Western Washington University
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Salish Sea Ecosystem Conference

2018 Salish Sea Ecosystem Conference (Seattle, Wash.)

Apr 6th, 11:45 AM - 12:00 PM

Survival of hatchery-origin juvenile pinto abalone (Haliotis kamtschatkana) outplanted to restoration sites in the San Juan Islands

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Carson, Henry; Ulrich, Michael; and Bouma, Josh, "Survival of hatchery-origin juvenile pinto abalone (Haliotis kamtschatkana) outplanted to restoration sites in the San Juan Islands" (2018). *Salish Sea Ecosystem Conference*. 544.
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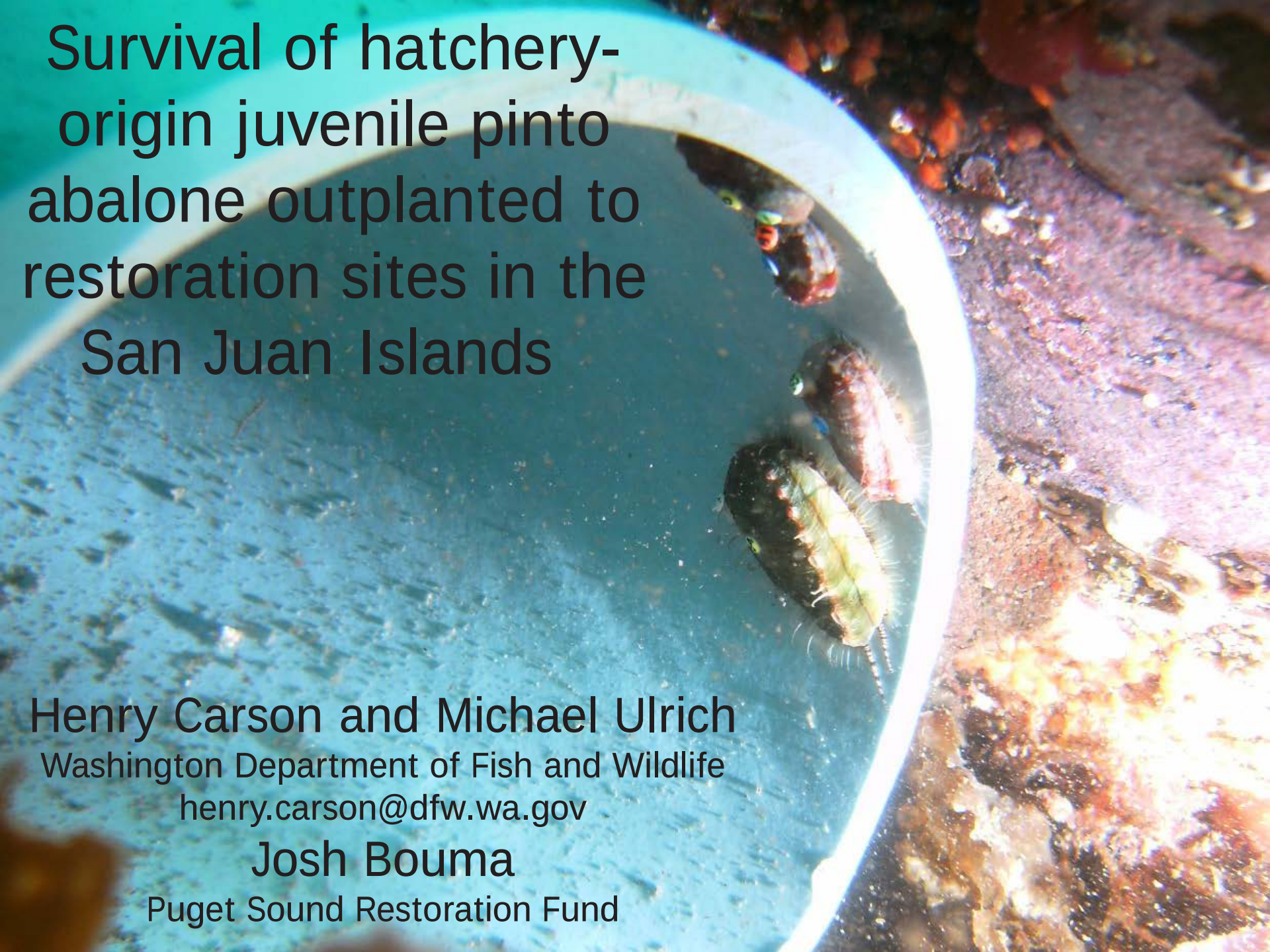
Survival of hatchery-origin juvenile pinto abalone outplanted to restoration sites in the San Juan Islands



