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2024 Juvenile Lamprey Study at McNary and John Day Dams: Preliminary Results

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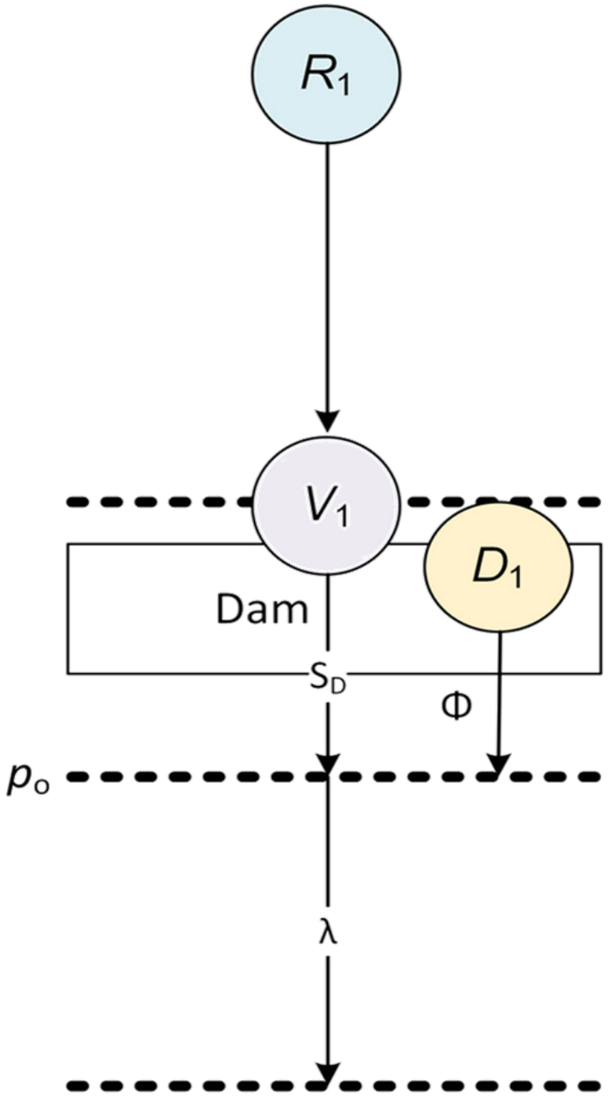
AFEP Review, December 3, 2024

Study Design

ViRDCt Dam Passage Survival Model



R_1 Live fish released far enough upstream of the dam to allow tagging/handling recovery and distribute as run-of-river fish

V_1 Live fish detected passing the dam form a virtual release group for estimating dam passage survival

D_1 Dead fish released at the dam to correct the bias that occurs from detecting V_1 fish that died during passage

Φ Assumption: The probability of dead-released fish arriving at the tailrace array and being detected (Φ) are representative of the probabilities of arrival and detection of fish from the V_1 group that die during dam passage

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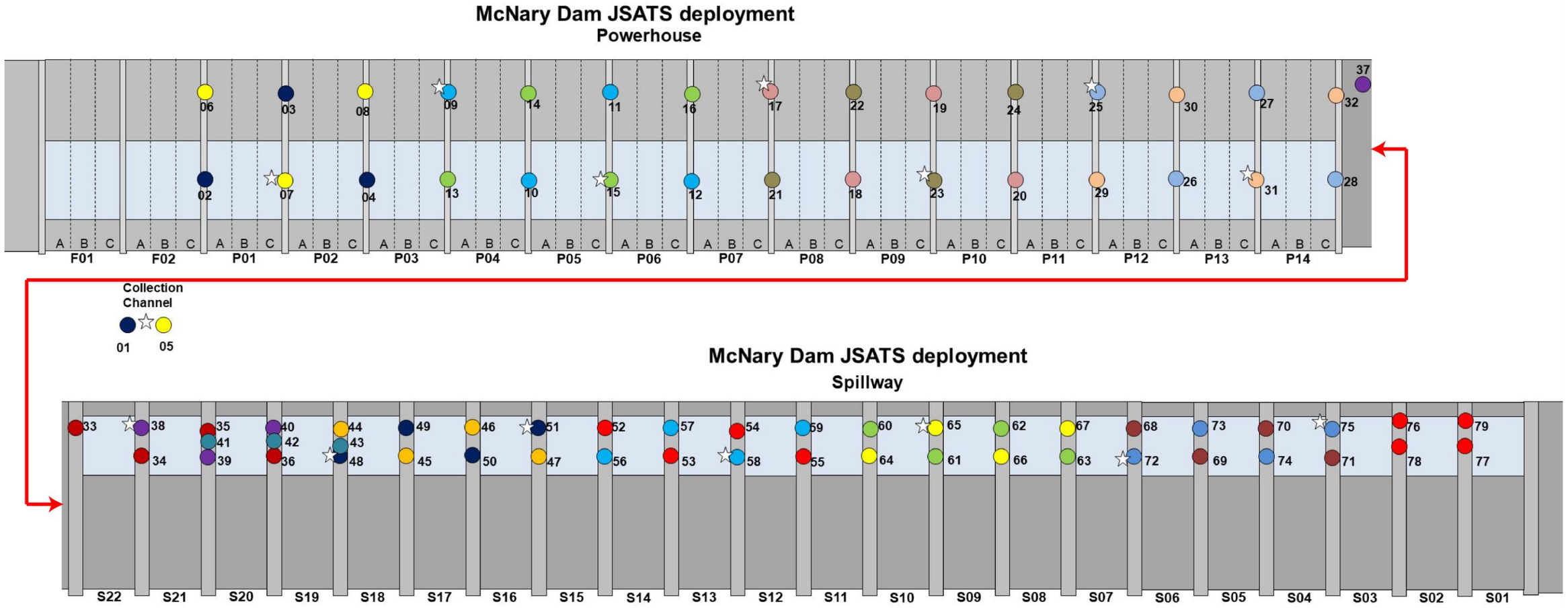
Study Design

