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# High connectivity among brown rockfish (Sebastes auriculatus) populations in Puget Sound: evidence from genetic parental identification, otolith microchemistry and oceanographic models

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# Dispersal in brown rockfish (*Sebastes auriculatus*) in Puget Sound: evidence from genetic parental identification, otoliths and oceanographic models


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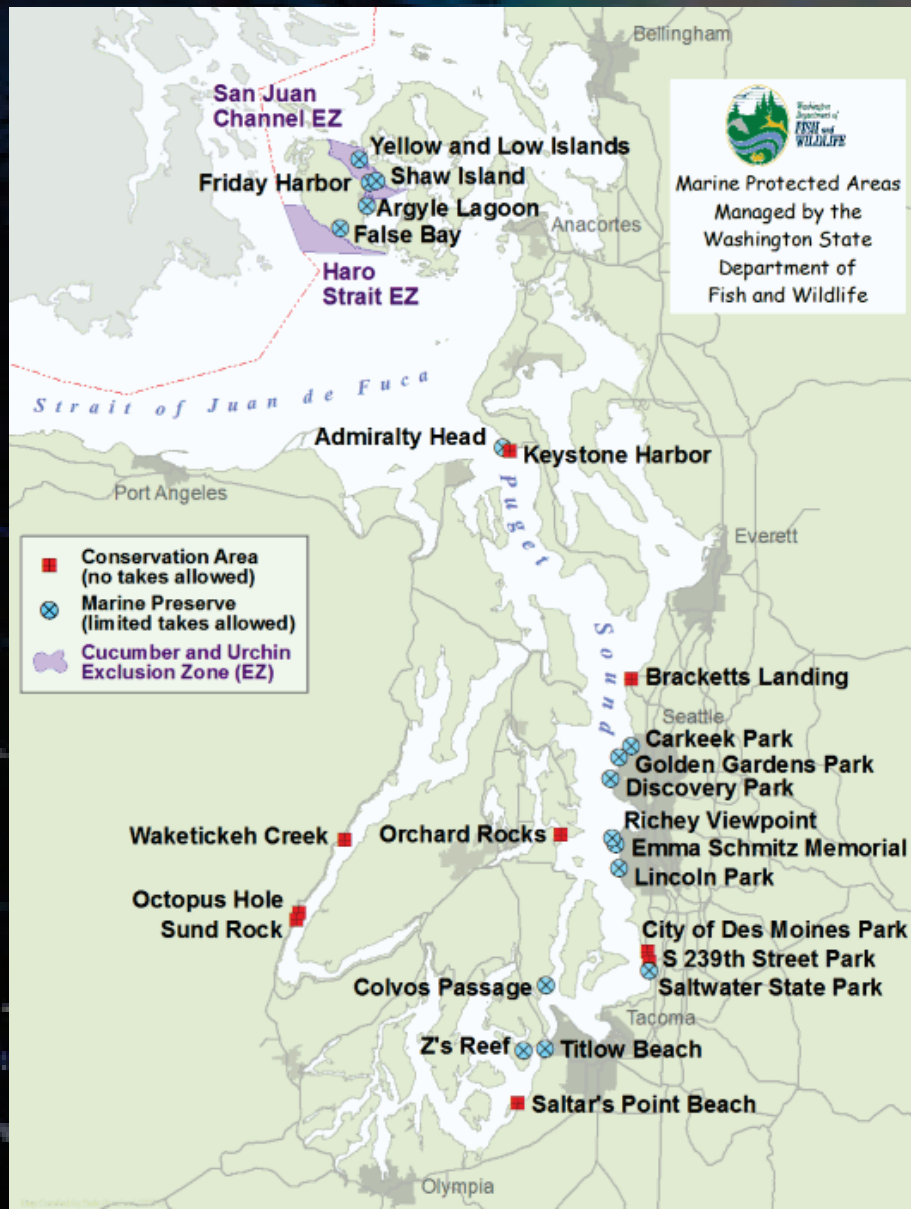
# Why are connectivity and dispersal important?

- **Marine Protected Areas**
  - Self recruitment
  - Export
  - Connectivity
- **Population resilience**
  - Does local perturbation affect other stocks?
- **Evolution**
  - Inbreeding and local adaptation
  - How important are local populations?
- **Problem**
  - Larval dispersal
  - Low genetic differentiation

