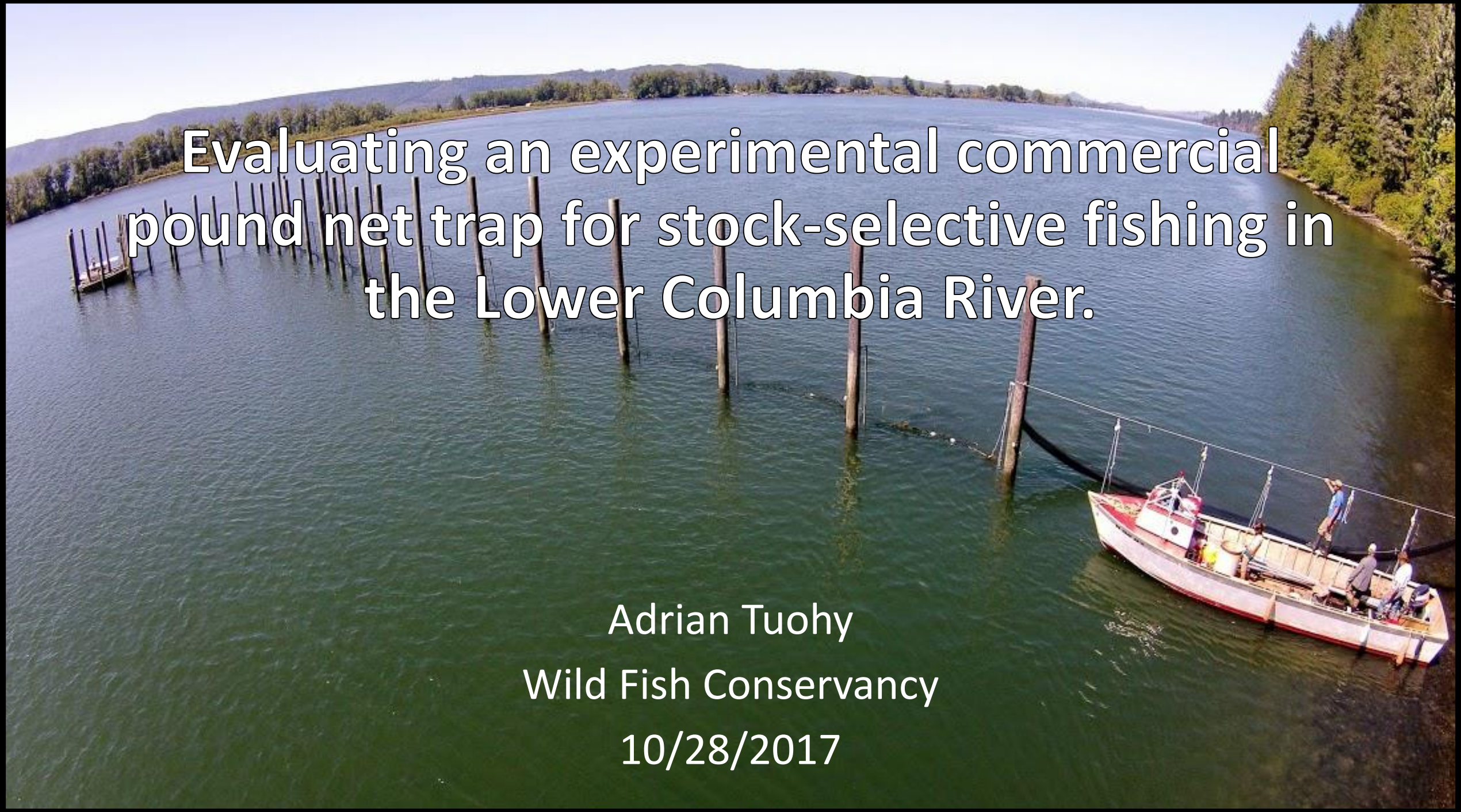


Evaluating an experimental commercial pound net trap for stock-selective fishing in the Lower Columbia River.

Adrian Tuohy

Wild Fish Conservancy

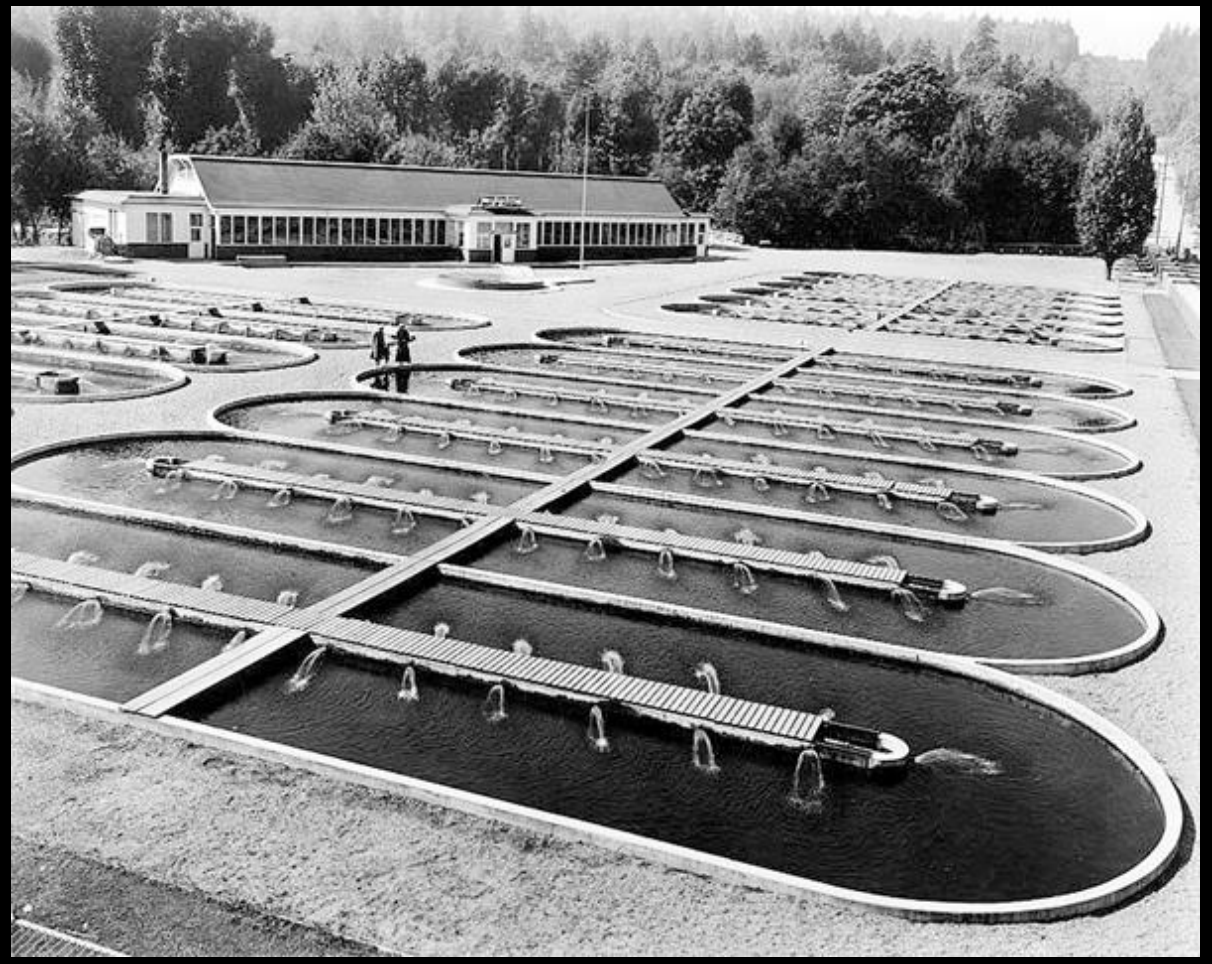
10/28/2017

Introduction

(Scholz et al. 1985; Chapman 1986)

Columbia River Salmonid Decline

- Causes:
  - Overharvest
  - Habitat Loss
  - Dams
  - Hatchery Production
- Less than 1/10th of historical abundance.
- Many stocks listed under ESA.



(Scholz et al. 1985; Chapman 1986; Lichatowich 1999; ISAB 2015; Fish Passage Center 2016)

The Challenge

- Mixed-stock fishery.
- Non-selective gears cause high rates of bycatch mortality.
- Harvest of non-target ESA-listed stocks impedes fishing opportunities and sustainable certification.
- Limited fishing opportunities enable hatchery fish escapement to wild salmon spawning grounds.

Hatchery and Fishery Reform Policy Decision

- "…develop and implement alternative fishing gear to maximize catch of hatchery-origin fish with minimal mortality to native salmon and steelhead." –WFWC 2009

- Addresses two H's:
  - 1) Harvest
  - 2) Hatcheries

(WDFW 2009)

Mortality from Seines

Fall Bright Chinook

Treatment	2011 Cumulative Mortality	2012 Cumulative Mortality
Beach Seine	44% (n=748)	25% (n=2623)
Purse Seine	22% (n=1643)	26% (n=2173)

Coho

Treatment	2011 Cumulative Mortality	2012 Cumulative Mortality
Beach Seine	50% (n=297)	38% (n=480)
Purse Seine	23% (n=702)	41% (n=548)