Detection Arrays and Release Locations

Study Design

Receiver Deployment at MCN

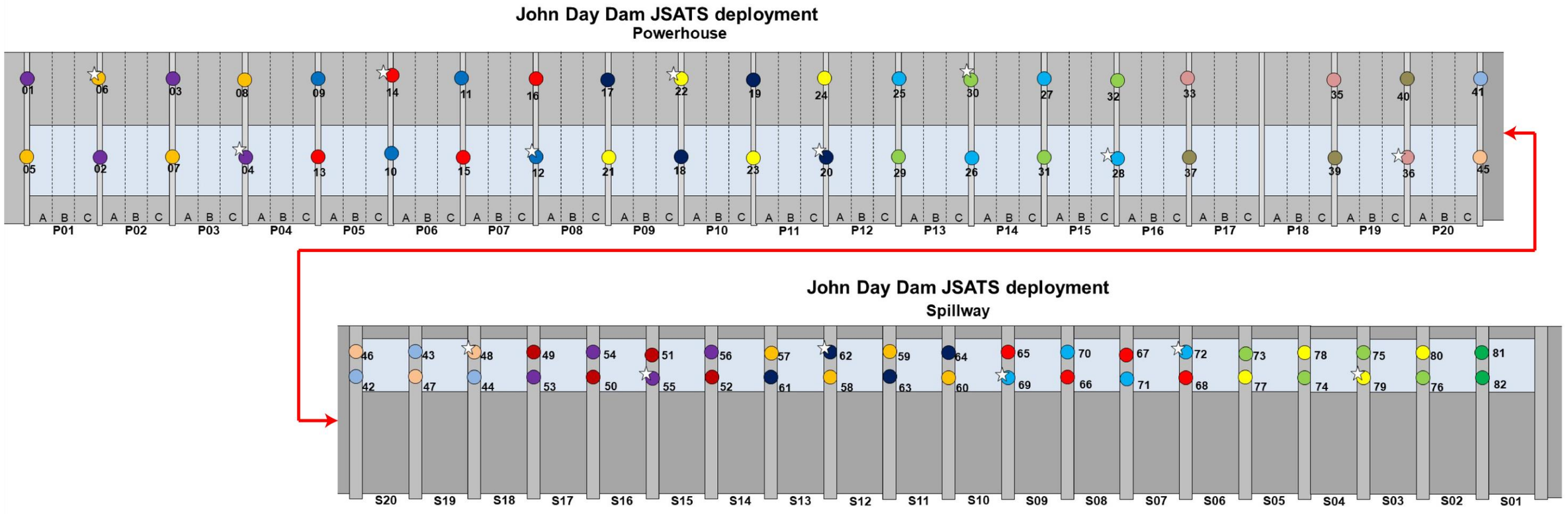
Forebay Cabled Array



Study Design

Receiver Deployment at JDA

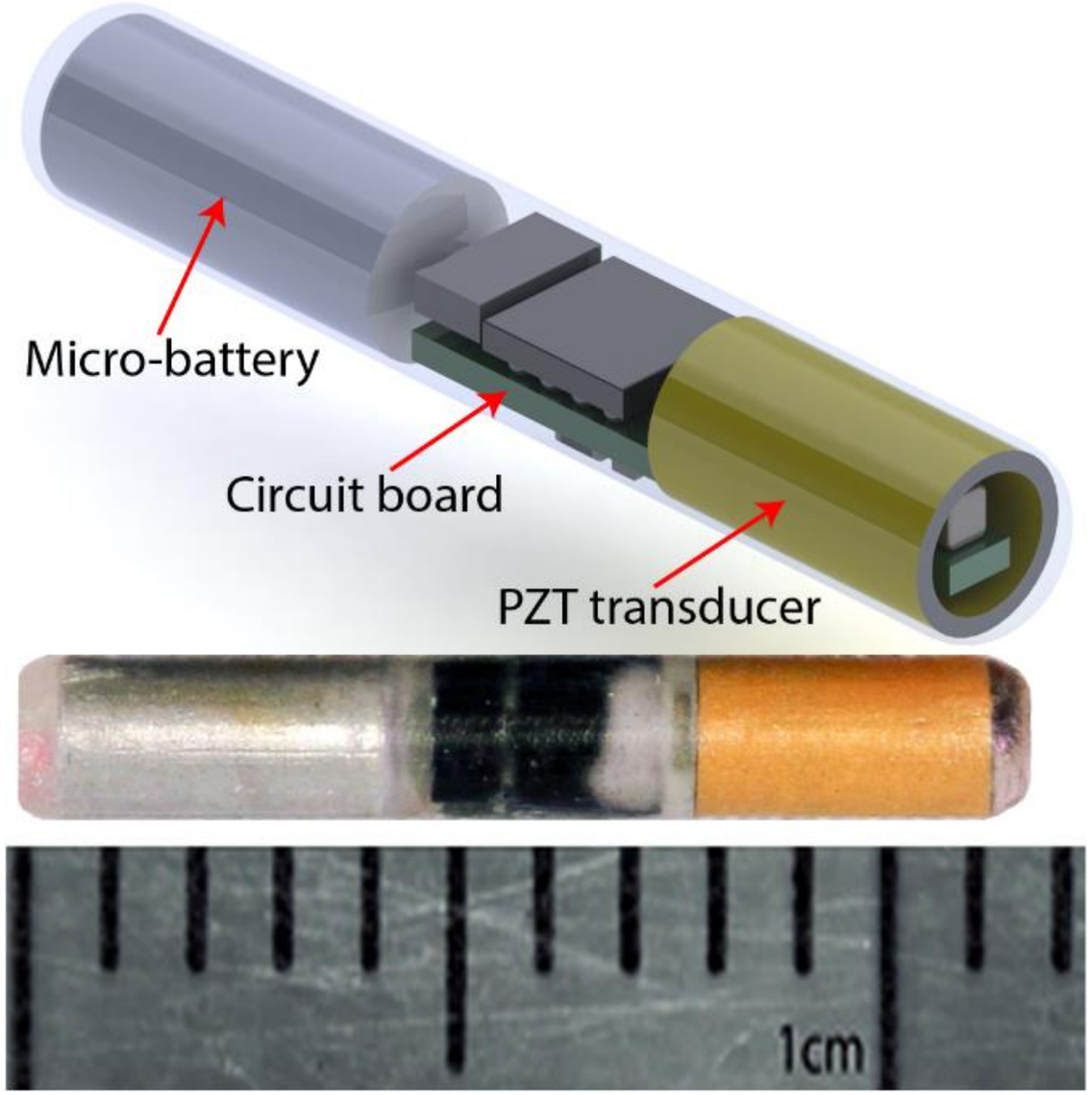
Forebay Cabled Array



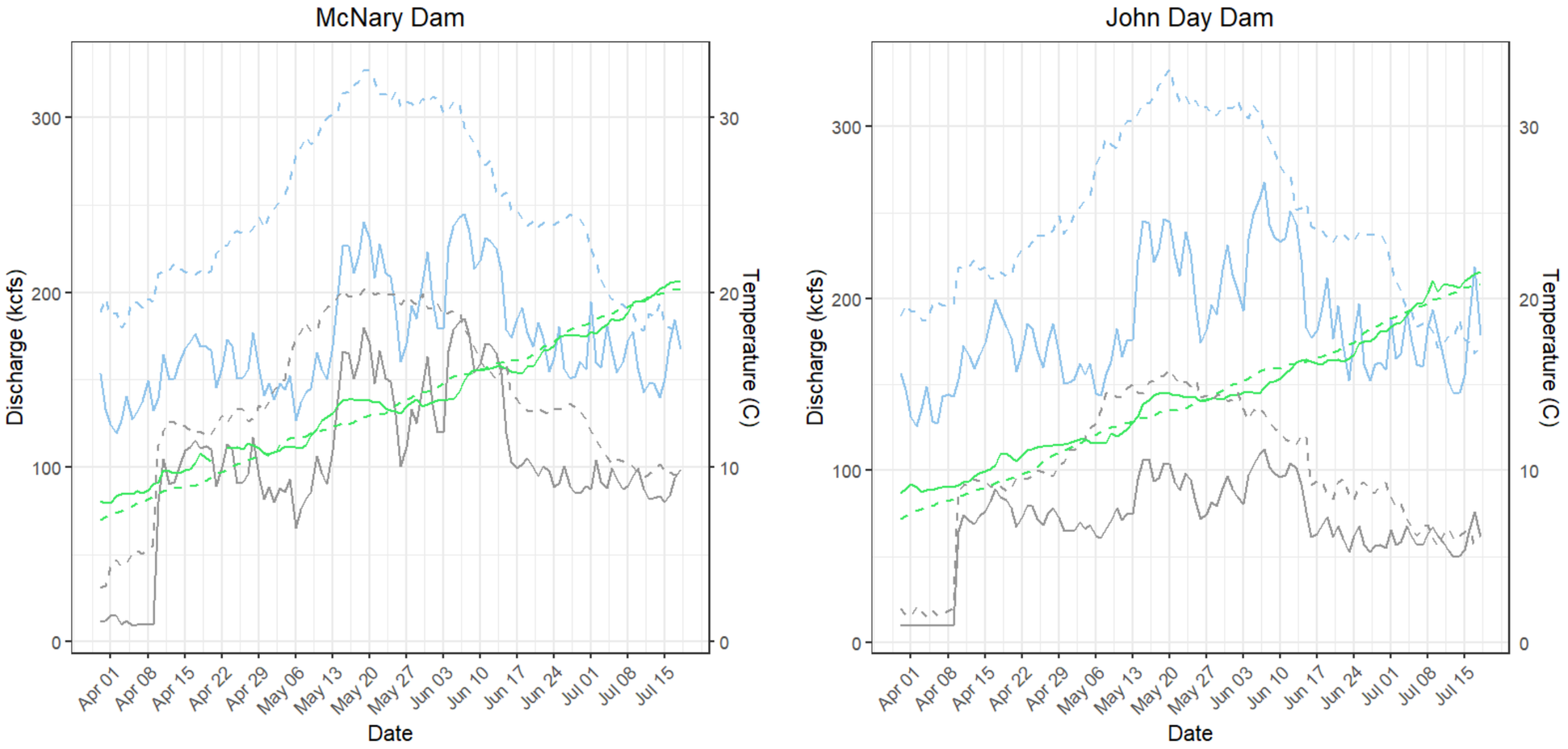
Study Design

Acoustic Transmitter

- Designed for juvenile lamprey and eels
- Dimensions: 12.0 mm x 2.0 mm
- Mass: 0.08 g
- Source level: 148 dB
- Tag life: ~30 days at 5-s pulse rate interval
- Carrier frequency: 416.7 kHz



Study Conditions



Survival

ViRDCt Model Assumption Tests – ROR Juveniles

