TEMPORAL AND SPATIAL VARIATION IN GROWTH IN THE SURFCLAM *SPISULA SOLIDISSIMA*

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Atlantic Surfclam (*Spisula solidissima*)

- Relatively long-lived – max age 35 years
- Broadcast spawners with seemingly no stock-recruit relationship
- Clams recruit over a broad region and population structure is determined by subsequent survival.
- The range of surfclams in the Mid Atlantic (MAB) and Georges Bank (GB) is moving north and east by tens of kilometers per decade.
- Habitats change, previously suboptimal become optimal as waters warm, optimal become suboptimal when it is too warm.
- Need to identify the optimal ranges as these movements continue. What will be the future spatial limitations for the stock and hence the fishery?
- Need a tool to project the epicenter of the available stock 5 to 10 or more years out from the present. This project examines the forward projection of growth rate in a spatially explicit manner using an available archive of material.
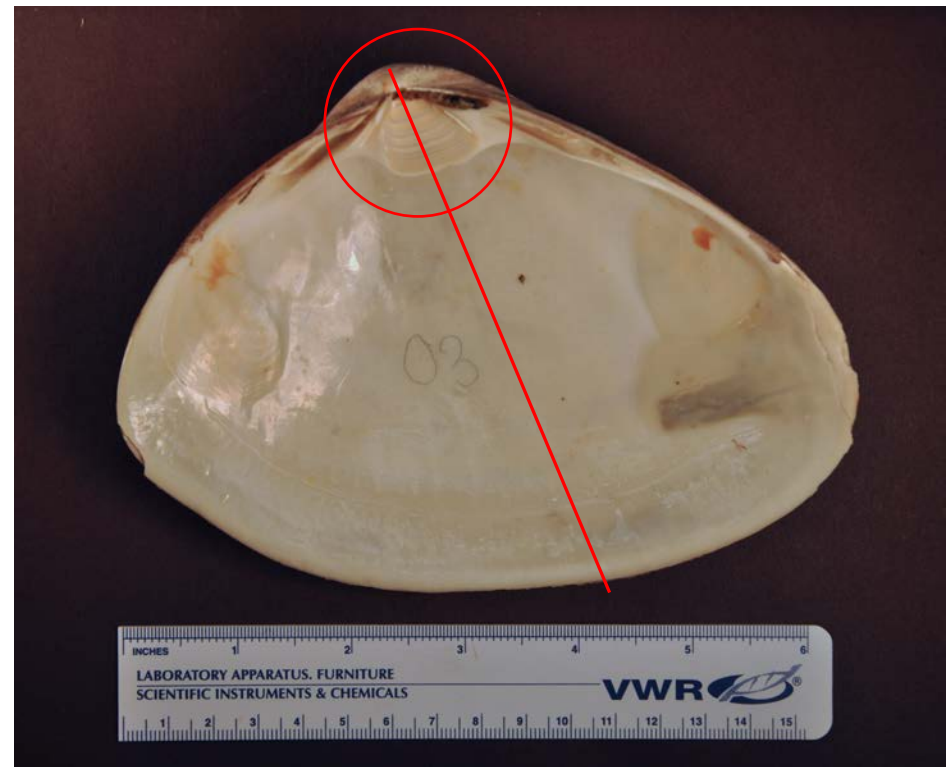
Materials and Methods

- NEFSC has an archive of **4930 hinges** from surf clams collected in1986, 2008, and 2011 through 2016 over the survey range. – a 33 year time series

- This archive has been used to estimate a growth curve for the entire fishery - but never examined in a more spatially explicit manner.

- This effort focuses on estimation of growth rate in a spatially explicit manner at smaller scales of space and time