WDFW 2014

YAMAHA

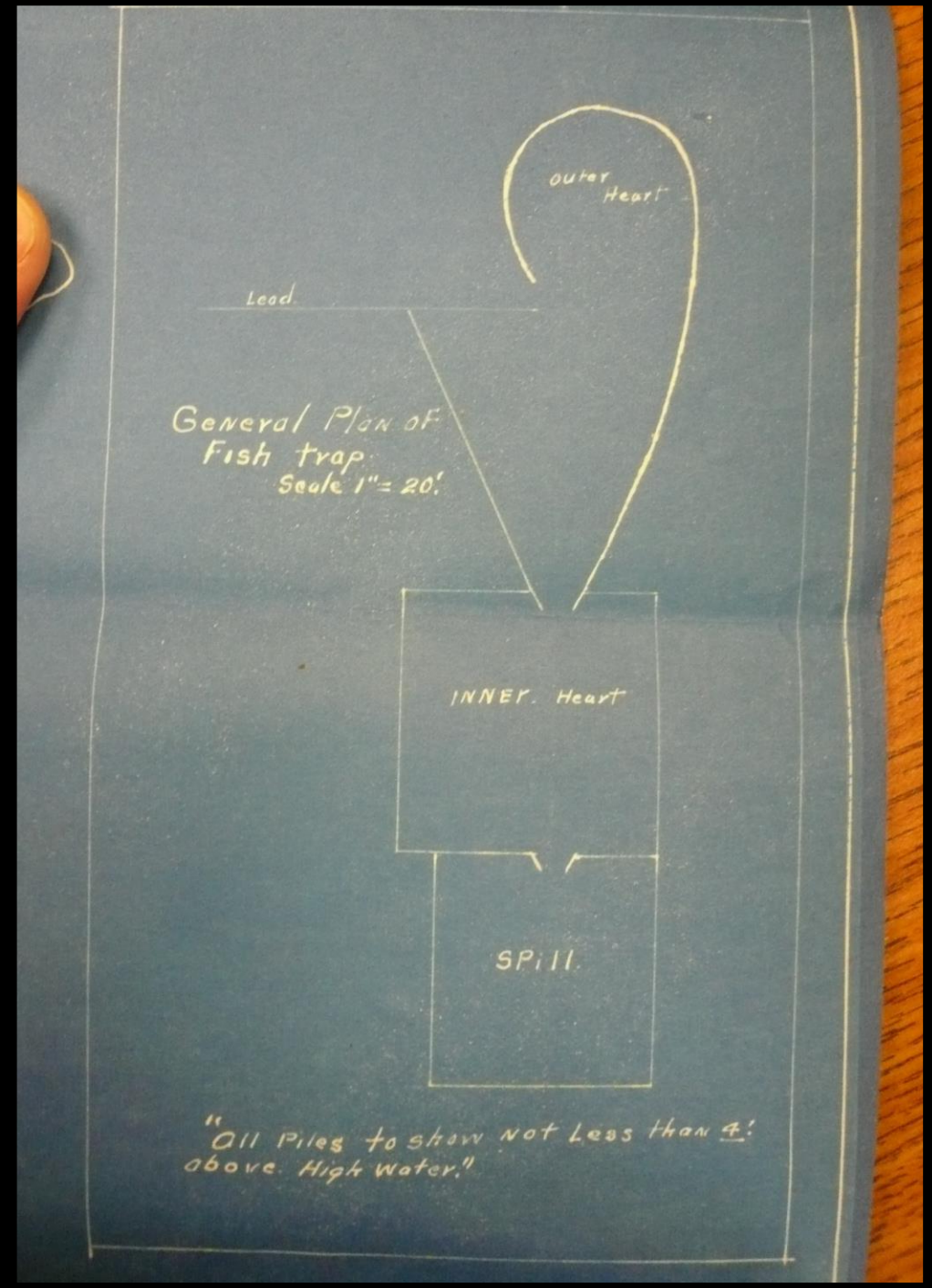
Year-1

Year-1 Objectives

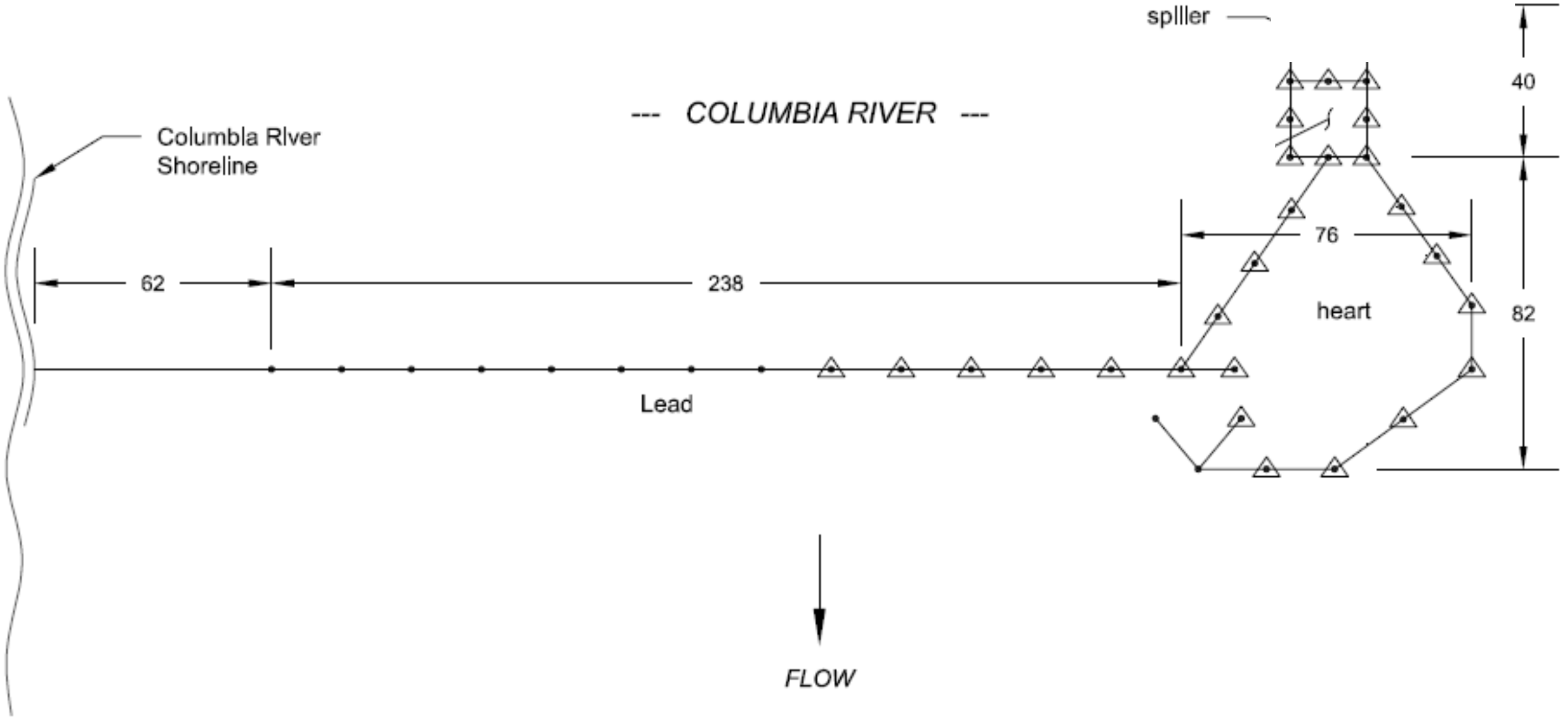
- Learn how to use pound net traps in the lower Columbia River. Identify any modifications that can improve gear effectiveness.
- Determine effectiveness of traps in capturing fish relative to previously tested alternative gears.
- Evaluate the ability of traps to selectively harvest hatchery fish and release wild fish through identification of immediate survival rate.

(Ashbrook 2007; WDFW 2014)