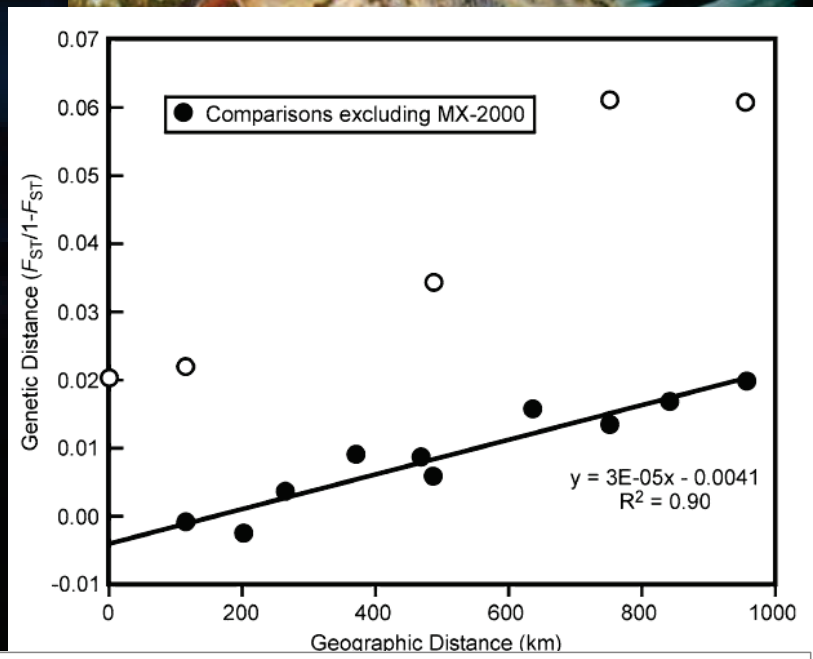


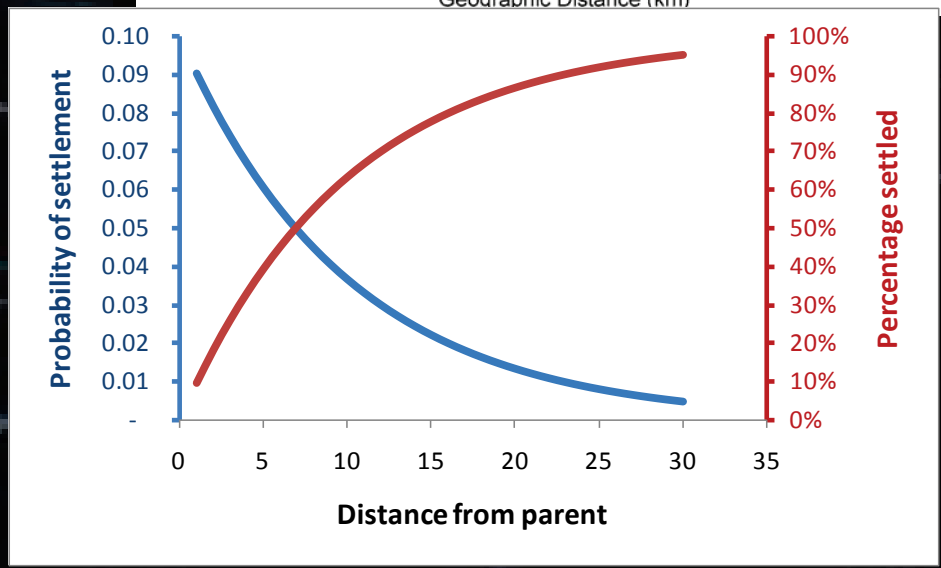
# Evidence for limited dispersal

## Brown rockfish

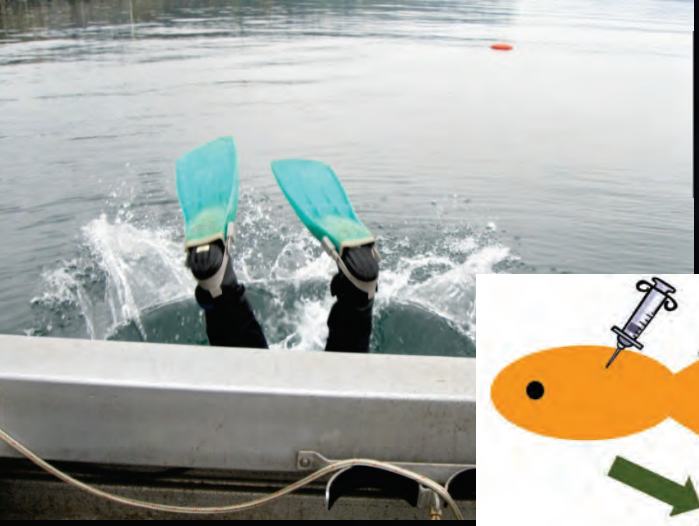
- **Adults**
  - Small home ranges
  - Long lived (~20 y)
  - Live bearing
- **Larvae**
  - 3 months pelagic

- **Genetic differentiation in CA**
  - **Buonaccorsi et al 2005**
  - Isolation by distance
  - Mean dispersal ~ 10 km
  - 40% of larvae should settle within 5 km