NEFSC surf clam age and shell length data: 2014 assessment
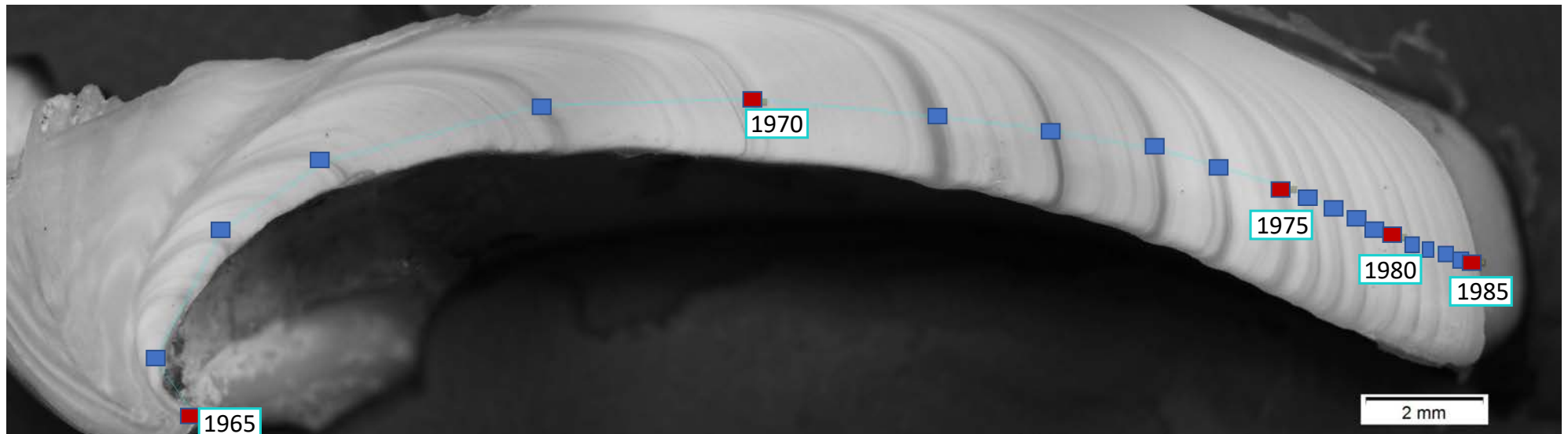

Lots of variability
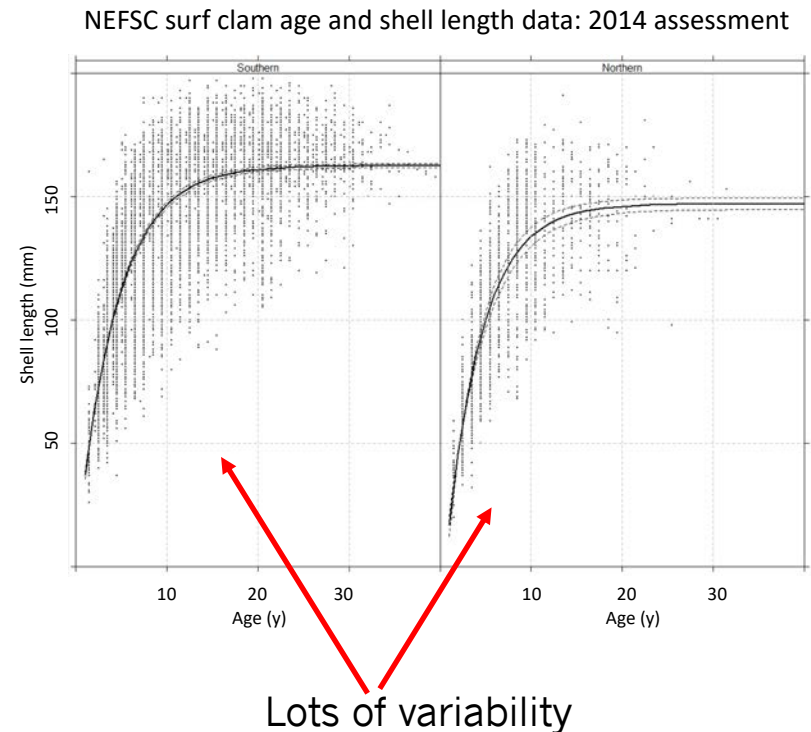
Materials and Methods