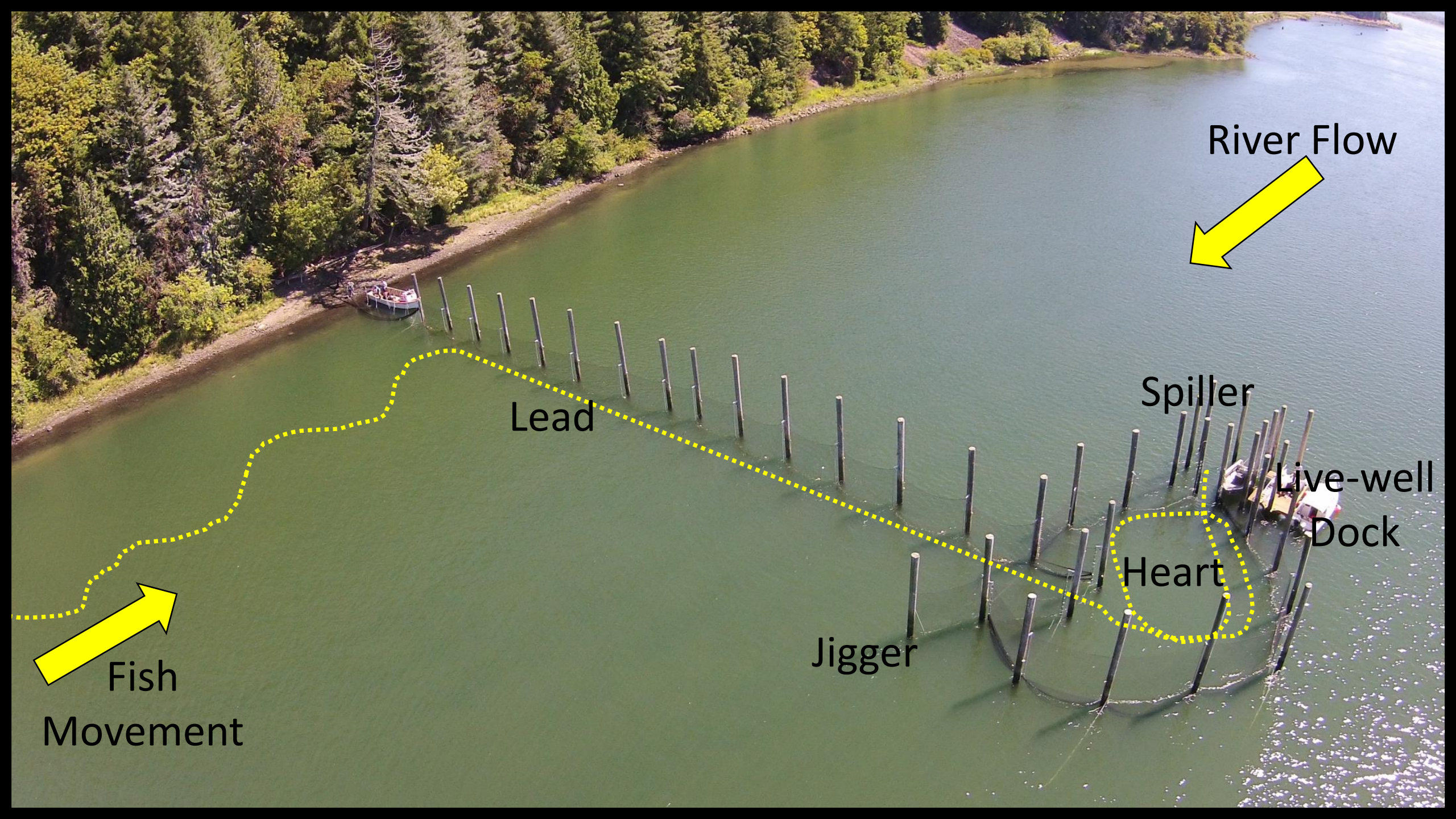
Methods

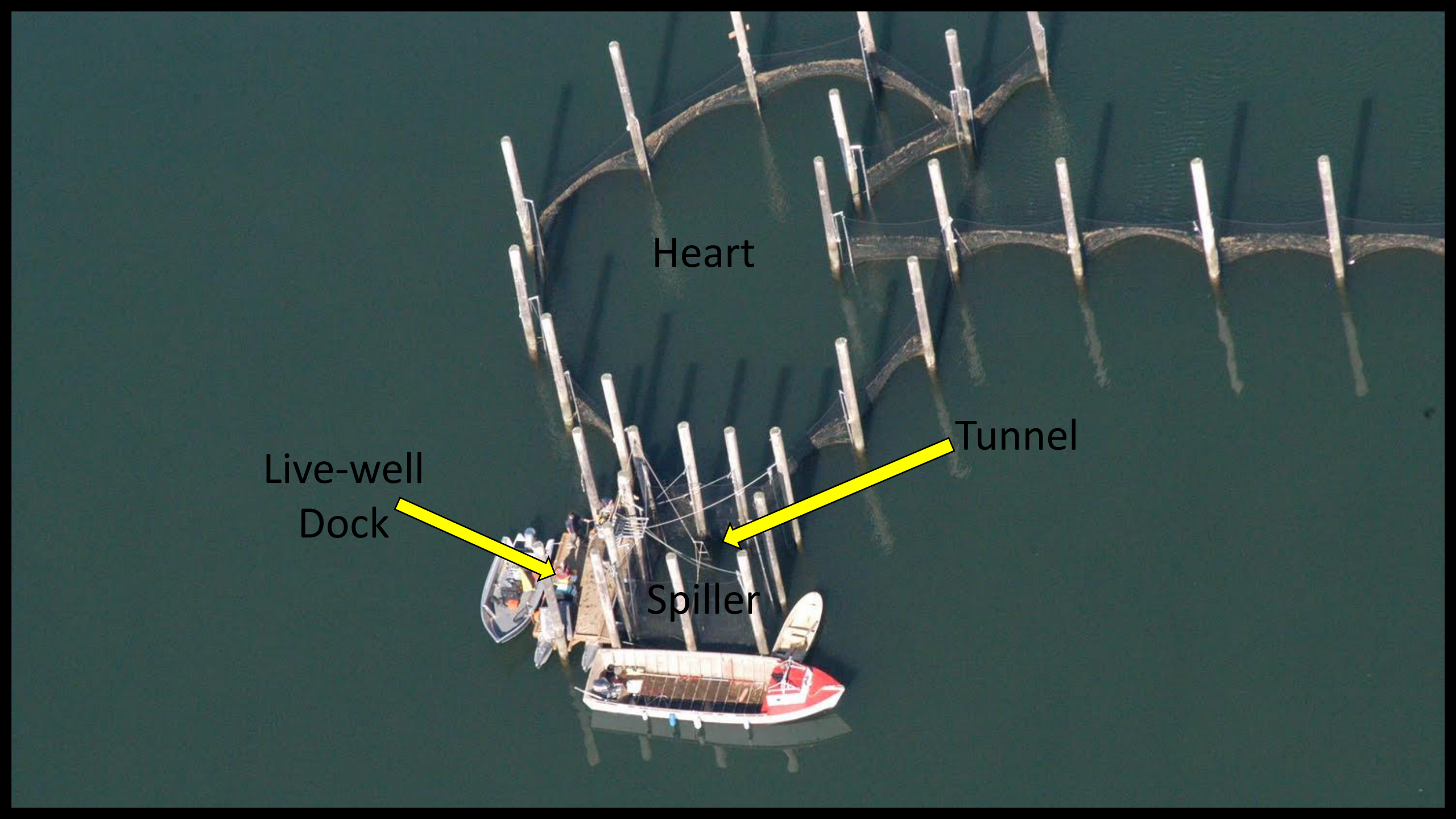

Outer Heart
Lead
General Plan of Fish trap
Scale 1" = 20'
INNER Heart
SPill
"All Piles to show not Less than 4' above High Water."

