SPATIAL AND TEMPORAL VARIATIONS OF ATLANTIC SURFCLAM (*SPISULA SOLIDISSIMA*) POPULATION DEMOGRAPHIC CHARACTERISTICS ALONG THE MIDDLE ATLANTIC BIGHT

Mauricio González Díaz*, Eileen E. Hofmann, John M. Klinck, Daphne Munroe, Eric Powell, Andrew Scheld

***Contact: mgonz023@odu.edu**

Acknowledgments:

BOEM Bureau of Ocean Energy Management

Grant M19AC00016

NOAA National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Data availability

Photo from wikimedia commons by Ashley Delvento

Outline

- Background on Atlantic surfclam
- Data sets and analysis description
- Population model used to simulate surfclam biomass along the MAB
- Summary and further work

Objectives

- Provide a retroactive analysis and a projection to the near future of the Atlantic surfclam population demographic parameters variability with changes in the environmental conditions along the Mid-Atlantic Bight in a climate change scenario.

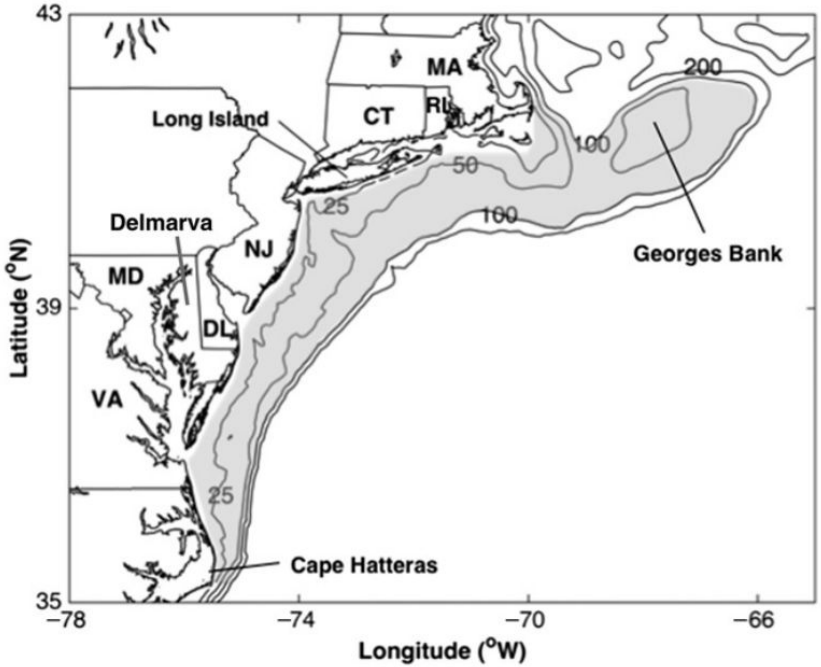
Outline

- Background on Atlantic surfclam
- Data sets and analysis description
- Population model used to simulate surfclam biomass along the MAB
- Summary and further work

Objectives

- Provide a retroactive analysis and a projection to the near present of the Atlantic surfclam population demographic parameters variability with changes in the environmental conditions along the Mid-Atlantic Bight in a climate change scenario.

Atlantic surfclam background



Map of the MAB region showing the distribution of Atlantic surfclam (shading) (from Hofmann et al. 2018, Journal of Shellfish Research)