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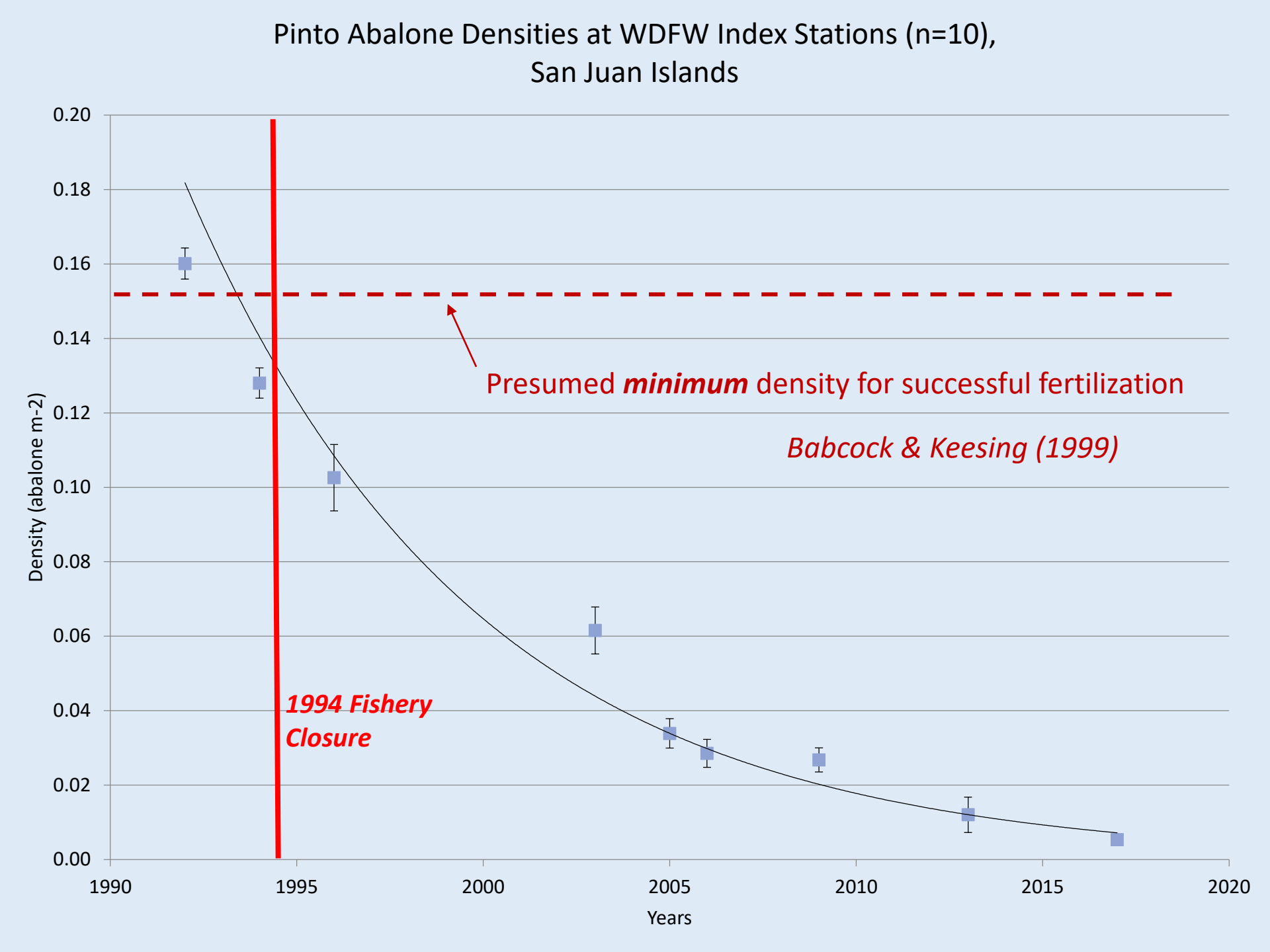
Josh Bouma
Puget Sound Restoration Fund

Pinto (Northern) Abalone *Haliotis kamtschatkana*

- Range from Baja California, Mexico to Sitka AK
- Rocky reef habitat, associated with kelp beds, generally 0 to -40’ water depth
- Herbivore – diatoms to macroalgae


Pinto Abalone Densities at WDFW Index Stations (n=10),
San Juan Islands
Density (abalone m-2)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1990
1995
2000
2005
2010
2015
2020
Years
Presumed minimum density for successful fertilization
Babcock & Keesing (1999)
1994 Fishery Closure

Introduction to WA Pinto Abalone Restoration Project

- Captive broodstock program initiated 2002 (singleton collections only)

- NOAA Mukilteo Research Station

- ~15,000 disease-free, ~ 20 month-old F1 juveniles, from 96 families, outplanted to 12 sites – some individuals tagged

