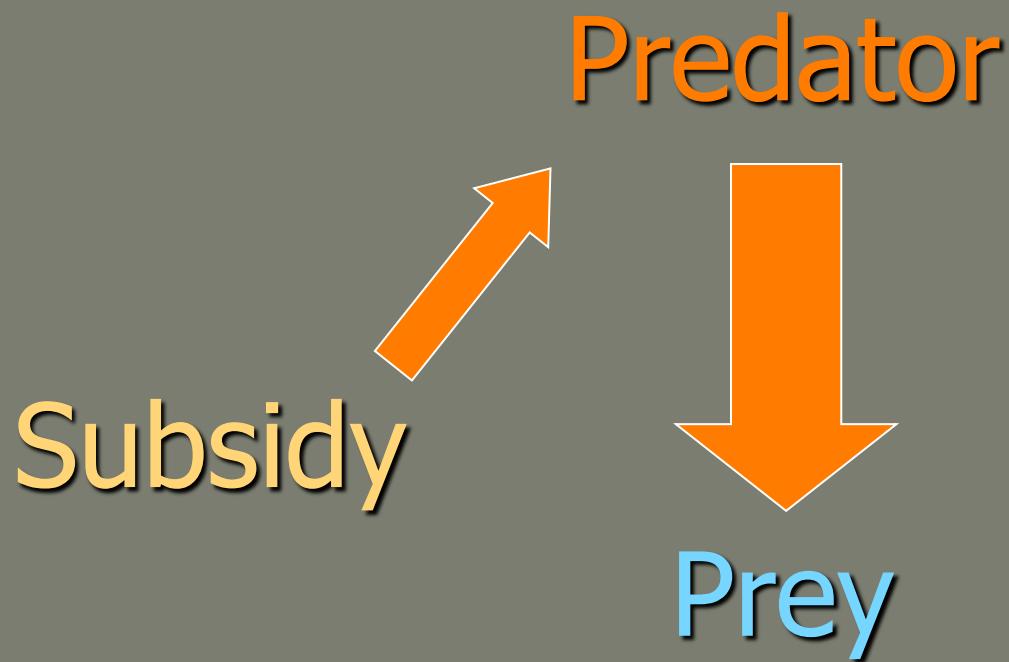


Subsidized predators and imperiled prey: the impact of avian predators on salmonids

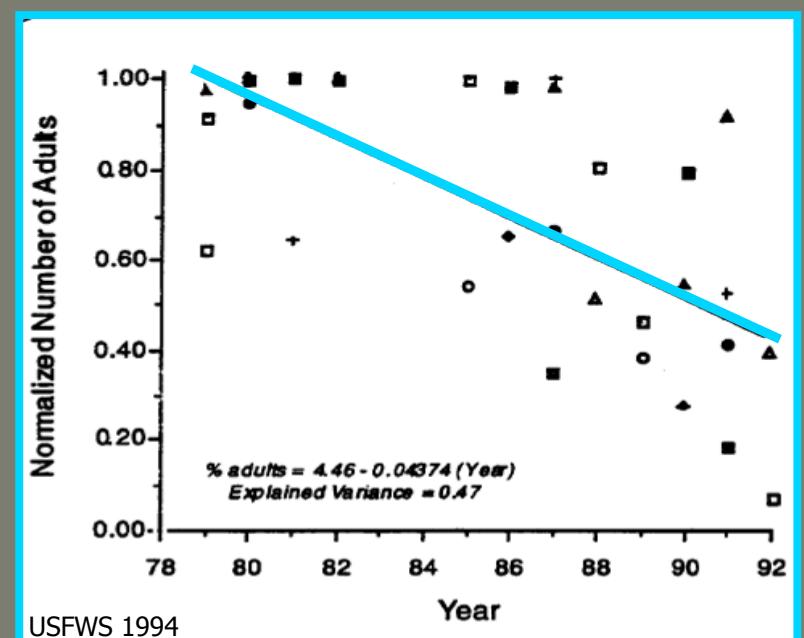
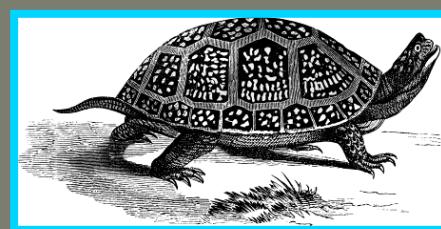
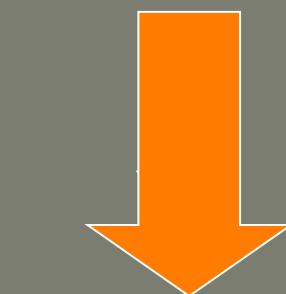
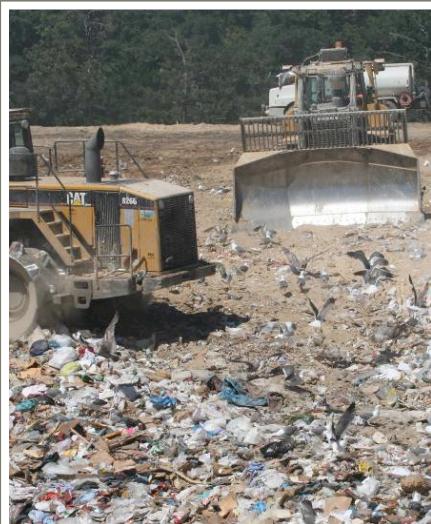


Ann-Marie K. Osterback
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Subsidized predation

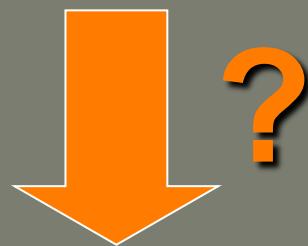


Subsidized ravens decrease endangered tortoise populations



Kristan and Boarman 2007

Do subsidized predators have an impact on salmonids?



?