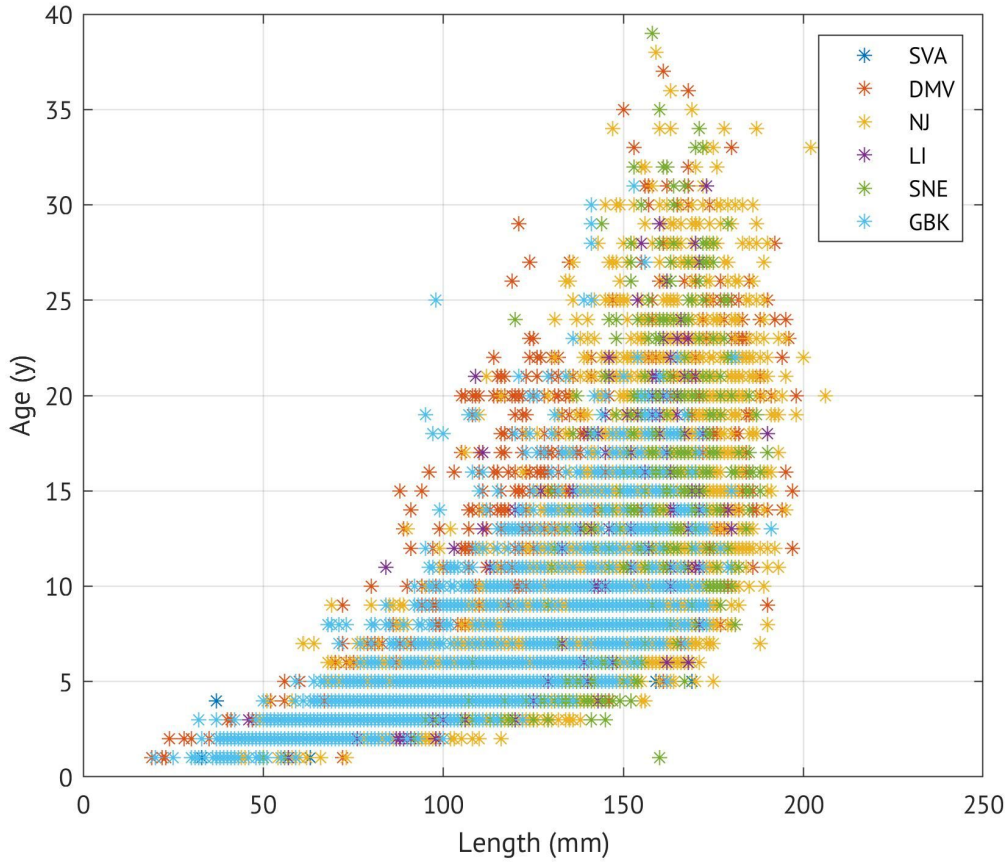
- Benthic biomass dominant
- Important for local economy and ecology
- Consistent surveys from 1982 to 2011, and 2012 to 2019 (NEFSC)
- Observed changes in biomass at the southern locations

Outline

- Background on Atlantic surfclam
- Data sets and analysis description
- Population model used to simulate surfclam biomass along the MAB
- Summary and further work

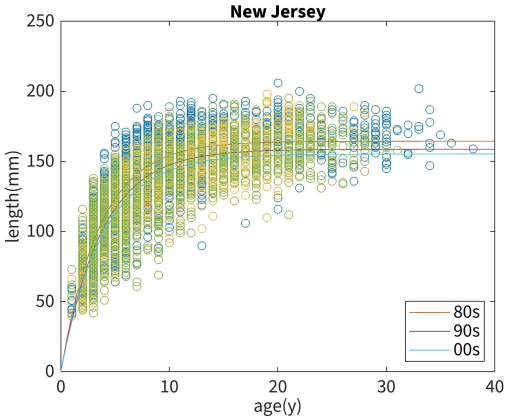
Objectives

- Provide a retroactive analysis and a projection to the near present of the Atlantic surfclam population demographic parameters variability with changes in the environmental conditions along the Mid-Atlantic Bight in a climate change scenario.

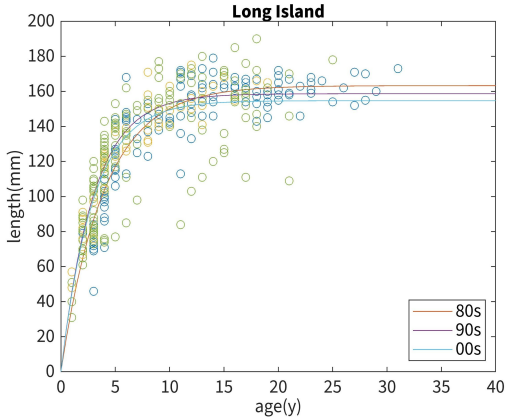


Survey data used in this research

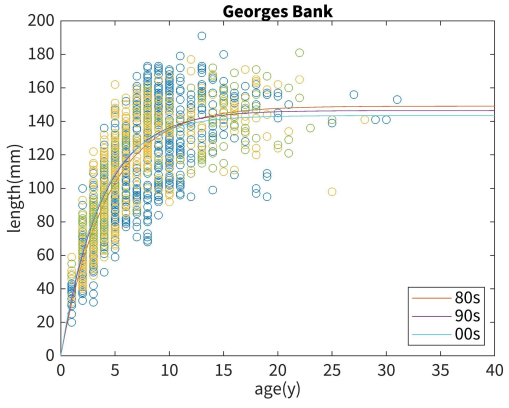
von Bertalanffy equation fits to the survey data