- Annual (or more frequent) surveys to assess survival, growth, movement

- Goal is to create a self-sustaining network of reproductive populations in Washington

PUGET SOUND RESTORATION FUND

Washington Department of FISH and WILDLIFE

Shannon Point Marine Center, Western Washington University

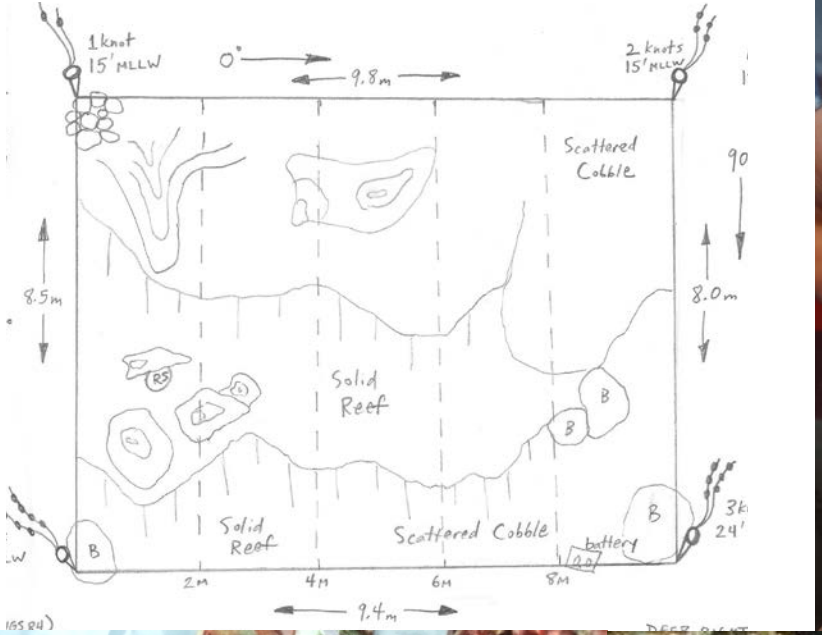
The SeaDoc Society, People and science healing the sea

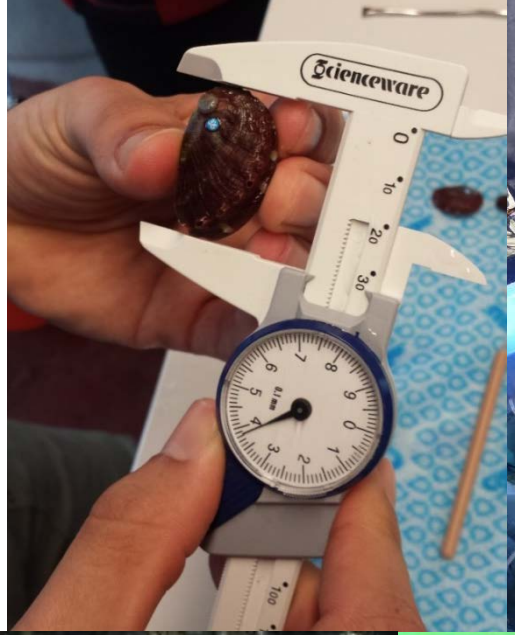
Jamestown S'Klallam Tribe, "The Strong People"

