Comparing survival of hatchery-reared pinto abalone (Haliotis kamtschatkana) released in mixed-age cohorts in Washington State

Presented by Katie Sowul
Washington Department of Fish and Wildlife
Abalone Biologist
Diving Safety Officer

Co-Authors
Puget Sound Restoration Fund
Josh Bouma
Caitlin O'Brien

Washington Dept of Fish and Wildlife
Hank Carson
Bethany Stevick
Taylor Frierson
Emily Loose
Welcome to the San Juan Islands!
What does an abalone outplant site look like in Washington?
What does an abalone outplant site look like in Washington?
Do the outplant sites work?

**Successful** = seeing 2% - 4%+ of abalone 1-year post-release

Seeing 2% - 4% after 1-year means 10%+ retention of same cohort in future surveys

About 2/3 of the 27 sites are successful

Not yet sure why some sites “fail”

Continue “pulse” outplanting to good sites

From 2009 – 2018 we only outplanted 2-year-olds
Why not release abalone one year earlier?

2 year-olds

- Takes up more lab space for longer period of time
- Requires more money $$$ and resources
- Bigger target for predators
- Potentially “domesticated”

1 year-olds

- Takes up less lab space for shorter period of time
- Requires less money $ and resources
- Smaller target for predators
- Potentially not “domesticated”

Pinto abalone art by the marvelous Andrea Dingeldein
The YAM Trials

- 6 “Young Abalone Modules” created from crab pots

- One cohort of 7 families released into wild
  - 321 abs @ 9 months
  - 243 abs @ 14 months
    (some hatchery mortality)
  - + control group

<table>
<thead>
<tr>
<th></th>
<th>1-year post release</th>
<th>2.5-years post full release</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 month-olds</td>
<td>12% observed</td>
<td>4% observed</td>
</tr>
<tr>
<td>14 month-olds</td>
<td>11% observed</td>
<td>2% observed</td>
</tr>
</tbody>
</table>
The YAM Trials

- 6 “Young Abalone Modules” created from crab pots
- One cohort of 7 families released into wild
  - 321 abs @ 9 months
  - 243 abs @ 14 months (some hatchery mortality)
  - + control group
- 1–year post release
- 2.5–years post full release

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Observed</th>
<th>Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 month-olds</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>14 month-olds</td>
<td>11%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Survival of 9 month-olds was the same as the average survival of 2 year-olds released in previous outplants.
Released at 1 year-old

“Held back” for a year to grow larger, released at 2 years-old
Found and established 6 brand new, never before outplanted sites

2 year-old cohort unbiased

Each site got:

- 840 1 year-olds (72%)
- 320 2 year-olds (28%)

1,160 abs/site

7,000 abs total
The “What Could Possibly Go Wrong” Outplant

1,160 abs/site
7,000 abs total

After one year
1 year-old observed: 0.8%
2 year-olds observed: 2.1%

This didn’t match our pilot, but why?

Let’s ~calm down~ and try again on our All-Star sites
The “Calm Down with the Variables” Outplant

- Outplanted to 6 “All-Star” known, previously outplanted, trusted sites
- 2 year-old cohort biased

Each site got:

- 541 1 year-olds (90%)
- 63 2 year-olds (10%)

602 abs/site
3,600 abs total
602 abs/site
3,600 abs total

After one year
- 1 year-old observed: **4.5%**
- 2 year-olds observed: **2.5%**
Outplanted to **10 sites**, mix of All-Stars and Fan Favorites

**2 year-old cohort biased**

Each site got:

- 820 1 year-olds (74%)
- 300 2 year-olds (26%)

**1,117 abs/site**

**11,100 abs total**

---

**The “We’re the Best Again” Outplant**
The “We’re the Best Again” Outplant

602 abs/site
3,600 abs total

After one year
- 1 year-old observed: 3.7%
- 2 year-olds observed: 4.5%
We’ve continued improving our outplant methods through this process. WDFW, PSRF, and partners will continue this progressive system of mixed-age cohort releases and continue trying innovative techniques.

We’ll continue expanding the number and area of outplant sites until Pinto abalone reach a self-sustaining abundance in Washington State.
Thank you!

Josh Bouma  
Hank Carson  
Ocean Working  
Taylor Frierson  
Bethany Stevick  
Emily Loose  

Caitlin O'Brien  
Betsy Peabody  
Jodi Toft  
Eileen Bates  
Jay Dimond  
Athena Maguire  

Everyone at IAS 2023!

Katie.Sowul@dfw.wa.gov  
Abalone@dfw.wa.gov
Washington State Abalone Recovery Program

**Population genomics** of wild and hatchery-raised pinto abalone

Presented by **Jay Dimond, Ph.D.**

Wednesday 11:45am
Genetics & Genome
WA224a

---

Can **settlement on coralline algae** ameliorate negative effects of **ocean acidification and temperature** increase on pinto abalone early life stages?

Presented by **Eileen Bates**

Wednesday 12:30pm
Biology & Physiology
WA224b

---

**Recovering Pinto abalone:** Use of conservation aquaculture to give Washington State’s largest rocky-reef grazing snail a population boost

Presented by **Josh Bouma**

Wednesday 3:00pm
Restoration Ecology & Biodiversity
WA224a

---

Prequel to this talk!