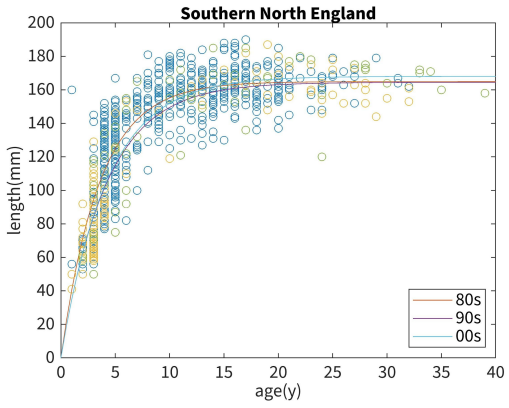
K = 0.266 y^{-1} ; L_∞ = 159.489 mm



K = 0.309 y^{-1} ; L_∞ = 158.844 mm



K = 0.262 y^{-1} ; L_∞ = 146.298 mm

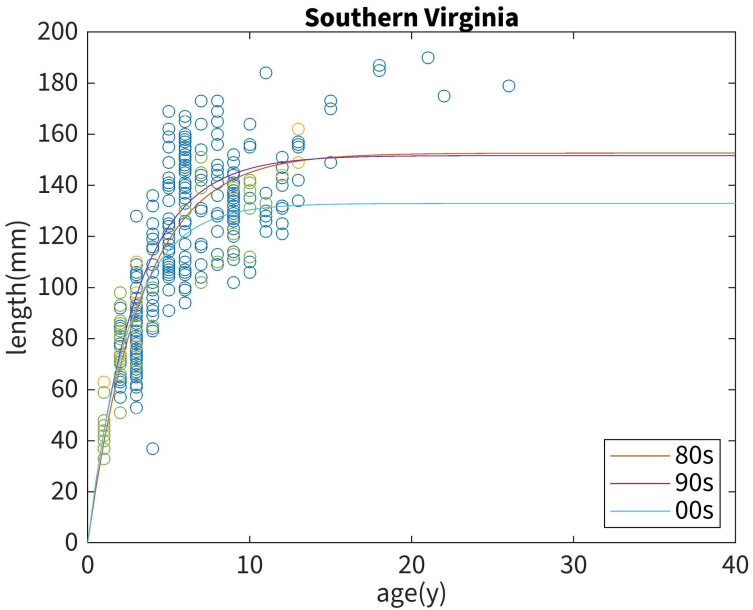


K = 0.252 y^{-1} ; L_∞ = 165.794 mm

$$L(a) = L_{inf} (1 - e^{-K a})$$

- L(a) is the length of the clam at a certain age
- L_{inf} is the asymptotic length
- K is specific growth rate (y^{-1})

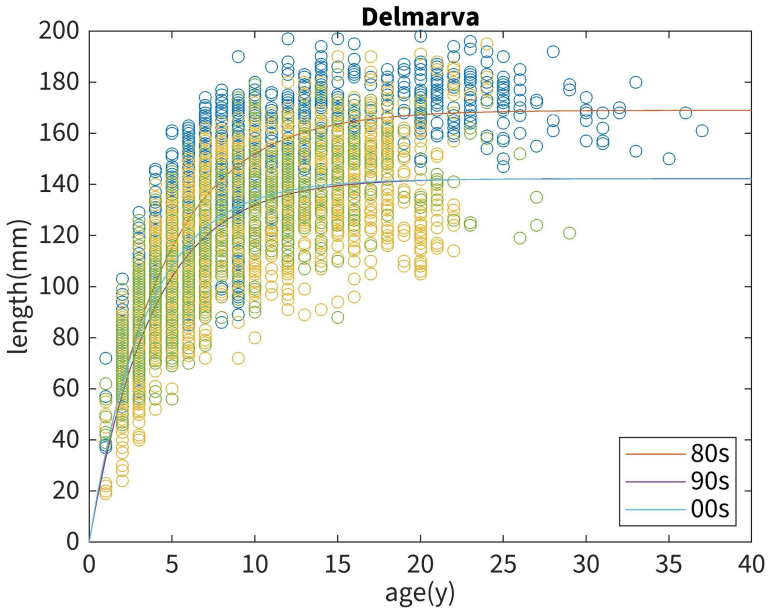
von Bertalanffy equation fits to the survey data



