

# Evidence of Multidecadal Recruitment in the Ocean Quahog, *Arctica islandica* in the Western Atlantic Ocean

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# Ocean quahogs (*Arctica islandica*)

- Distribution along both coasts of the North Atlantic basin.
- Tolerates bottom temperatures up to 16° C.
- Shell length up to ~ 130 mm.
- Current estimates age oldest specimen at 507 years (Butler et al. 2013).



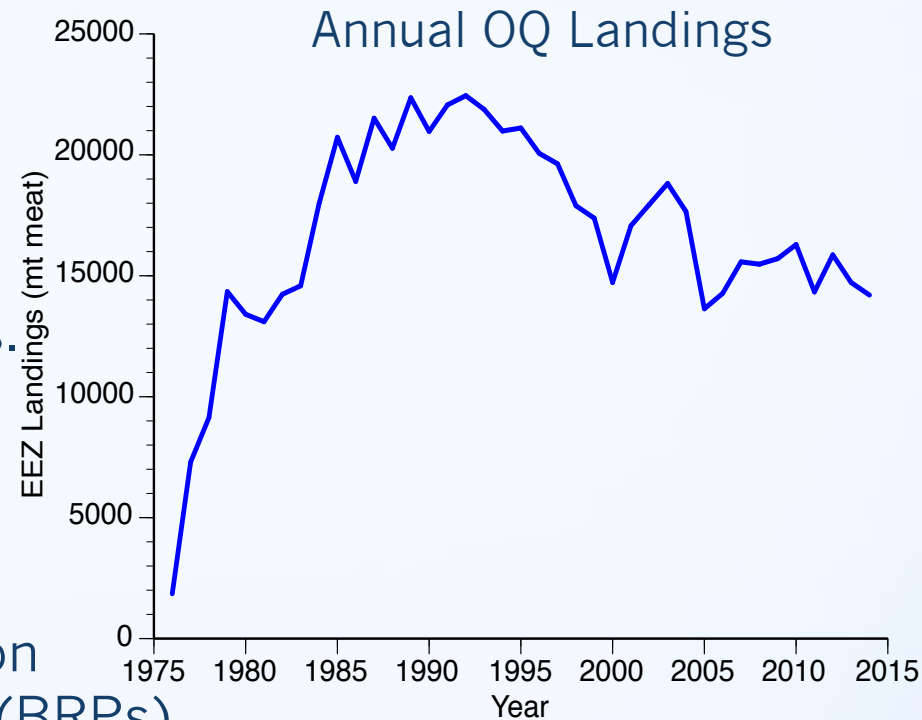
# Recruitment

- Literature suggests recruitment events are regional and infrequent, occurring once or twice every 20-40 years (Powell & Mann 2005).
- While recruitment appears to be rare in the context of the fishery, as these animals commonly exceed 200 years in age, recruitment is frequent considering their longevity.
- Do not recruit to fishery for 1-3 decades after settlement.
- Any increase in stock productivity anticipated from fishing down the stock would likely be delayed due to time lag between settlement and recruitment to fishery.



## Ocean Quahog Fishery

- Commercially important species since fishery began in late 1960's.
- Recent annual landings range from ~14,000-16,000 mt (meat).
- Fishing limits set using information about biological reference points (BRPs).
- Limited information available about OQ stock metrics makes setting BRPs uncertain.
- Updating BRPs is dependent upon the development of a long-term recruitment index.