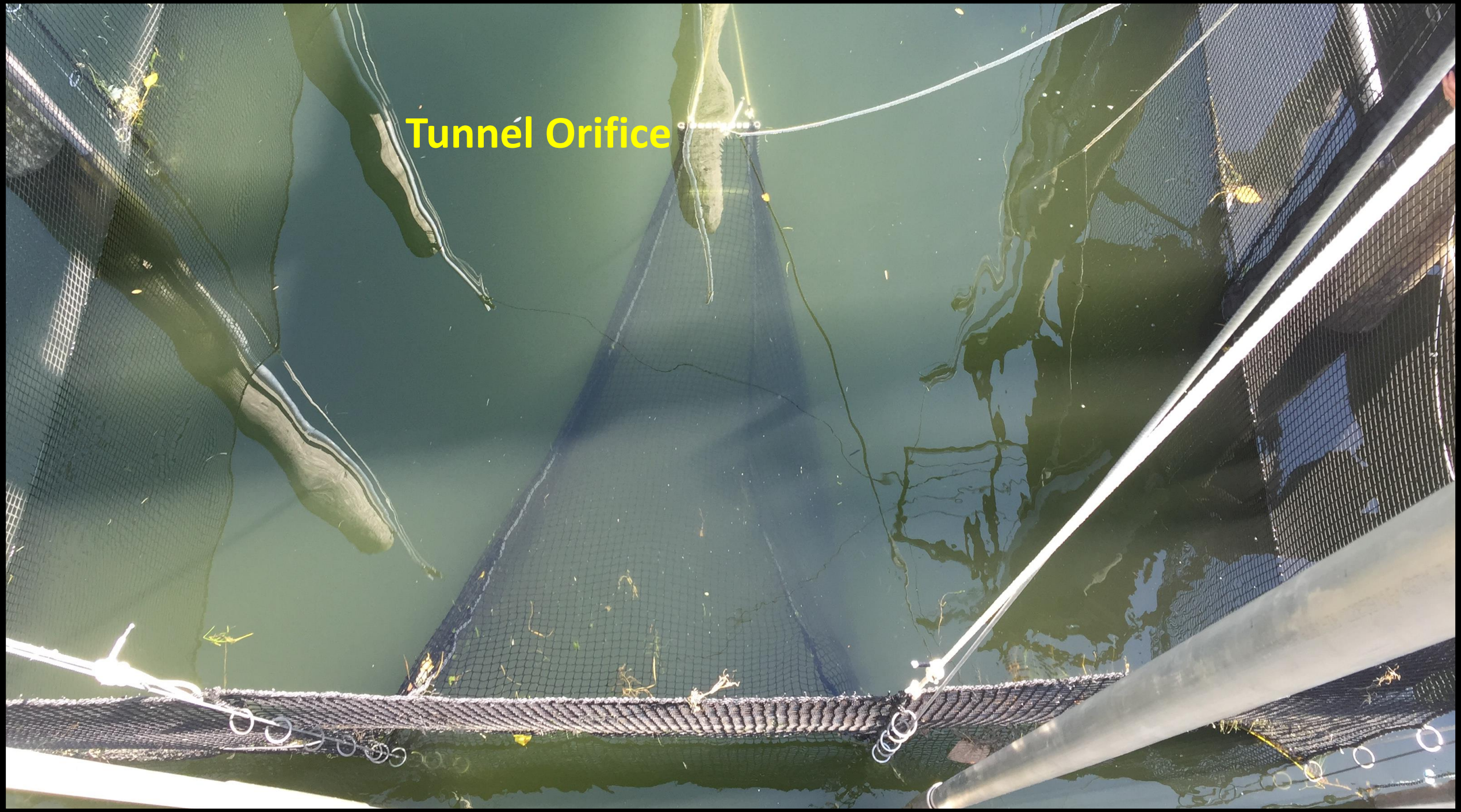
△ PILING WILL BE SHIFTED FROM EXISTING LOCATION TO THIS POINT



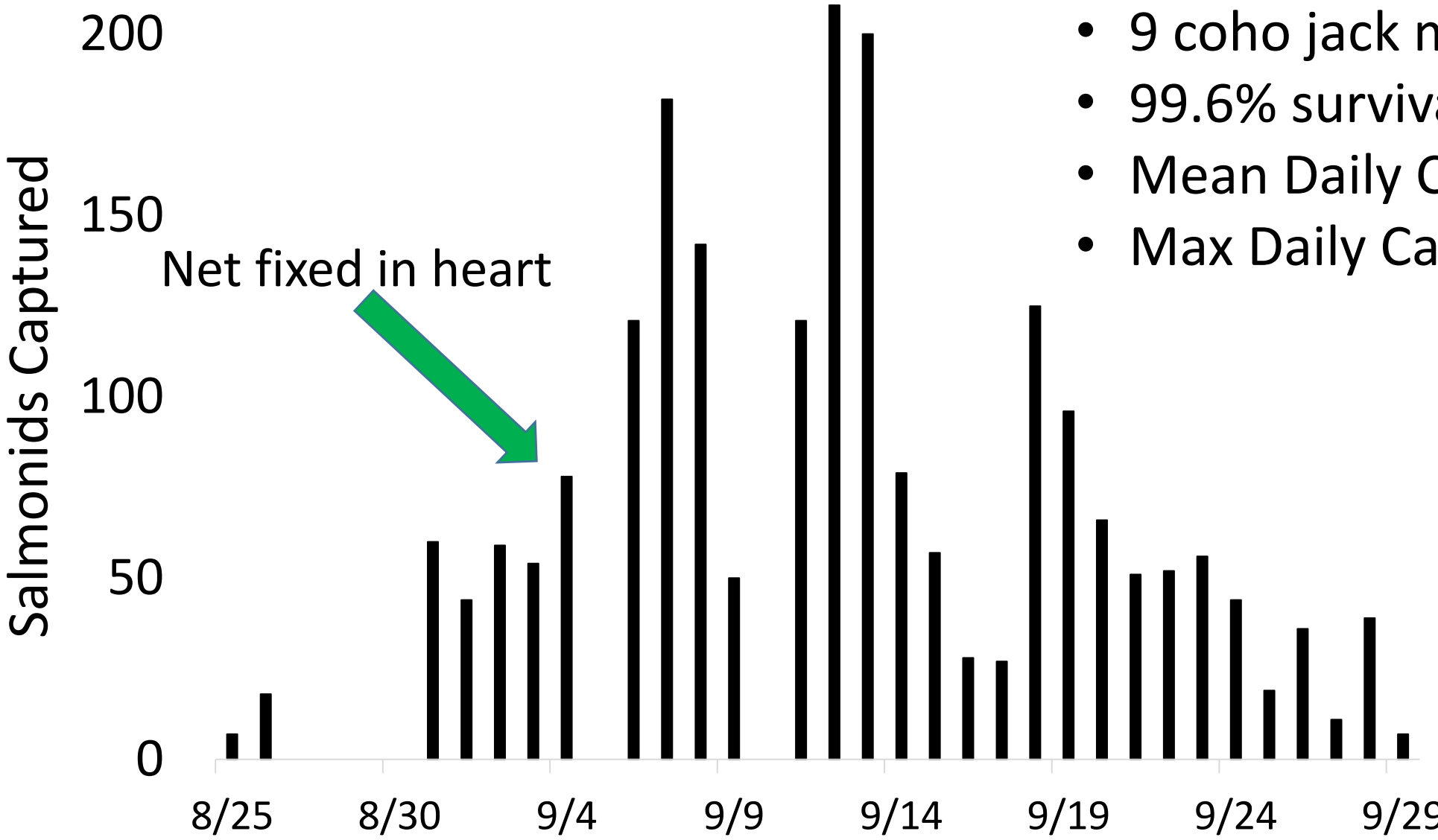
STEER
WASHINGTON
B45127W


River Flow
Lead
Spiller
Live-well
Dock
Heart
Jigger
Fish
Movement

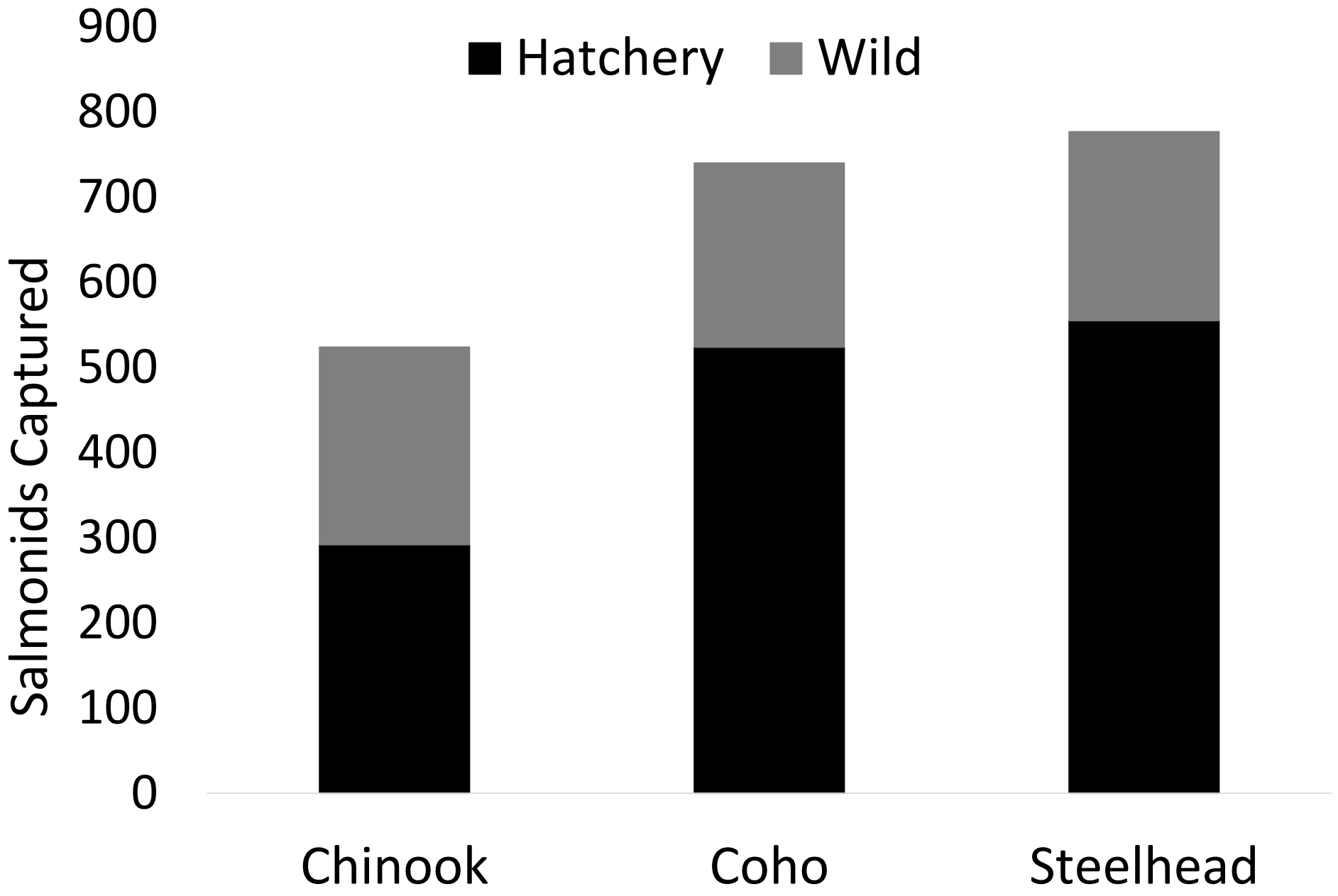

Heart
Tunnel
Live-well
Dock
Spiller

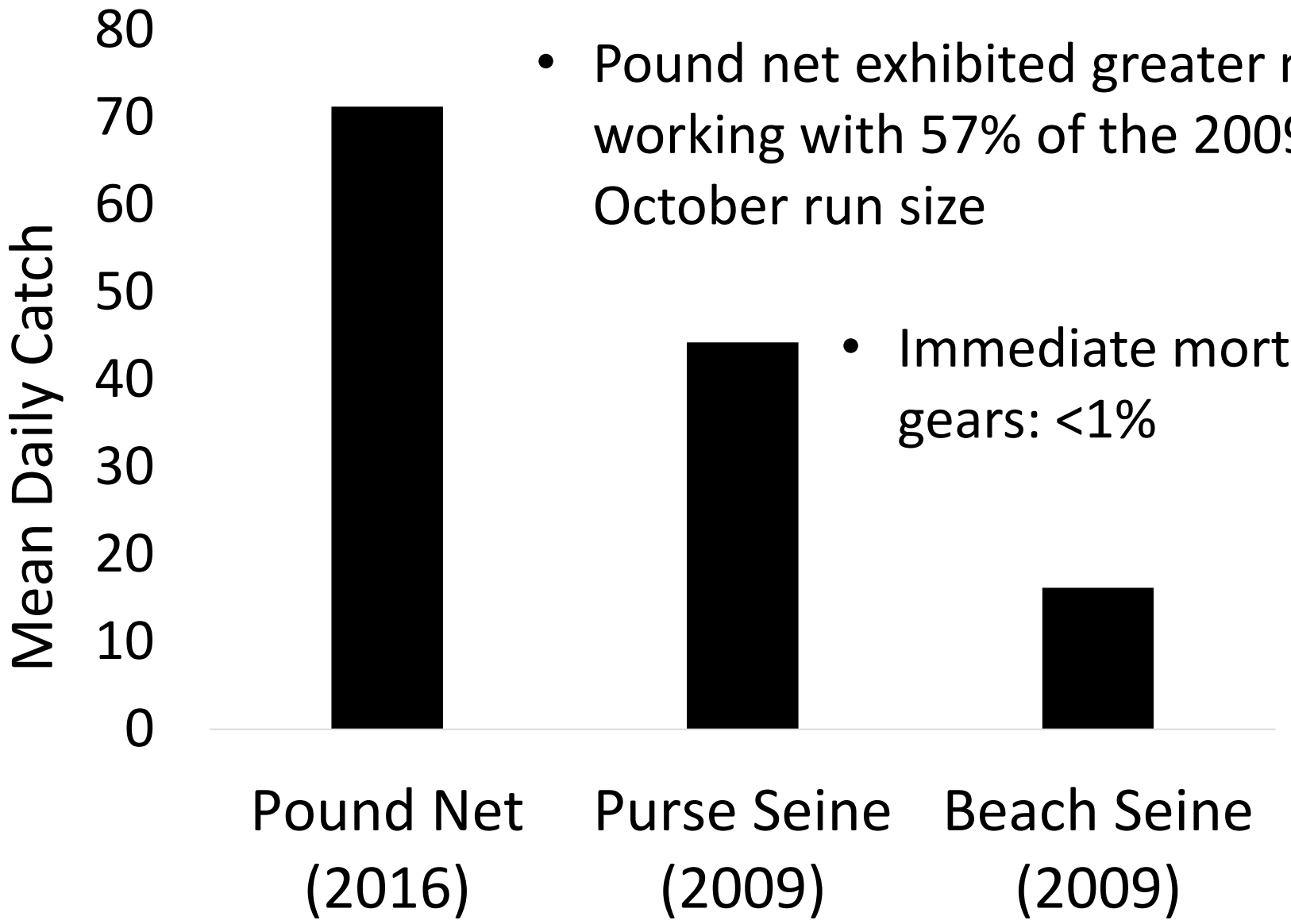

Tunnel Orifice

Year-1 Results



- 2,144 salmonids captured
- 9 coho jack mortalities
- 99.6% survival rate
- Mean Daily Catch: 71
- Max Daily Catch: 208