K_{80s} = 0.300 y^{-1} ; $L_{\infty 80s}$ = 152.601 mm

K_{90s} = 0.339 y^{-1}; $L_{\infty 90s}$ = 151.641 mm

K_{00s} = 0.397 y^{-1} ; $L_{\infty 00s}$ = 132.911 mm

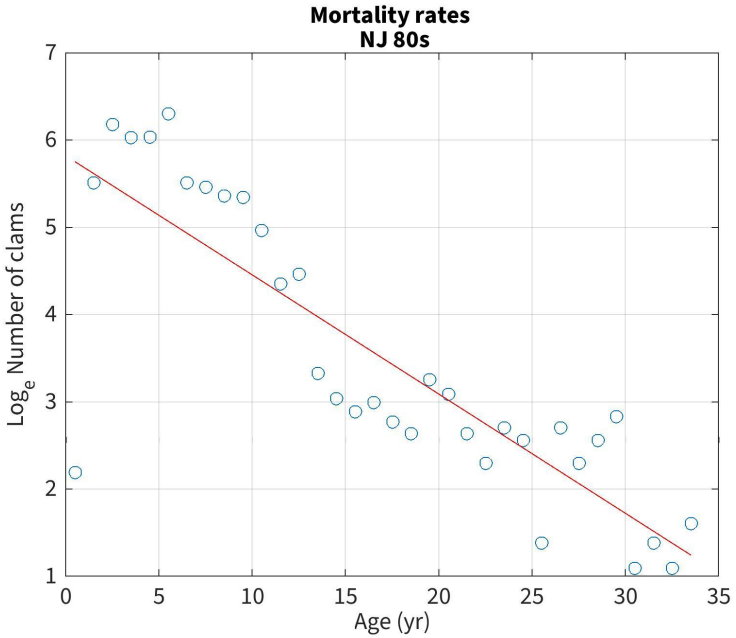


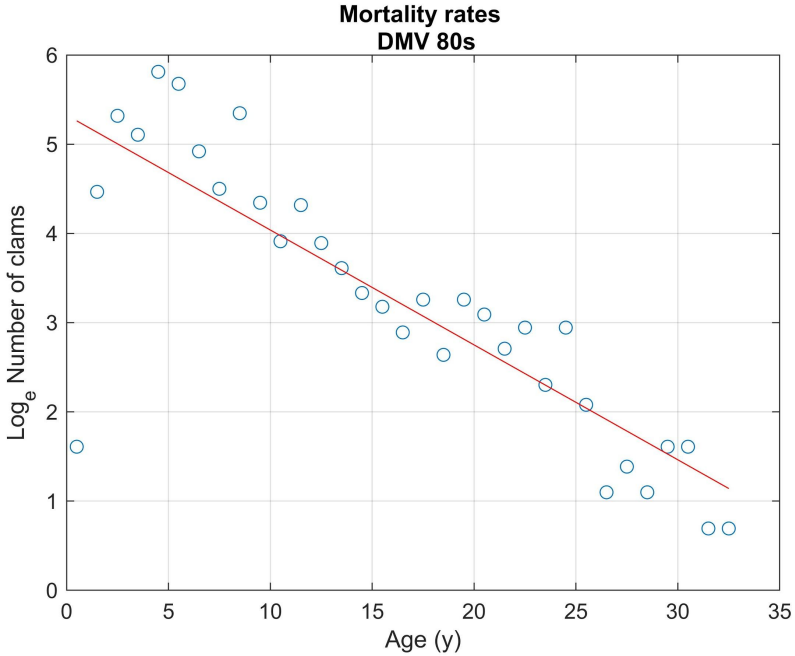
K_{80s} = 0.229 y^{-1}; $L_{\infty 80s}$ = 168.982 mm

K_{90s} = 0.262 y^{-1} ; $L_{\infty 90s}$ = 142.246 mm

K_{00s} = 0.286 y^{-1} ; $L_{\infty 00s}$ = 142.092 mm

Relationship between maximum age and mortality rate (Hoening, 1983, Fishery Bulletin).