Northwest Straits Initiative

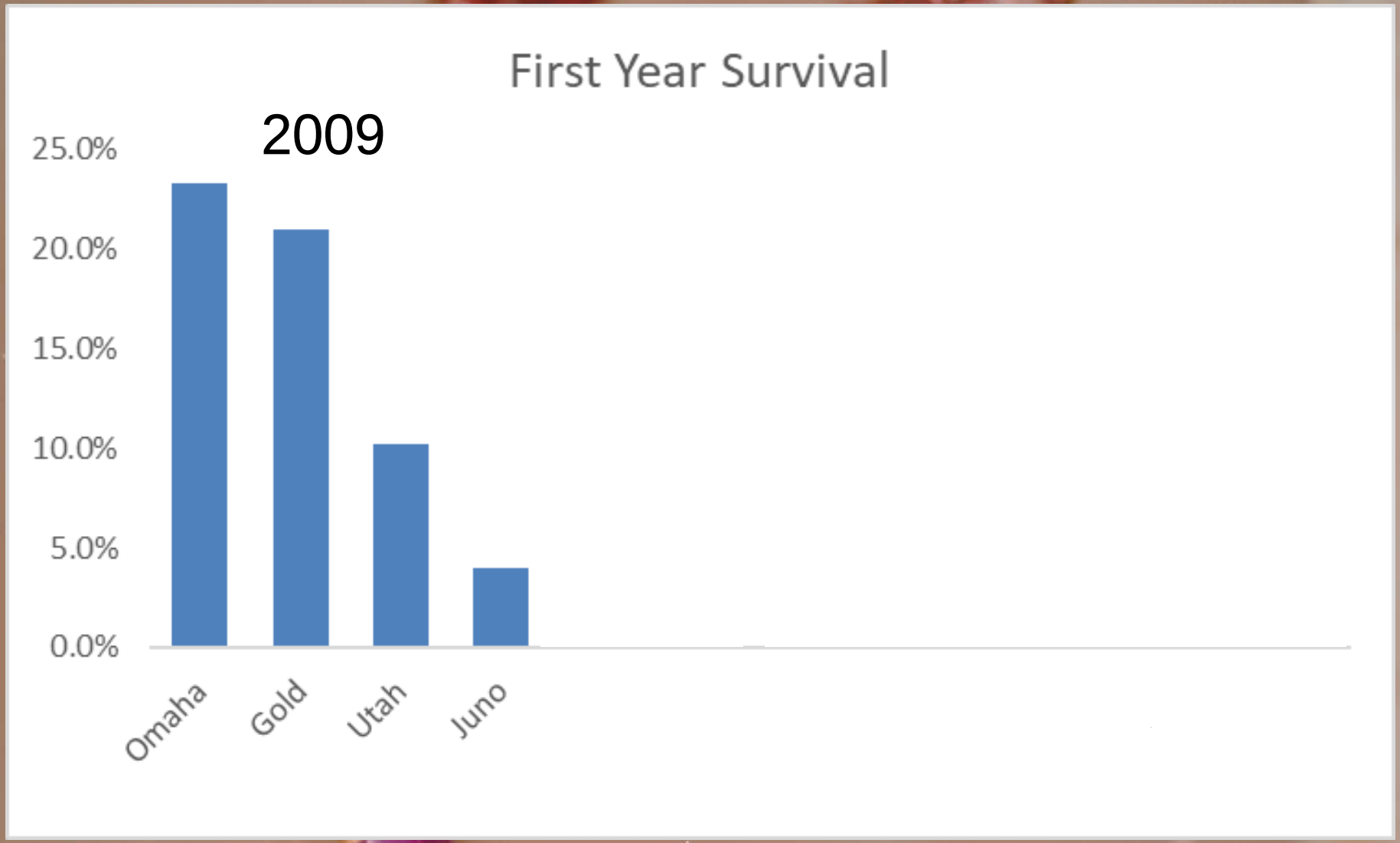
National Oceanic and Atmospheric Administration, NOAA, U.S. Department of Commerce

SAFS School of Aquatic and Fishery Sciences


1 knot
15' MLLW
0°
9.8m
2 knots
15' MLLW
Scattered
Cobble
90
8.5m
8.0m
Solid
Reef
B
Solid
Reef
Scattered Cobble
battery
2m
4m
6m
8m
9.4m

