

# Adult lamprey passage success and behavior in the lower Columbia River, 2008

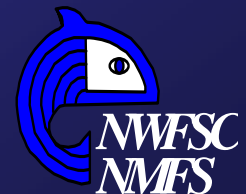
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<sup>1</sup>University of Idaho

<sup>2</sup>Northwest Fisheries Science Center

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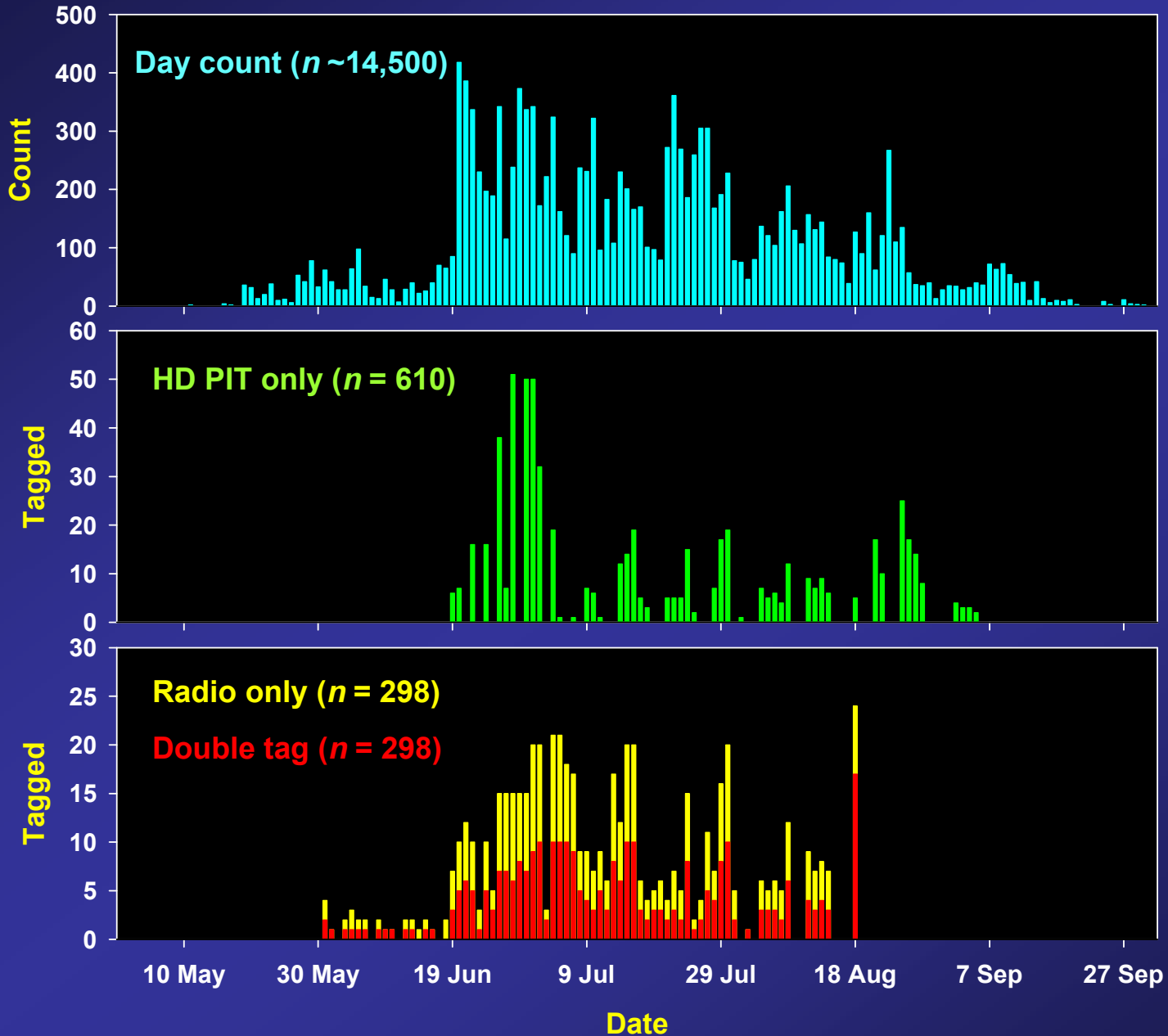


# 2008 Study Objectives

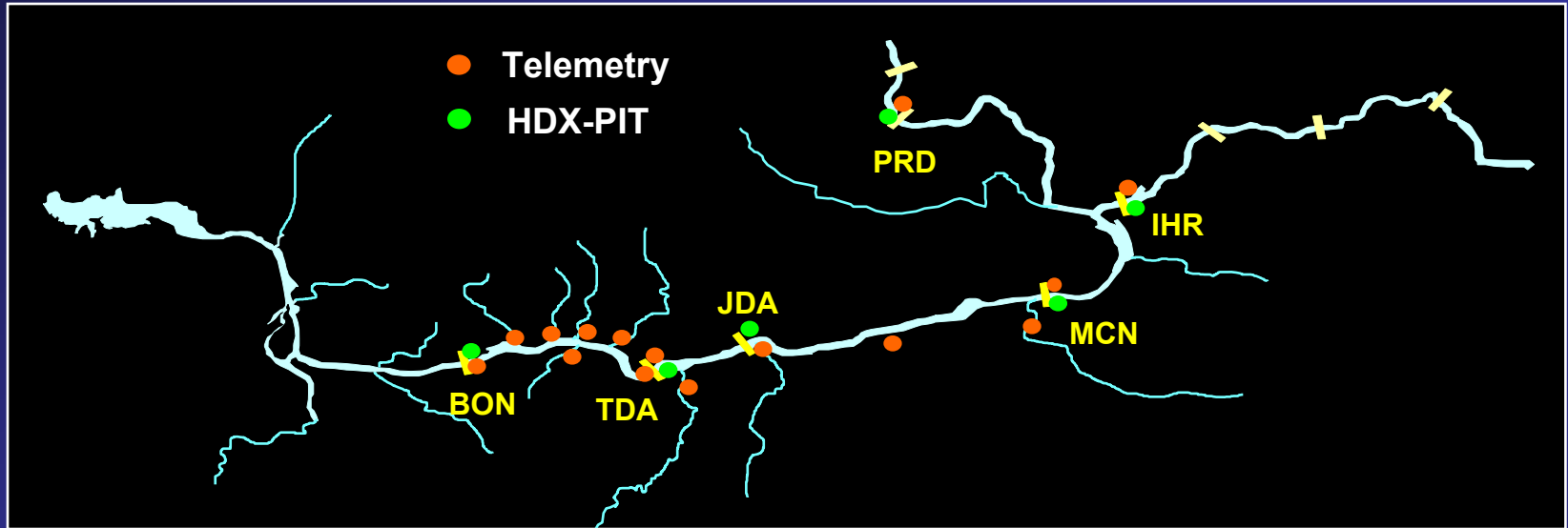
- ▶ **Monitor adult lamprey behavior and passage success**
  - **Dam and reach passage efficiency**
  - **Migration rates**
- ▶ **Compare results by tag type (telemetry, half-duplex PIT tags)**
  - **Double tagging evaluation**
  - **Detection efficiencies**
  - **Tagging effects**



