Comparing Shell Aging Methodologies to Analyze Growth Rate of the Pismo Clam (Tivela stultorum)

Eliana Maietta, Noël Clark, Alexandria Marquardt, Benjamin Ruttenberg
Biological Sciences Department, California Polytechnic State University
emaietta@calpoly.edu | 714.360.6520 | @elliemaietta

Background

- Prominent and iconic fishery in California
- Statewide population declined through the 1900s
- One shell ring equivalent to one year of age
- Historical studies used external aging strategy and estimated 6-9 years to reach 5 inches
- Recent work used internal aging strategy and estimated 16-18 years to reach 5 inches
- Accurate age assessment vital for management and restoration

Paired T-Tests:

- Internal method higher age estimate for all specimens tested together (p < 0.01; x = 0.14)
- External method aged shells <100 mm in length higher than internal method (p < 0.01; x = 0.15)
- No significant difference between aging strategies for shells >100 mm in length

Project Goal

- Determine whether external and internal shell aging strategies provide comparable age estimates

Methods

- Collected 479 shells north of Point Conception
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- Two researchers counted internal and external annuli of each shell
- Third researcher acted as a tiebreaker
- “True internal” and “true external” ages compared
- Sectioned large shells with tile saw
- Sectioned small shells with low-speed saw
- Sanded and polished images

Results

- There is a significant difference between aging strategies but it is not biologically relevant
- Species’ growth rate appears to have dramatically changed
- Takes years longer to reach legal size
- Current estimates of recovery time could be too optimistic
- More time for individuals to spawn before reaching legal size
- Future work aims to understand growth in laboratory settings

Fig 1: Histogram of size distribution for Pismo clams collected throughout California. Dark grey indicates dead clams collected north of Point Conception. Medium grey indicates live clams collected north of Point Conception. Light grey indicates clams collected south of Point Conception. Dashed line indicates legal size.

Fig 2: Clam shell length (mm) by age of specimen (years). Comparison of external (dark blue) and internal (light blue) aging methods. Dashed line indicates legal size.

Fig 2: Clam shell length (mm) by age of specimen (years). Comparison of external (dark blue) and internal (light blue) aging methods. Dashed line indicates legal size. A shows all specimens. B shows less than 100 mm in length. C shows greater than 100 mm in length.

Conclusions

Acknowledgements

This project would not have been possible without the Bill and Linda Frost Fund, Doug and Rob Brewster, the VIMS Molluscan Ecology Lab, and the following collaborators.

References