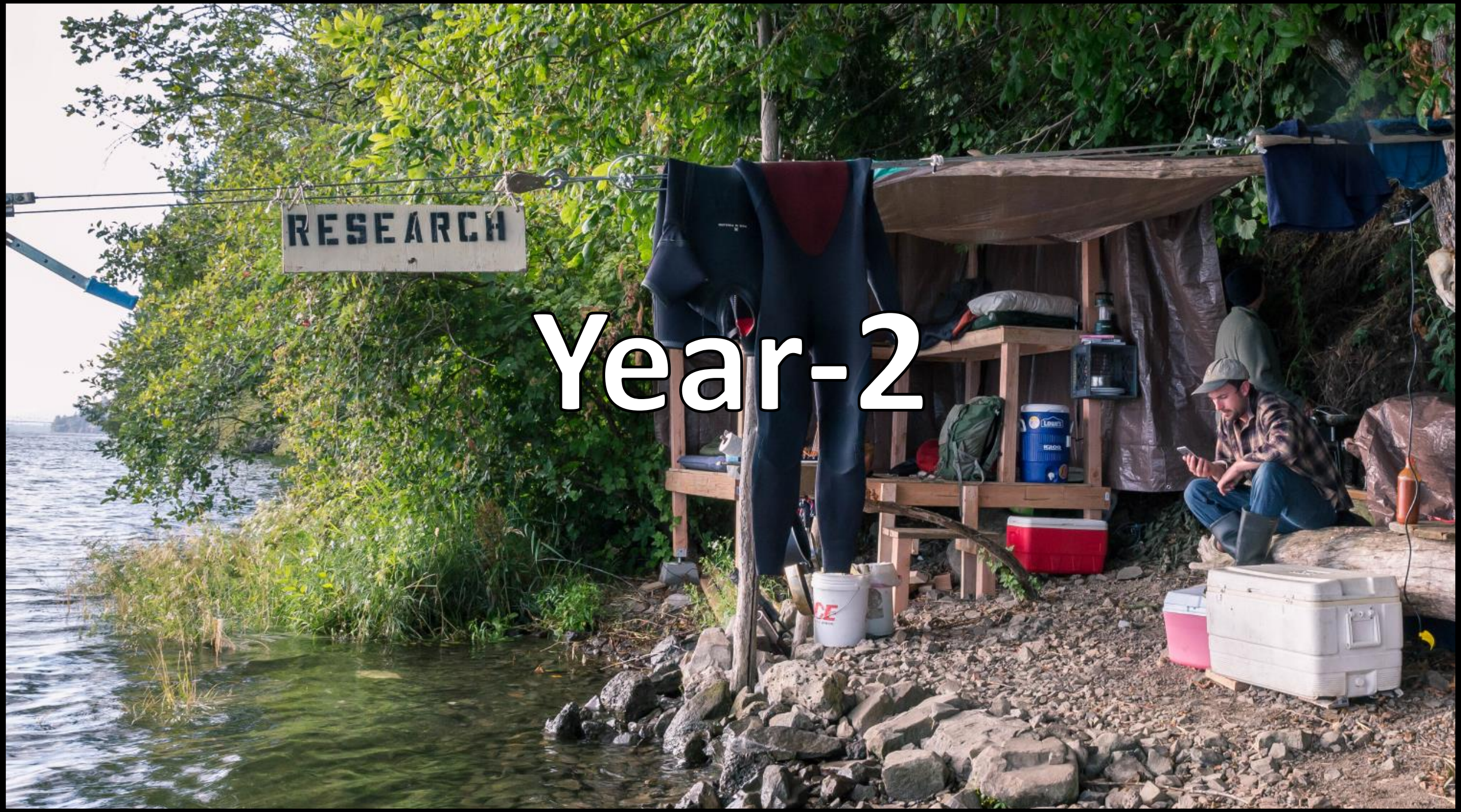

900
800
700
600
500
400
300
200
100
0
Salmonids Captured
Hatchery
Wild
Chinook
Coho
Steelhead



- Pound net exhibited greater mean catch, working with 57% of the 2009 August-October run size
- Immediate mortality for all gears: <1%

Year-1 Conclusions

- Fish traps can catch commercially viable quantities of fish.
- Immediate survival is very high.
- Due to minimal air exposure, handling, and entanglement, fish traps likely result in high post-release survival.
- Minor modifications could increase efficiency and survival.
- Further testing is warranted.

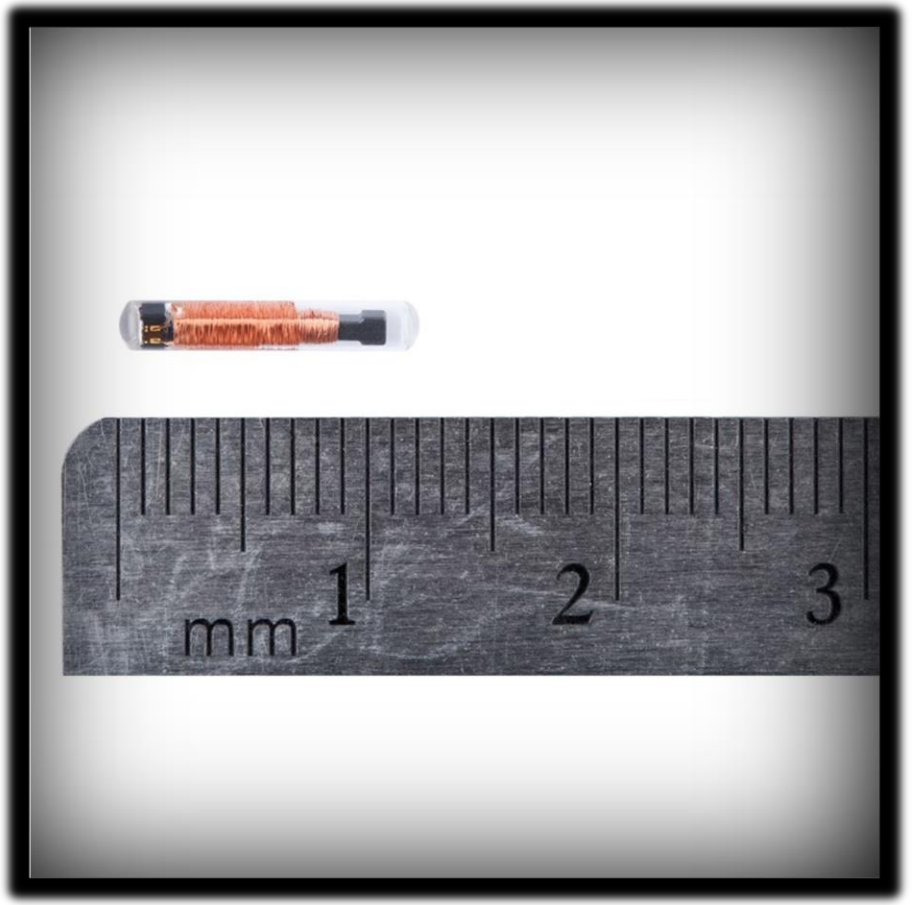

RESEARCH
Year-2

Year-2 Objectives

- Test and refine operation of a modified pound net trap.
- Determine effectiveness of the trap in capturing fish relative to previously tested alternative gears (total catch, composition, CPUE).
- Evaluate ability of the trap to effectively capture and release wild Chinook and steelhead through estimation of cumulative survival.
- Analyze covariates of recapture probabilities (stock, water temp., capture conditions, fork-length, date of capture/release, etc.)
- Analyze covariates of species-specific CPUE (tide height, tide stage, date, time of day, water temp., etc.)

Test Fishing and Tagging

- Study Period: August 26th – September 29th
- Target Species: Hatchery-origin Fall Chinook, coho, and steelhead.
- Mark-release-recapture methodology.
- Treatment: Salmonids trapped, lifted, spilled, tagged, and released from trap.
- Control: Salmonids dip-netted from spiller chamber, tagged, and released.
- PIT tag approx. 2,000 Chinook, 1,000 steelhead.
- Gather fin-clip samples from all tagged fish.



Estimating Post-Release Survival

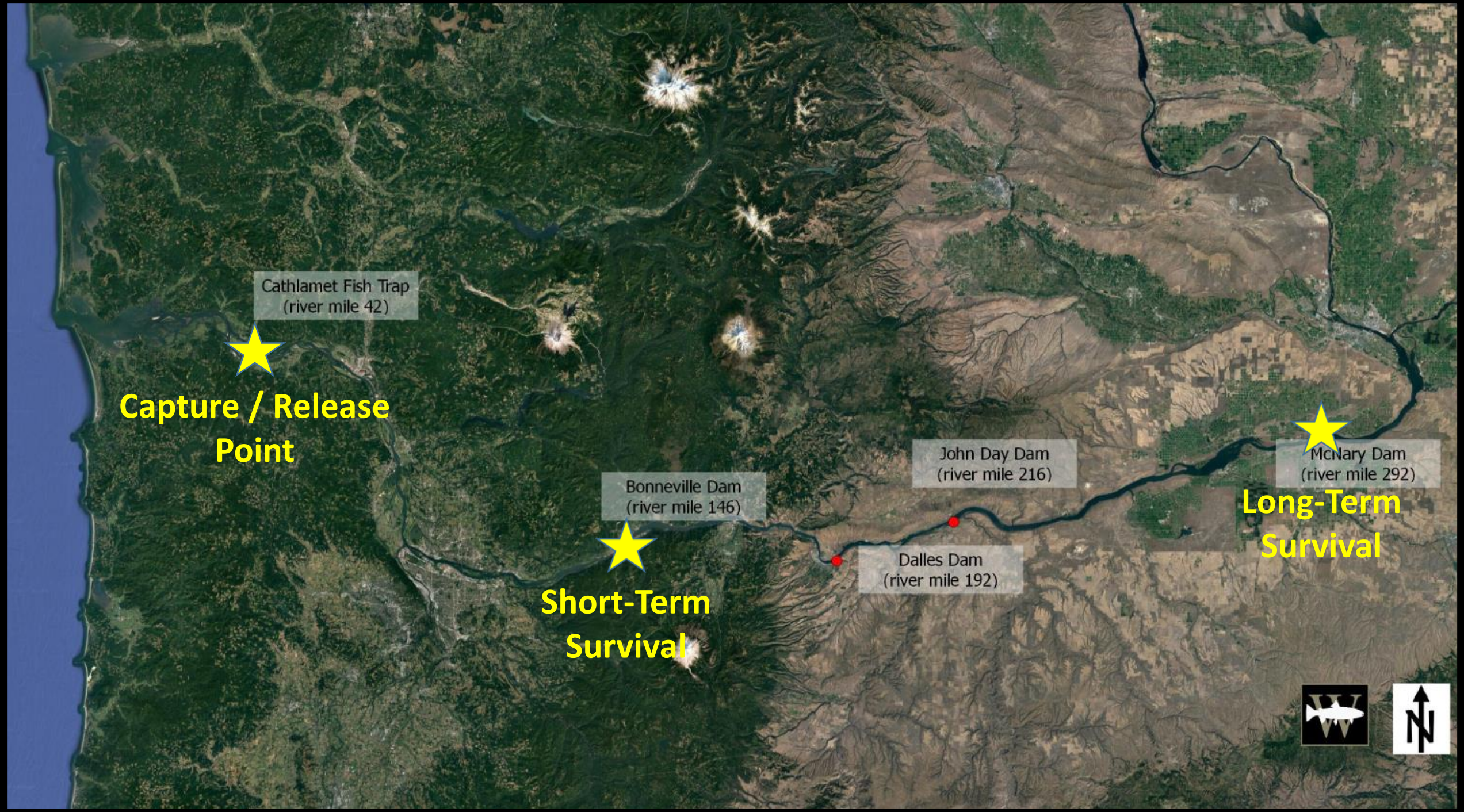
- Detect tagged salmonids passing Bonneville and McNary through PTAGIS.
- Compare detection of control and treatment fish.
- Estimate short-term and long-term post-release survival through a Jolly-Seber analysis and Ricker's two-release method.
- Analyze sub-sample of fin-clips with appropriate set of Columbia basin-specific microsatellite and/or SNP markers. Assign individuals to above and below Bonneville Dam populations or population groups.