# Methods: Tagging at Bonneville



# Methods: Monitoring



## Telemetry

Ladder exits

Tailraces

Fishways (not JDA, PRD)

Tributaries

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## Half-Duplex PIT tag

Ladder exits

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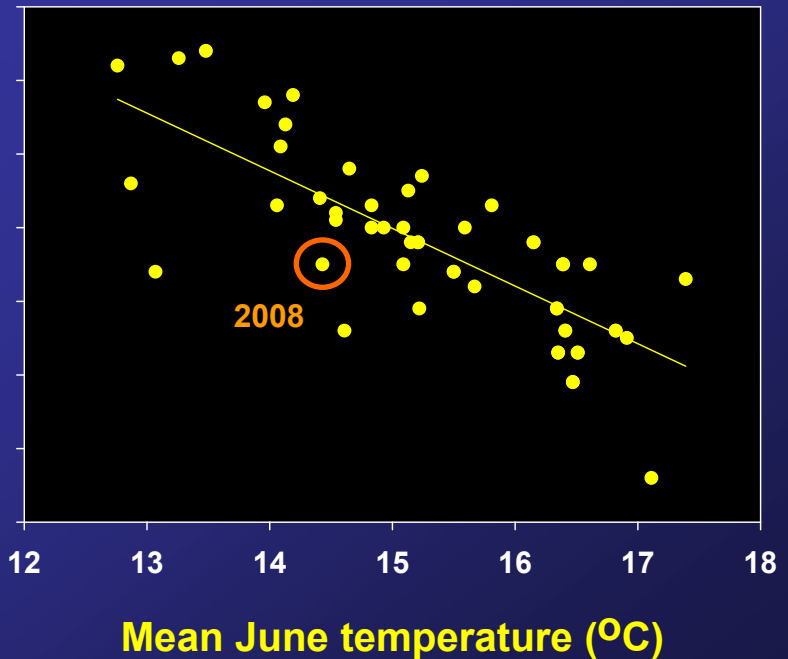
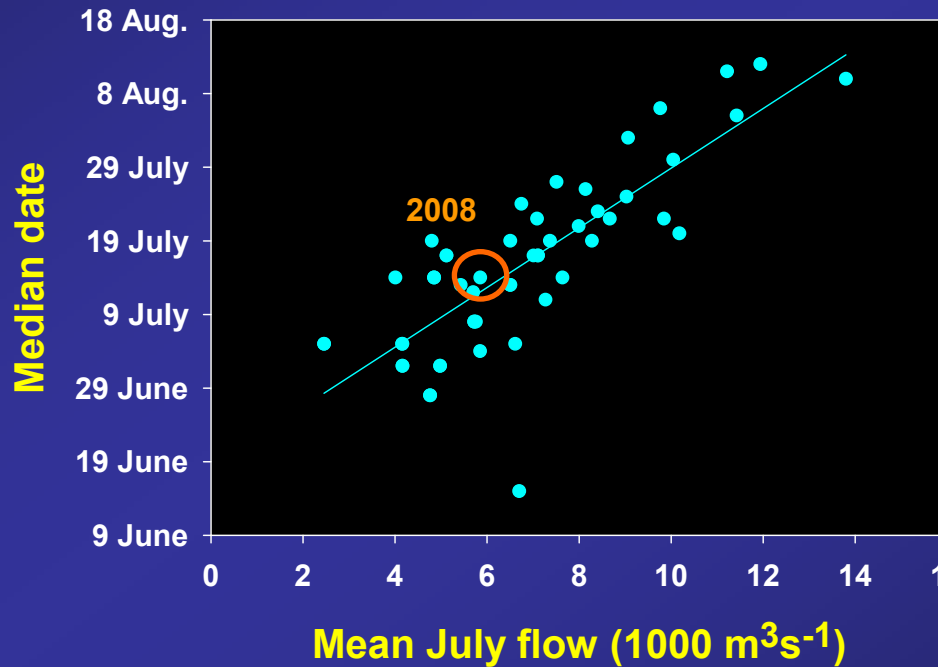
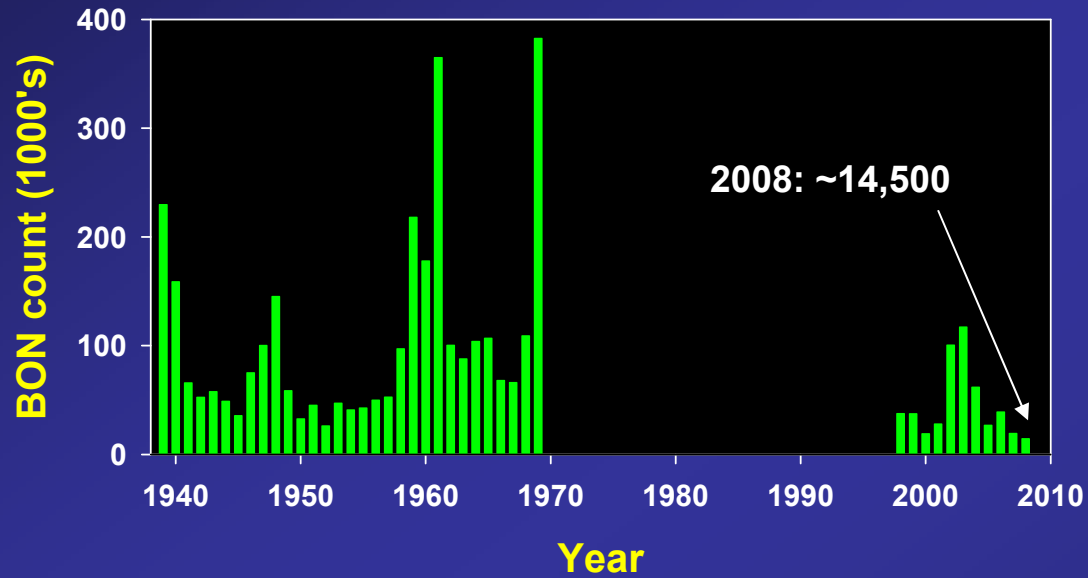
Fishway sites (BON, MCN, IHR)

