Geoduck genetics: what we know, what we don't know, and why it matters

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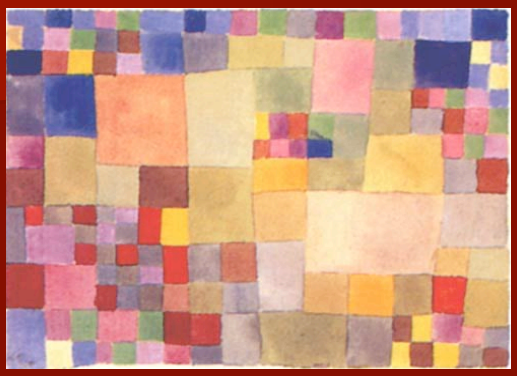
Why do we care about geoduck genetics?

- Native vs non-native shellfish
- Non-native: do no harm
  - Invasive
  - Food web effects
- Native: do no harm
  - Diversity
  - Fitness

Key Life History Traits

- Larval and juvenile viability
- Adult viability
- Age at maturation
- Reproductive success
- Fecundity (number of gametes)
- Fertility (reproductive)
- Genetic diversity and Connectivity



- *Flora on the Sand* Paul Klee

- *Blue night* Paul Klee

Outline

- What we know
  - Population genetics
  - Maturation dynamics
  - Maturation Control
- What we don't yet know
  - Reproductive success
  - Viability
  - Domestication
  - Fecundity
- Conclusions

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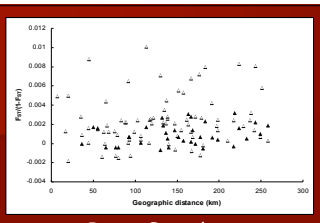
Differences between sites:

- small
- few
- not isolated by distance

High genetic connectivity at this spatial scale:

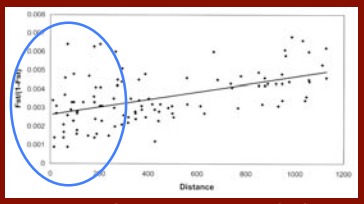
- long-lived adults
- pelagic larvae
- hydrodynamics



Genetic distance vs geographic distance

Puget Sound

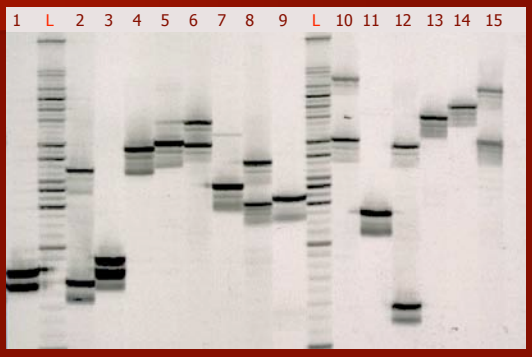
Vadopalas et al. 2004



Washington, BC, SE Alaska

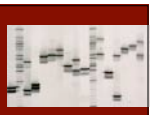
Miller et al. 2006

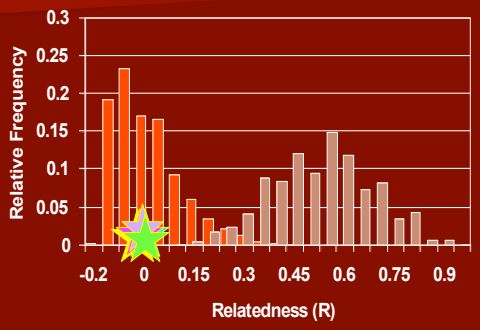
Genetic Variability

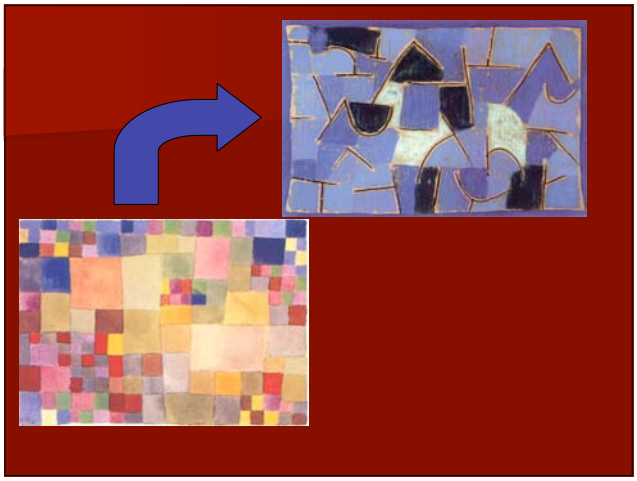


Geoduck aggregations exhibit high genetic variability (and high effective population sizes)

Year Class Analysis







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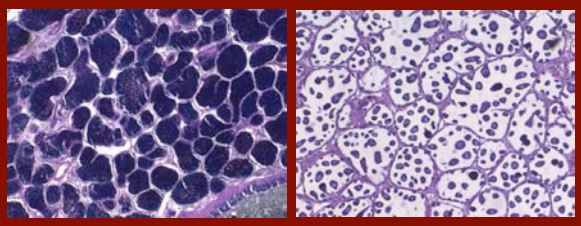
Maturation