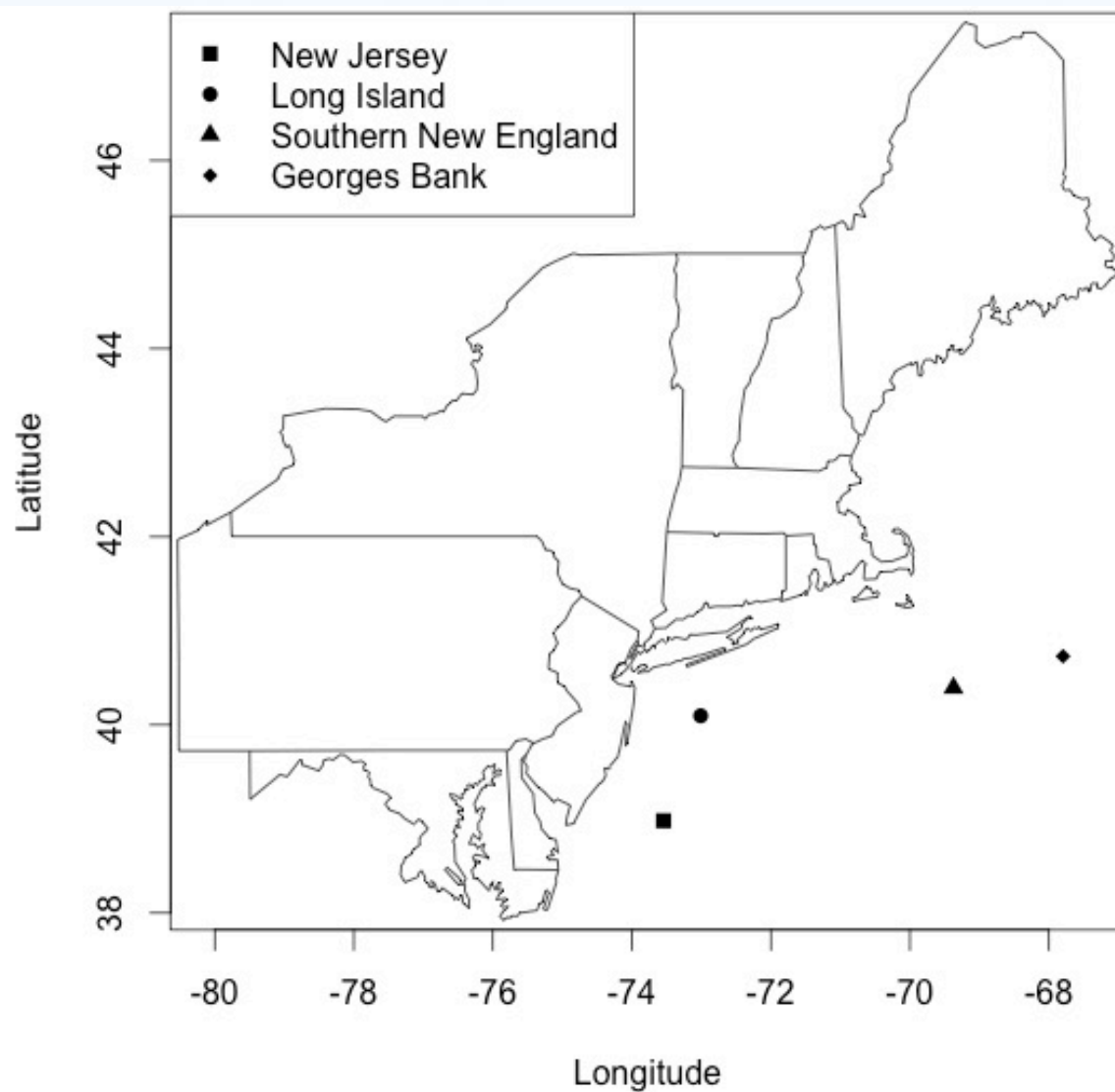


# Objectives

Consensus is that no progress on BRPs can be made without information on long-term recruitment dynamics.

- To utilize imaging software to provide individual ages from analysis of yearly growth bands of selected individuals.
- To develop population age-frequencies for ocean quahogs.
- To use these age frequencies to develop a recruitment time series supporting reference point recommendations for ocean quahogs.

# Sample Collection Locations







- Clams are collected with a commercial clam dredge.

- 2 collections per site
  1. First ~400 clams measured and retained.
  2. Every clam is measured but only clams within largest 20<sup>th</sup> percentile retained.



# Sampling Methods

- Full size distribution from each site is split up into 5 mm intervals from 80-120 mm (80 mm fully selected to fishery).
- ~20 clams sampled from each size interval at all sites.
- An additional 20 individuals from one 5 mm size bin at each site have been sampled.