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LPS systems (BON)

# Context: The 2008 migration

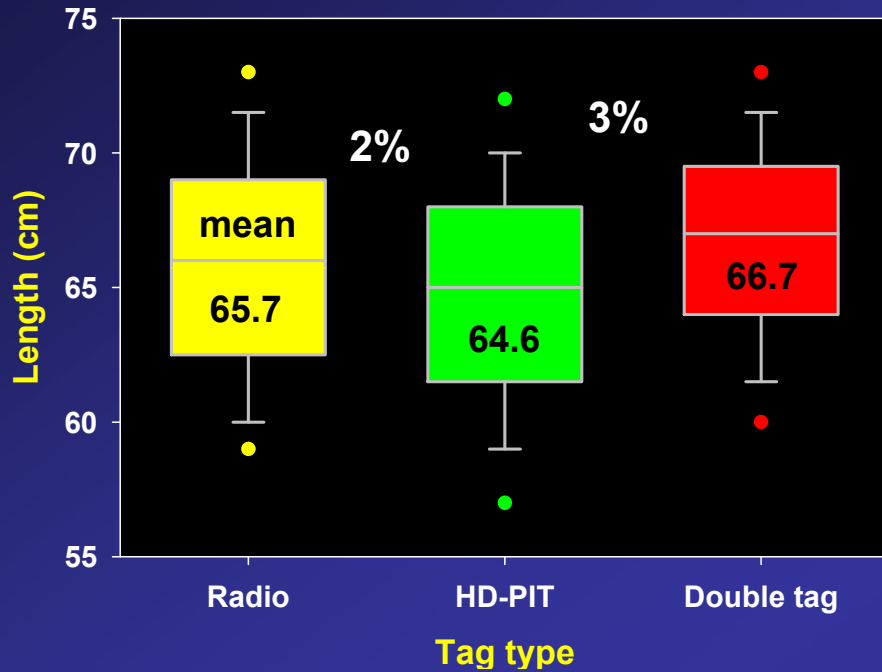
Starke & Dalen 1995; DART



# 2008 Results

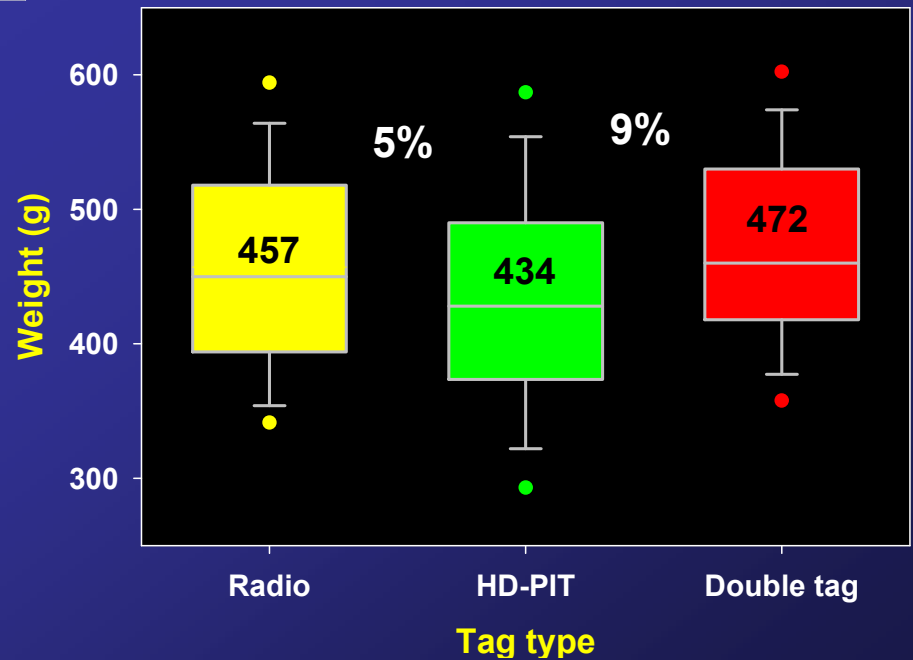