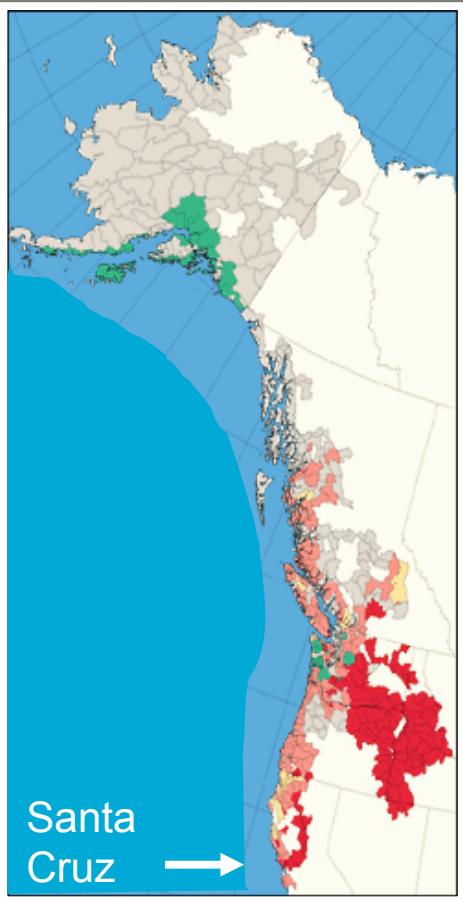


Western gulls at a local landfill

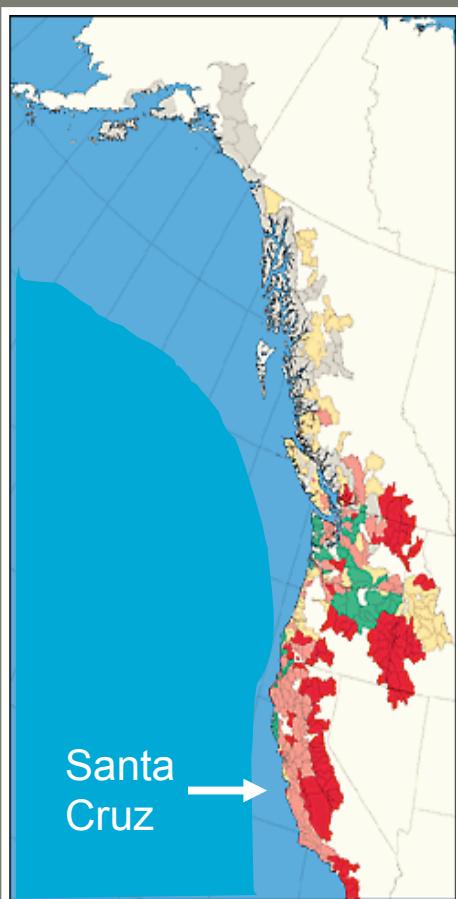


California salmon populations are at risk

Coho



Steelhead



Endangered Coho

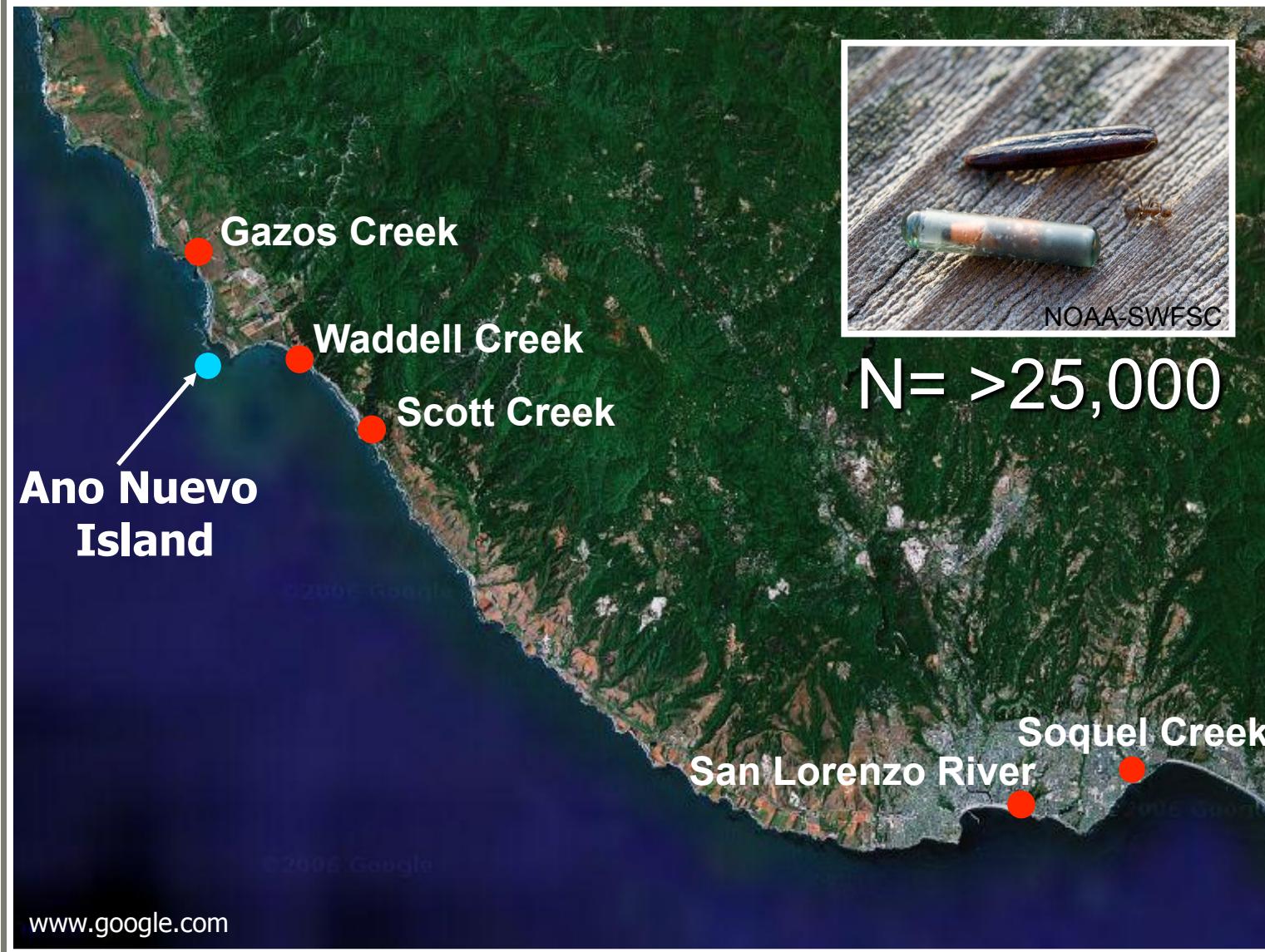
– Endangered since 2005

Threatened Steelhead

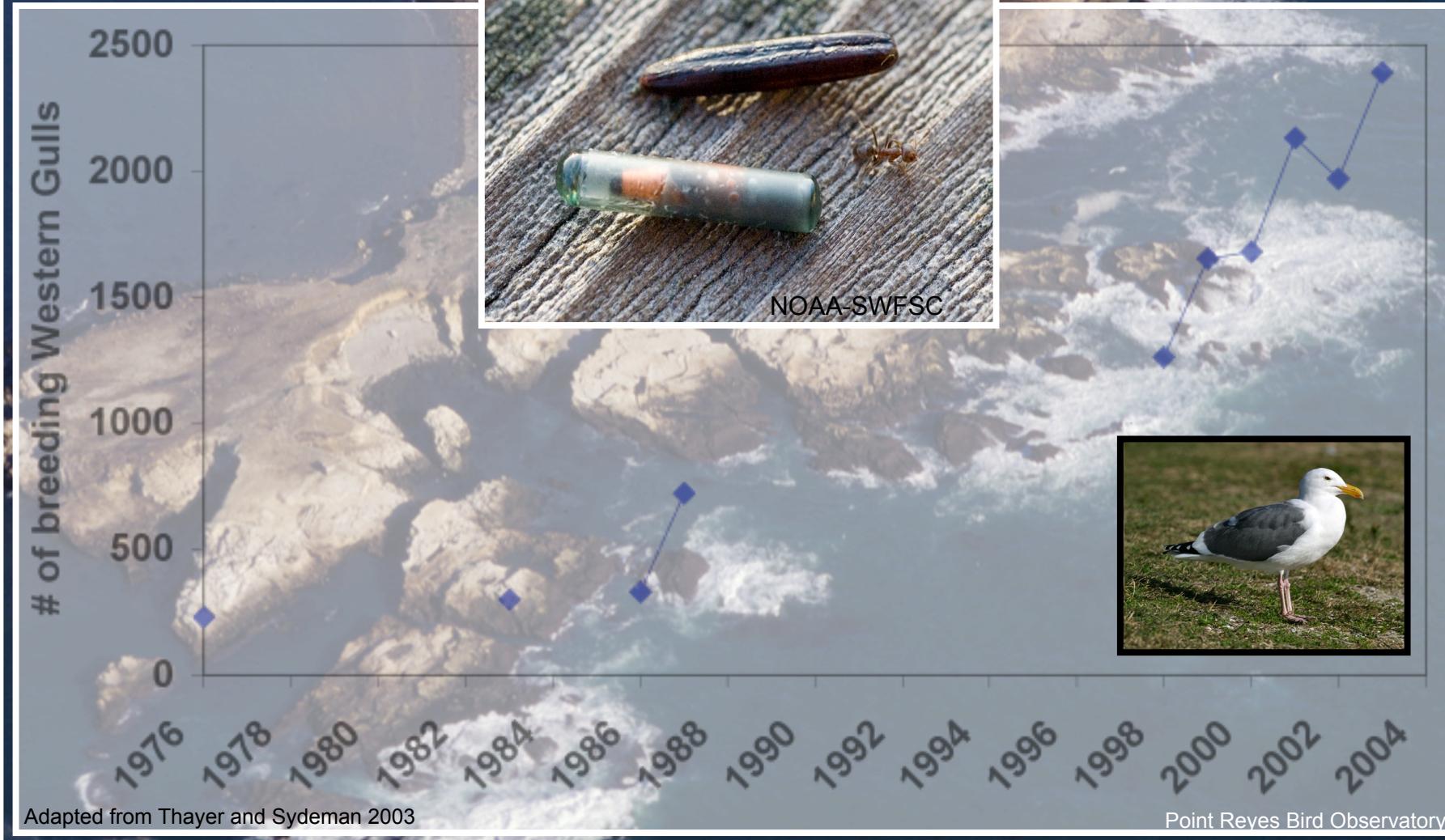