- Surfclam shells record complete growth record

- Hinge (circled) is protected from outside abrasion

- Shells are sectioned along line and polished to see growth signatures
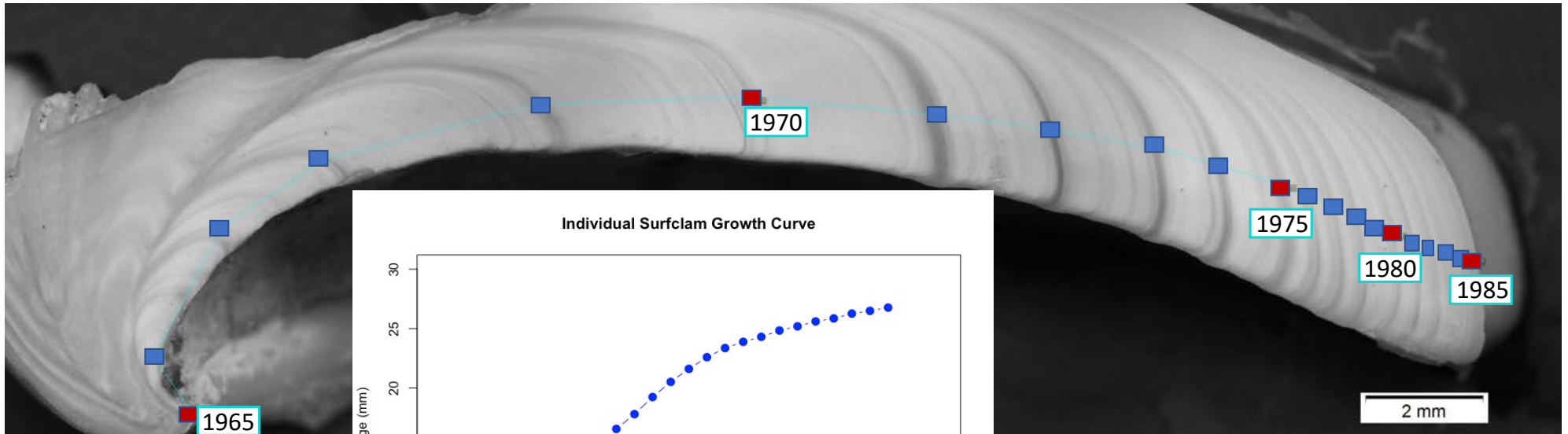
Materials and Methods

Sectioned surfclam hinge with annual growth lines (dark) marked.
This specimen was collected in 1986, with an estimated age of 21 years, making the birth year 1965.

Materials and Methods


Individual Surfclam Growth Curve

Materials and Methods

- Range of exploited surfclams includes the Mid Atlantic Bight and Georges Bank areas.

- Material from NEFSC surveys covering this entire footprint
  - Thanks here to NEFSC age and growth lab, especially Eric Robillard, for providing access to this material