# Lamprey size by tag type



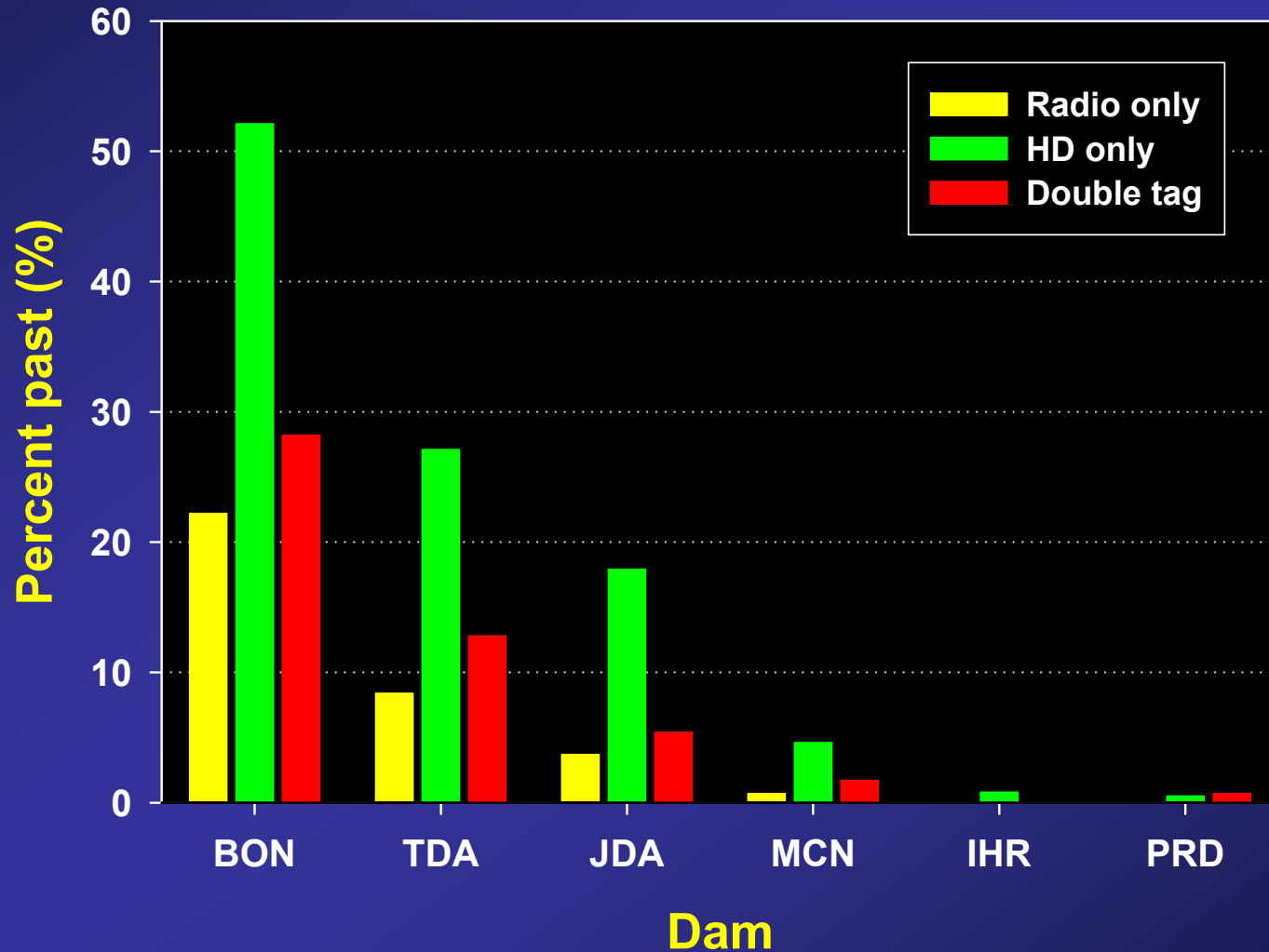
ANOVA  $F = 21.5$   
 $P < 0.001$

ANOVA  $F = 22.8$   
 $P < 0.001$



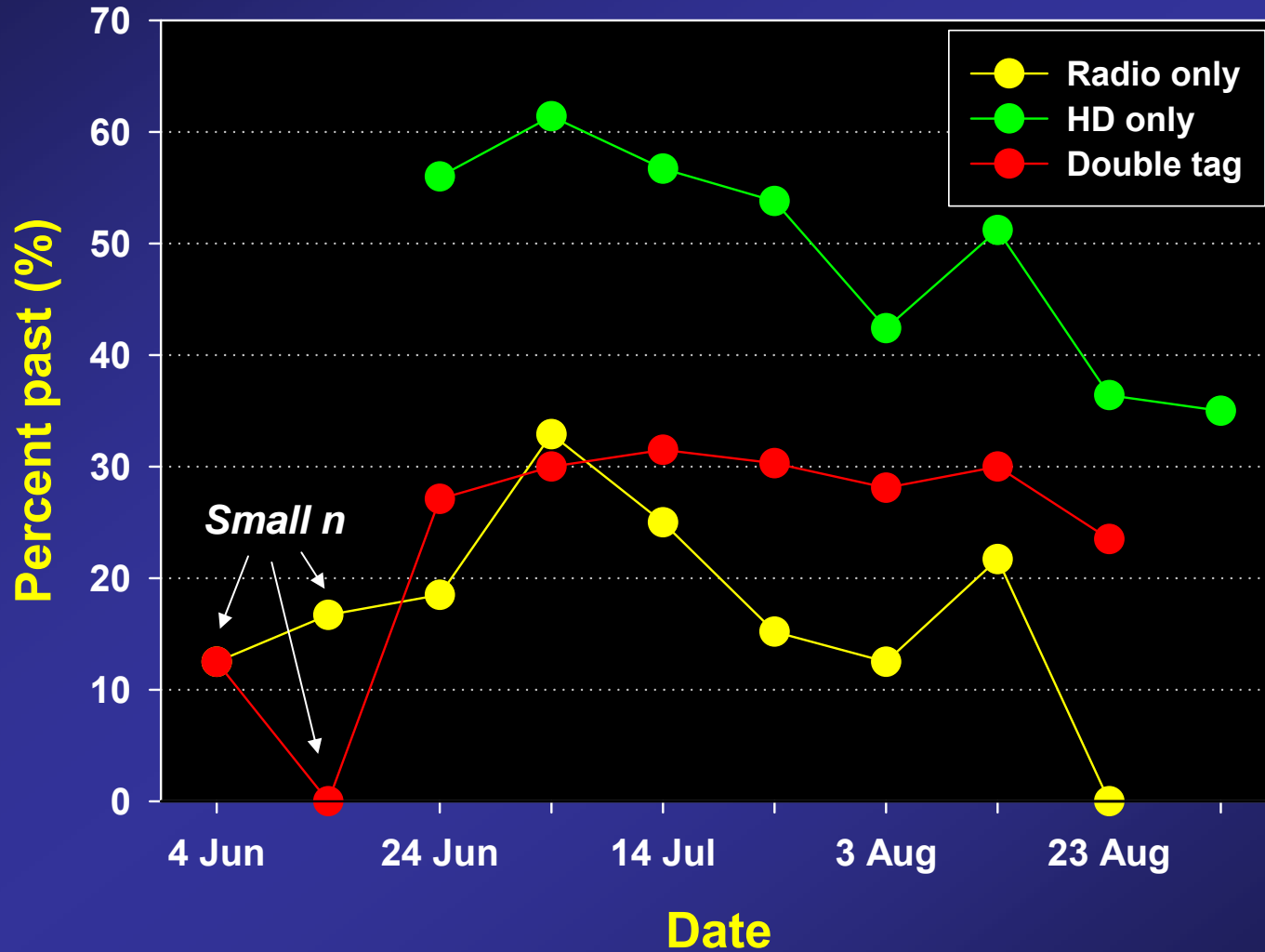
# Dam passage estimates

## Escapement from