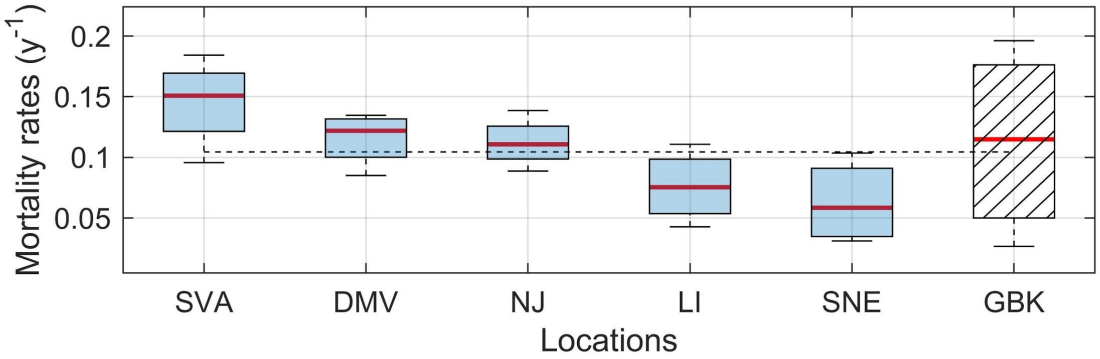




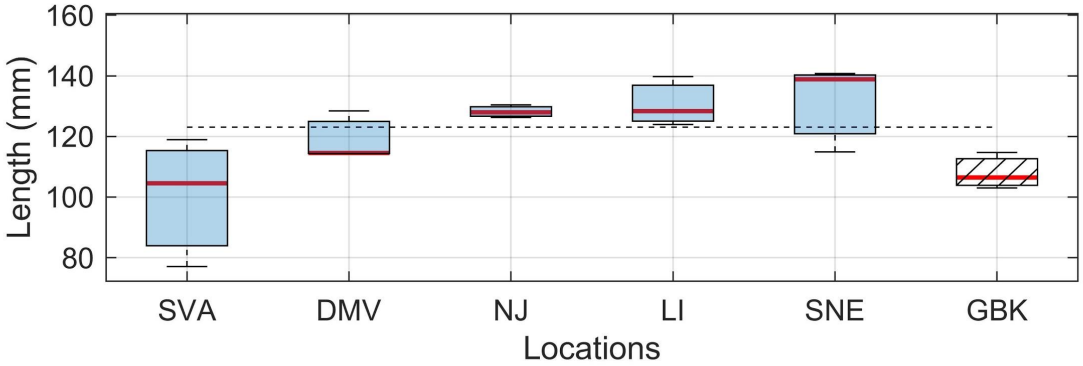
$$\ln(Z) = a + b \ln(t_{max})$$

where Z is the constant instantaneous rate of mortality, and t_{max} is the maximum age found in the sample.

Temporal and Spatial variations



South **North**



- South to North reduction in mortality rates
- South to North increase in asymptotic length