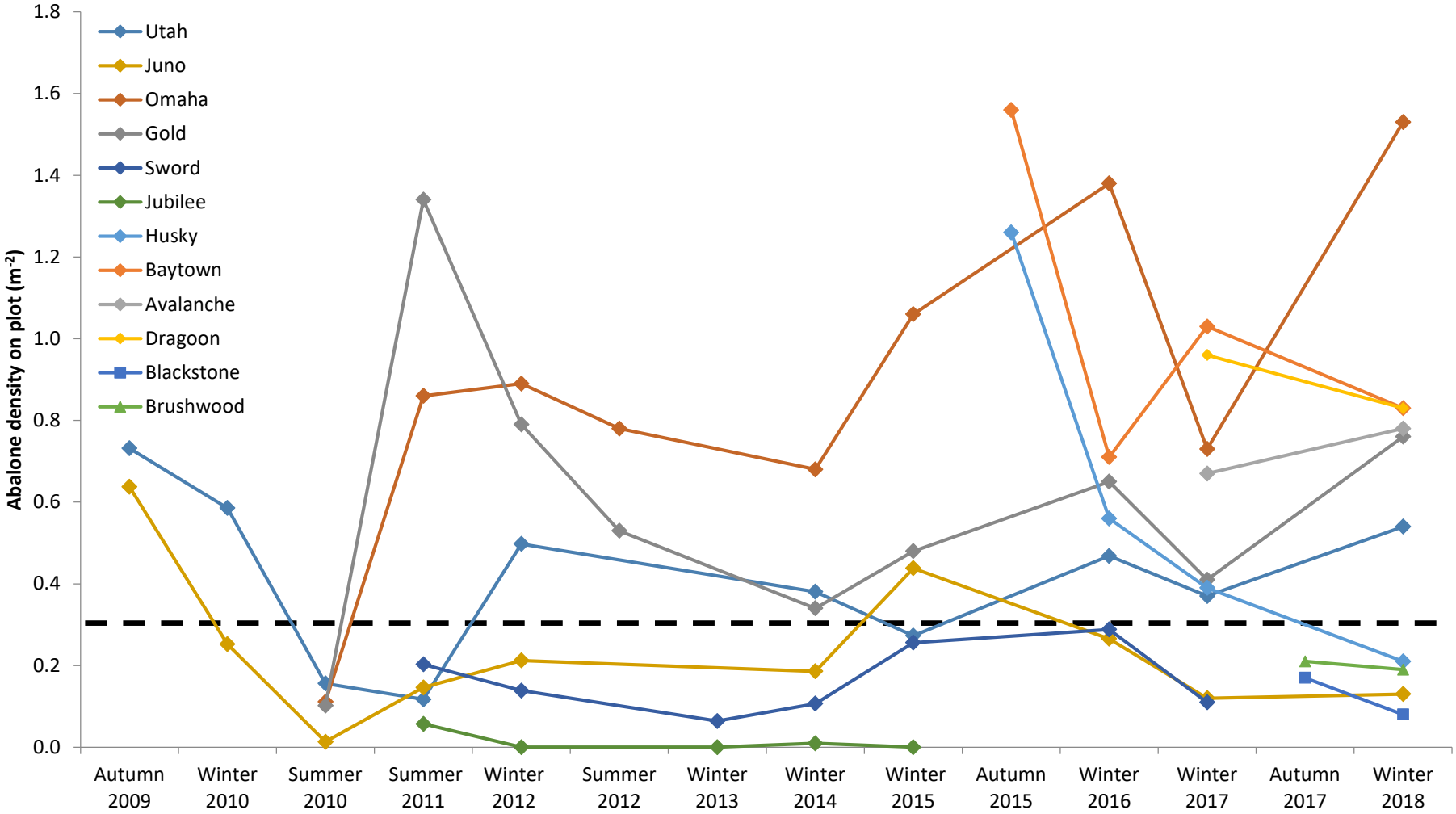

Scienceware

How have the outplanted abalone survived in the wild?



How have the outplanted abalone survived in the wild?

Plot density over time



What happened to all the missing abalone?

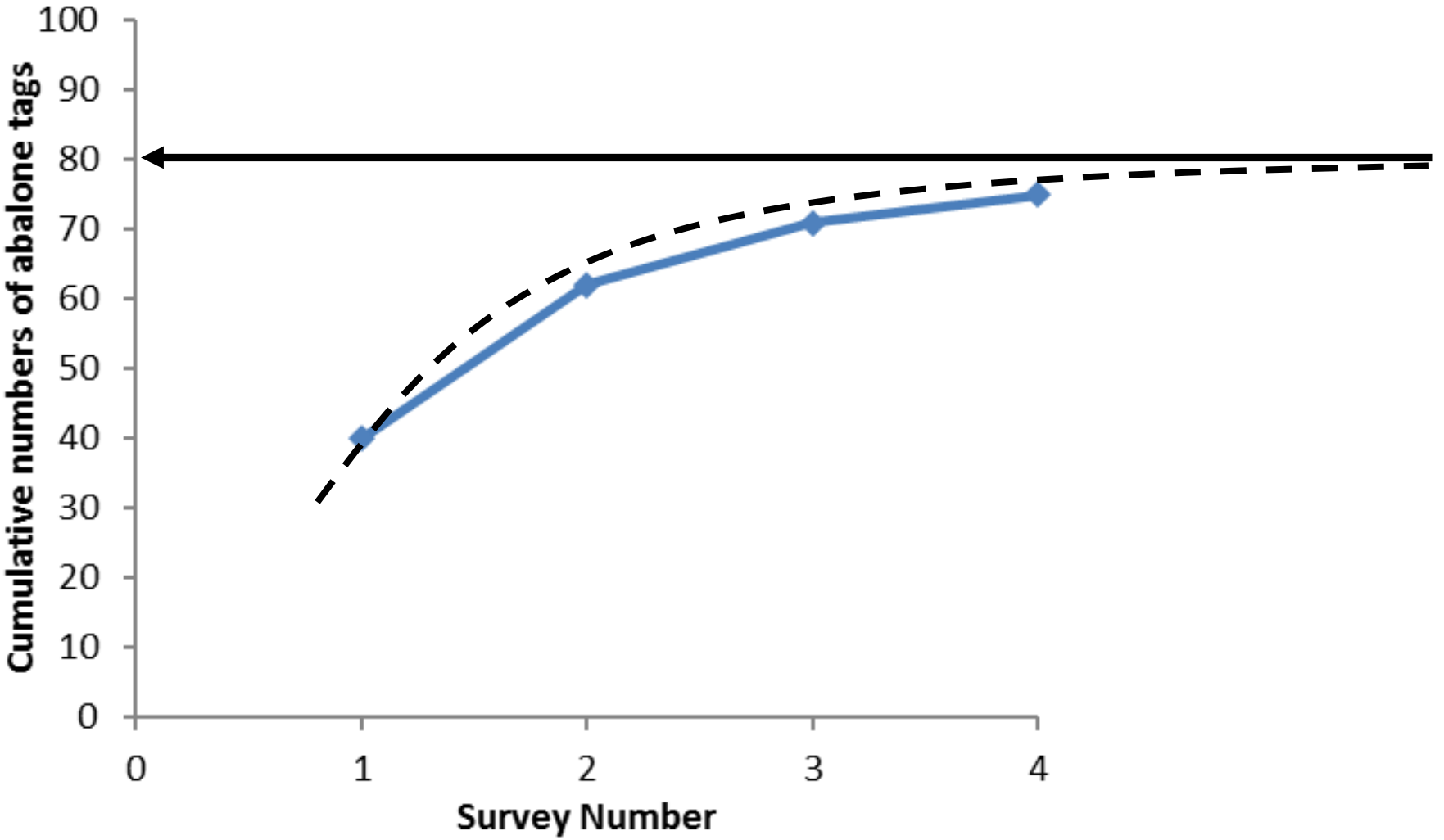
They died.