– Threatened since 1997

Low risk Unknown Concern At risk Extinct

Central California Coast Watersheds



Ano Nuevo Island



Research Goals

Part 1: Use recovery of PIT tags to

- a. Quantify predation rates by gulls
- b. Identify factors influencing predation risk

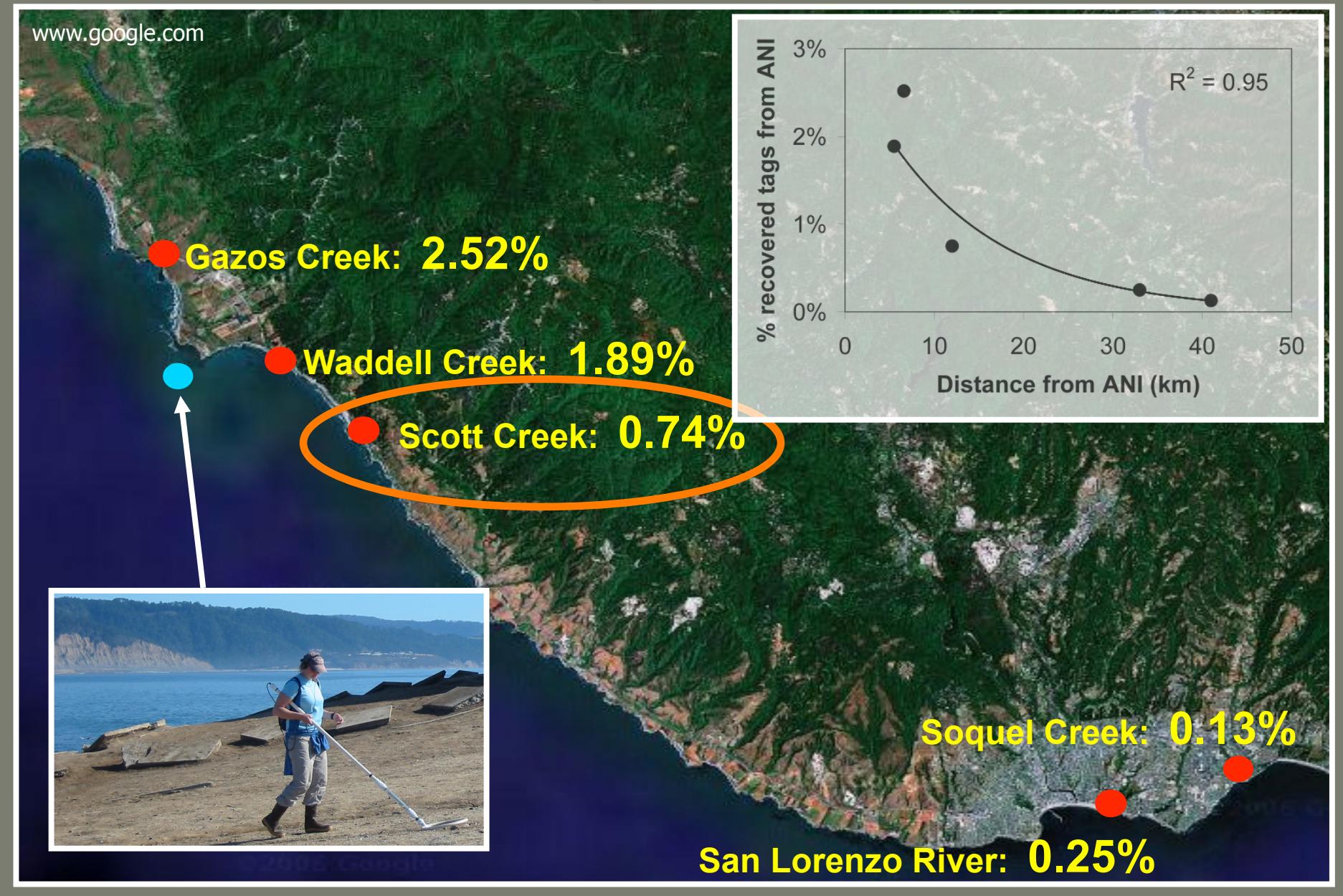
Part 2:

**Use a large scale experiment to investigate
predation risk**

Quantifying predation with PIT tag recoveries on the Island



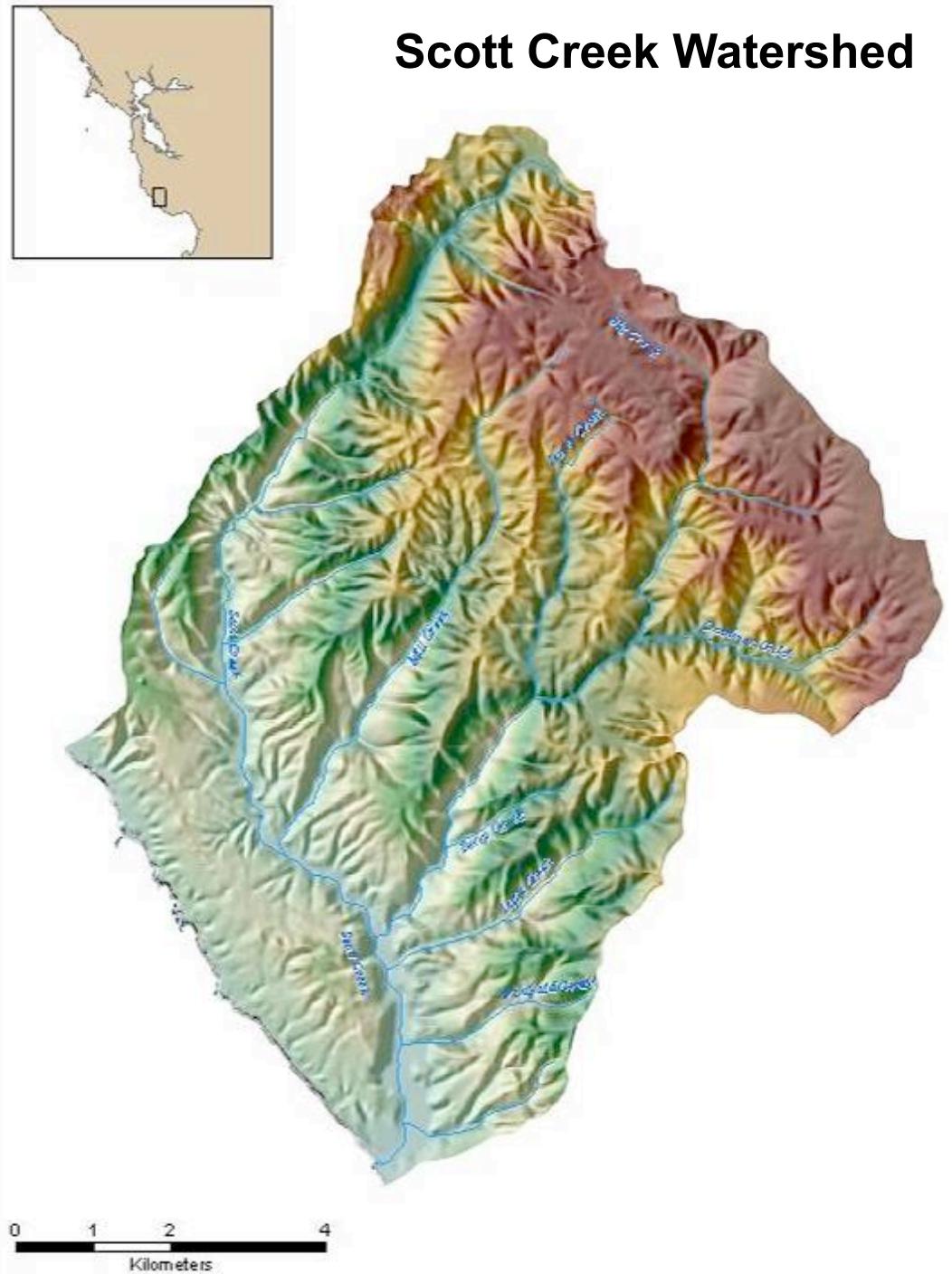
Minimum predation rates



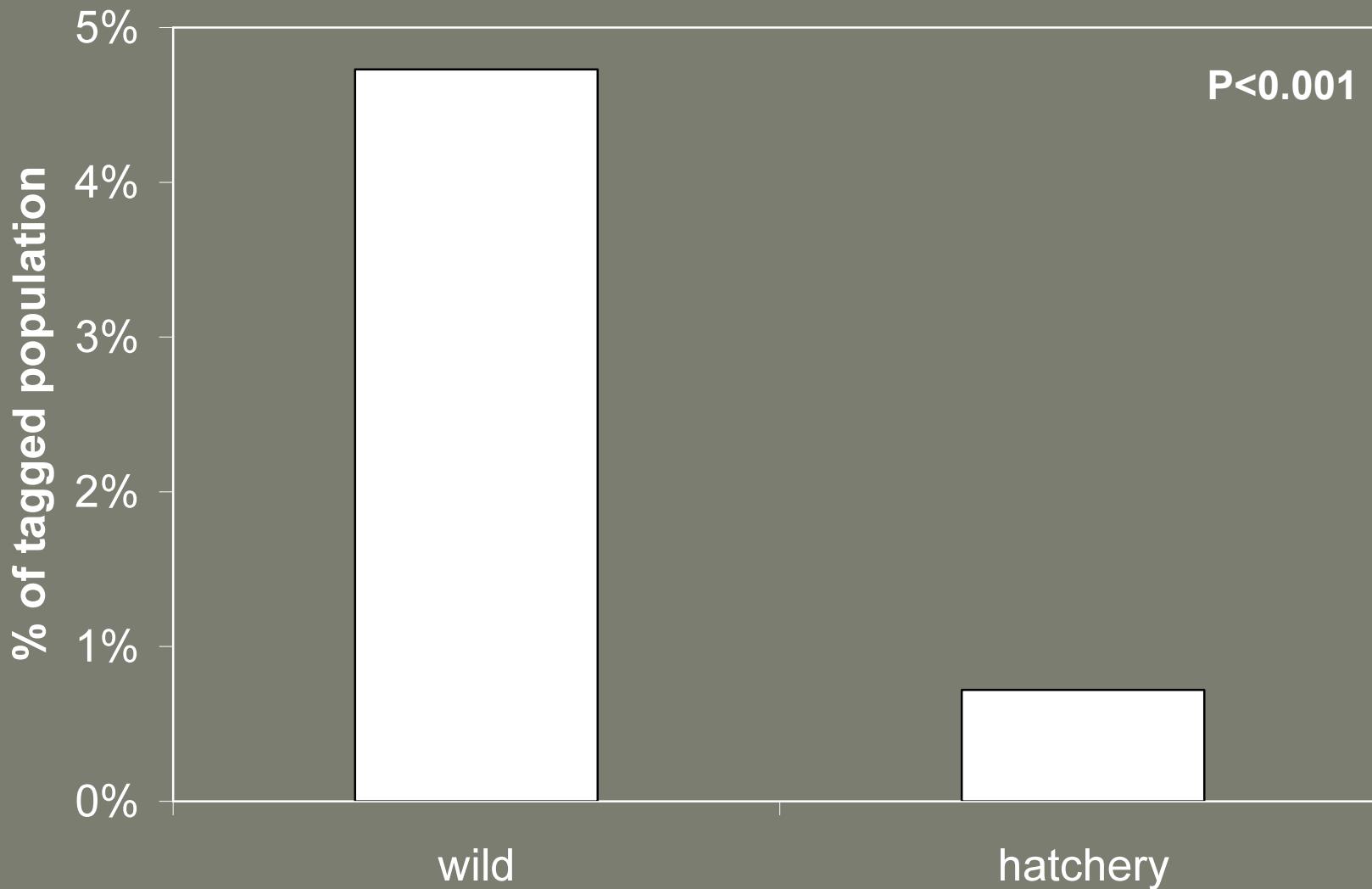
What factors influence predation risk?

- Steelhead and Coho
- Small conservation hatchery
- Analysis included a logistic regression
 - Response: “Eaten” and “Not eaten”