- Full season dead-released fish detection rates
  - MCN: 23/72 = 31.9%
  - JDA: 1/73 = 1.4%
- The temporal distribution of dead-released fish did not differ from that of live-released fish that died during dam passage at MCN and JDA
- The spatial (i.e., route) distribution of dead-released fish did not differ from that of live-released fish that died during dam passage at MCN and JDA
- The dead-released detection rate did not differ by route (powerhouse vs. spillway) at MCN or JDA

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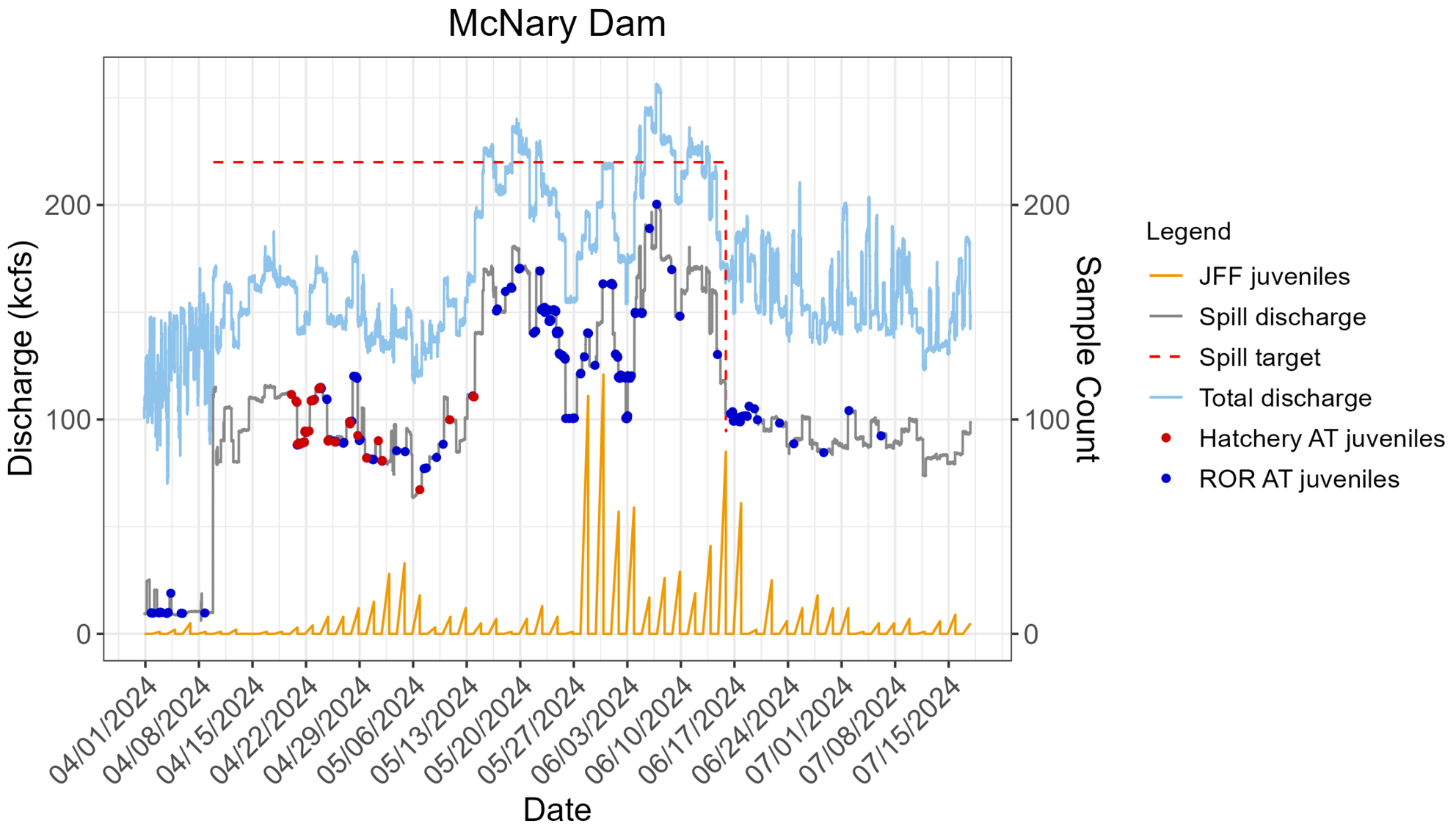
Lamprey Passage Timing at MCN