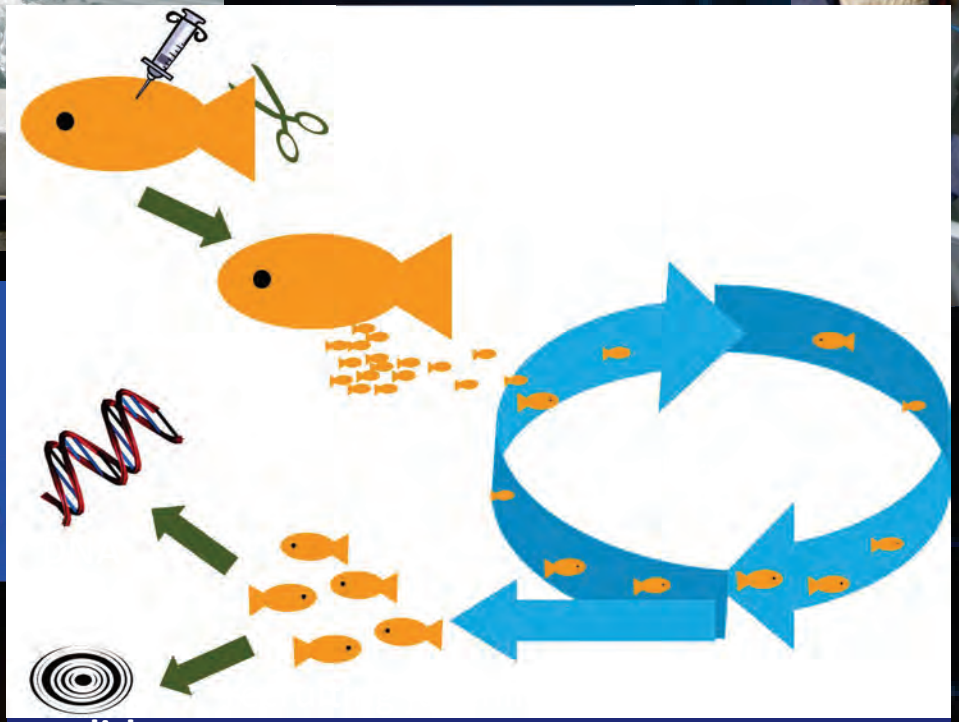


# How to find Nemo



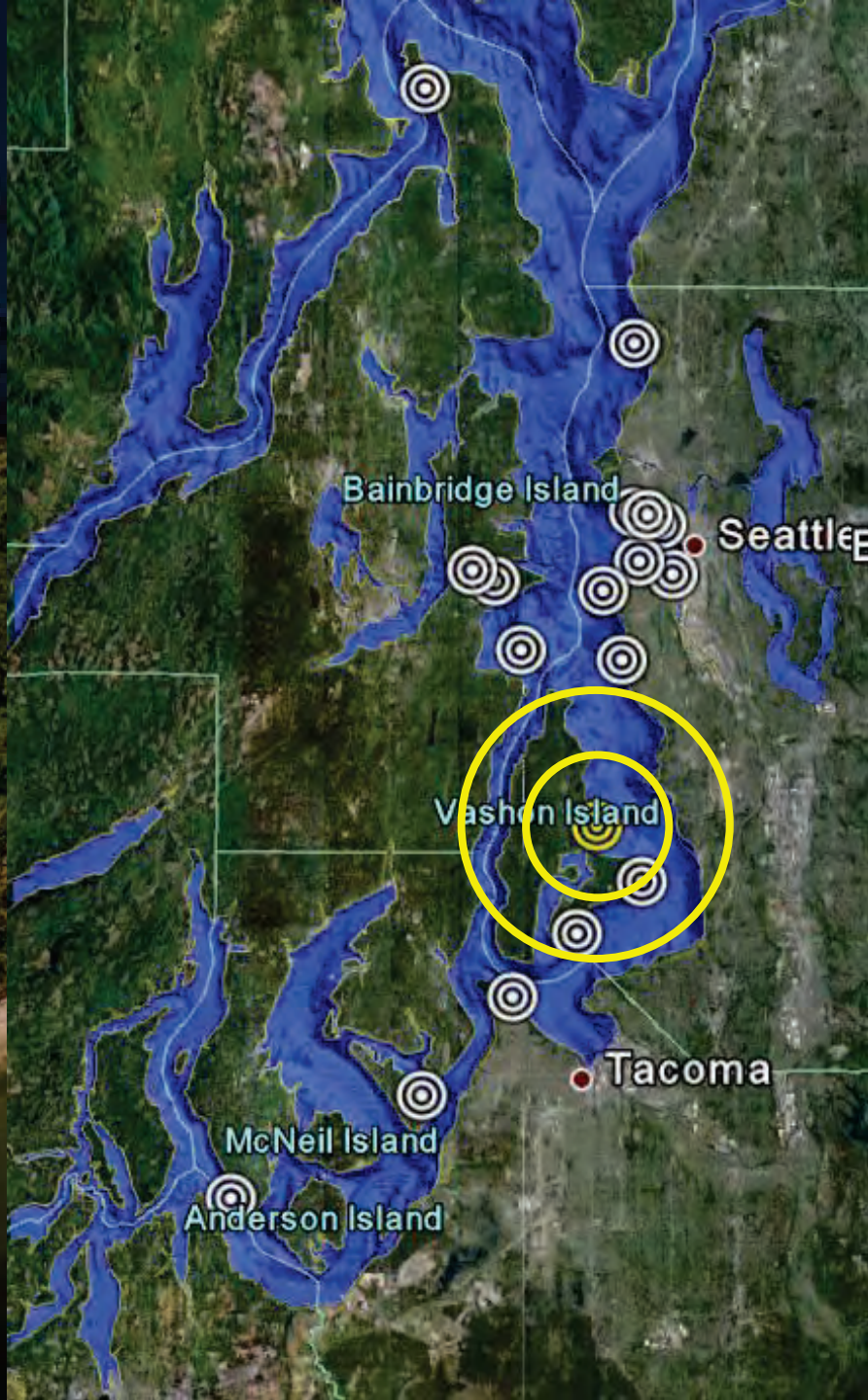
Genetics
Otoliths
Oceanography



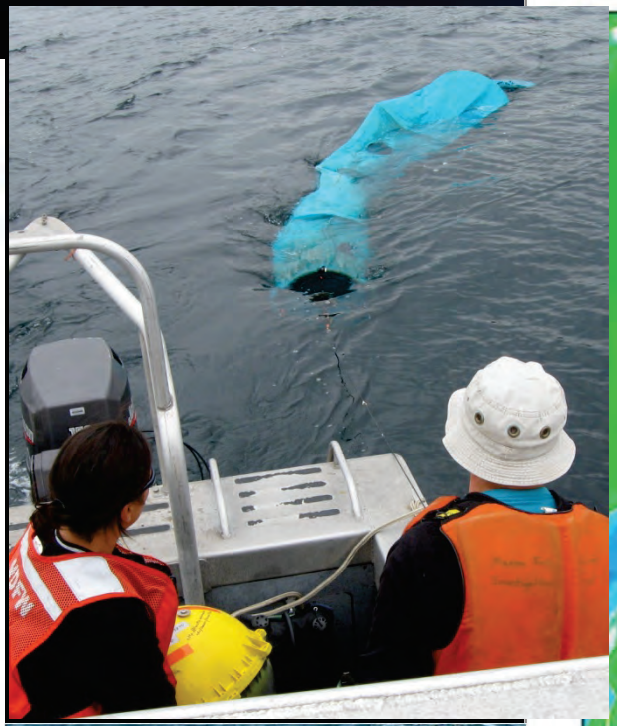
otolith
(SrCl)