SEATTLE
Seahawks

WASHINGTON
STATE

0298

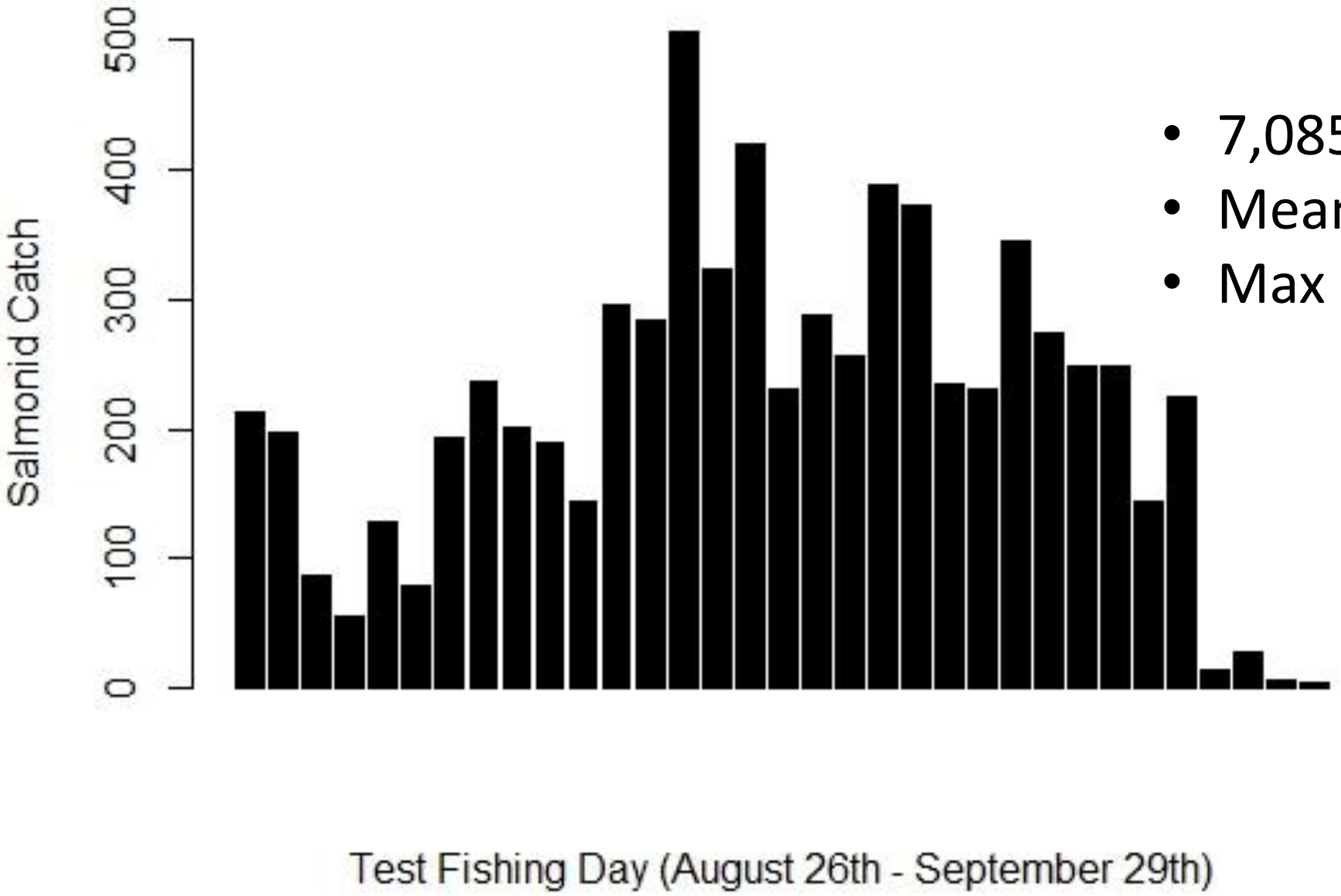
HANSEN


Cathlamet Fish Trap
(river mile 42)
Capture / Release Point
Bonneville Dam
(river mile 146)
Short-Term Survival
John Day Dam
(river mile 216)
Dalles Dam
(river mile 192)
McNary Dam
(river mile 292)
Long-Term Survival

Year-2 Results

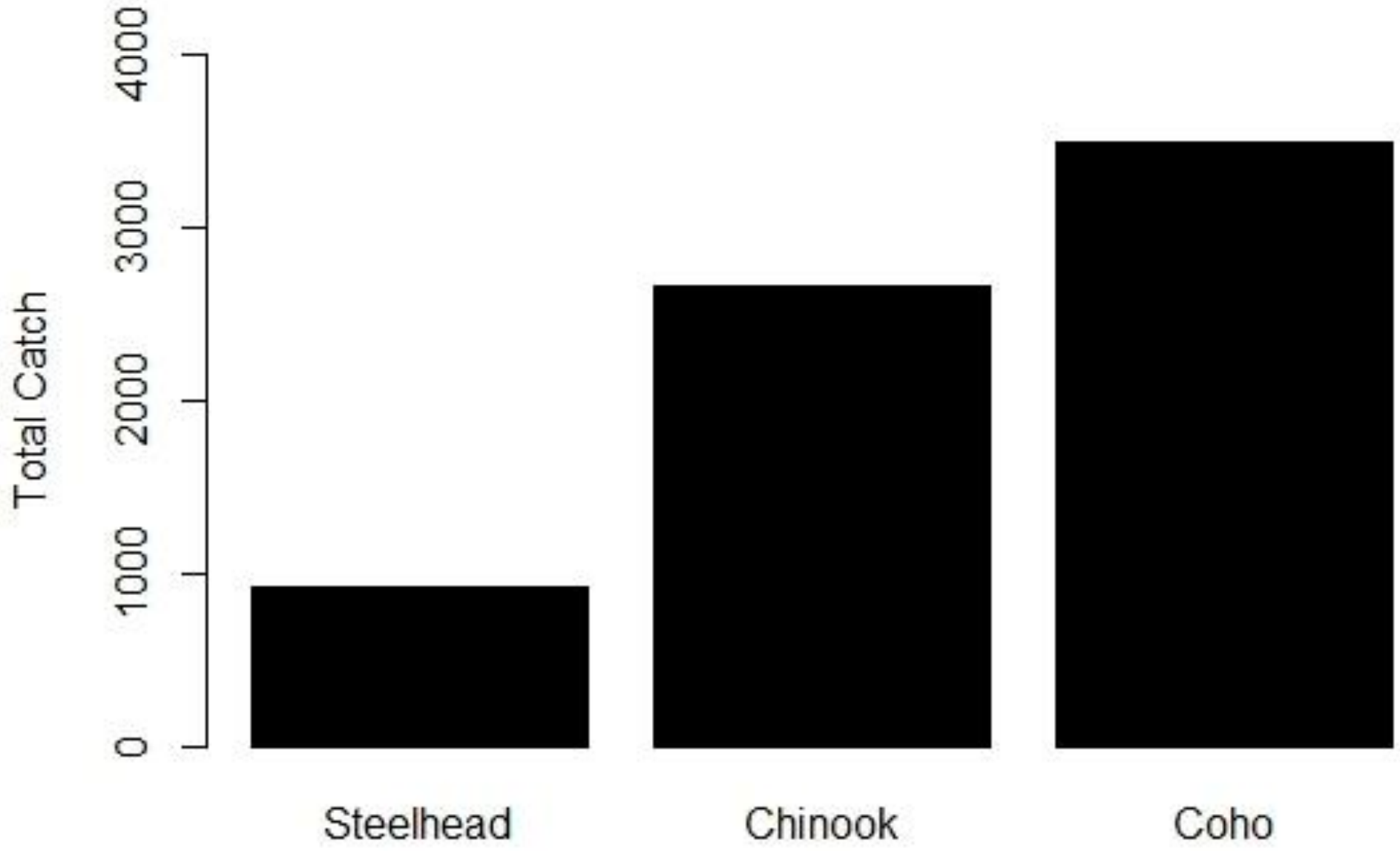
[PRELIMINARY]