Survival - MCN

MCN Dam Passage – ROR juveniles

Season	Routes	Diel	Live N	$\hat{S}$	$\hat{S}$ (SE)
Full Season (Apr 1 – Jul 6)	All	Both	306	0.7391	0.0436
Full Season (Apr 1 – Jul 6)	PH	Both	149	0.6940	0.0555
Full Season (Apr 1 – Jul 6)	Conv. Spill	Both	123	0.7358	0.0732
Full Season (Apr 1 – Jul 6)	TSW	Both	34	0.9188	0.0604
Full Season (Apr 1 – Jul 6)	All	Day	65	0.5677	0.0912
Full Season (Apr 1 – Jul 6)	All	Night	241	0.7837	0.0450
Pre-Spill (Apr 1 – Apr 8)	All	Both	18	NA*	NA*
Pre-Runoff (Apr 20 – May 14)	All	Both	70	0.9297	0.1076
Runoff (May 17 – Jun 14)	All	Both	193	0.6465	0.0727
Summer Spill (Jun 16 – Jul 6)	All	Both	25	0.8079	0.0917

*Assuming 1.0 det. prob., $\hat{S}$ = 0.6440

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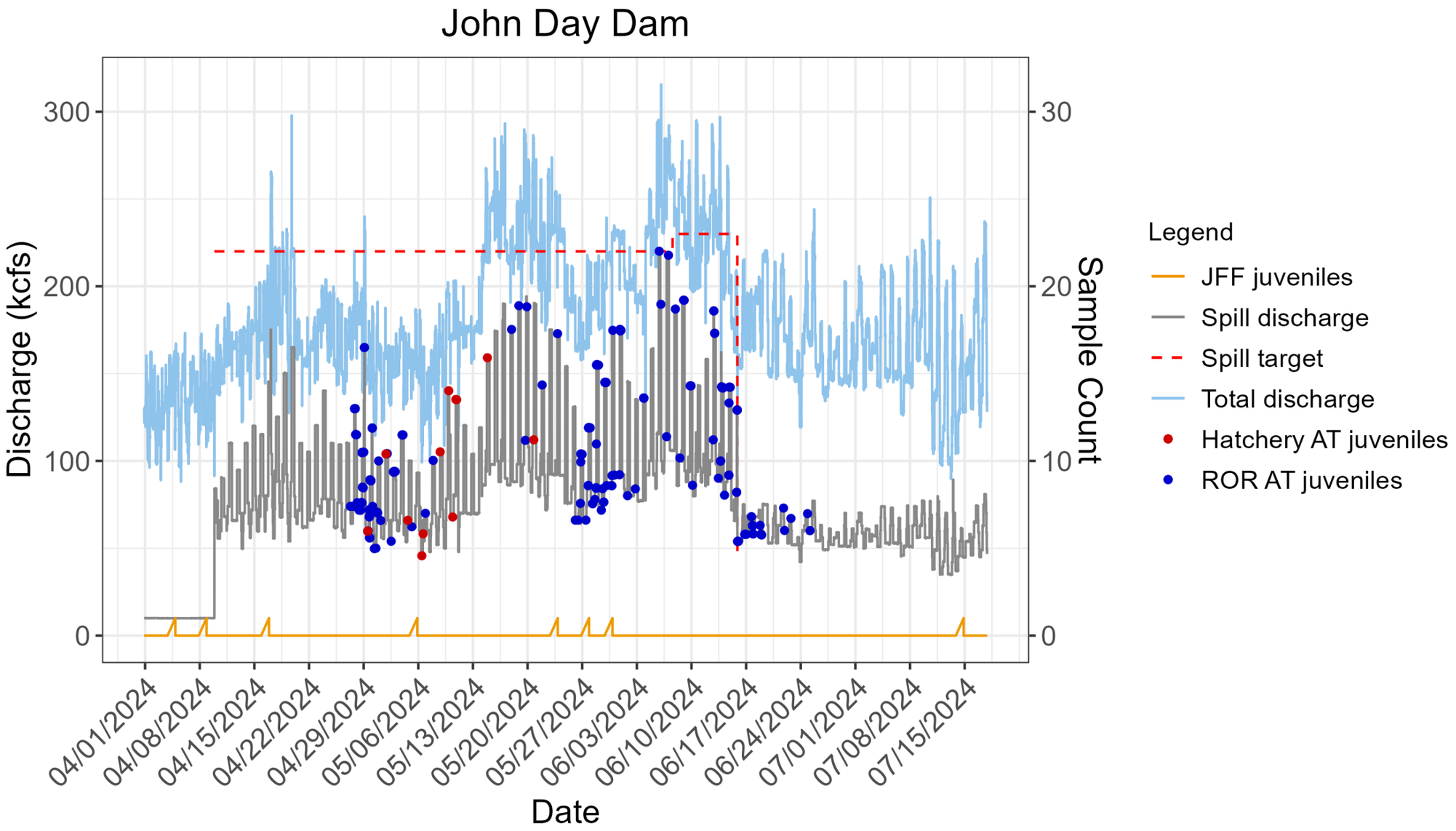
Lamprey Passage Timing at JDA



Survival - JDA

JDA Dam Passage – ROR juveniles

Season	Operation	Routes	Diel	Live N	$\hat{S}$	$\hat{S}$ (SE)
Full Season (4/27 – 6/25)	All	All	Both	233	0.7100	0.0334
Full Season (4/27 – 6/24)	All	PH	Both	122	0.5938	0.0470
Full Season (4/27 – 6/25)	All	Conv. Spill	Both	75	0.8381	0.0445
Full Season (4/28 – 6/19)	All	TSW	Both	36	0.8242	0.1292
Full Season (4/27 – 6/25)	All	All	Day	46	0.3958	0.0735
Full Season (4/27 – 6/24)	All	All	Night	187	0.7873	0.0351
Full Season (4/27 – 6/22)	All	PH	Day	39	0.3767	0.0822
Full Season (4/27 – 6/24)	All	PH	Night	83	0.6959	0.0528
Spring Spill (4/27 – 6/15)	PS	All	Both	80	0.5883	0.0565
Spring Spill (4/27 – 6/15)	Max spill	All	Night	123	0.7757	0.0448
Summer Spill (6/16 – 6/25)	Summer	All	Both	30	0.7212	0.0922
Spring Spill (4/27 – 6/14)	PS	All	Day	41	0.3951	0.0781
Spring Spill (4/27 – 6/15)	PS	All	Night	39	0.7931	0.0657