release



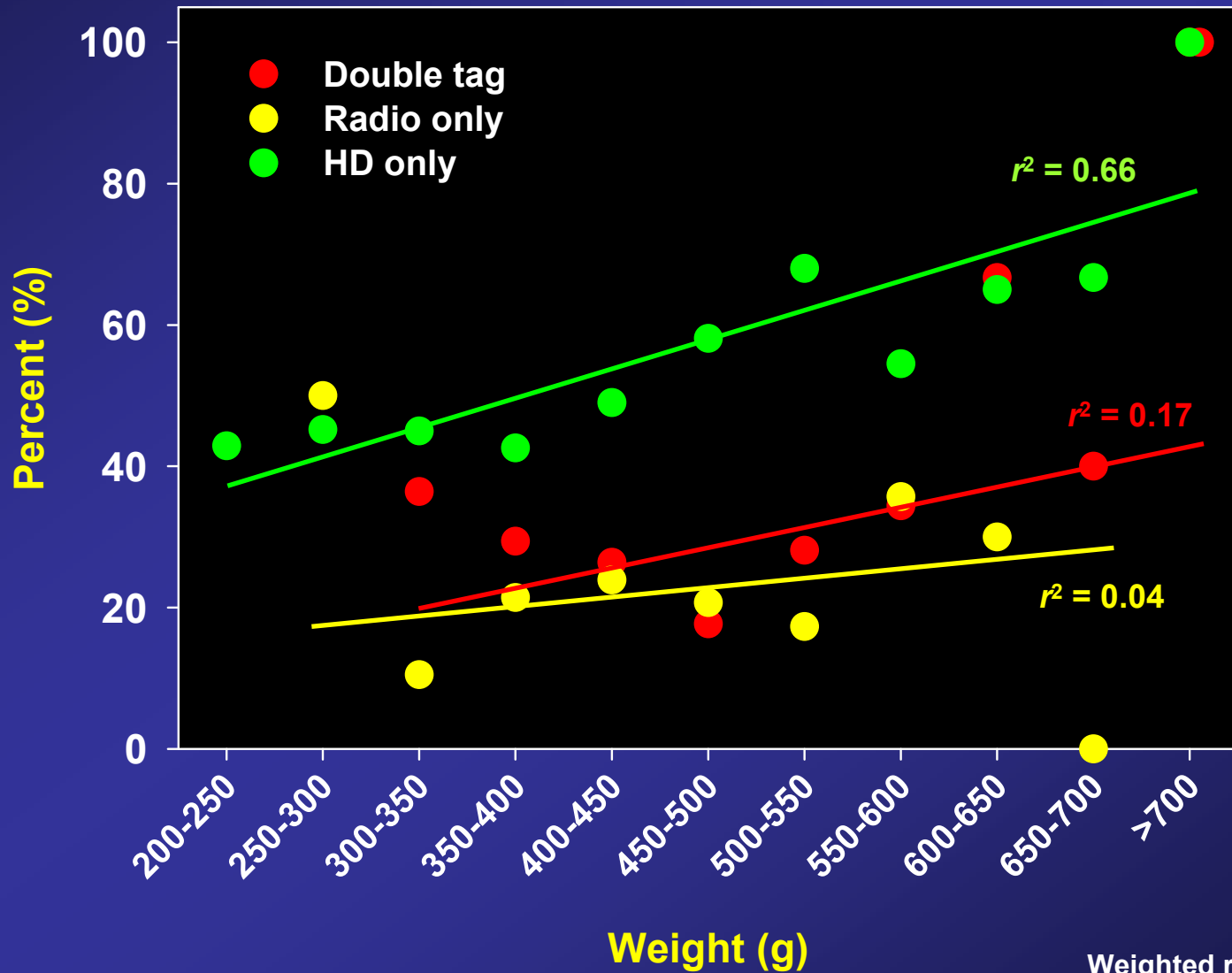
# Migration timing effects

## Escapement: Release to Bonneville exit



# Size effects

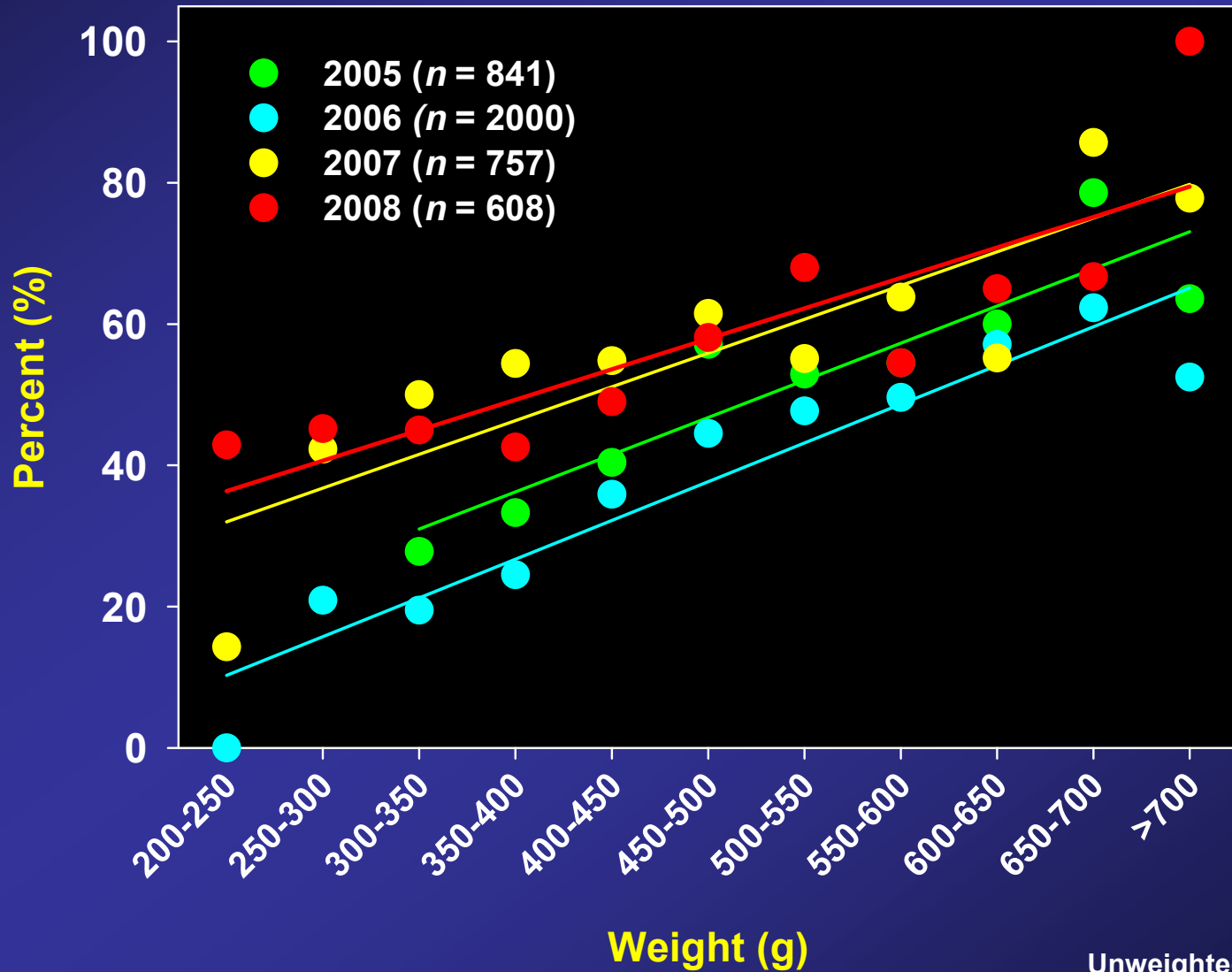
## Escapement: Release to Bonneville exit