- Consider three regions:
  - N&E of Hudson Canyon
  - DE Bay to Hudson Canyon
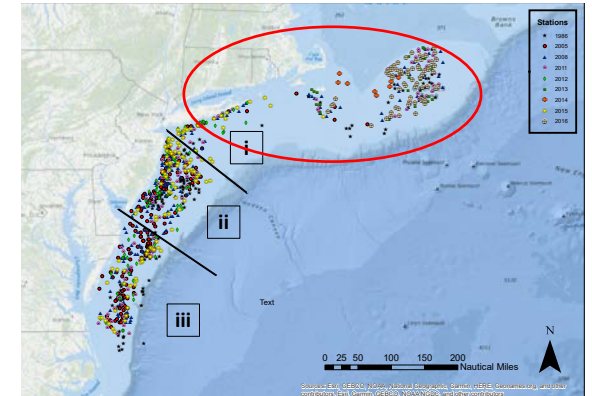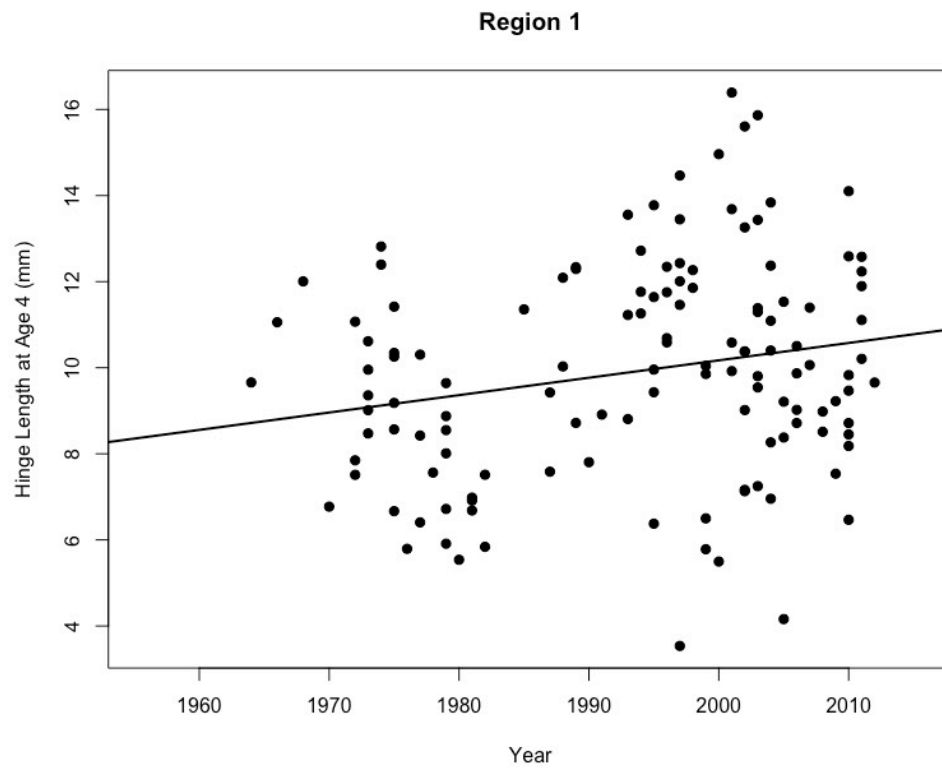 - S of DE Bay