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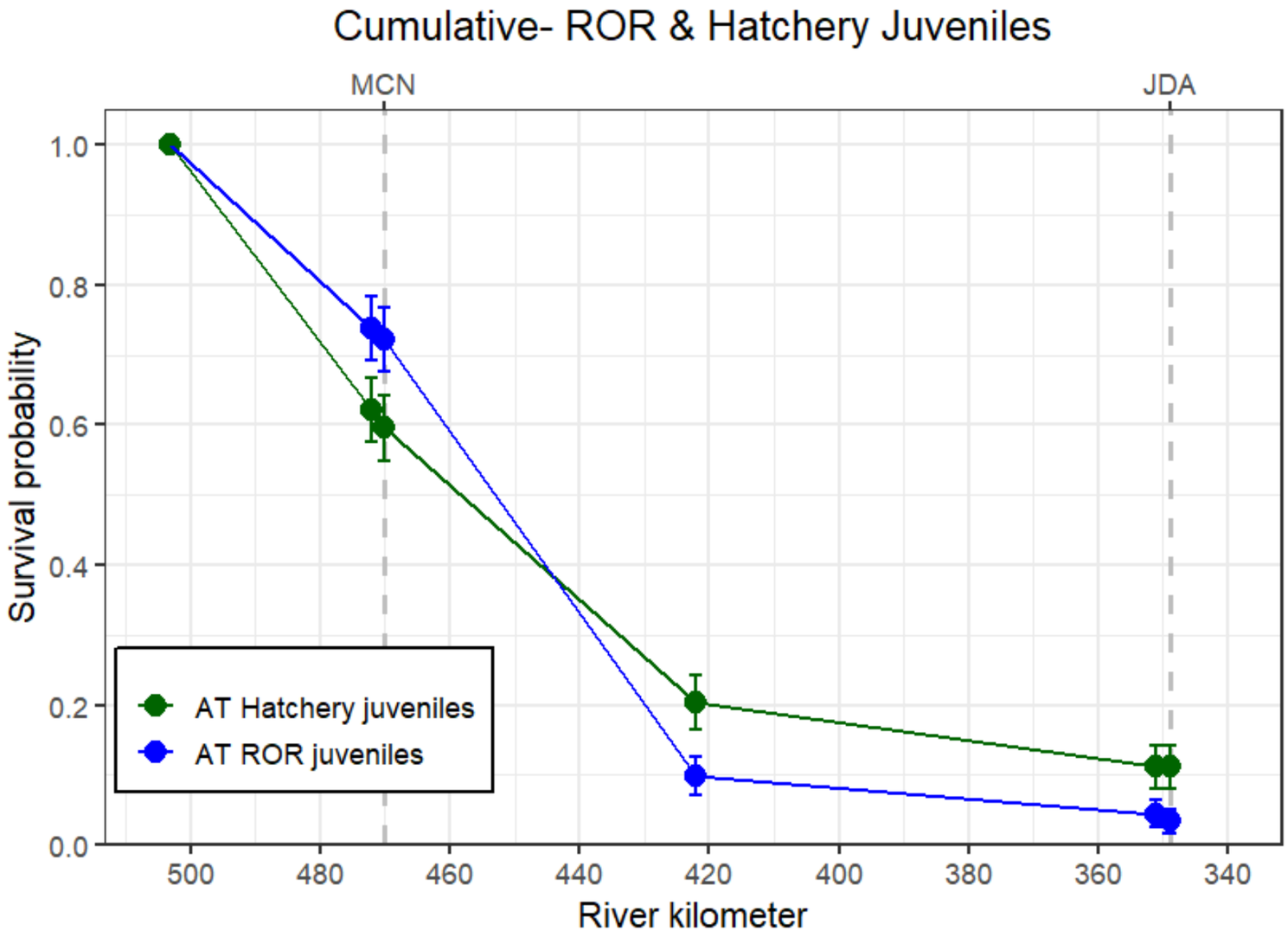
Survival

Cumulative – April 18 & 19 ROR & Hatchery Juveniles



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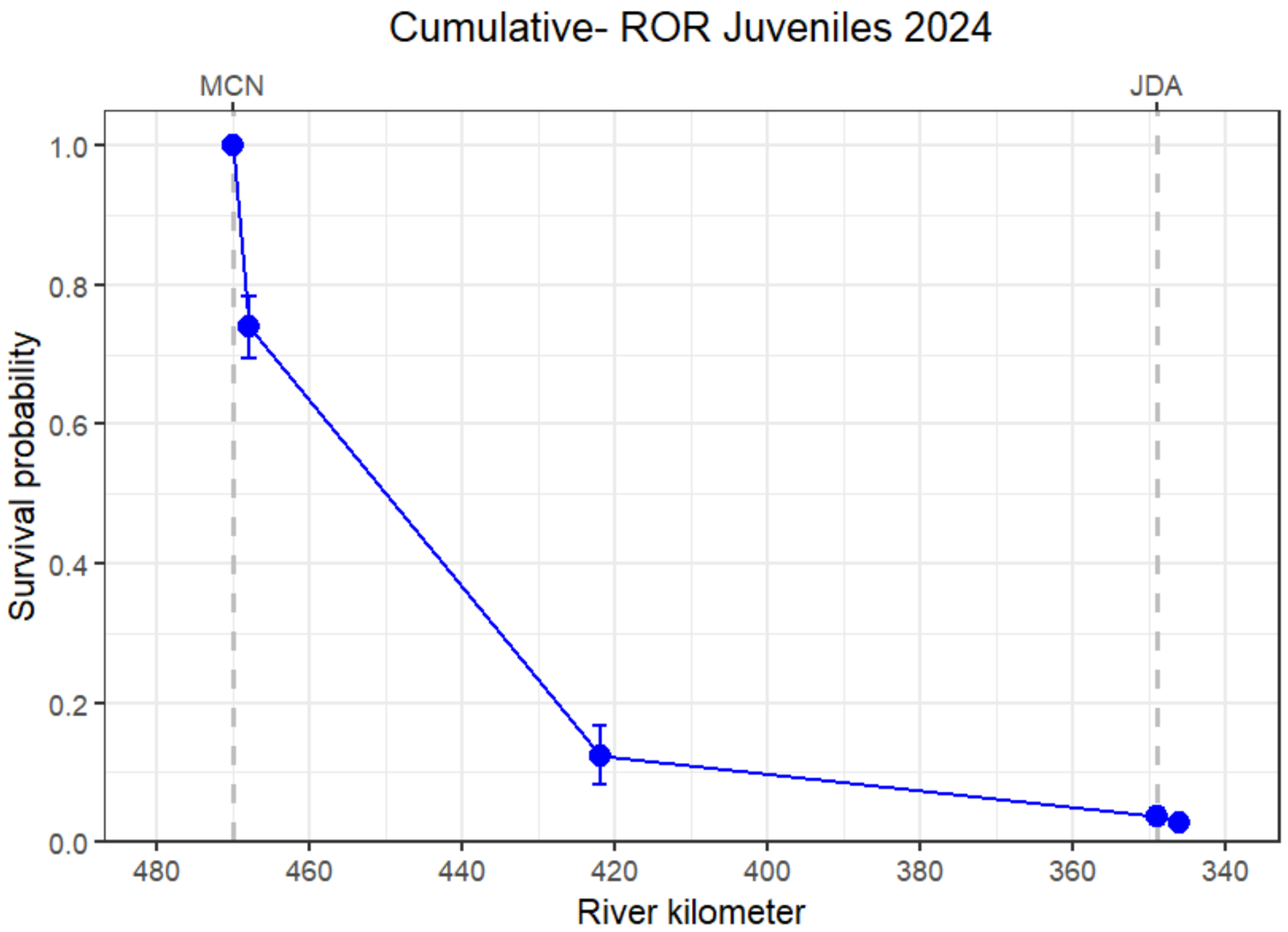
Survival