Weighted regressions

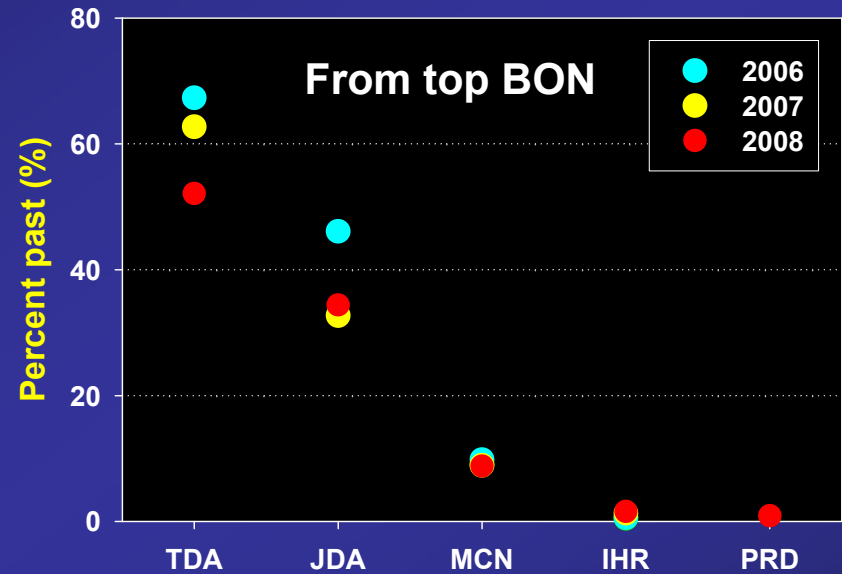
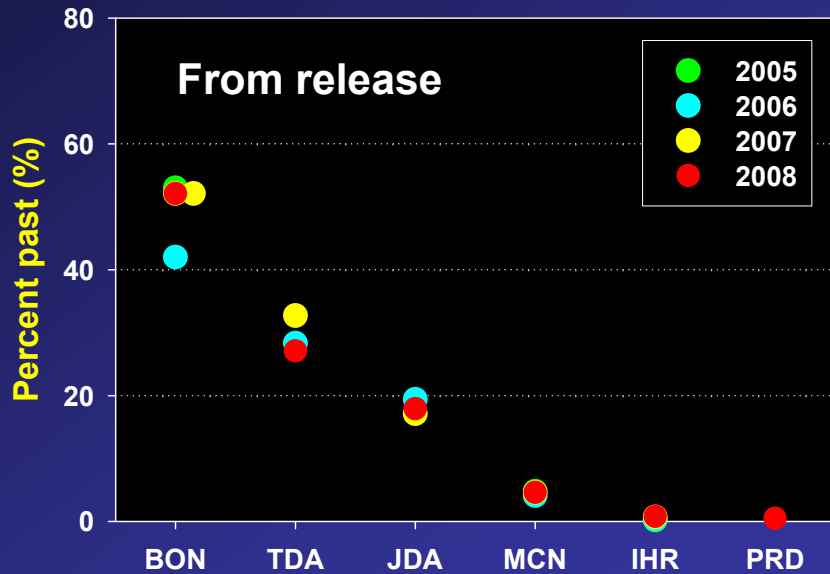
# Size effects across years (HD only)