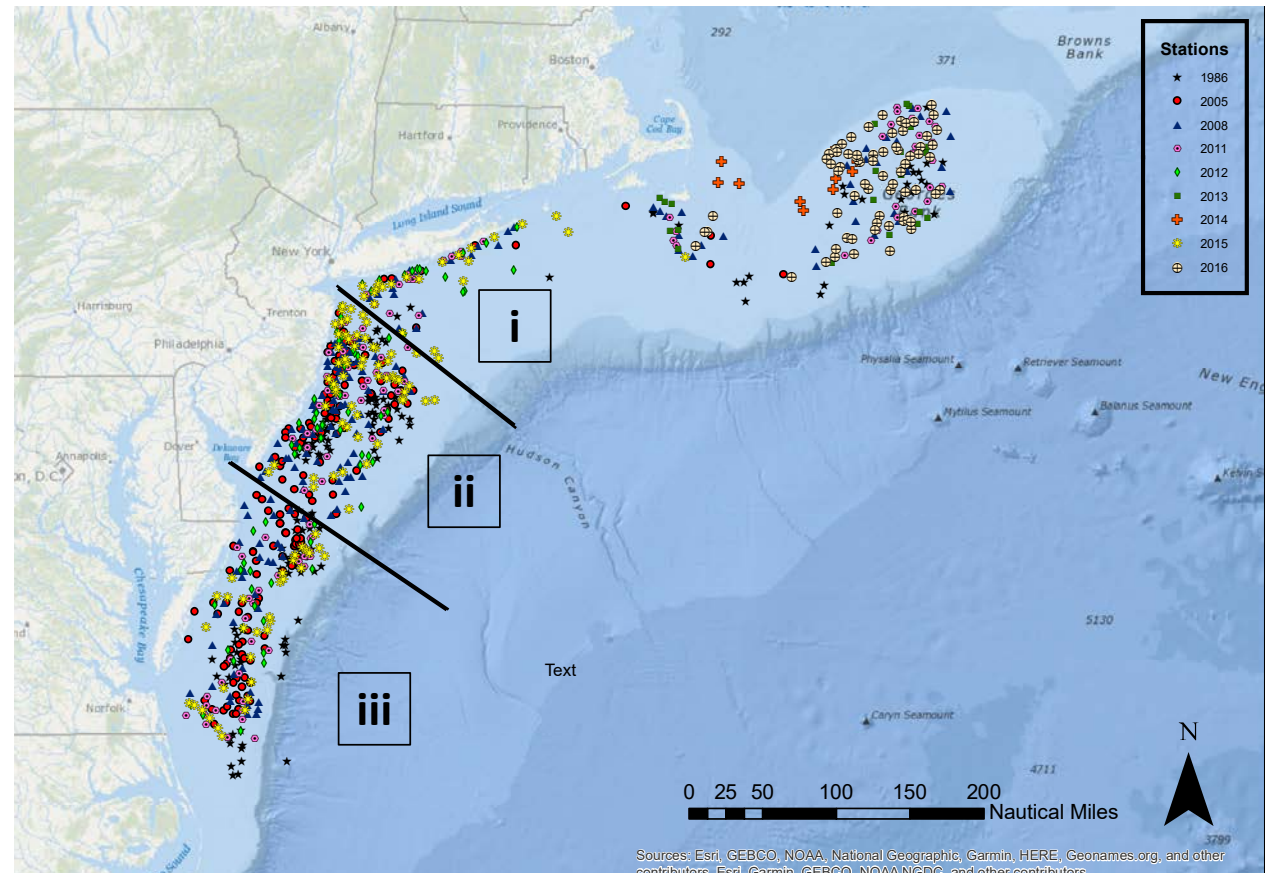
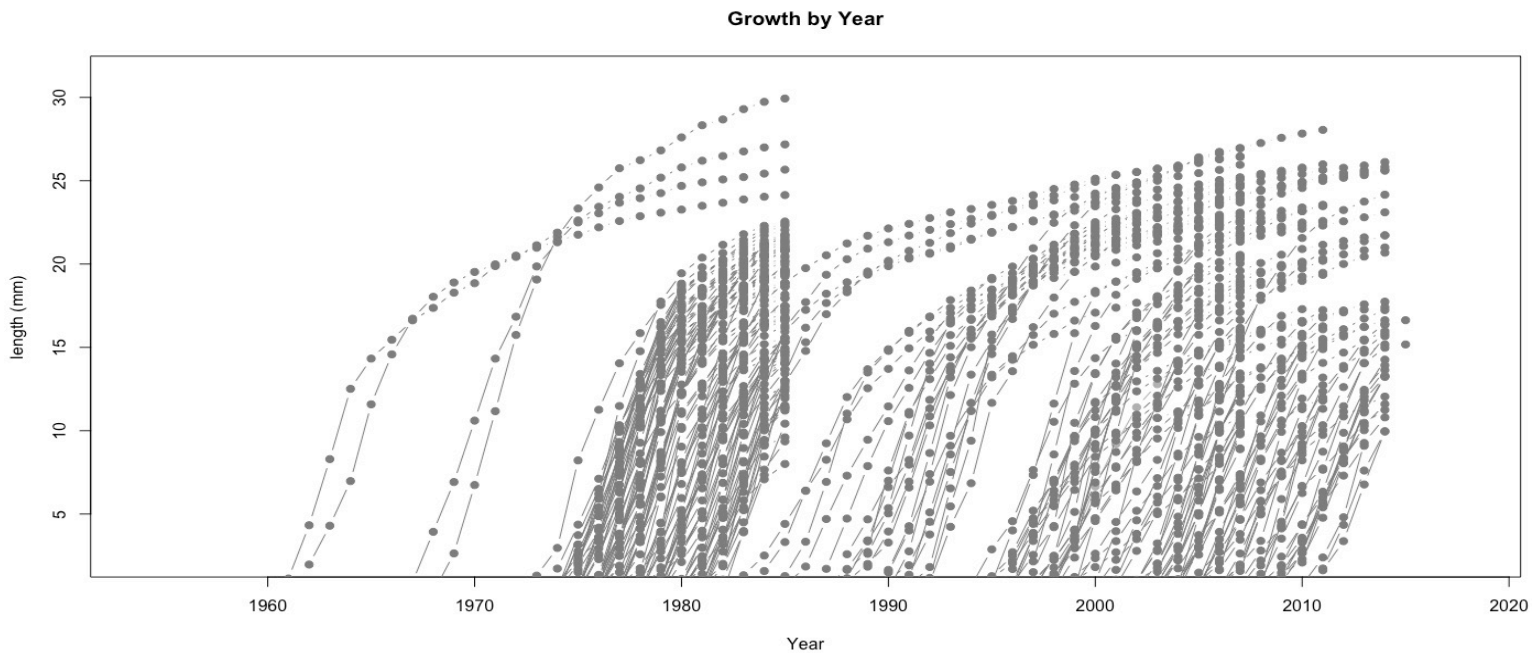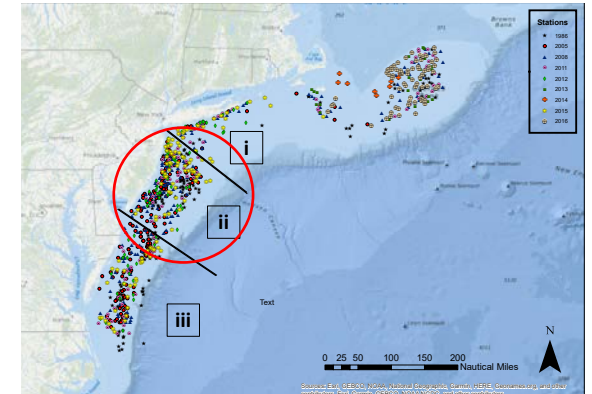# Results – Region i