Salmonid Catch

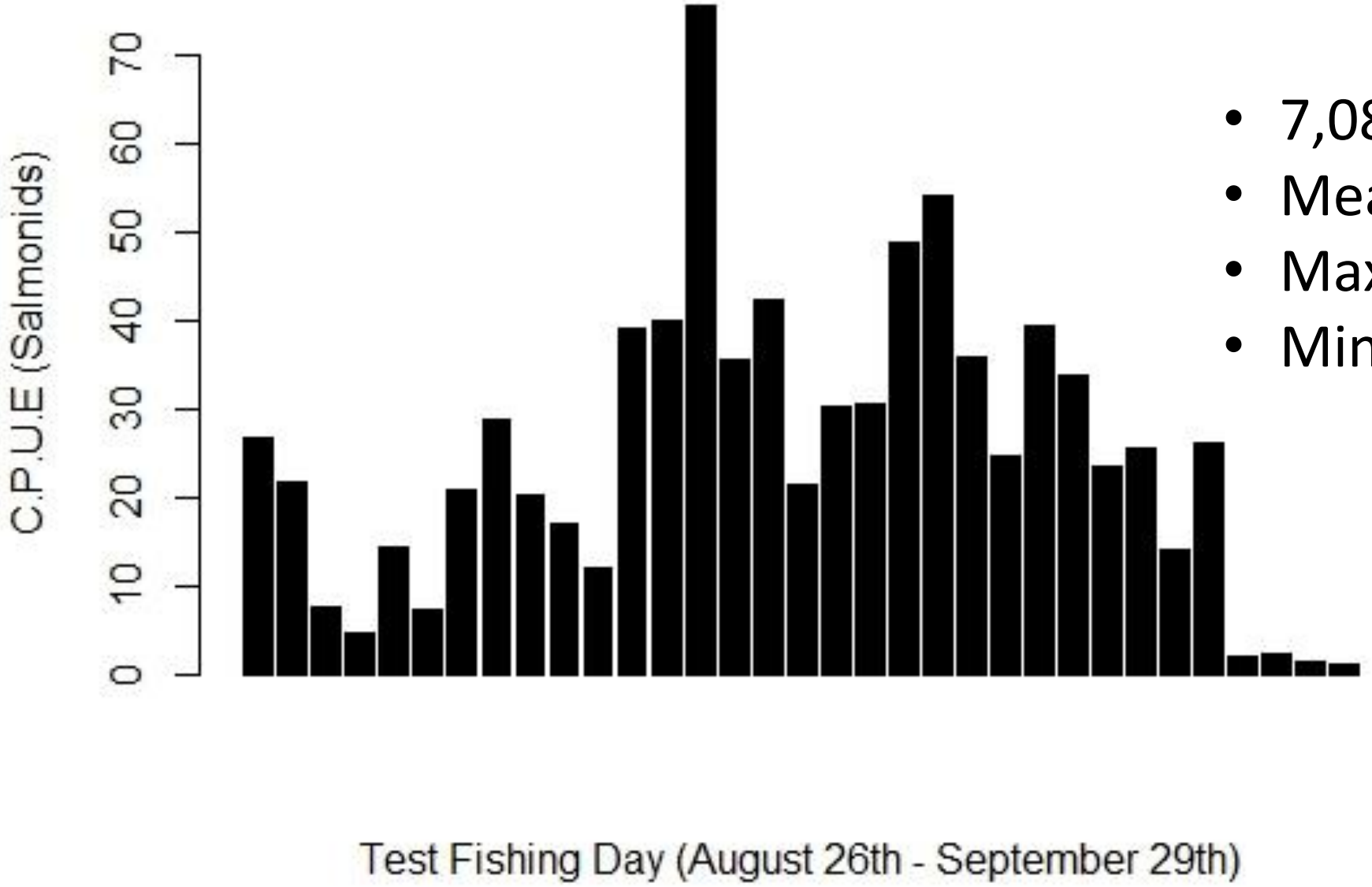


- 7,085 salmonids
- Mean Daily Catch: 215
- Max Daily Catch: 506

Species Composition

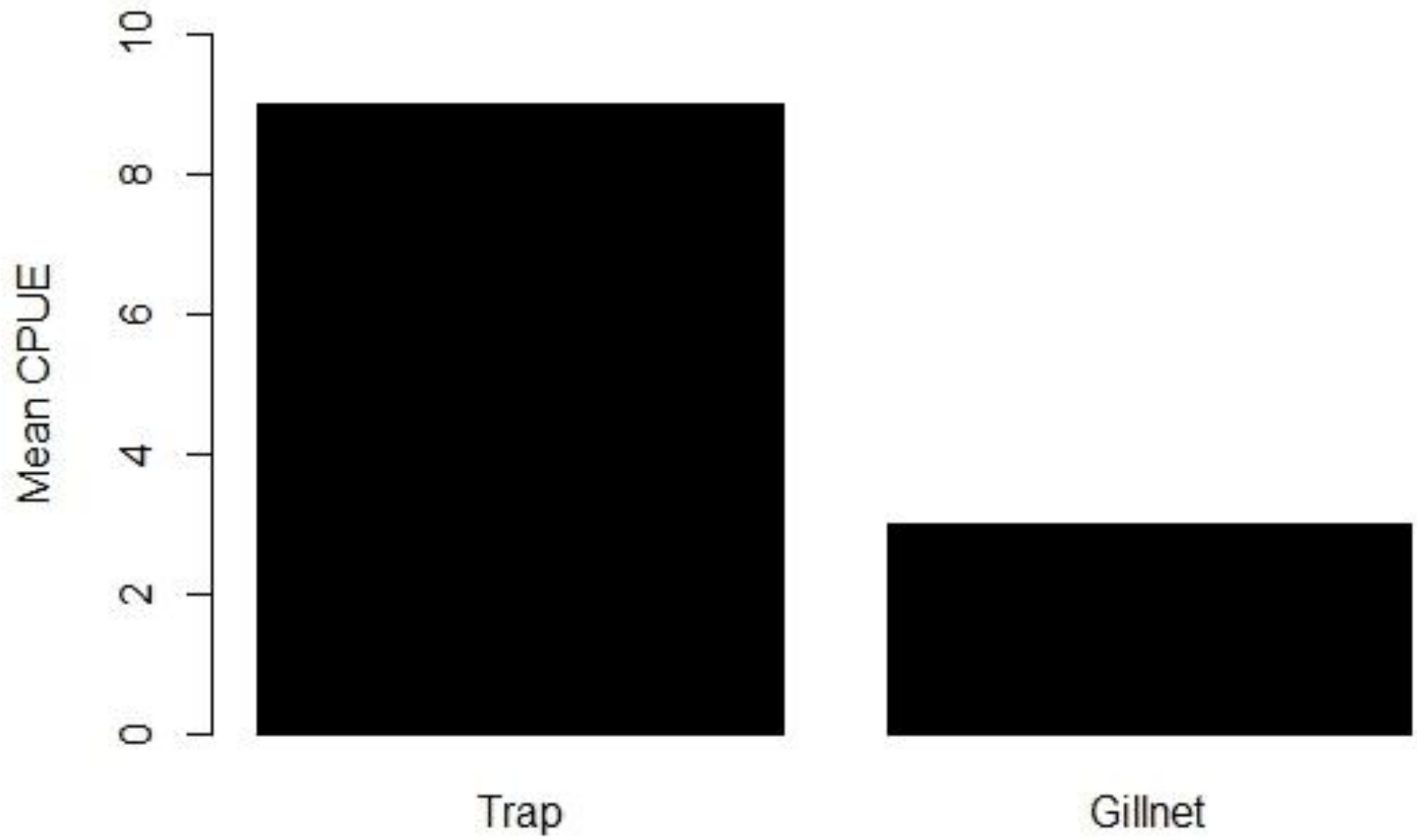


CPUE (Salmonids)



- 7,085 salmonids
- Mean CPUE: 25
- Max CPUE: 76
- Min CPUE: 1

Trap vs. Gillnet (Marketable Chinook and Coho)



Chinook Relative Survival

99.8%

Steelhead Relative Survival

95.7%

Discussion

- 1) Traps are very efficient:
  - As a result of modifications, catch was more than 3 times greater than the previous year, working with 81% of the run-size.
  - CPUE of the trap was 3 times greater than that of a gillnetter in 2017.
- 2) Traps have very high survival rates:
  - Modifications increased immediate survival to 99.9%.
  - Cumulative Chinook survival of far exceeds that of existing gears (99%).
  - Cumulative steelhead survival is equal or greater than existing gears (96%).
- The pound net trap is a viable stock-selective commercial harvest tool.

Developing a Working Model for Sustainable Salmon Fisheries

1) Identify a commercially viable, sustainable fishing gear.
2) Develop trap specific regulations to keep it sustainable.
3) Legalize use of alternative gears.
4) Establish co-op utilizing alternative gear.
5) Advocate and help fishermen transition (by-out/trade).
6) Make it profitable:
   - Increased efficiency and harvest opportunities.
   - Sustainable certification > Increased prices for fishermen.
   - Best harvest practices (bleed fish, local ice-house, local processing).
   - Savvy marketing.
7) Advocate and apply this sustainable model in other mixed-stock fisheries.

Benefits Consistent with C3619

- Wild salmon recovery:
  - Increased survival and escapement of non-target stocks.
  - Efficient removal of hatchery fish and reduced genetic and ecological impacts.
  - Realization of habitat restoration benefits.
- Coastal community revitalization:
  - Increased commercial/tribal fishing opportunities.
  - Sustainable certification > Higher price-point-per-pound.
  - Rejuvenation of industry and economies of working waterfront communities.
- Development of lasting, sustainable wild fisheries.

Next Steps: 2018

- <u>Determine feasibility in Spring Chinook, Shad, and Summer Chinook fisheries</u>:
  - Secure research funding.
  - Obtain required research permits and take coverage.
  - Perform research.
  - Identify successes, failures, and required modifications in each fishery.
- <u>Why?</u>:
  - Diversify portfolio for fishermen.
  - Identify new profitable markets.
  - Reduce impact of invasive fish.

Next Steps: 2018

- <u>Join the Lower Columbia alternative gear emerging Fall fishery</u>:
  - Attain an *Emerging Fisheries Permit* and *license* for Fall 2018.
  - Commercially operate the trap and bring fish to market.
  - Gather additional data / monitor.
- <u>Why?</u>:
  - Bridge the gap prior to legalization.
  - Demonstrate economic potential.
  - Reduce uncertainty for investors.

Next Steps: 2018

- <u>Build a foundation for a successful legal fishery</u>:
  - Identify challenges of bringing fish to market for the first time.
  - Build relationships with fishermen, processors, marketers, buyers, and consumers.
  - Apply/secure federal funds to build other components of the working model.

Needs in 2018

- Secure funding and state/federal permits for spring-summer feasibility studies.
- Acquire an Emerging Fisheries Permit and license for Fall 2018 fishery.
- Obtain letters of support for state, federal, and foundation grant proposals.

Acknowledgements

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Research was conducted in collaboration with Blair Peterson, NOAA, and WDFW. A special thanks to Blair, Tammy, and Jesus Peterson, Roger Davis, Jim Lichatowich, Erin Wilkinson, Miranda Wecker, Jessica Helsley, Ron Warren, Jeromy Jording, Tucker Jones, Charles Morrill, and Christensen Networks for making this possible.

Thank You!