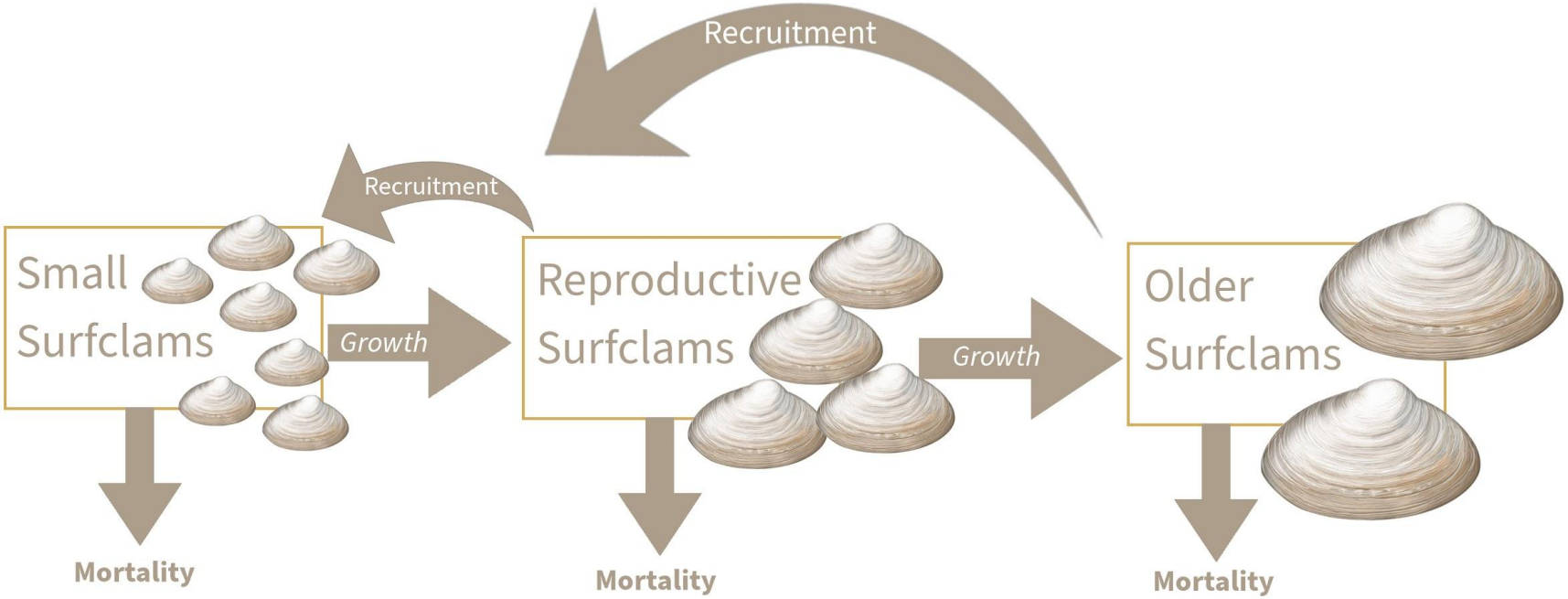
Outline

- Background on Atlantic surfclam
- Data sets and analysis description
- Population model used to simulate surfclam biomass along the MAB
- Summary and further work

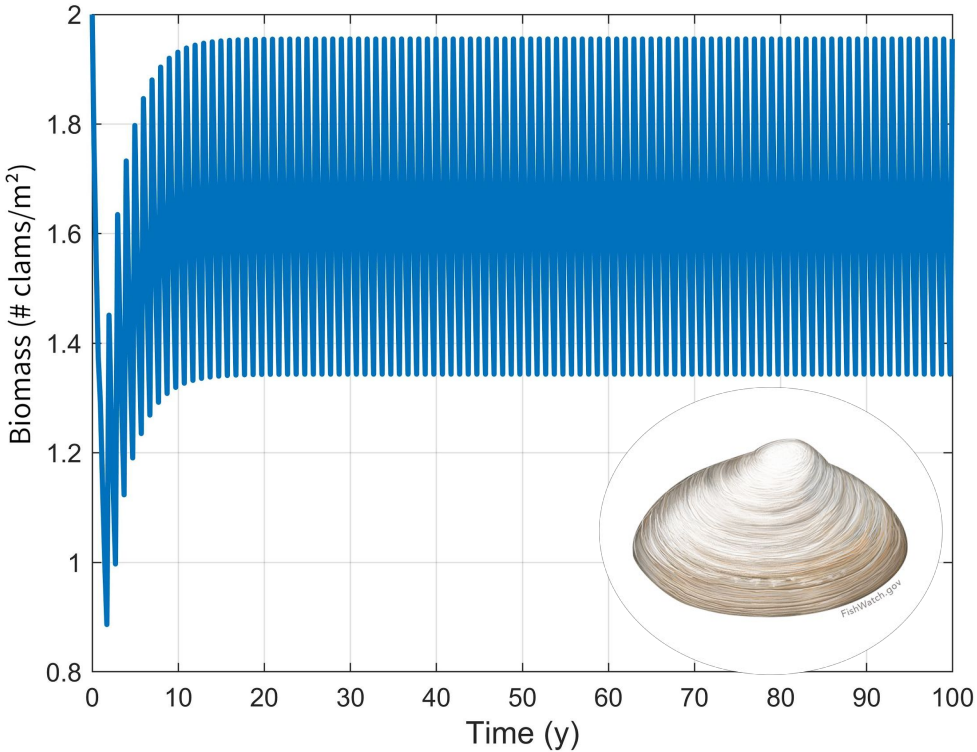
Objectives

- Provide a retroactive analysis and a projection to the near present of the Atlantic surfclam population demographic parameters variability with changes in the environmental conditions along the Mid-Atlantic Bight in a climate change scenario.