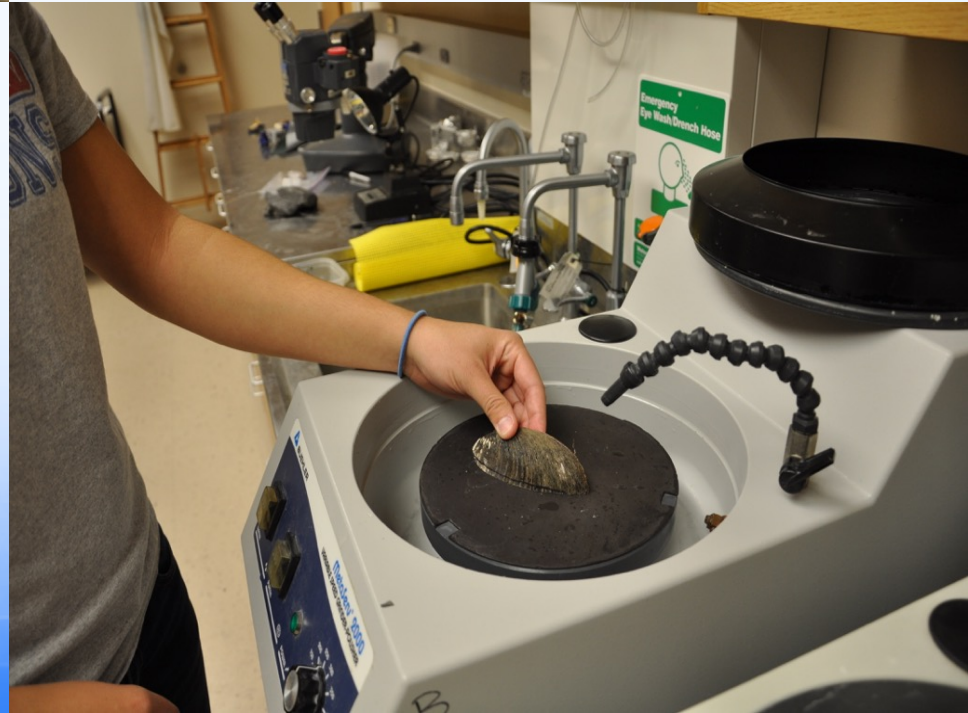




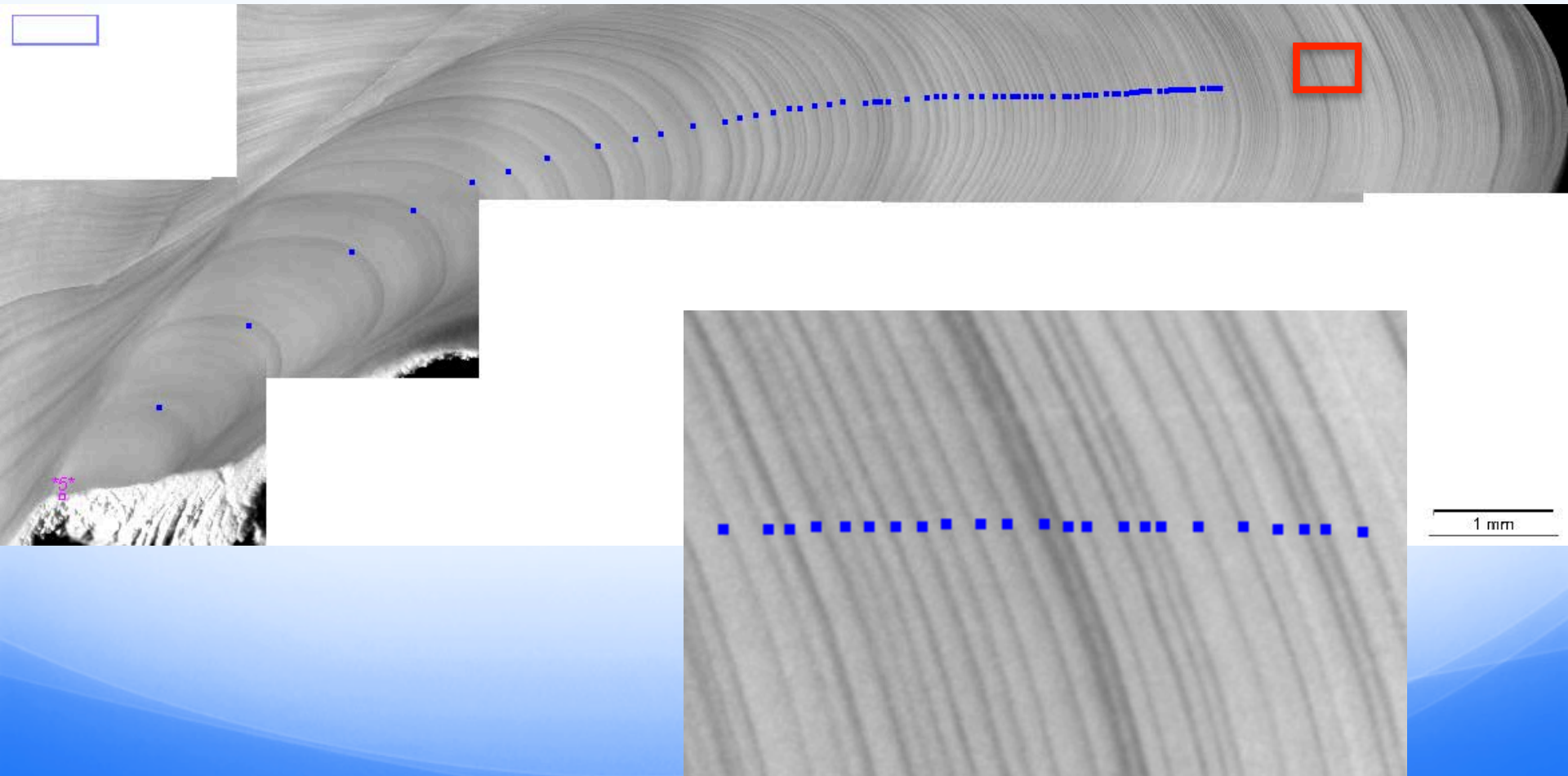


- Clams are sectioned along the height axis on a commercial tile saw.