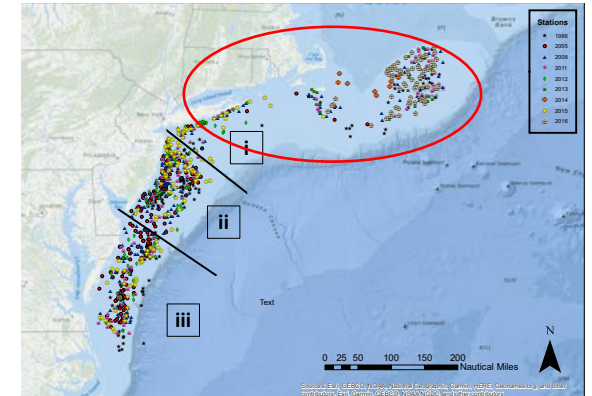
Growth by Year
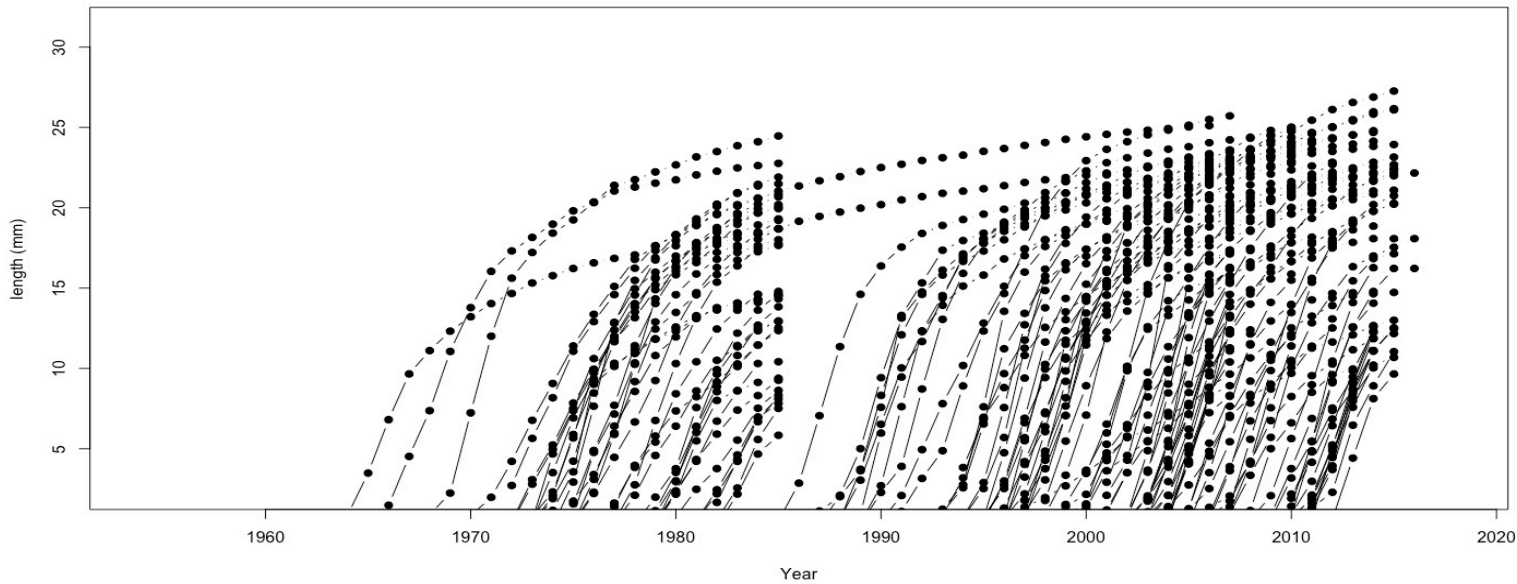
Little change in max size over the study period, but what about growth rate?