Empty shells are recovered, but only account for 1 – 5% of outplanted individuals.

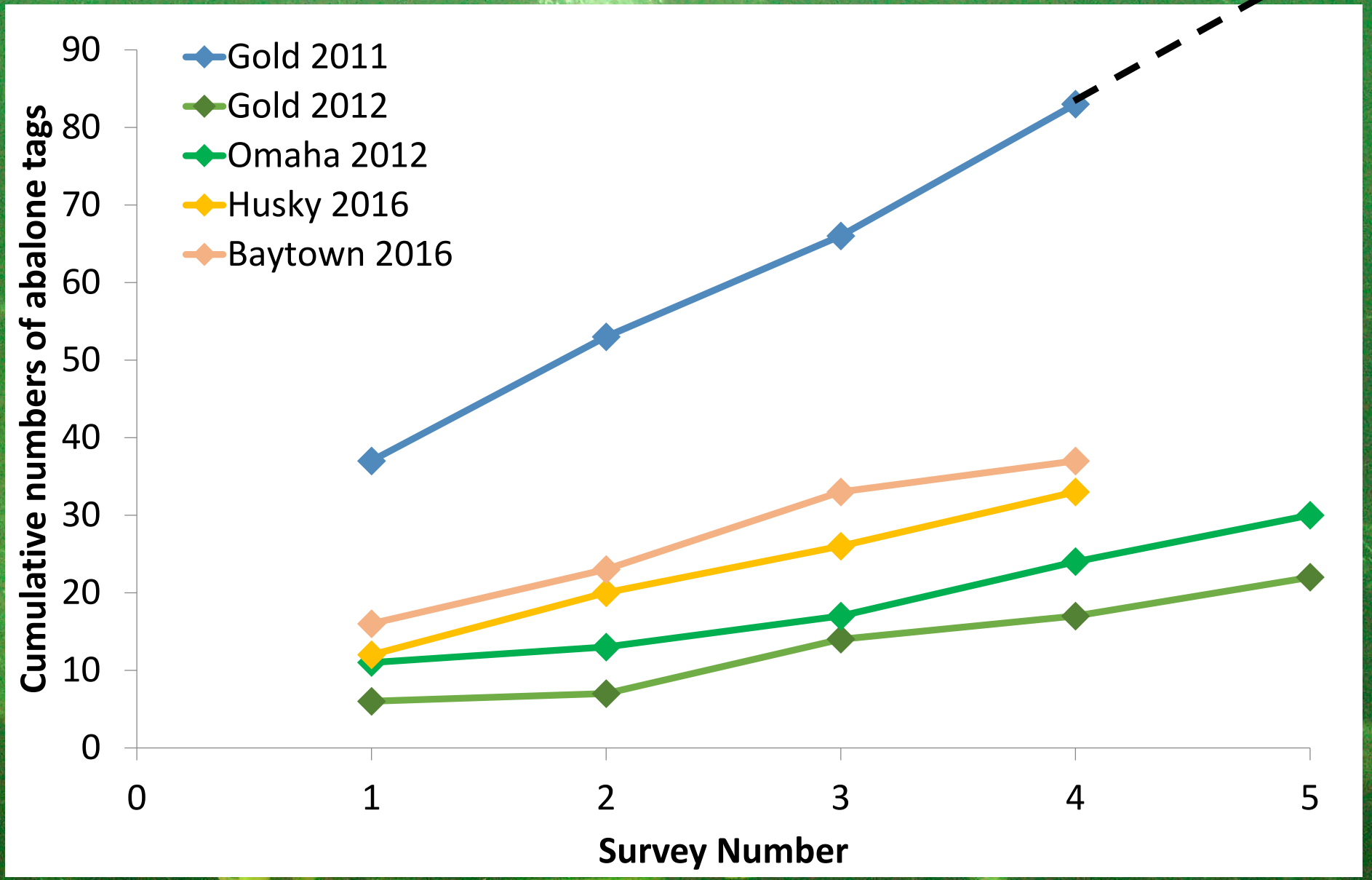
They left.