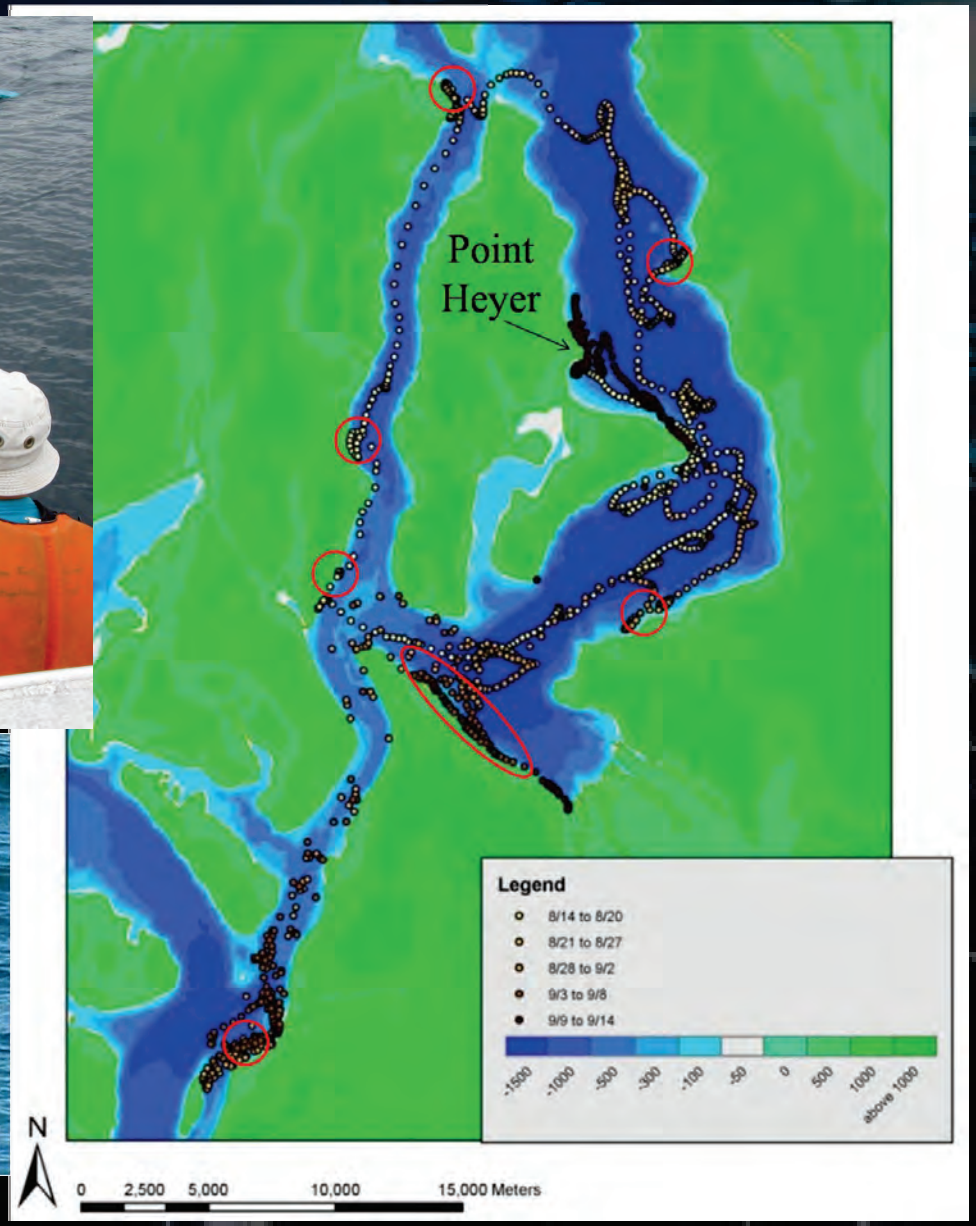
# Sampling

- 1835 fish sampled
  - 874 adults, 961 offspring
- 3 years, 18 sites
- Pt Heyer
  - 464 adults (50%)
  - 816 juveniles