Results – Region i

Region 1

Hinge Length at Age 4 (mm) vs Year

Results – Region ii

Growth by Year

Gradually decreasing growth rate and max size over the study period

Results – Region ii

Region 2

Results – Region iii

Growth by Year
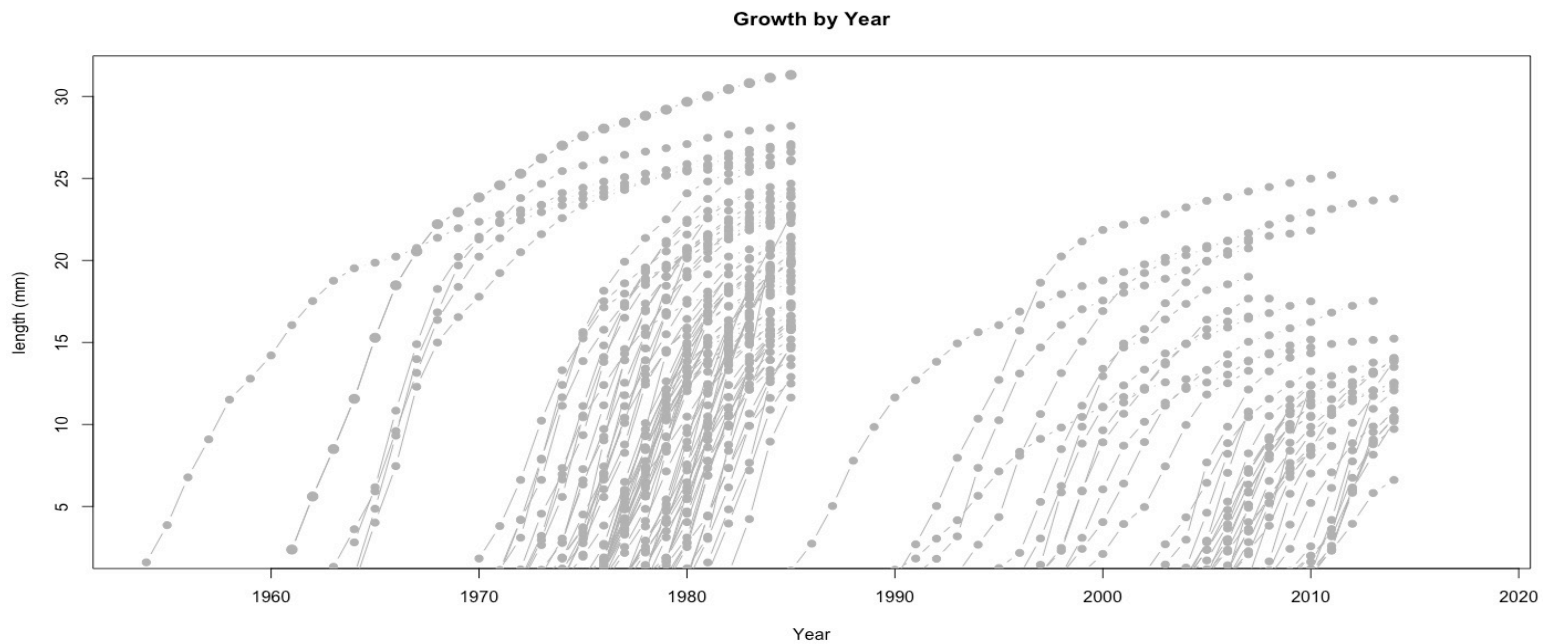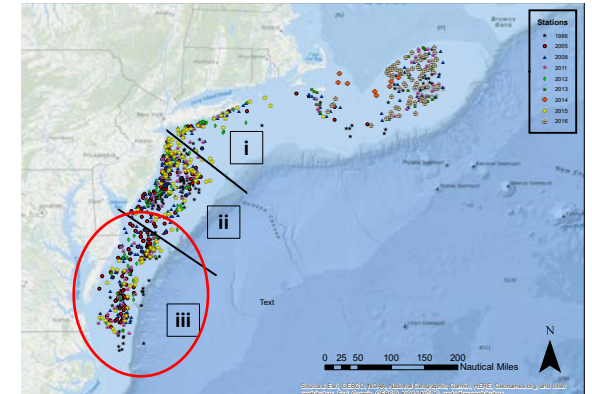
Notable decrease in both growth rate and max size over the study period