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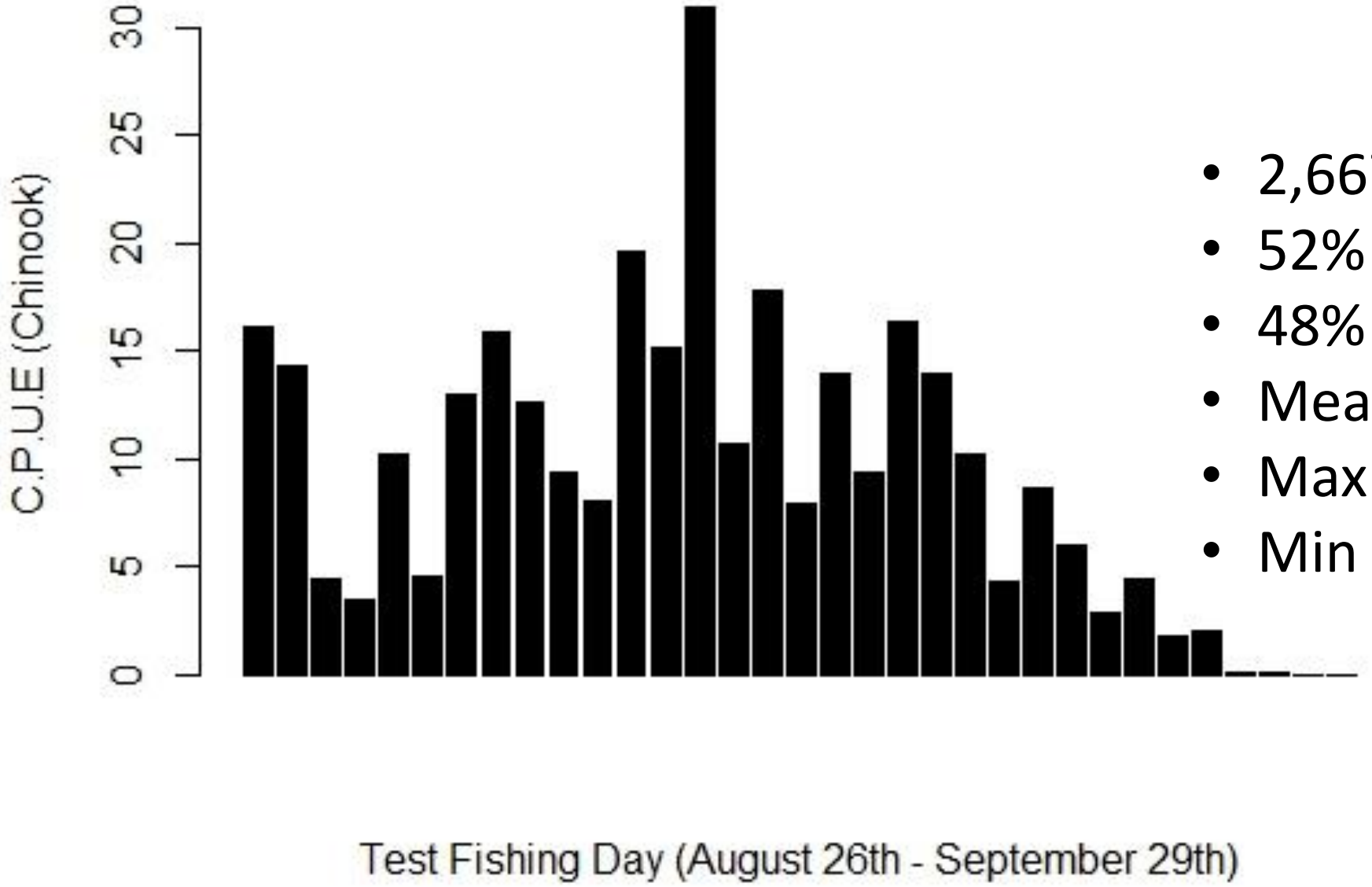
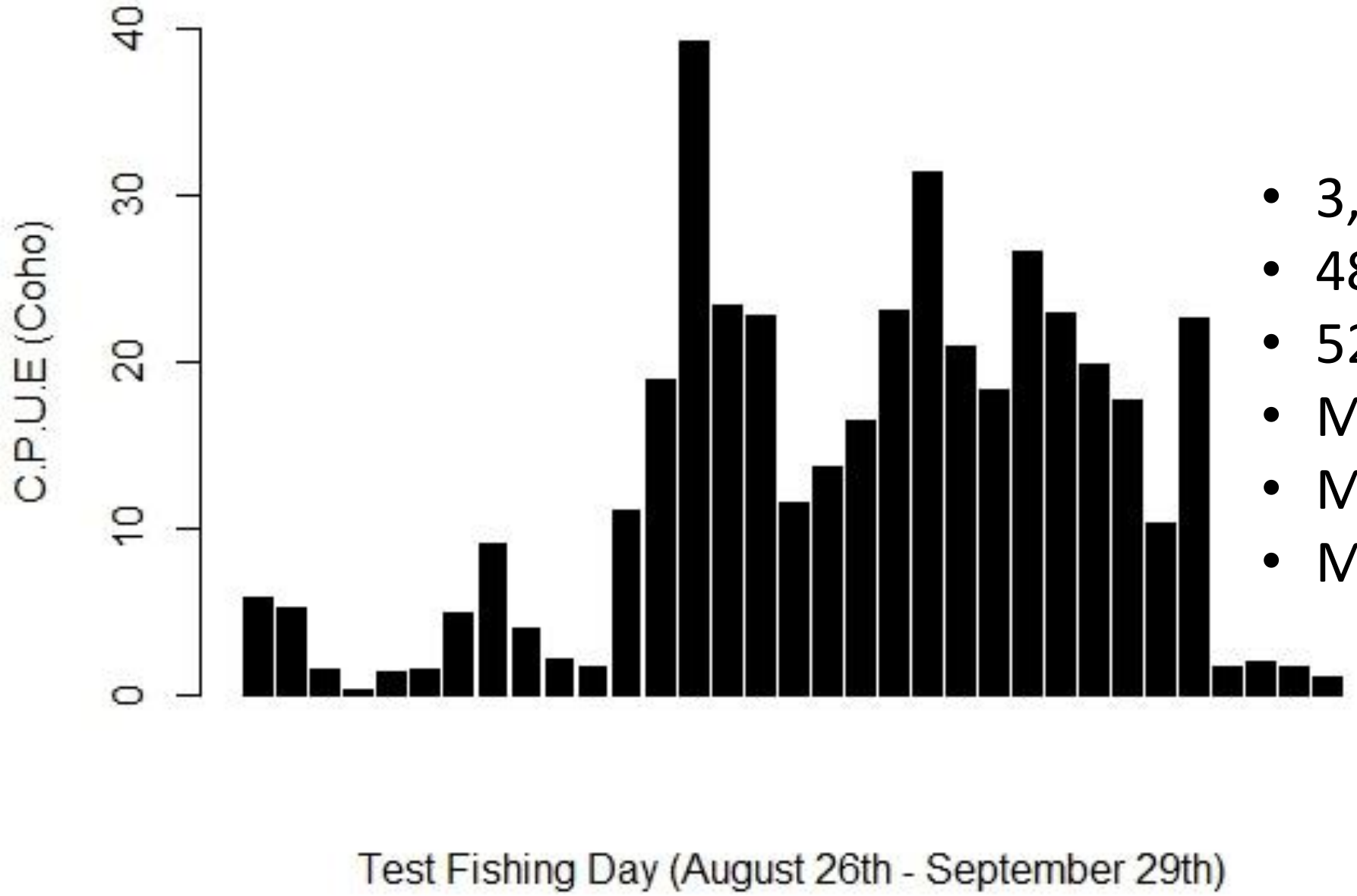
CPUE (Chinook)



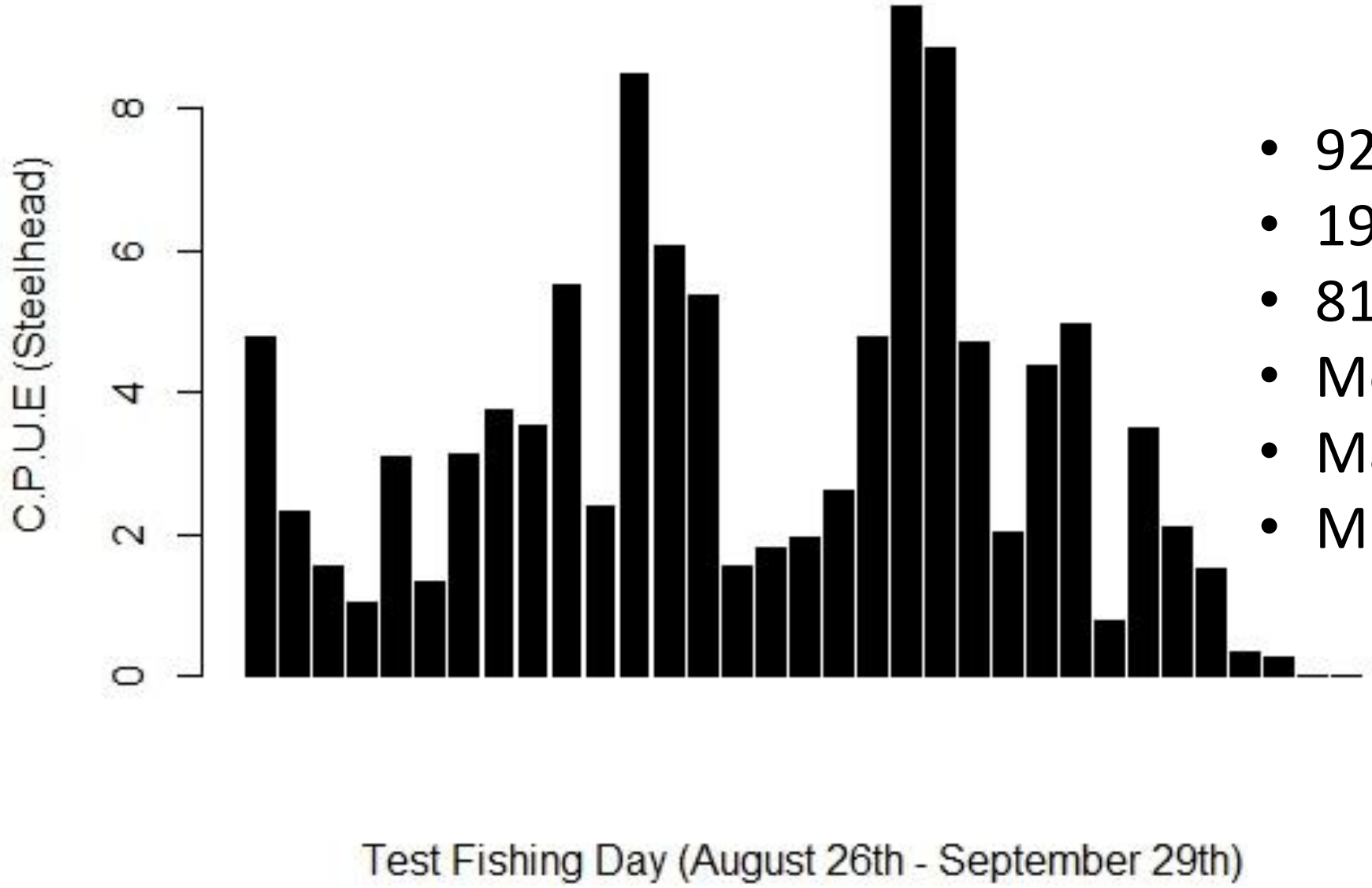
- 2,667 Chinook
- 52% wild-origin
- 48% hatchery-origin
- Mean CPUE: 9
- Max CPUE: 31
- Min CPUE: 0

CPUE (Coho)



- 3,497 coho
- 48% wild-origin
- 52% hatchery-origin
- Mean CPUE: 13
- Max CPUE: 39
- Min CPUE: 0

CPUE (Steelhead)



- 921 steelhead
- 19% wild-origin
- 81% hatchery-origin
- Mean CPUE: 3
- Max CPUE: 9
- Min CPUE: 0

Chinook Relative Survival (Pound Net Trap)

CUMULATIVE: GEAR (RM 42) TO MCNARY

Treatment	No. Tagged	No. Recaptured	Recapture Prob.	Relative Survival
Control	978	229	0.234	
Pound Net	1091	255	0.234	0.998

SHORT-TERM: GEAR TO BONNEVILLE

Treatment	No. Tagged	No. Recaptured	Recapture Prob.	Relative Survival
Control	978	570	0.583	
Pound Net	1091	619	0.567	0.973

LONG-TERM: BONNEVILLE TO MCNARY

Treatment	No. Over BON	No. Recaptured	Recapture Prob.	Relative Survival
Control	570	229	0.402	
Pound Net	619	255	0.412	1.025

Steelhead Relative Survival (Pound Net Trap)

CUMULATIVE: GEAR (RM 42) TO MCNARY

Treatment	No. Tagged	No. Recaptured	Recapture Prob.	Relative Survival
Control	383	233	0.608	
Pound Net	409	238	0.582	0.957

SHORT-TERM: GEAR TO BONNEVILLE

Treatment	No. Tagged	No. Recaptured	Recapture Prob.	Relative Survival
Control	383	303	0.791	
Pound Net	409	313	0.765	0.967

LONG-TERM: BONNEVILLE TO MCNARY

Treatment	No. Over BON	No. Recaptured	Recapture Prob.	Relative Survival
Control	303	233	0.769	
Pound Net	313	238	0.760	0.989