Movement of tagged animals (that are recaptured) is minimal
For restoration purposes, is there a difference between these two?

They are there we just can’t see them.

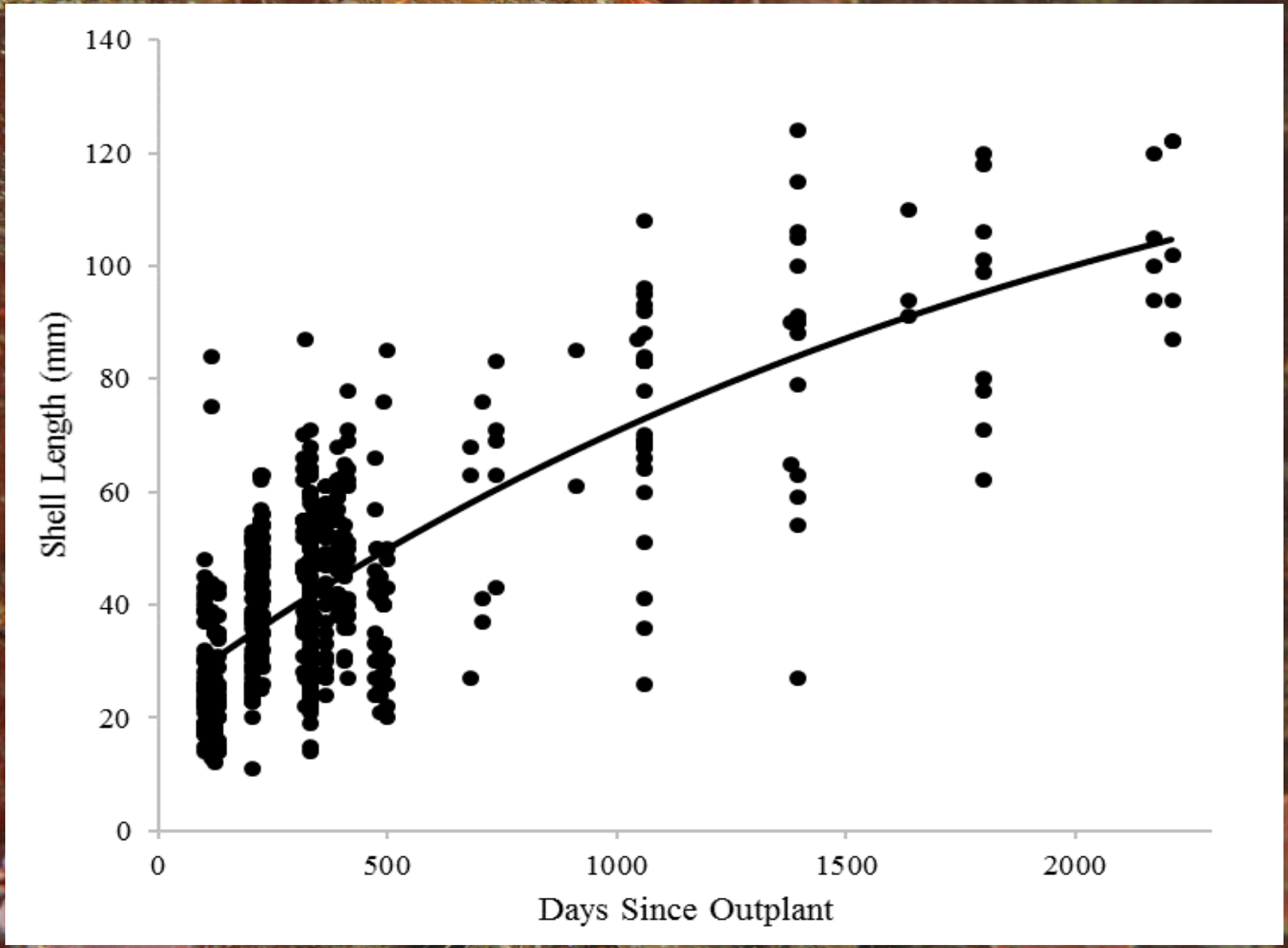


How ‘detectable’ are abalone?