Release to Bonneville exit



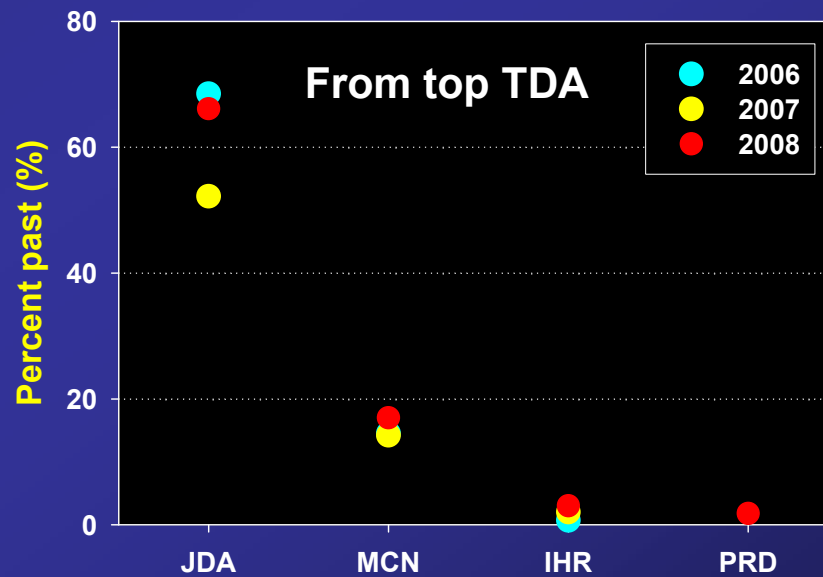
Unweighted regressions

# Dam passage estimates (HD only)



Dam

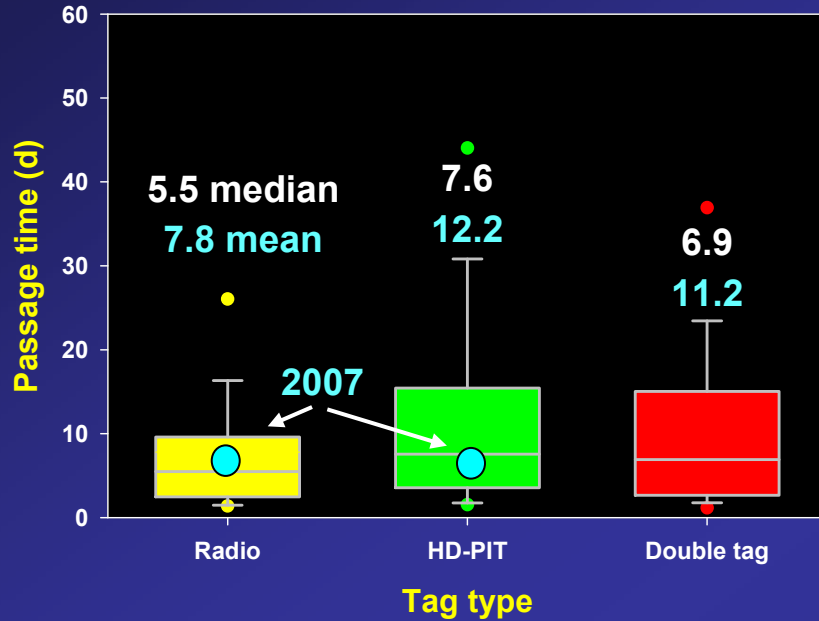
Dam



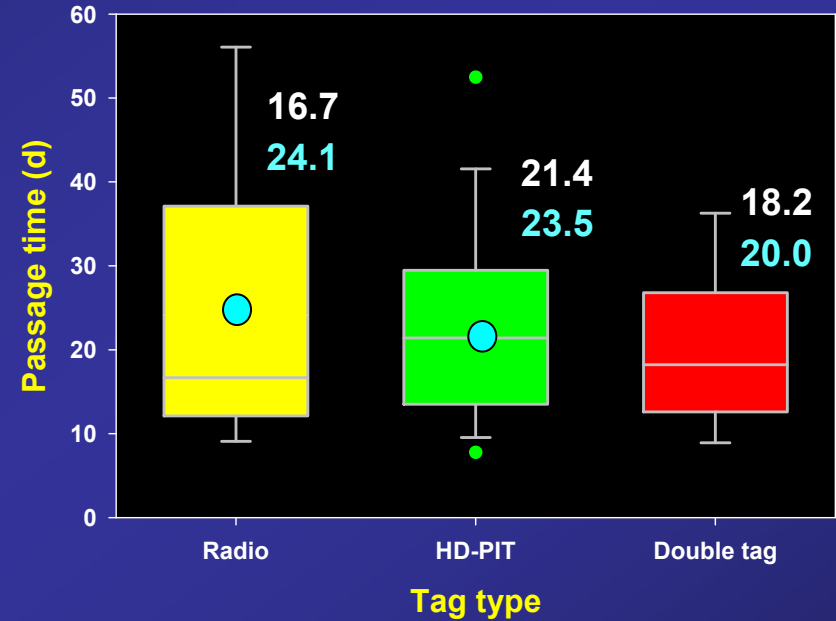
Dam

# Passage times

## Release - Bonneville exit

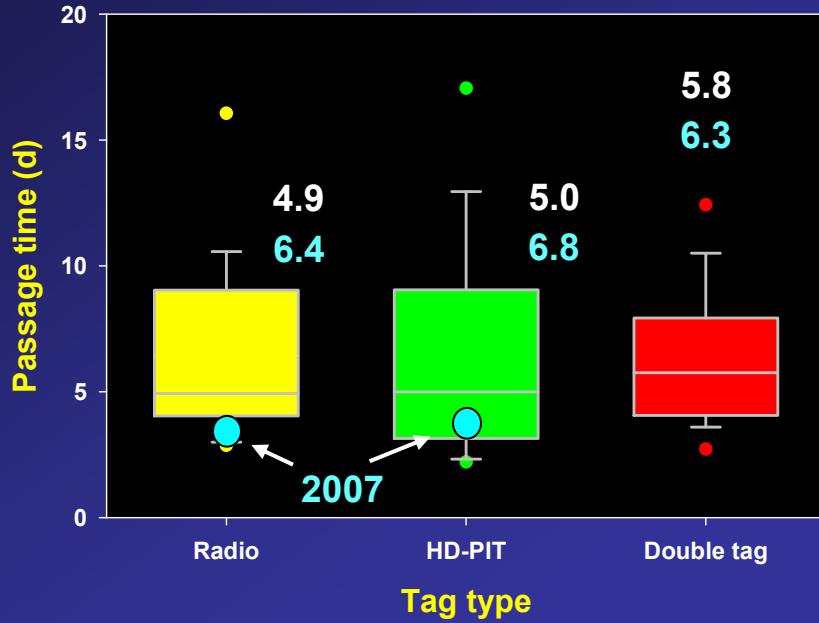


## Release - John Day exit

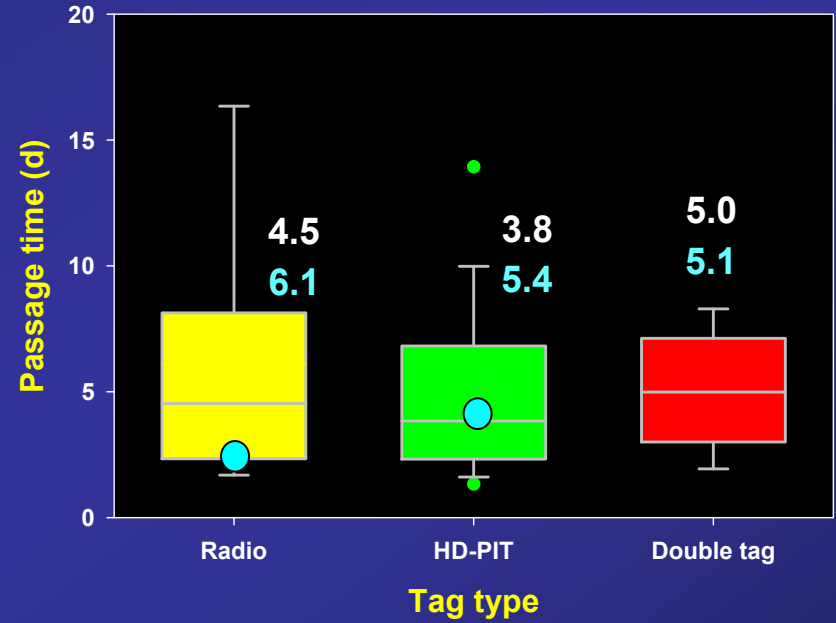


# Passage times

## Bonneville exit – The Dalles exit



## The Dalles exit – John Day exit

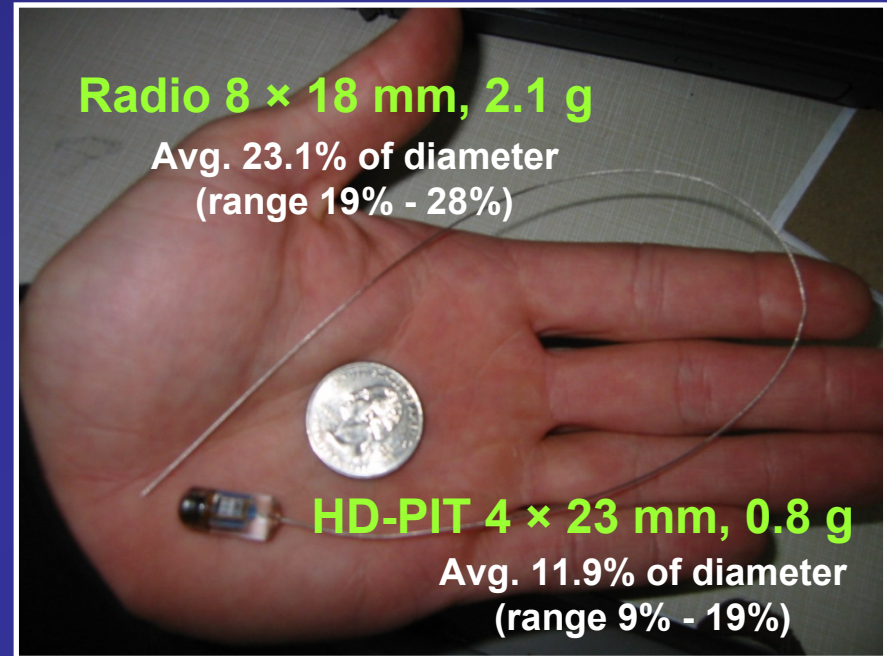
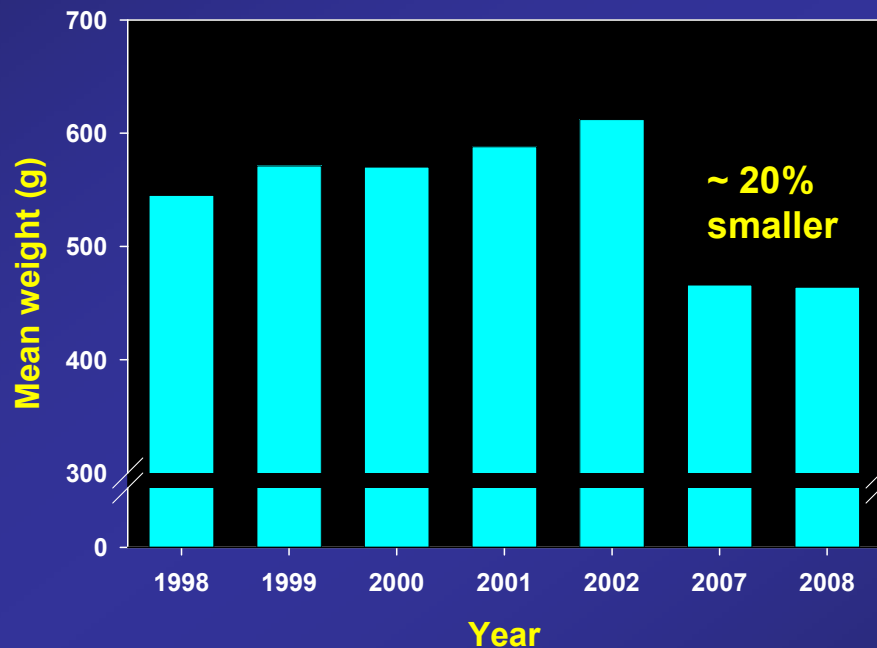




# Underperformance by radio-tagged fish

## Compared to HD-PIT fish

- ▶ Handling time: 3 vs. 10 min
- ▶ Incision larger on RT fish
- ▶ No antenna on HD fish
- ▶ Tag diameter : Fish diameter



## Compared to previous telemetry

- ▶ More representative tagging, smaller fish
- ▶ Results in-line with early studies

# Double-tag detection efficiencies

<u>Dam</u>	<u>Site</u>	<u>Total</u>	<u>Radios detected</u>	<u>HD-PIT detected</u>
BON	WA-shore exit	38	95%	63%
BON	Bradford exit	42	93%	88%
TDA	East exit (1)	31	94%	36%
TDA	East exit (2)	31	94%	68%
TDA	North exit	8	88%	63%
JDA	South exit	13	62%	100%
JDA	North exit	3	67%	100%

\* Missed detections included power outages, shed / failed tags

# Double-tag detection efficiencies: upstream redundancy

<u>Dam</u>	<u>Site</u>	<u>Total</u>	<u>Radios detected</u>	<u>HD-PIT detected</u>
BON	WA-shore exit	38	95%	63% 84%
BON	Bradford exit	42	93% 97%	88%
TDA	East exit	31	94%	36% 48%
TDA	East exit (2)	31	94%	68% 81%
TDA	North exit	8	88%	63% 88%
JDA	South exit	13	62%	100%
JDA	North exit	3	67%	100%

# Detection efficiency conclusions

- ▶ High detection of radio tags at sites with both systems
  - Active tags
- ▶ HD-PIT detection rates consistent with single-antenna FD sites
  - HD redundancy at individual sites would improve estimates
  - HD redundancy across dams (TDA, JDA) accounts for many missed detections



# Summary

- ▶ **Multiple objectives in 2008**



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- ▶ Migration rates were variable
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# Summary

- ▶ Multiple objectives in 2008
- ▶ Adult escapement was consistent with previous years
  - Larger fish were more likely to pass dams
- ▶ Migration rates were variable
  - Fish moved faster late in the migration
- ▶ Telemetry and HD-PIT studies provide complimentary data
  - Telemetry essential for behavioral evaluations, and monitoring reservoirs, tailraces, tributaries
  - HD-PIT is cost effective for system-wide evaluations and has fewer negative handling effects



# Acknowledgements

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