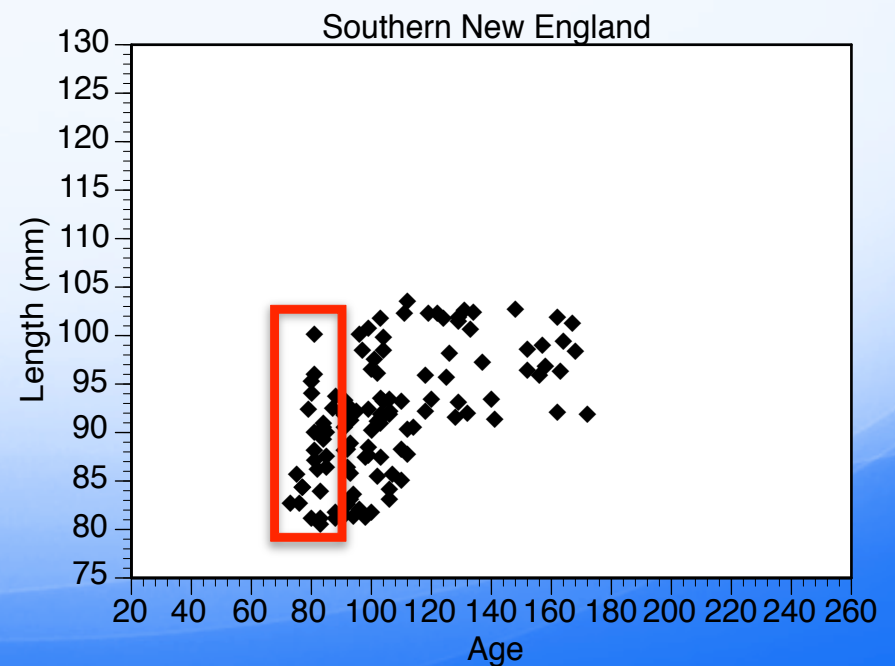
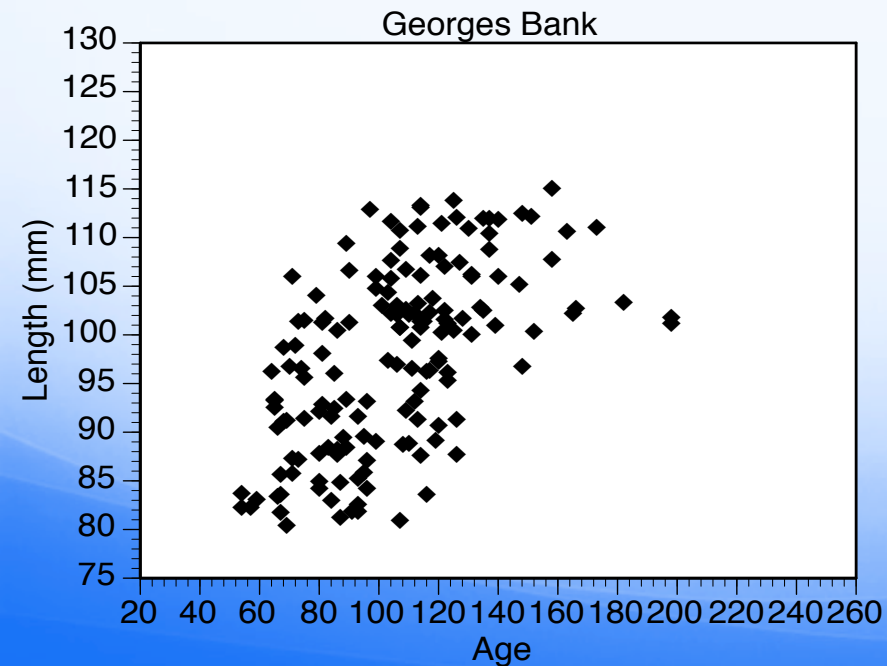
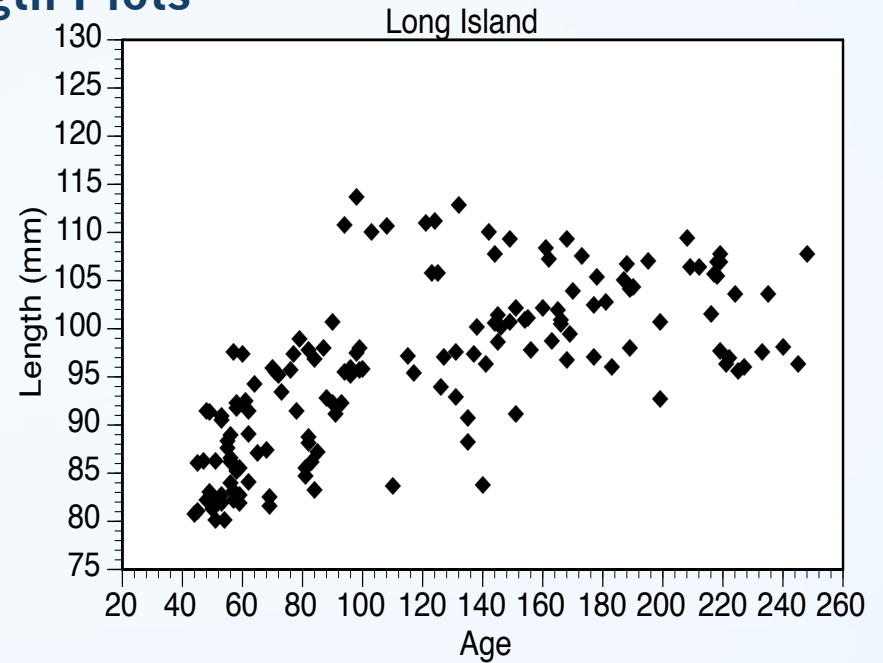
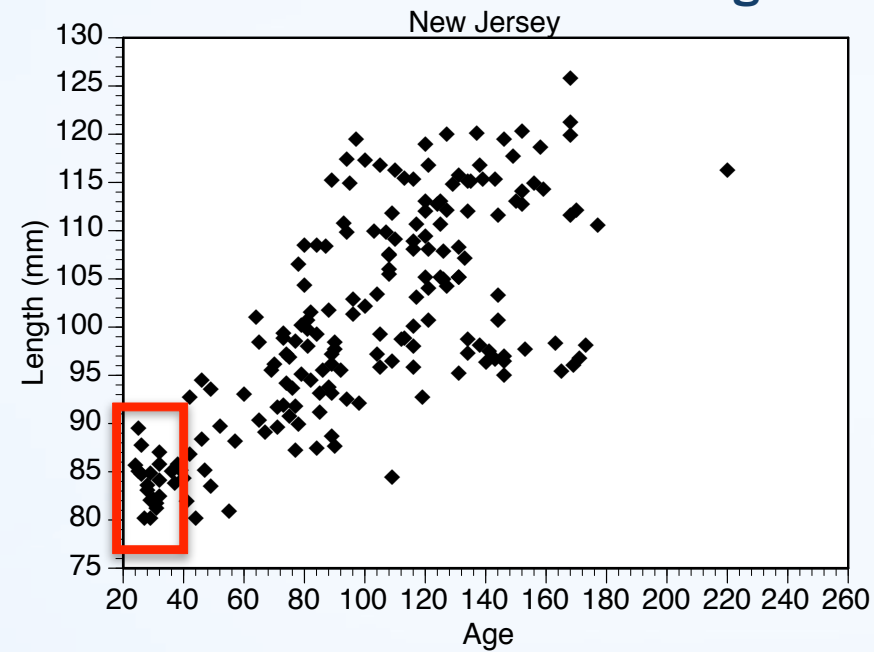
- Clams are ground on increasingly fine sand paper grits and polished using diamond suspension on a wet polishing wheel.