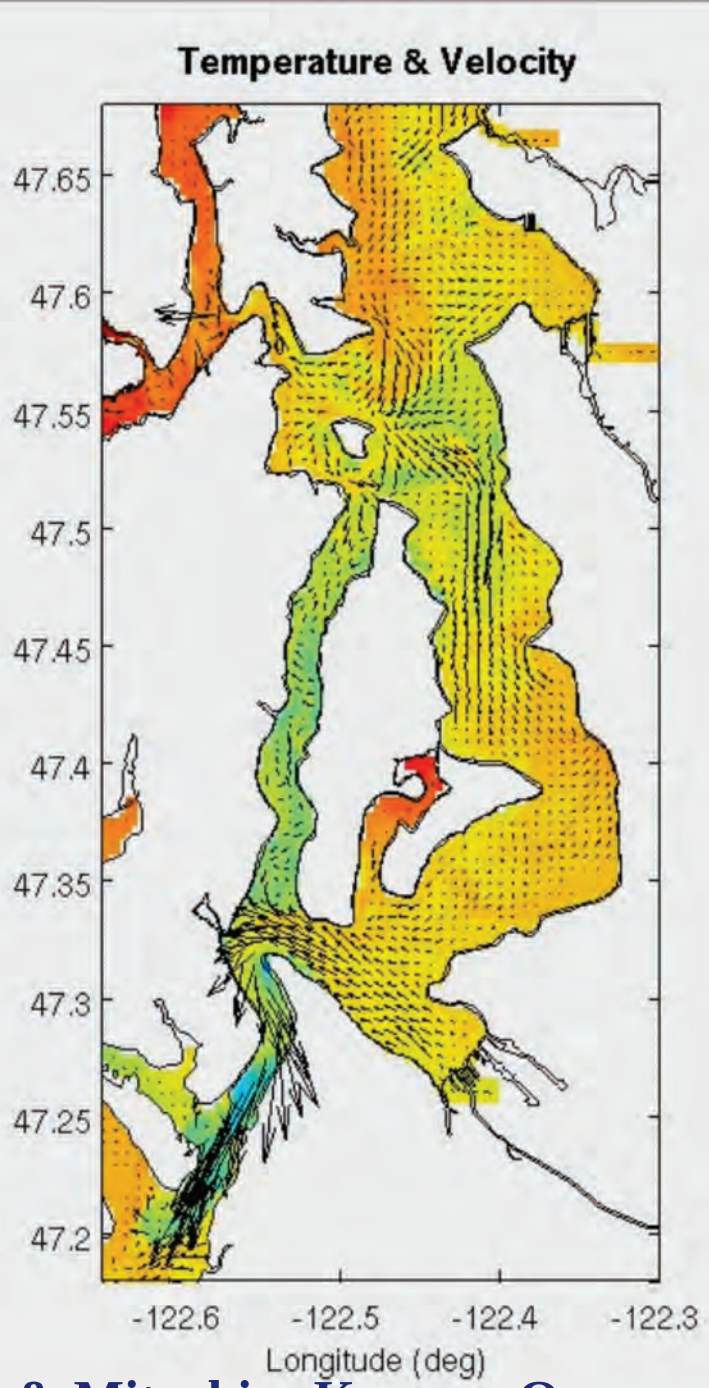



# Drifter experiments

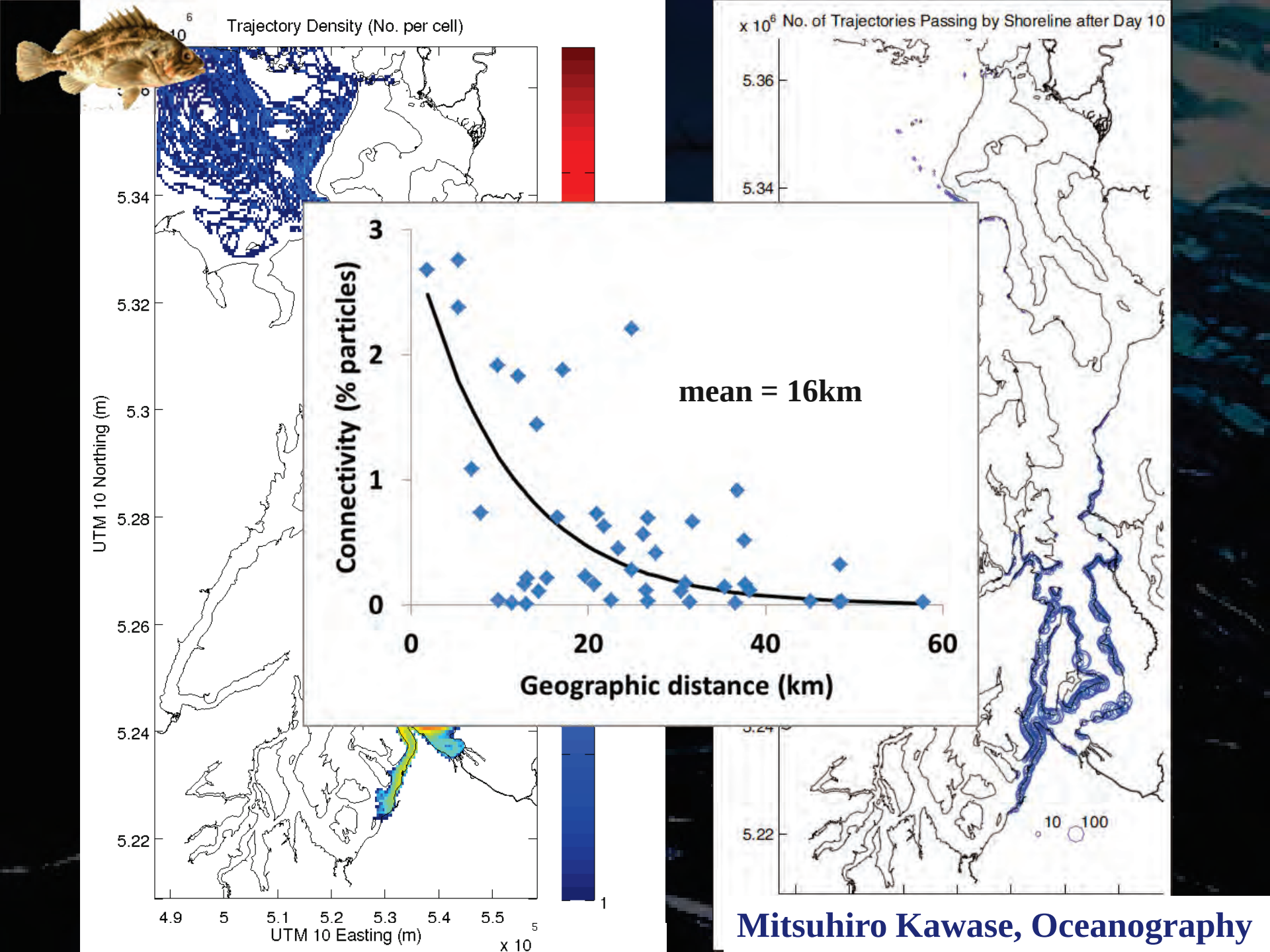






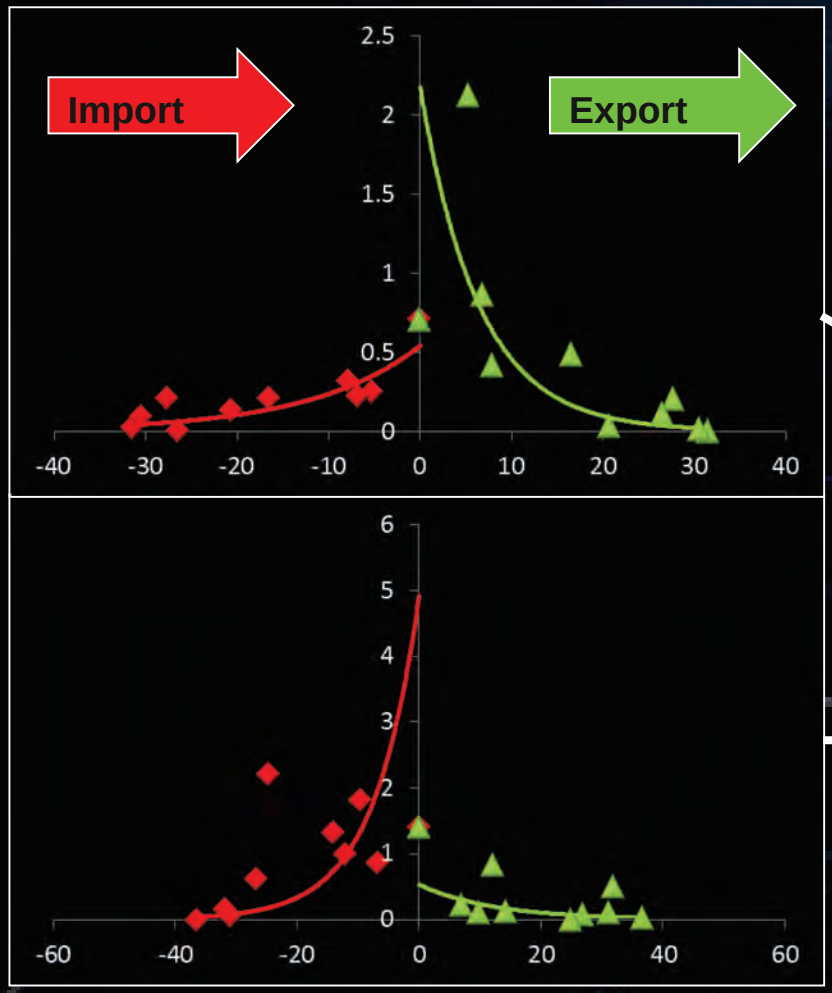



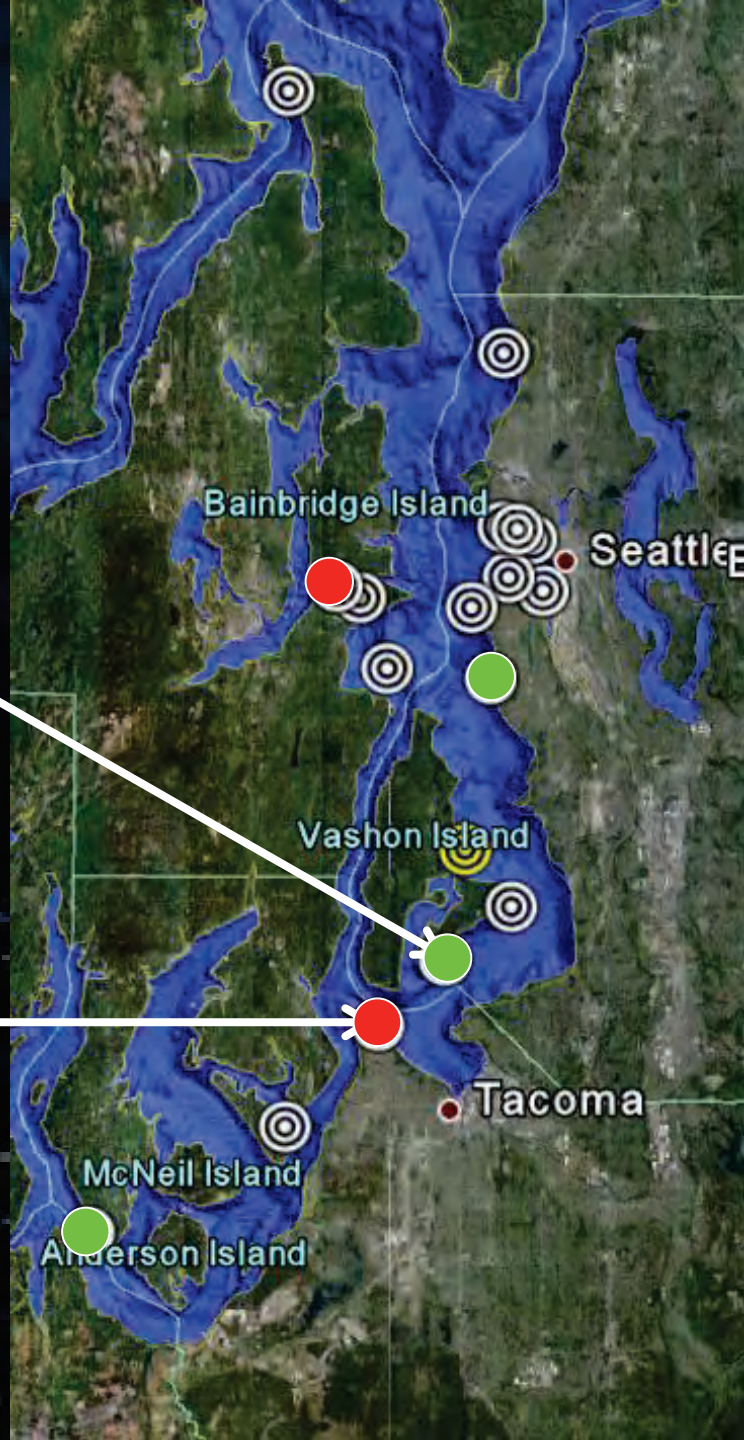