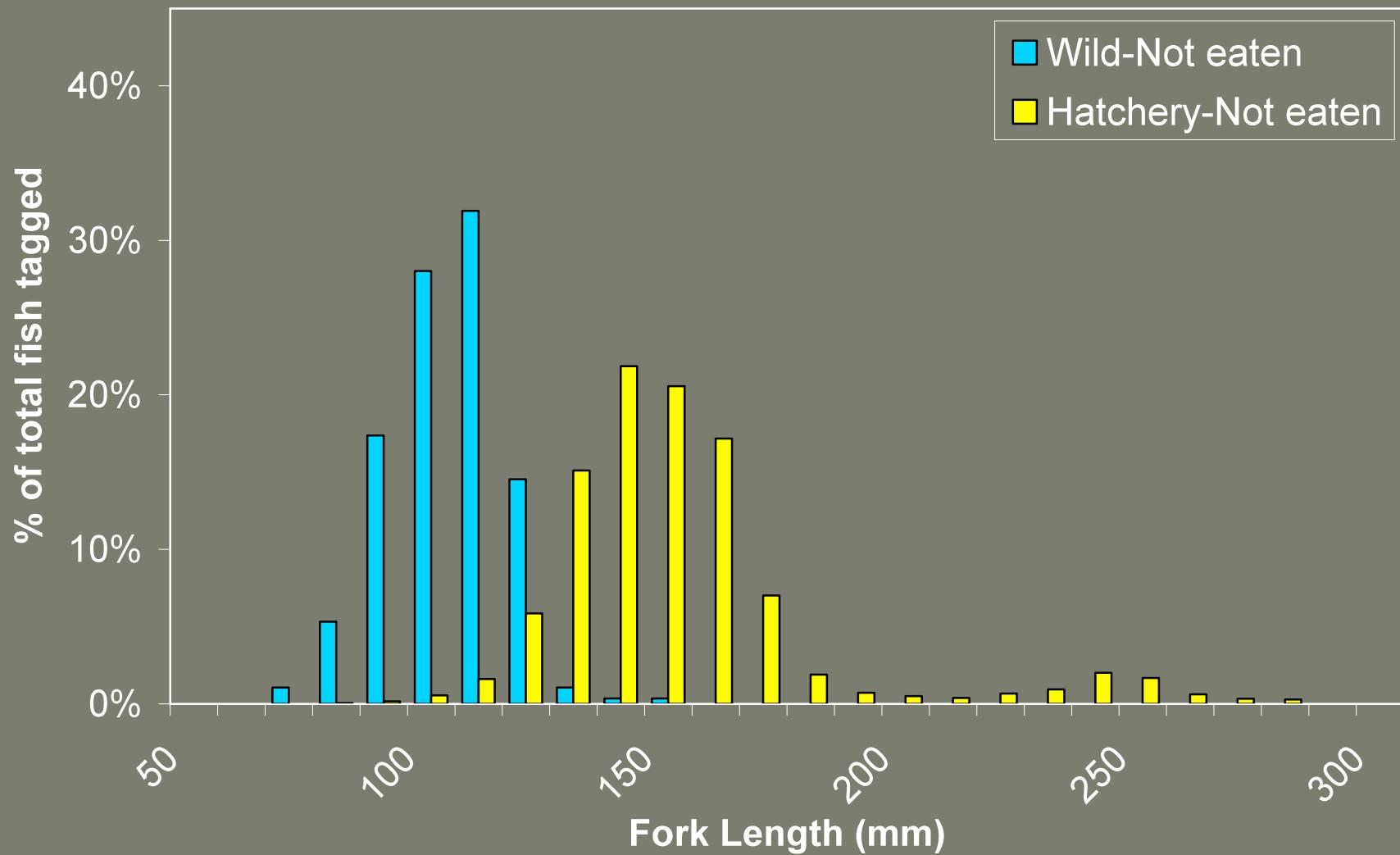
Scott Creek Watershed



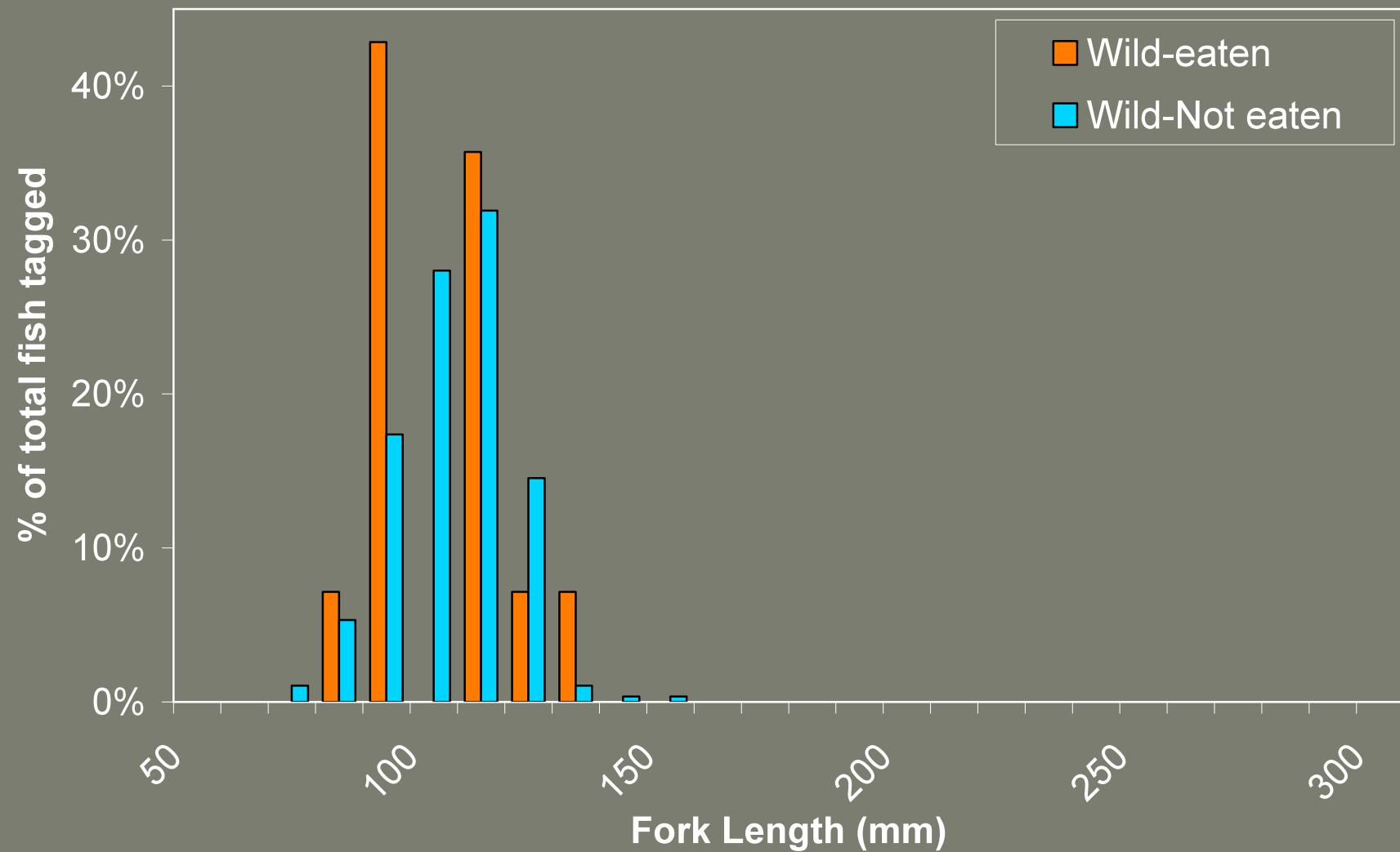
Wild Coho were more susceptible to predation than hatchery Coho



