of Natural Resources  
Brant Point Hatchery



University of Massachusetts Boston Environmental Analytical Facility  
Dean Robyn Hannigan, Pr Alan Christian & Amy Johnson

CaPE Lab-Provincetown Center for Coastal Studies  
▶ Agnus Mittermayer