Cameron Sparr & Mitsuhiro Kawase, Oceanography




Mitsuhiro Kawase, Oceanography

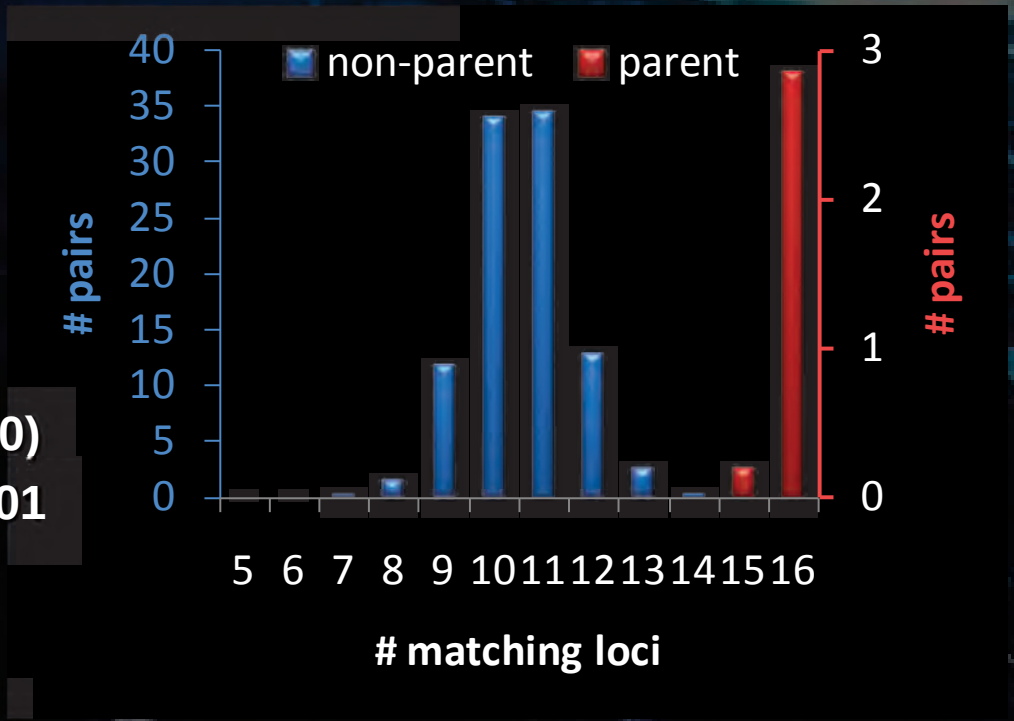
# Sources and sinks



# Genetic Analyses

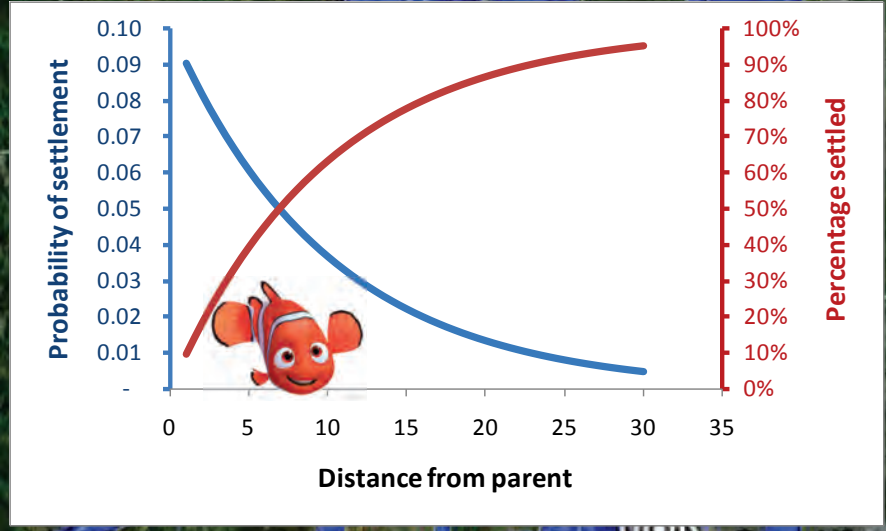
- **16 microsatellites**
  - $H_E$ = 0.87
  - ~ 1% error rate
- **Simulations**
  - Cervus 3 and Christie (2010)
  - # false pairs in data set: 0.01
- **Matching pairs**
  - 8 parent-offspring pairs
  - 1 with two parents