Cumulative – ROR Juveniles



Behavior - MCN

Factors Affecting Passage Routing – ROR Juveniles

	Total N	PH %	TSW %	Deep Spill %	Spillway %	$\hat{S}$ (SE)
Day	65	48%	15%	37%	52%	0.568 (0.091)
Night	241	49%	10%	41%	51%	0.784 (0.045)
Pre-spill	18	89%	11%	0%	11%	*0.644*[2]
Pre-runoff	70	50%	13%	37%	50%	0.930 (0.108)
Runoff	193	42%	11%	47%	58%	0.647 (0.073)
Summer spill	25	64%	8%	28%	36%	0.808 (0.092)
Overall	**306**	**49%**[1]	**11%**	**40%**	**51%**	**0.739 (0.045)**

[1]Assuming equal release-to-MCN survival of AT-only and PIT-only groups, 4% of PIT-only passage occurred through the JBS

[2]Assumes detection probability of 1.0

Behavior - JDA

Factors Affecting Passage Routing – ROR Juveniles

	Total N	PH %	TSW %	Deep Spill %	Spillway %	$\hat{S}$ (SE)
Day	46	85%	11%	4%	15%	0.396 (0.074)
Night	187	44%	17%	39%	56%	0.787 (0.035)
PS	79	71%	18%	11%	29%	0.583 (0.057)
PS Day	41	85%	12%	2%	15%	0.395 (0.078)
PS Night	39	56%	23%	21%	44%	0.793 (0.066)
Max spill	123	34%	15%	50%	66%	0.776 (0.045)
Summer spill	30	77%	13%	10%	23%	0.721 (0.092)
Overall	**233**	**52%***	**16%**	**32%**	**48%**	**0.710 (0.033)**

*Assuming equal release-to-JDA survival of AT-only and PIT-only groups, 4% of PIT-only passage occurred through the JBS

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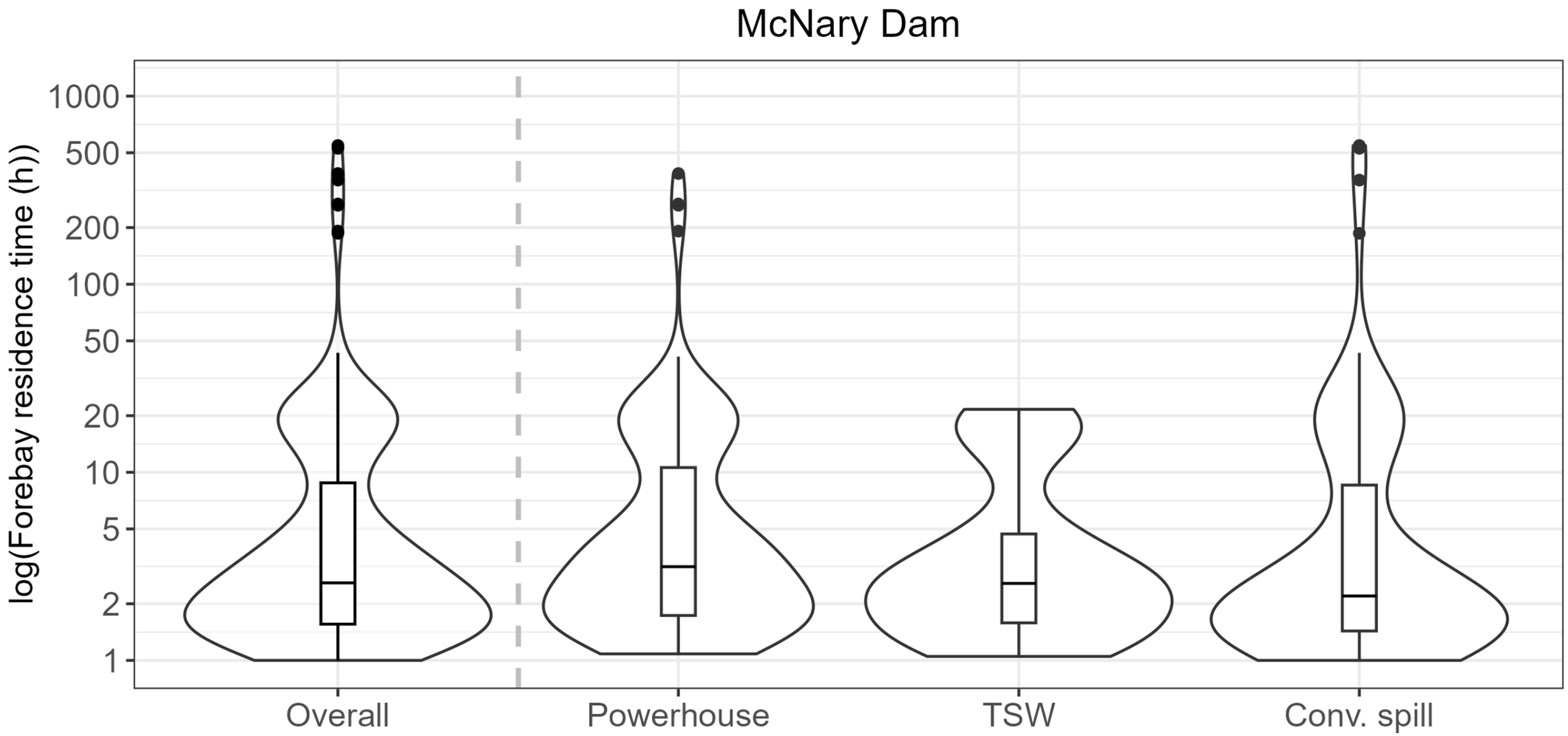
Behavior - MCN