Results – Region iii
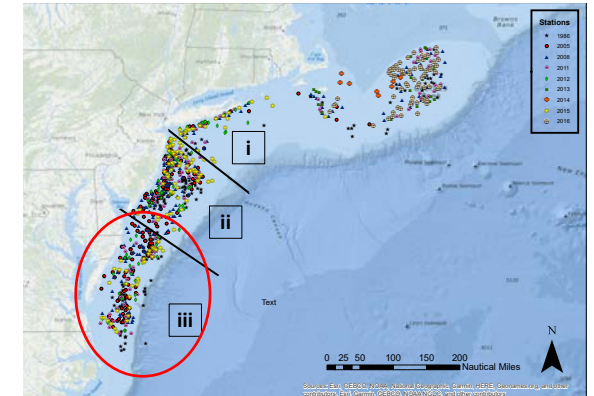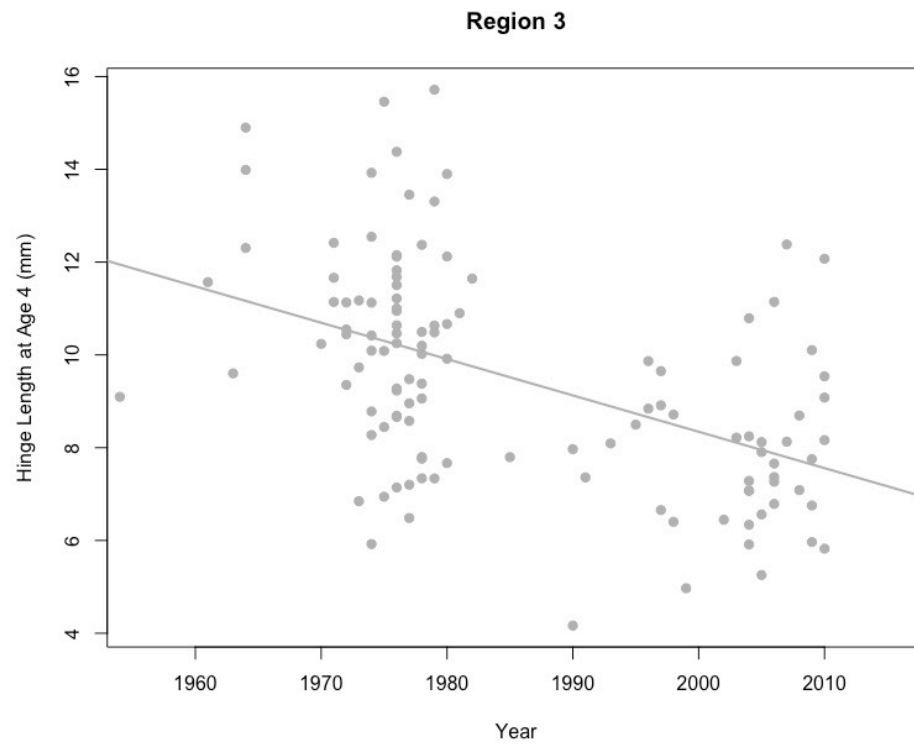
Region 3

Summary of Results

- In Region 1 (north and east of Hudson Canyon) terminal size appears stable, with a slight increase in growth rate over time.

- In Region 2 growth rate and terminal size decrease slightly over time

- In Region 3 (southernmost region) growth rate and terminal size decrease over time, more dramatically than in region 2

- Trends of clam growth over time are not the same over the spatial range

- The optimal range for surfclams has been shifting north over the study period

Future Directions

- Is this shift in optimal range continuous over the study period, or are there years in which these trends in growth rate change rapidly?

- Use of linear modeling to determine significant variables governing trends in growth rate and terminal size over time
  - Potential variables include: temperature, depth, location

- What will be the future spatial limitations of the stock and hence the fishery? Can we predict the epicenter of the available stock 5 to 10 or more years into the future?

Acknowledgements

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