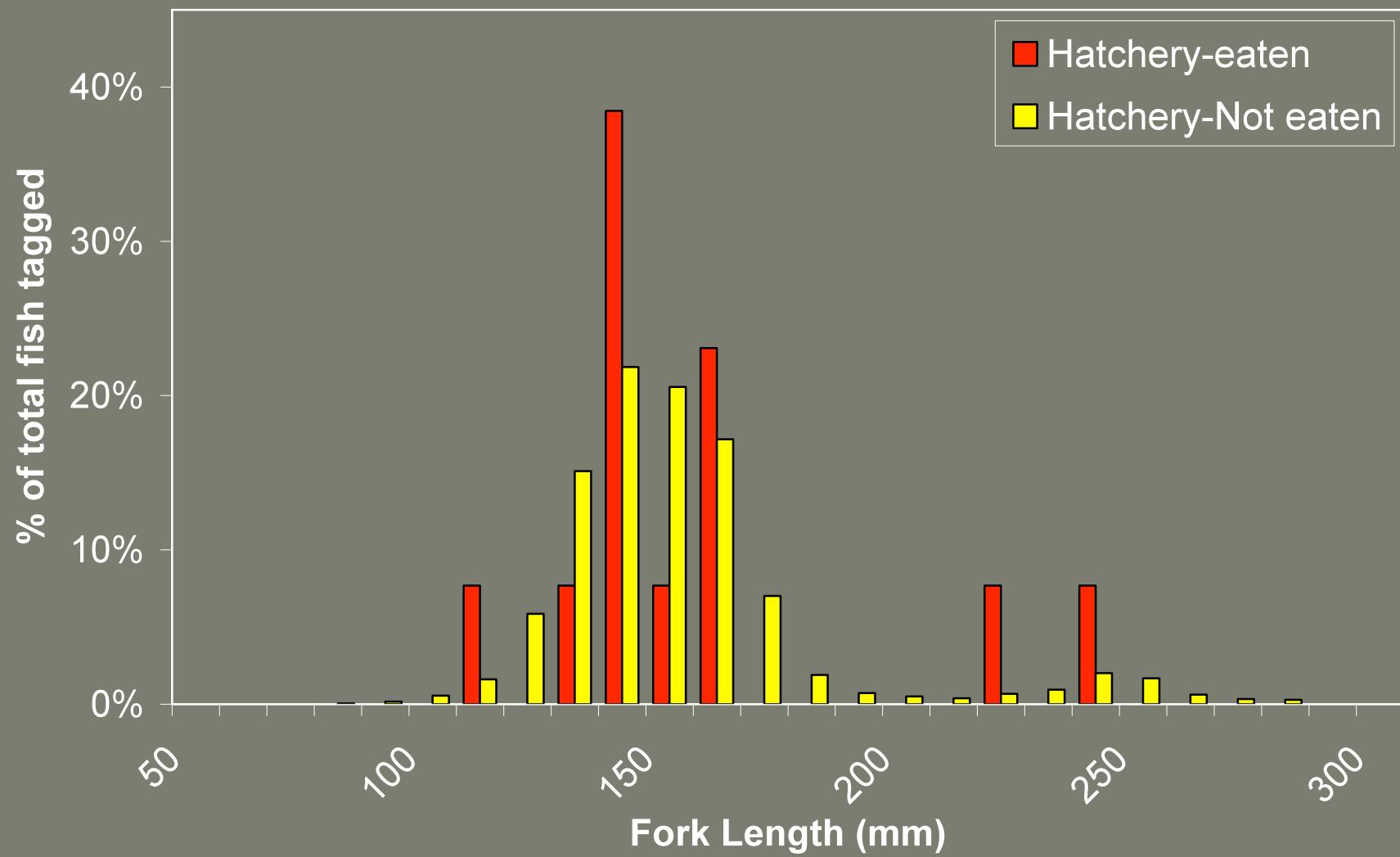
Wild Coho are also typically much smaller than hatchery Coho



Predation occurred across all size classes of wild Coho



Results were similar for hatchery Coho,
with all size classes preyed on



So are wild Coho eaten more because they're wild or because they're small?

It's both.



The model cannot separate the affect of “hatchery vs. wild” or “length”

Coho

Model	Δ AIC
Wild/Hatchery	0.00
Wild/Hatchery	0.94
Wild/Hatchery x Length	
Wild/Hatchery	1.99
Length	
Wild/Hatchery x Length	2.36
Wild/Hatchery	2.65
Length	
Wild/Hatchery x Length	

Steelhead

Model	Δ AIC
Wild/Hatchery	0.00
Length	
Wild/Hatchery	0.30
Length	0.69
Wild/Hatchery x Length	
Wild/Hatchery	1.06
Wild/Hatchery x Length	
Wild/Hatchery	1.83
Length	
Wild/Hatchery x Length	

Thirty six different Logistic Regression models were run. Above are only the best fit models