Forebay Residence Times – ROR Juveniles



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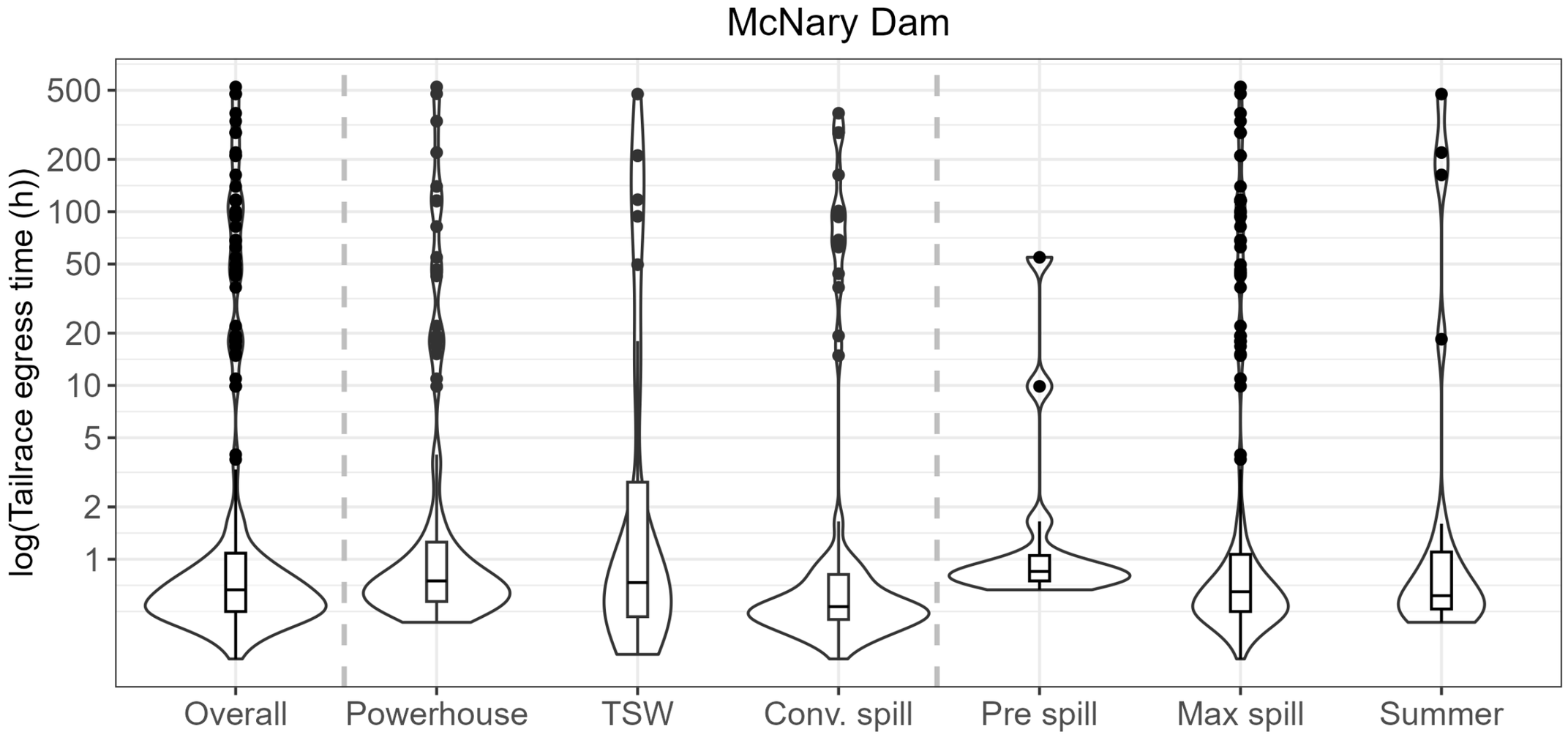
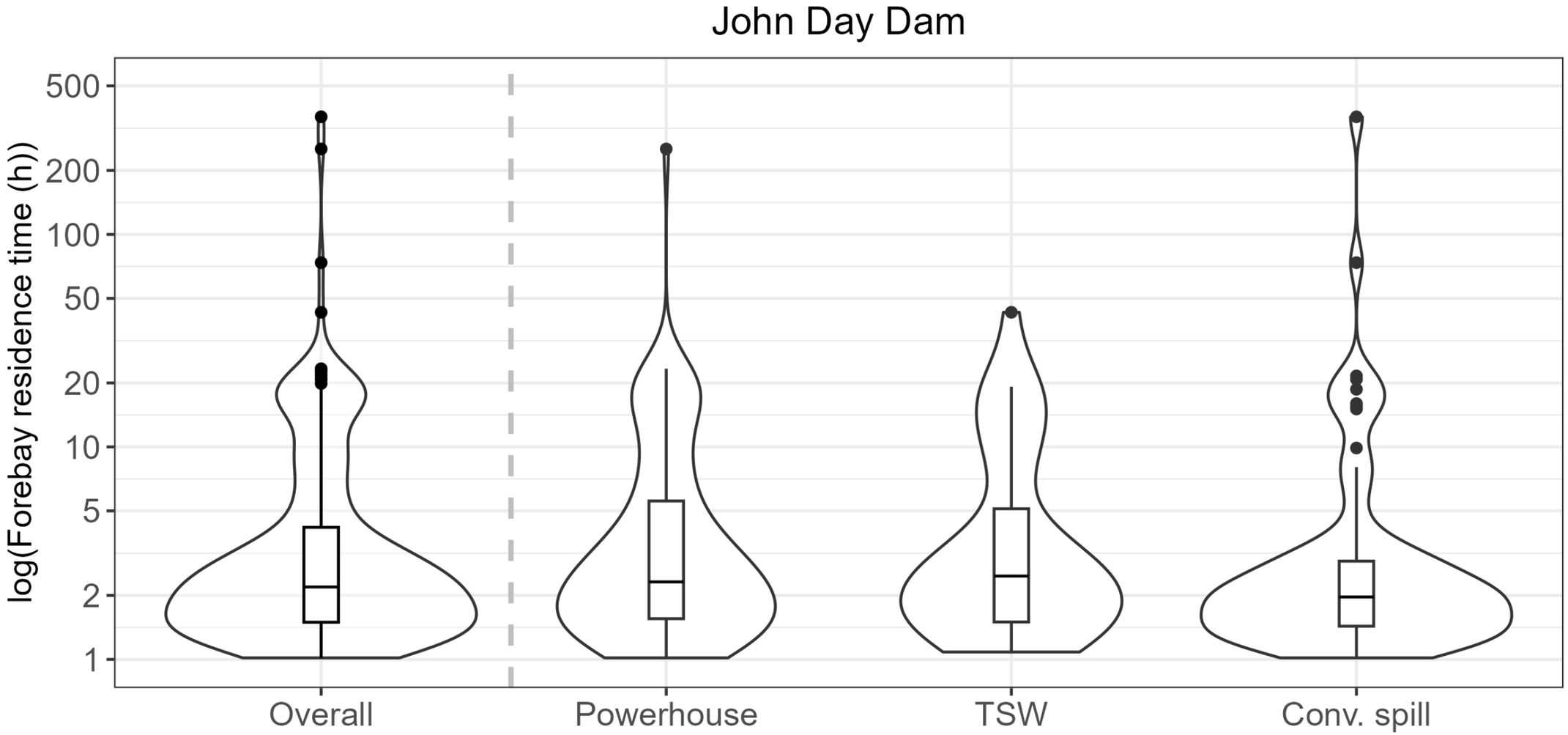
Behavior - MCN