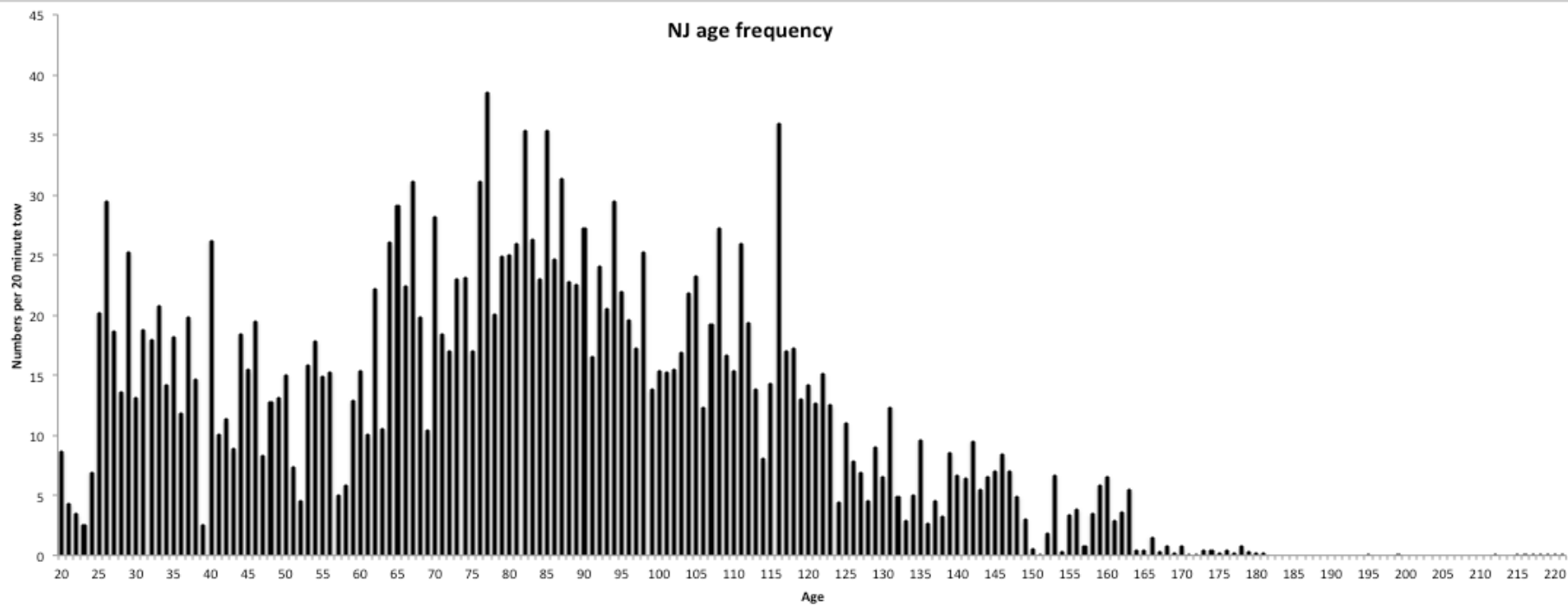
# Annual Growth Band Analysis



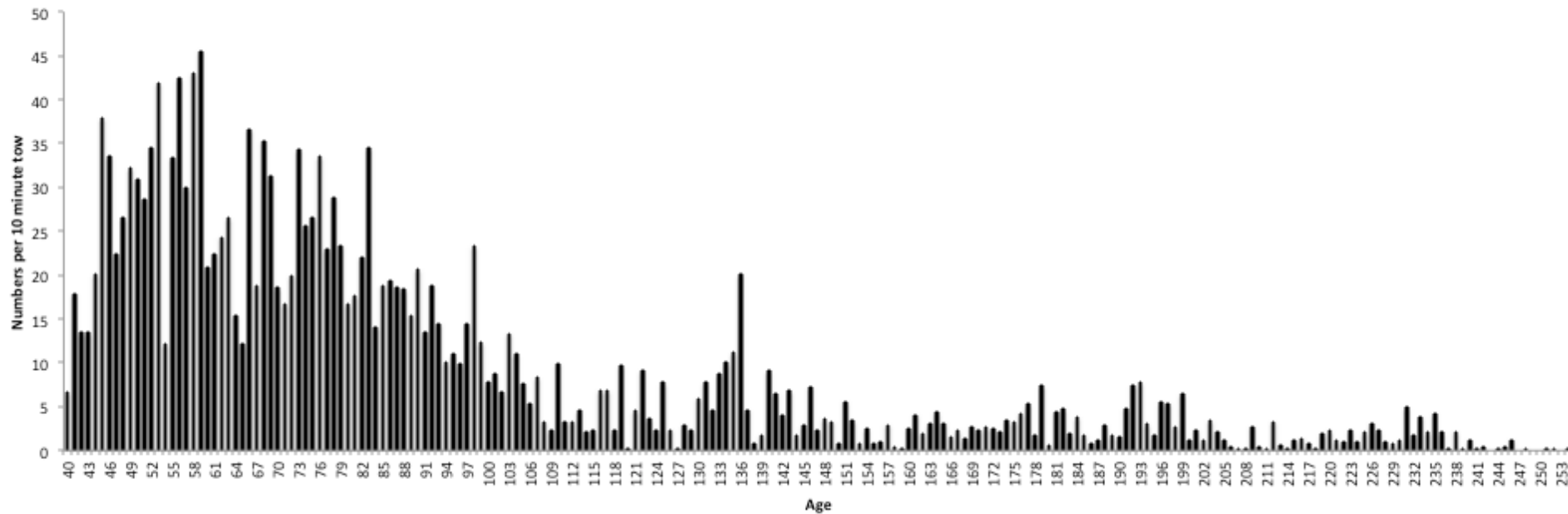
## Age-at-Length Plots



NJ age frequency

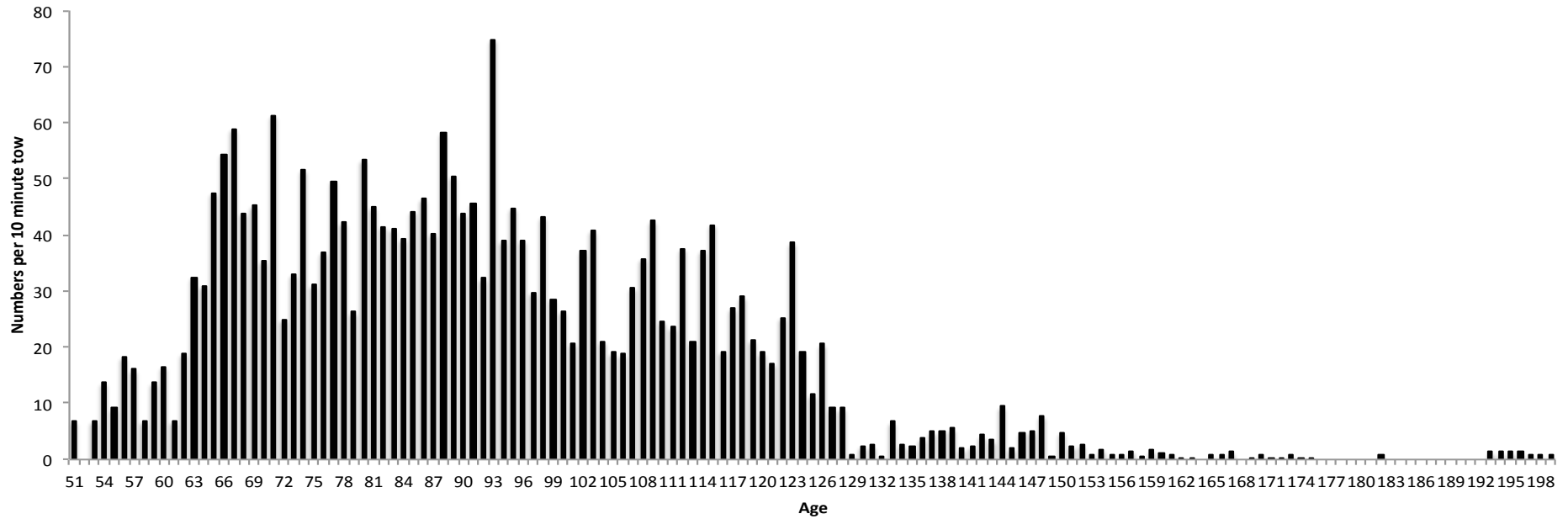


LI age frequency

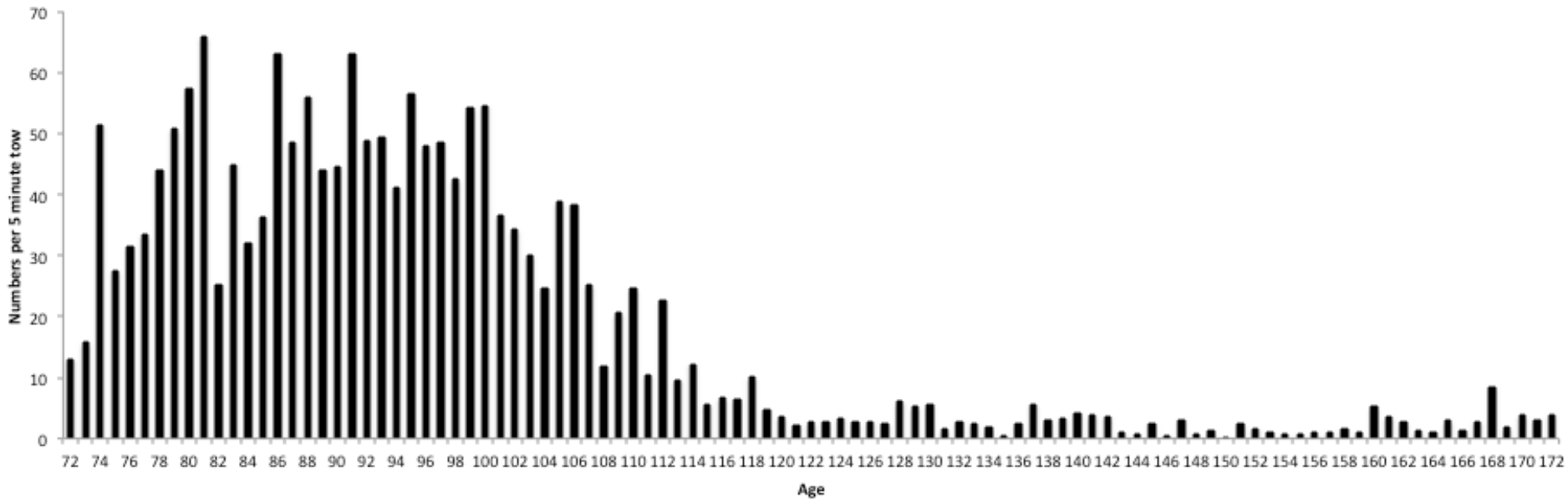




**GB age frequency**



**SNE age frequency**



# Conclusions

- All 4 sites have old, rarely occurring individuals present in the tail end of the population age-frequency.
- Oldest animal at each site:
  - NJ: 220 y
  - LI: 248 y
  - GB: 198 y
  - SNE: 172 y
- All 4 sites experience a ramp up of recruitment:
  - NJ: 1855 (~160 y)
  - LI: 1905 (~110 y)
  - GB: 1890 (~125 y)
  - SNE: 1900 (~115 y)
- Hypothesis: increase in recruitment co-occurs with ending of the Little Ice Age as the water warmed up.

# Conclusions

- The populations at all 4 sites come to an asymptote, indicating that population is at carrying capacity.
- Large year classes not common, recruitment seems to be consistent over a long period of time.
- Decrease in young individuals at all 4 sites is due to truncation of data set (only clams > 80 mm aged), not due to a reduction in recruitment.

# Acknowledgements



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