Population model for Atlantic sufclam



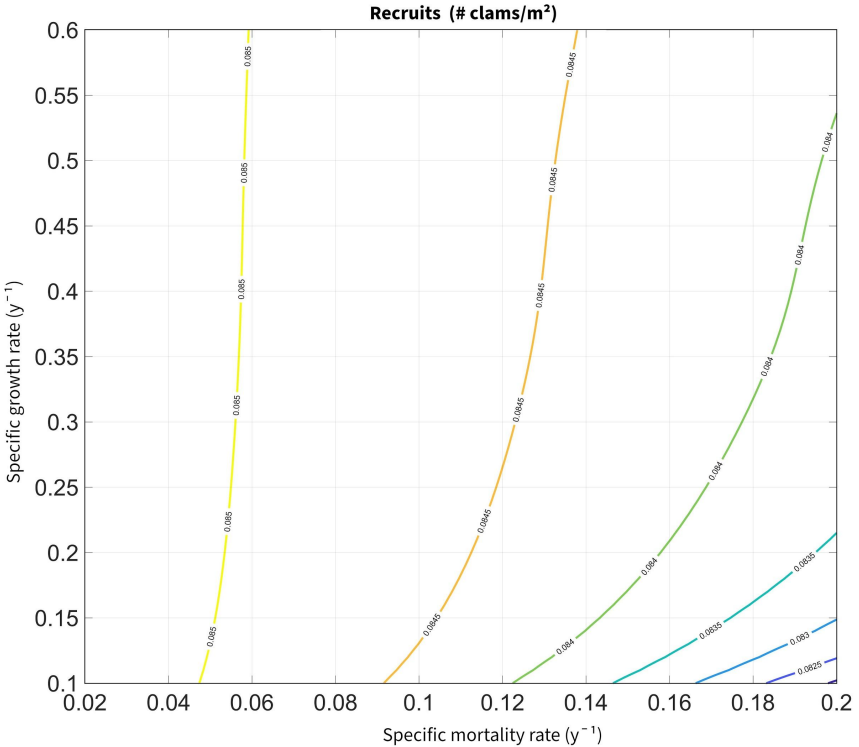
Model results: Population adjustment time