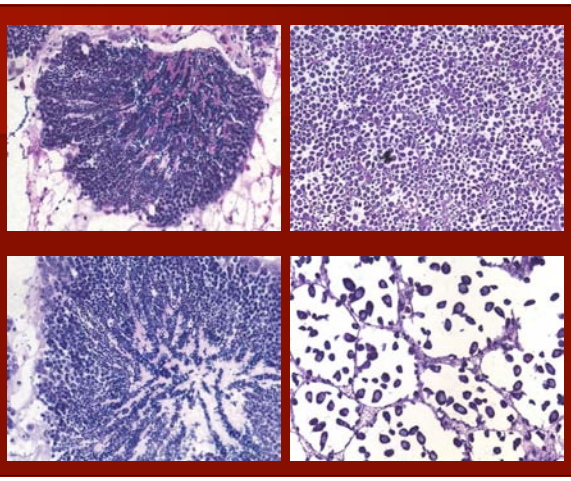
- Sparse data on young geoduck clams
- Spawning behaviors undocumented
- Few intertidal sites with young geoduck

Maturation

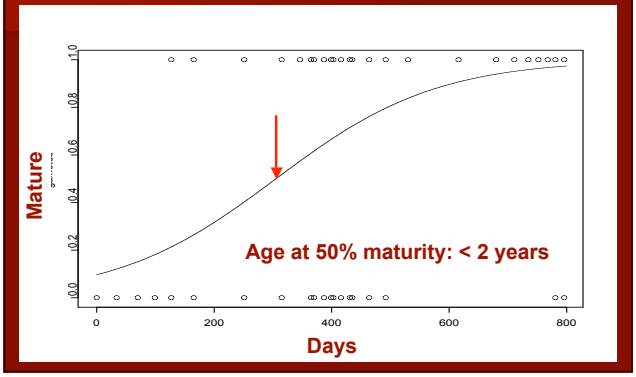


Male

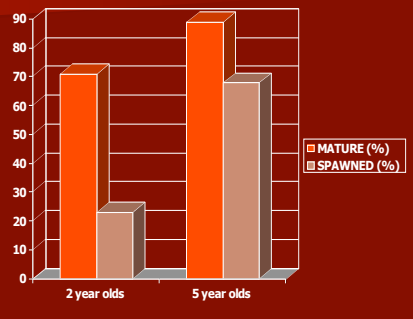
Female



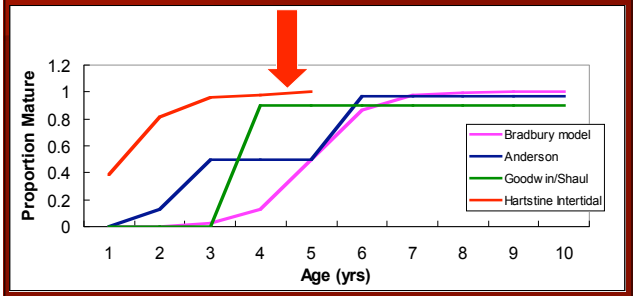
Age at maturation in intertidal geoduck



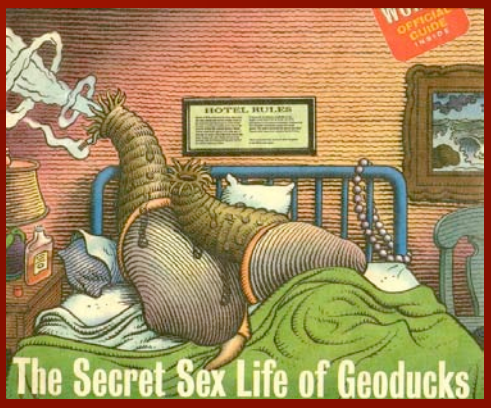
Maturation and spawning rates in intertidal geoducks



Proportion mature



- Maturation stage in cultured and wild geoducks was temporally correlated
- MALE:FEMALE RATIO significantly different from 1:1



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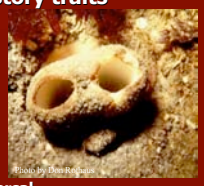
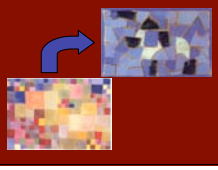
What we don't know yet:

- **Genetic Risk Assessment—life history traits**
  - Genetic characterization
    - Local adaptation?
    - Cultured-wild differences?
    - Source-Sink dynamics
  - Reproductive Success
  - Viability of larvae, juveniles, adults
  - Fecundity
  - Behavioral and tolerance effects on dispersal
    - Salinity
    - Temperature
    - Diel
    - Settlement cues
- **Genetic Risk Reduction**
  - Triploids
    - Sterile?
    - Reversion?
    - Performance?





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