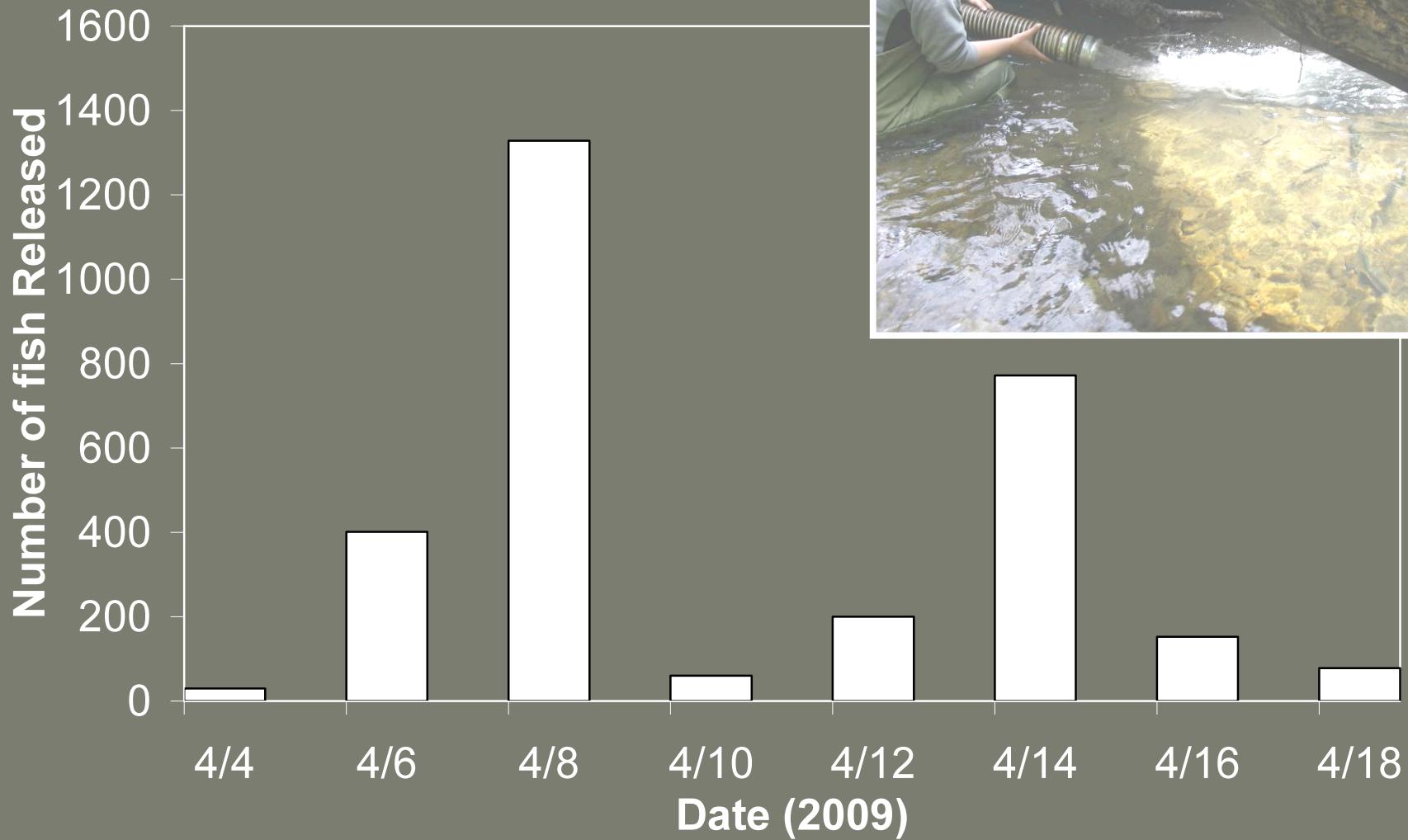


Large-Scale Experiment

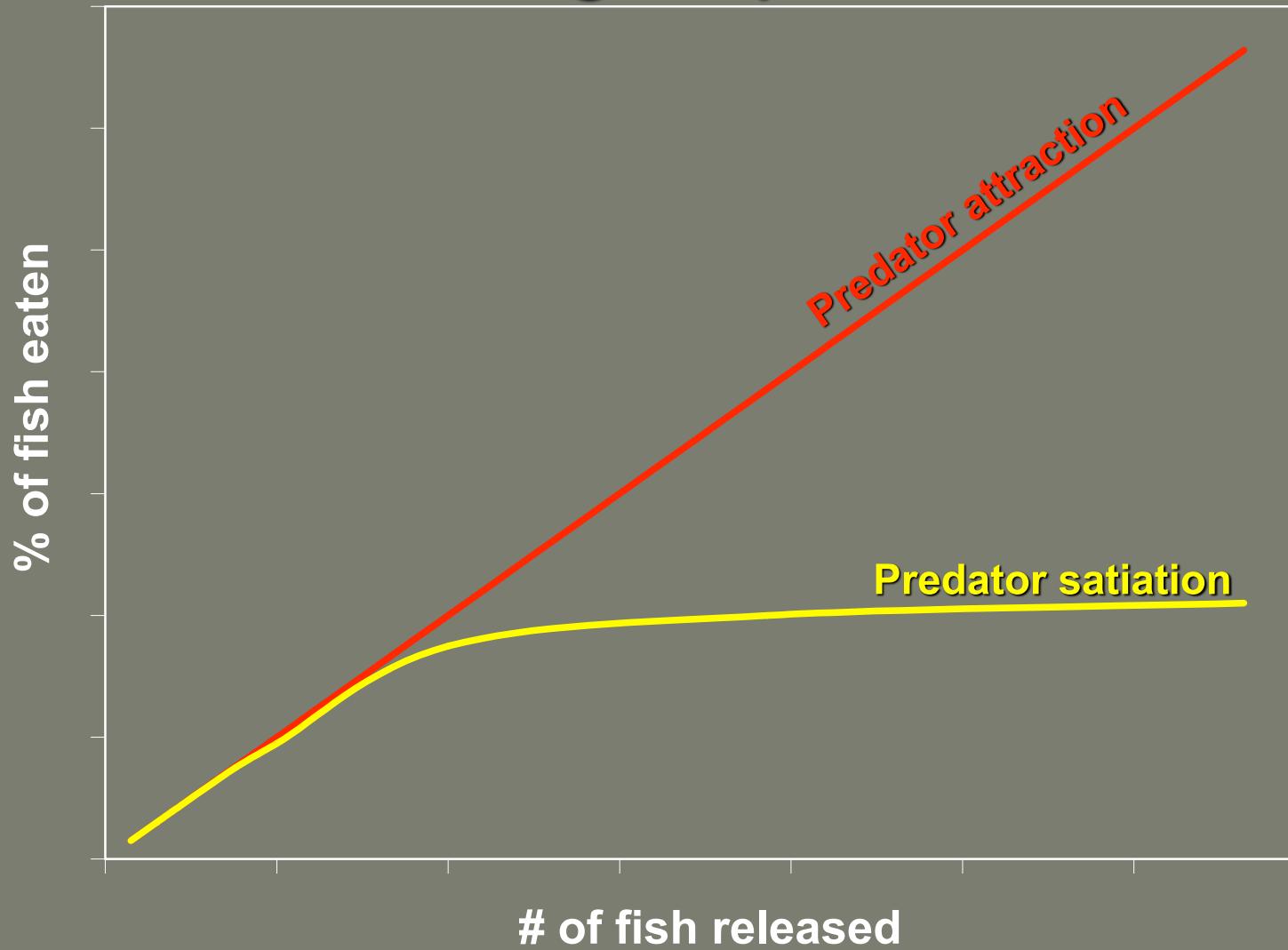
How does group size influence predation risk?



Experimental Design



How does predation risk change with group size?



How many of these PIT tags will we find on the island?