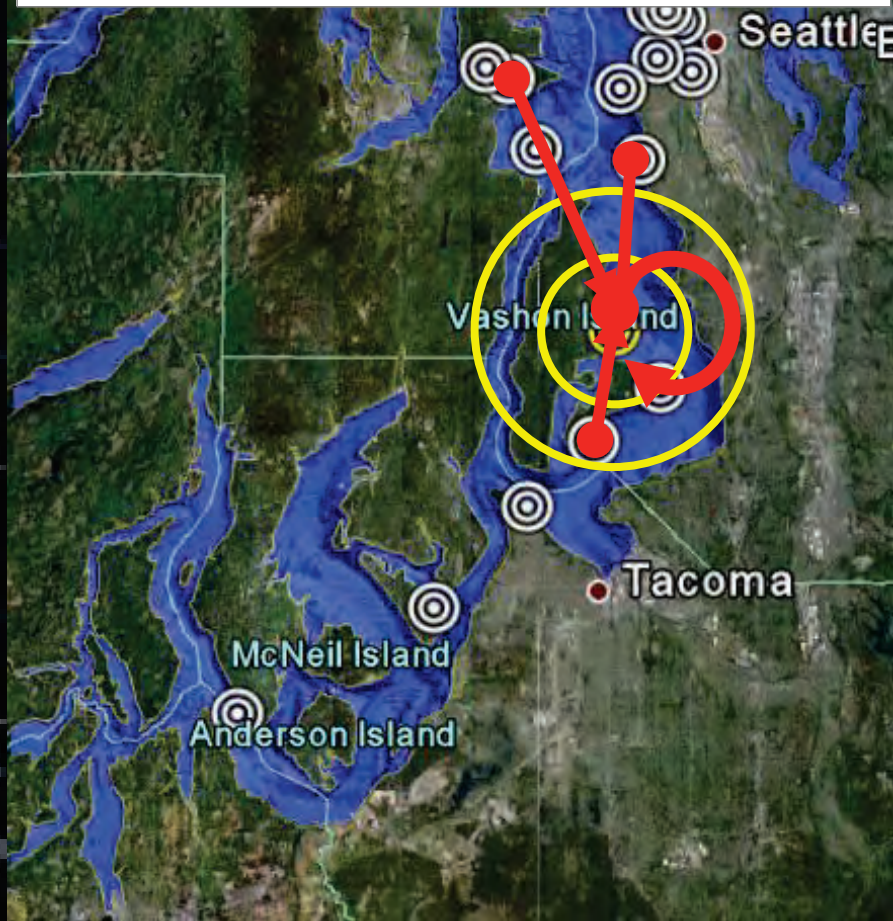



- **None from injected parents**
  - No positive otoliths

# We found Nemo!

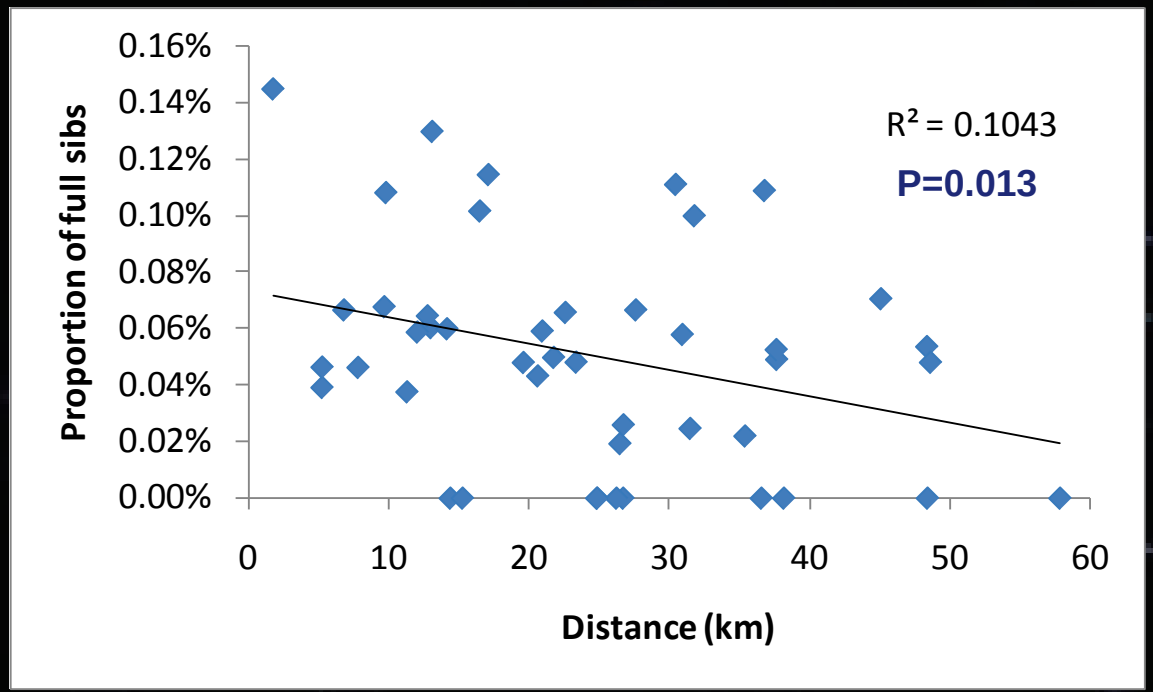
- **8 offspring from known parents**
  - 4 from parents at Point Heyer
    - 1 with both parents
  - 4 from elsewhere
- **816 juveniles sampled**
  - 0.5% of juveniles
  - 50 % parents sampled
  - 1% locally produced
- **40% self-recruitment expected within 5 km**
  - Random recruitment in PS
  - Pt Heyer is a sink population
  - Lots of rockfish nearby



# Random recruitment?

- 10 sites with N>20
  - $F_{ST}$ = 0
- No evidence for sweepstakes recruitment
  - Genetic variation within and between samples similar between adults and offspring
- Proportion of full sibs in pairwise comparisons
  - Isolation by distance



# Conclusion


- **Low self recruitment**
  - 40% expected vs 1% observed
- **Oceanography**
  - Low mean dispersal distance
  - Sources and sinks
- **Population structure**
  - No sign differentiation
  - But some evidence for isolation by distance from kinship
- **Implication**
  - Some evidence for limited dispersal
- **To do**
  - Oceanographic predictions vs suitable settlement habitat
  - Oceanographic model: newer and better
  - Demographic model including adjacent habitats

# Acknowledgements


- **Funding**
  - Washington Sea Grant
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