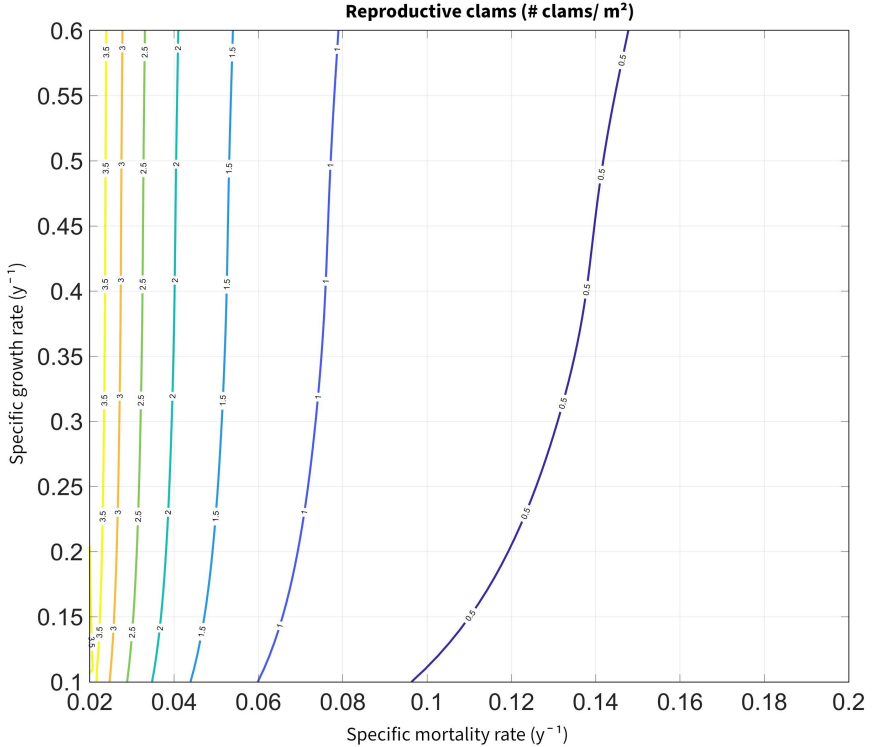


Adjustment time ~10 years

First reproductive cohort at 2 years since the start of the model

Model results: Sensitivity analysis





Outline

- Background on Atlantic surfclam
- Data sets and analysis description
- Population model used to simulate surfclam biomass along the MAB
- Summary and further work

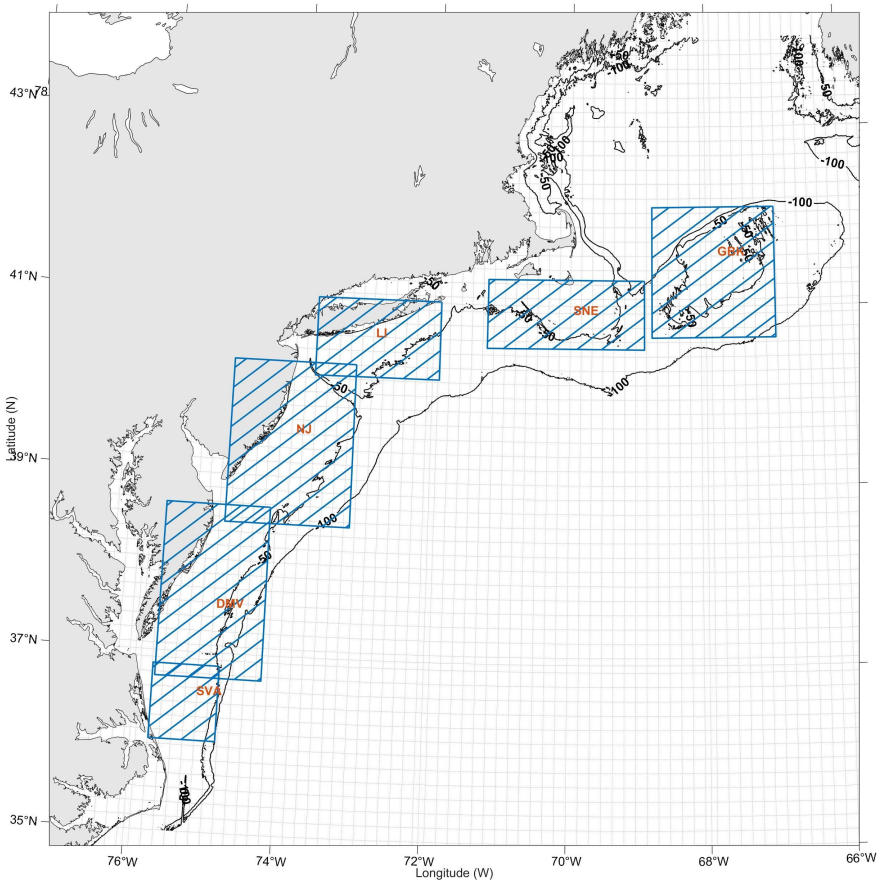
Objectives

- Provide a retroactive analysis and a projection to the near present of the Atlantic surfclam population demographic parameters variability with changes in the environmental conditions along the Mid-Atlantic Bight in a climate change scenario.

Summary

- Surfclam population rates changed from 1980s to 2000s
- Important population demographic parameters change in a latitudinal gradient
  - Southern MAB surfclam population is shrinking
  - Northern MAB surfclam population is expanding
  - Central MAB surfclam population present little change

Further work



- Include the entire MAB
- Include effect of warming bottom temperatures
- Include effect of modified habitat resulting from offshore wind farms

Feel free to contact me if you have any question!
*Contact: mgonz023@odu.edu

Acknowledgments:
BOEM
Bureau of Ocean Energy Management
Grant M19AC00016

NOAA
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Data availability