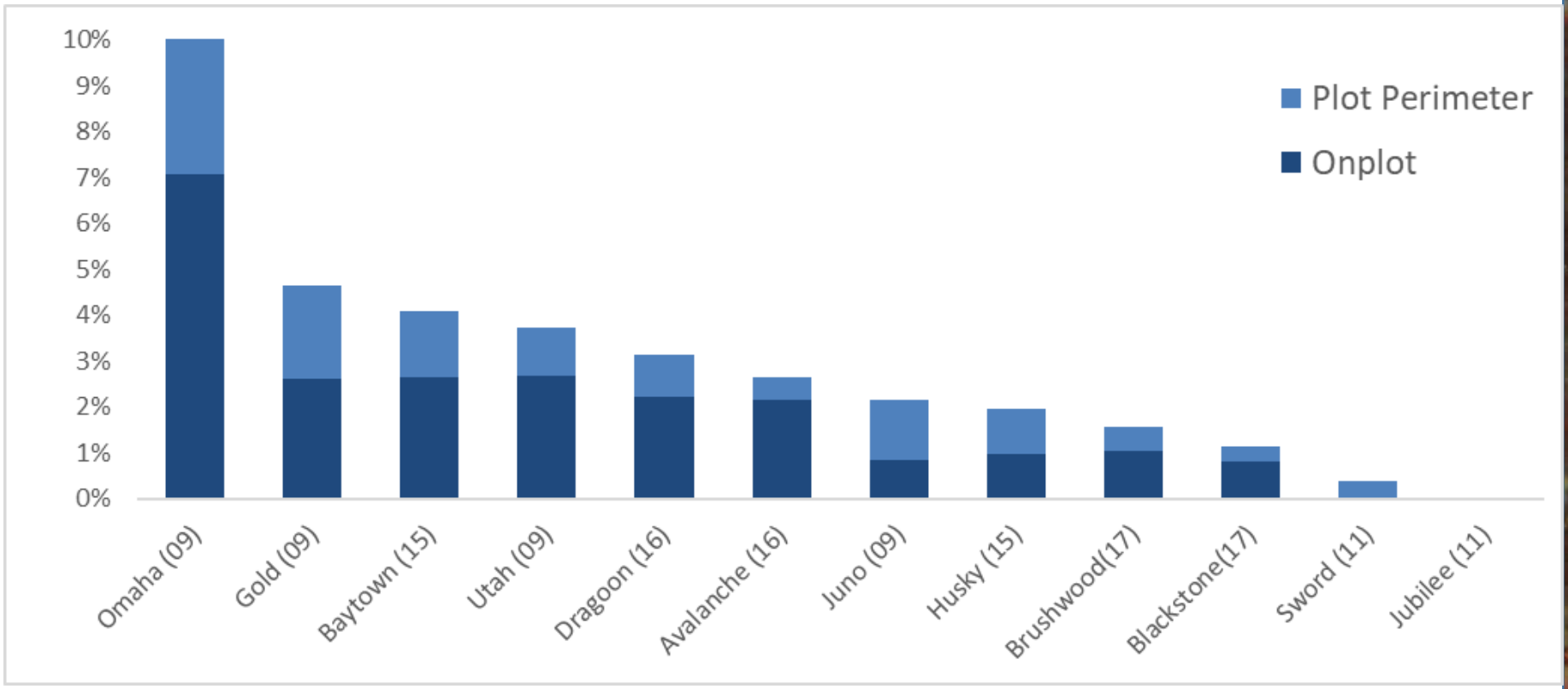
How ‘detectable’ are abalone?

How many have reached reproductive size?



How many have reached reproductive size?

"Outplant success" = $\frac{\text{current number at reproductive size}}{\text{total number outplanted}}$



“Repeal and Replace”

Stop outplanting to sites with success rate <2%

Monitoring can continue

Establish new sites

Continue to overseed existing sites to maintain densities and increase genetic diversity

What most affects survival – site, family, or size-at-outplant?

- A mark-recapture model (Cormac-Jolly-Seber) shows that site is >>>> more important than the other two factors to survival

- Our main constraint to restoration-scale outplanting, other than hatchery production, is the ability to identify sites with high survival (or retention).

- Pilot-studies are in place now to test if we can outplant sooner

- Other to-dos:
  - Measure on-plot genetic diversity directly
  - Predictive habitat model ongoing with SeaDoc Society
  - Investigate relationship between adult density and fertilization efficiency
  - Raise a #$@&-ton of money

Thank you

Ocean Working
Bethany Stevick
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Caitlin O'Brien
Brian Allen

Joe Gaydos
Dana Morin
Don Rothaus
Ralph Downes
Taylor Kimball

Skagit County MRC
SeaDoc Society
Vincent J. Coates Foundation
WA Dept. of Natural Resources
Western Washington University

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How much do abalone move around?

How often do tagged abalone change lanes on outplant plots?