Tailrace Egress Times – ROR Juveniles



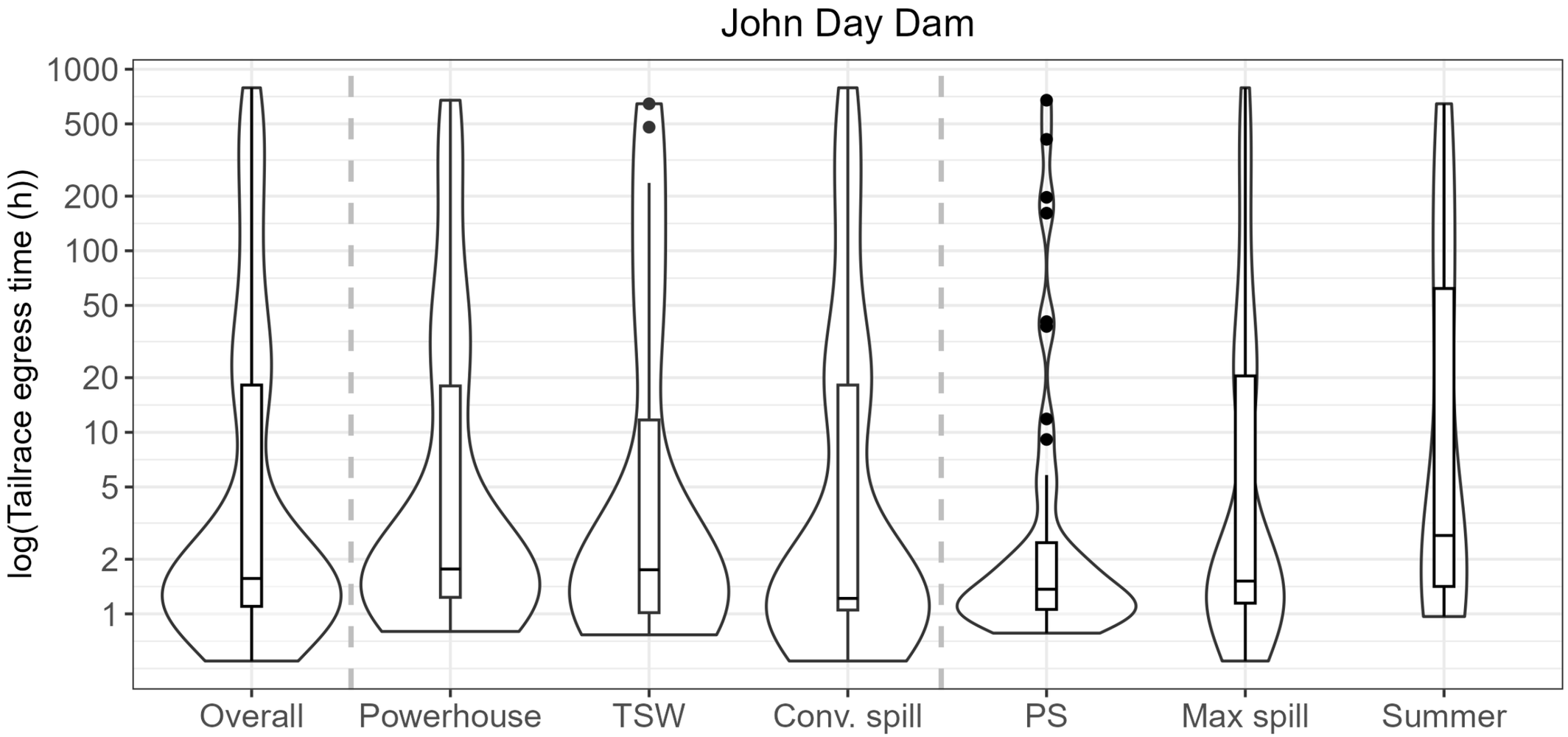
Behavior - JDA

Forebay Residence Times – ROR Juveniles



Behavior - JDA

Tailrace Egress Times – ROR Juveniles



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Summary

- MCN & JDA dam passage survival (0.710 – 0.739) was lower than observed at LSRD in ’22 and ’23 (0.815 – 0.911)
- MCN
  - Survival similar through powerhouse and spillway
  - Similar PH and SW passage proportions during day and night (same operations)
  - Survival lower during day (0.567) compared to night (0.784) indicating avian predation
- JDA
  - Survival higher through spillway compared to powerhouse
  - Higher PH passage during the day (PS spill) compared to night (max spill)
  - Survival lower during day (0.396) compared to night (0.787)
  - Nighttime PH survival (0.696) and nighttime PS survival (0.793) relatively high, indicating daytime avian predation
- Survival of artificially propagated juvenile lamprey lower than ROR juveniles to MCN but higher to JDA

Summary

- Forebay residence times generally quite low (75% spent < 9 h in MCN FB and < 4 h in JDA FB)
- Tailrace egress times fast (< 2 h) for most lamprey at MCN
- Tailrace egress times < 2 h for fastest 50%, > 20 h for slowest 25% at JDA

Acknowledgments

- **US Army Corps of Engineers** for funding the study
- **Corps-Tribal Lamprey Work Group** for project coordination and guidance
- **Yakama Nation Fisheries** for supplying fish for surgeon training, live and dead fish releases
  - Ralph Lampman, Tyler Beals, Dave'y Lumley
- **U.S. Army Corps of Engineers Staff** for field support**:**
  - Bobby Johnson, Paul Bertschinger, Martin Ahmann Jr., James Harris, Michael Lotspeich, Eric Grosvenor, David Miller, Elizabeth Holdren, Denise Griffith, Axel Addis, Deb Snyder, Cole Reeves, and numerous support staff
- **Fish collection from various agencies:**
  - Matt Paulsen, Paul Burke, Darren Chase, Shawn Rapp, Phoebe Hill, Mark Morasch, Thomas VanNice, Eric Harries, Mary Spanos, and Christian Vargas
- **Pacific Northwest National Laboratory Staff:**
  - Adam Hall, Brandon Boehnke, Emily Akins, Cassy Shaffer, Morgan Gilligan, Kofi Poku, Jacob Keffer, Micah Little, Kevin Baar, Aaron Newton, John Stephenson, Jun Lu, Jarin Sakamoto, Kristian Nelson, Chase Pheifer, Wengian Chen, Joe Hawkins, Greg Kondyukov, Sandy Rech, Xingmin Lin, Aidan Henson, Dana Vesty, Kris Hand, Kathy Lavender, Taylor Oxman, Jackie Razey, Drea Rose-Walker, Brett Pflugrath, Pascal Elsinghorst, Rodrigo Ruiz, Richard Lundy, Trevor McBride, Mitchell Myjak, and many more.
- **Columbia Basin Research, University of Washington** for reviewing the statistical results
  - Rebecca Buchanan, Rich Townsend
- **U.S. Department of Energy** for co-funding the technology development