NOAA-SWFSC

N=3...and counting

Meanwhile, we are already observing interesting patterns



- Intrinsic characteristics



- Outmigration timing

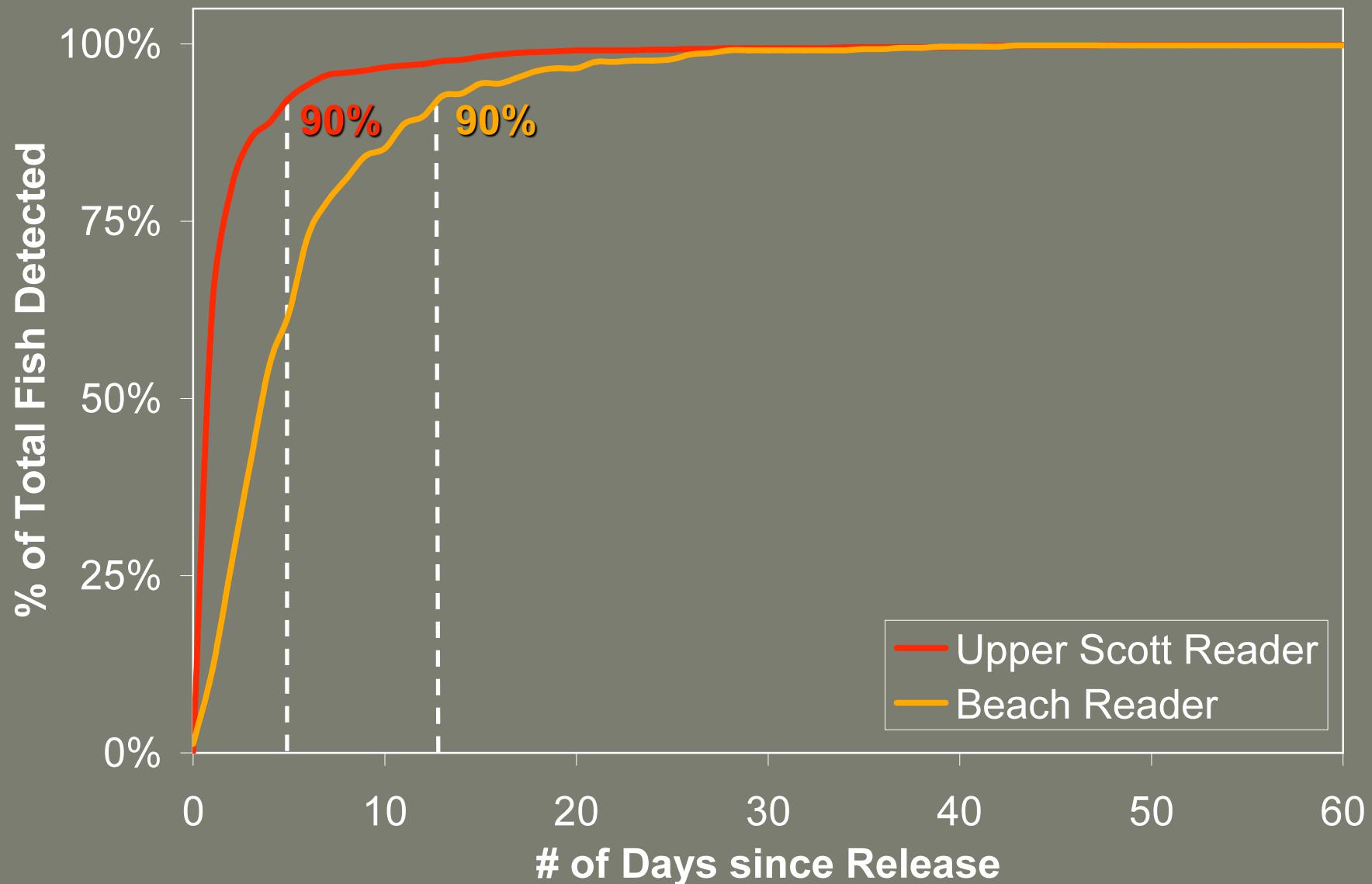


- Movement throughout the system

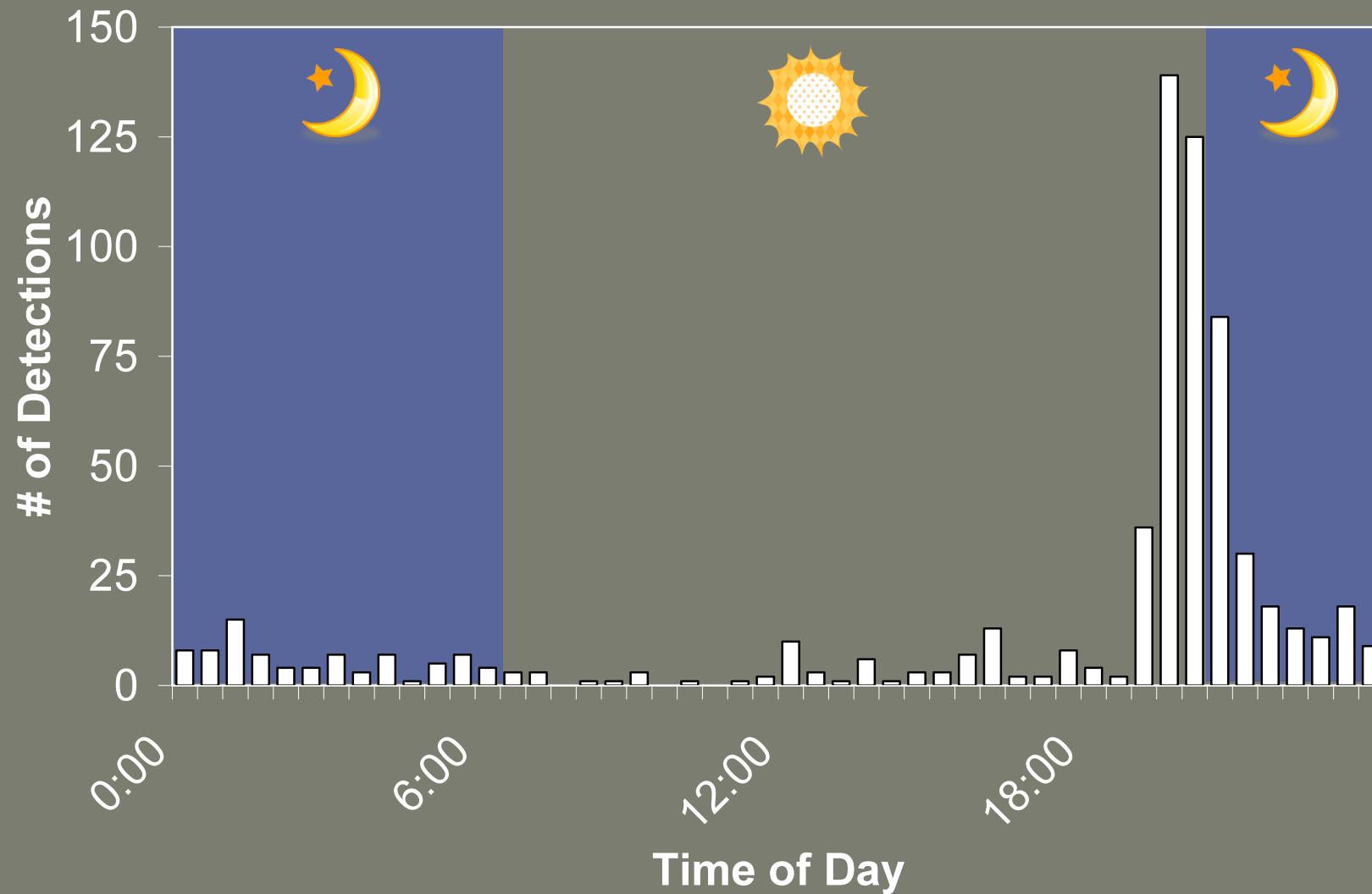


- Recaptures of those that never migrated

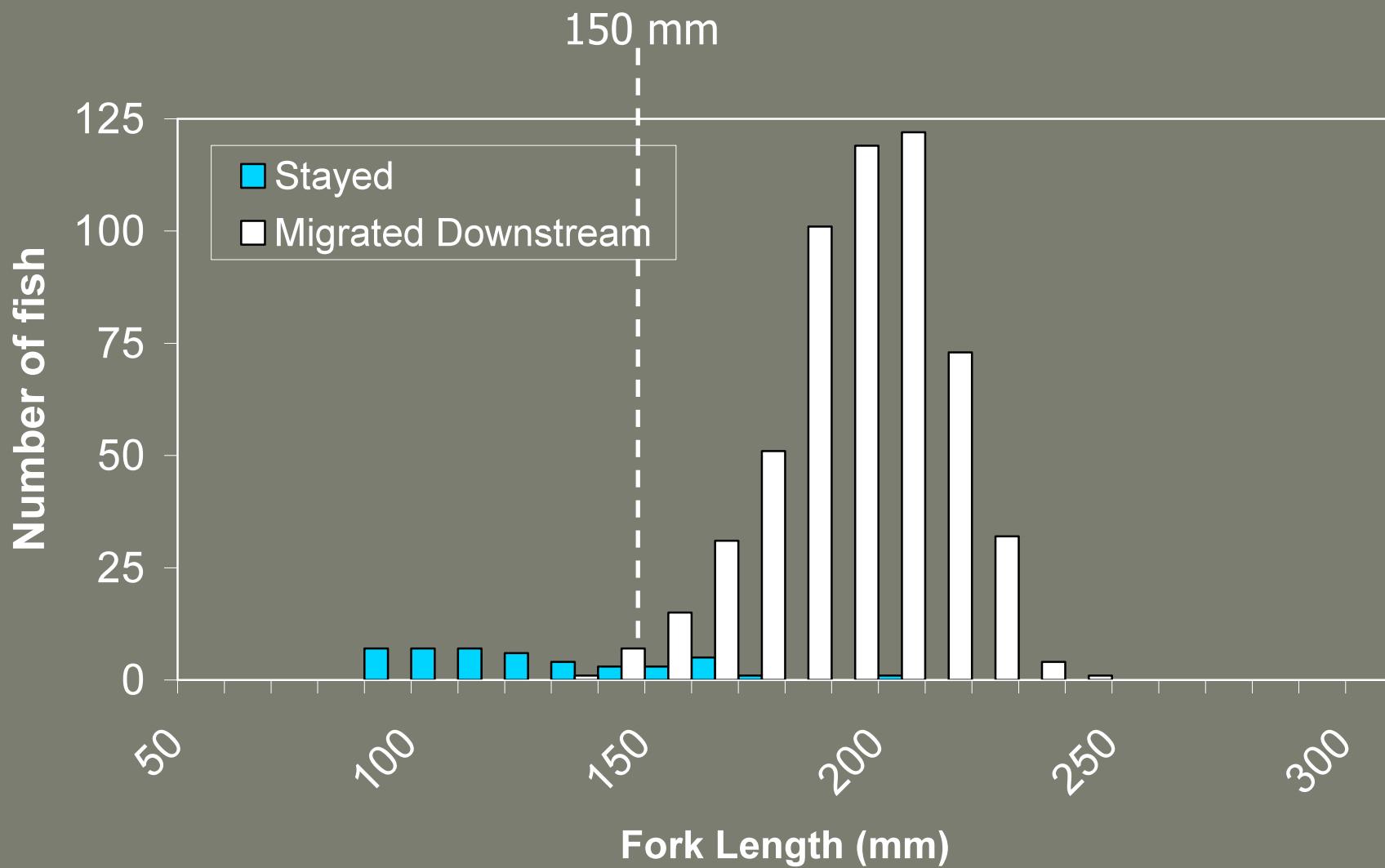
Those that migrated, left quickly



Fish migrated mostly at Dusk



Smaller fish did not migrate



Summary

- Recovering PIT tags provide an effective method to quantify minimum predation rates
- Western gulls are substantially contributing to juvenile salmonid mortality
 - Predation occurred disproportionately on wild/small fish
- If anthropogenic subsidies continue to increase gull populations, wild populations will be affected the most



Acknowledgements

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Questions?

