Does origin matter? Hatchery influence on the survival of Interior Columbia River Spring Chinook salmon

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NOAA/OSU Juvenile Salmon and Ocean Ecosystem Survey

Assessing the Relative Importance of Local and Regional Processes on the Survival of a Threatened Salmon Population

Jessica A. Miller, David J. Teel, William T. Peterson, Antonio M. Baptista

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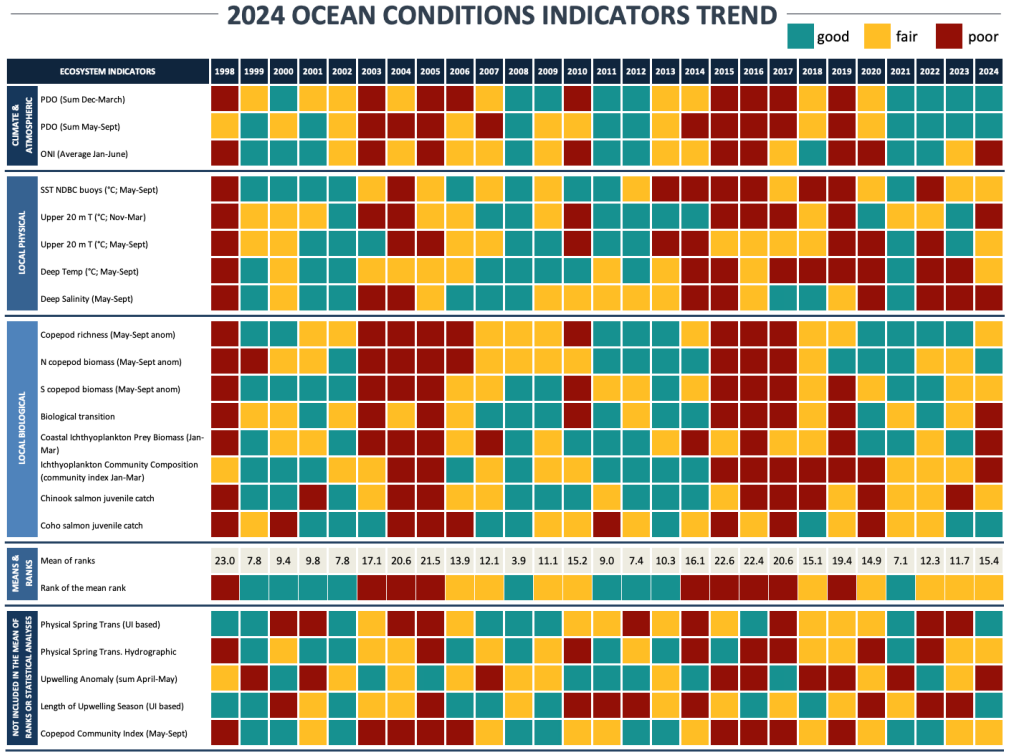
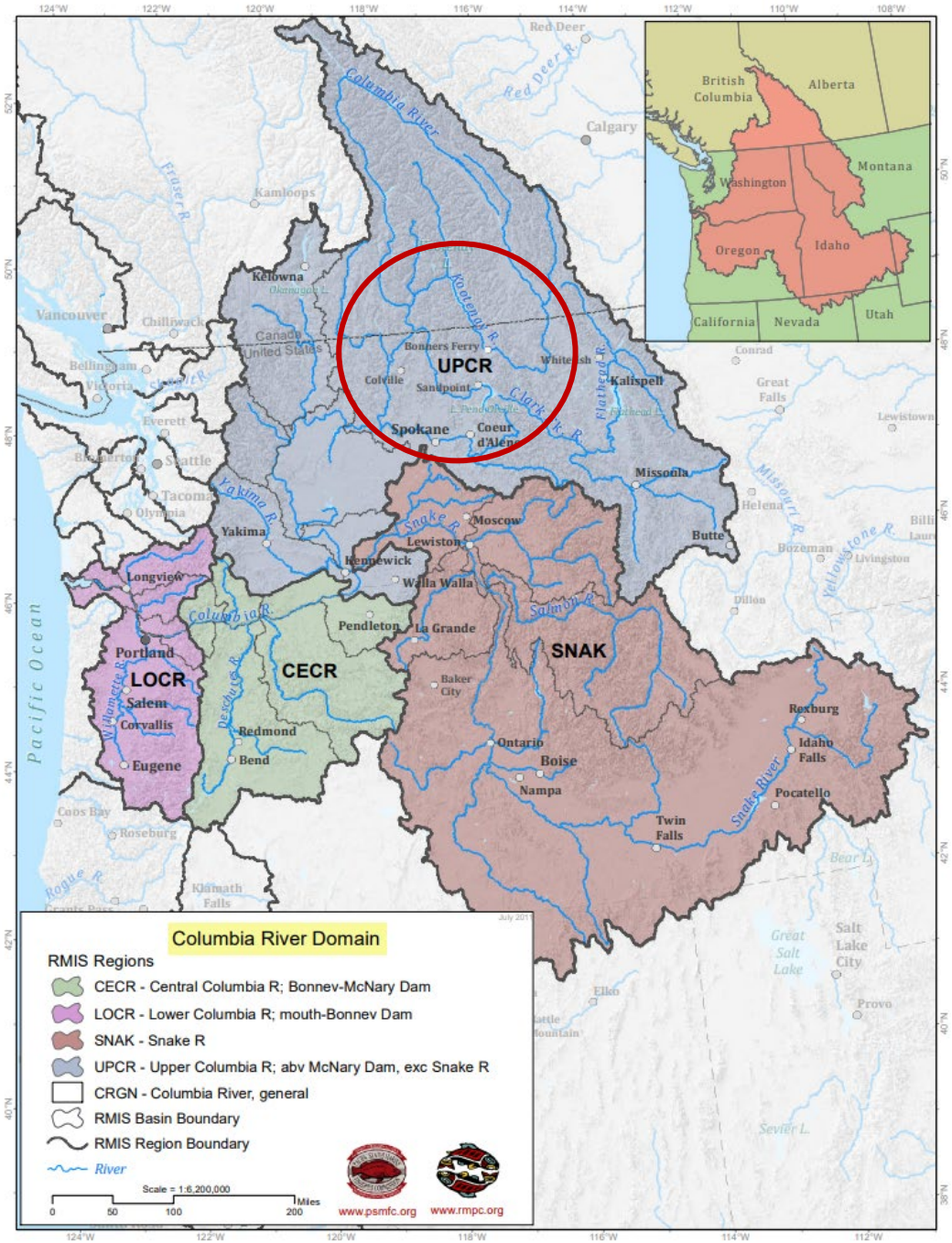
Freshwater growth can provide a survival advantage to Interior Columbia River spring Chinook salmon after ocean entry

C. R. Norrie[1,*], C. A. Morgan[1], B. J. Burke[2], L. A. Weitkamp[3], J. A. Miller[4]



Interior Columbia River Spring Chinook Salmon (*Oncorhynchus tshawytscha*)

- Upper Columbia River Spring ESU – **Endangered**



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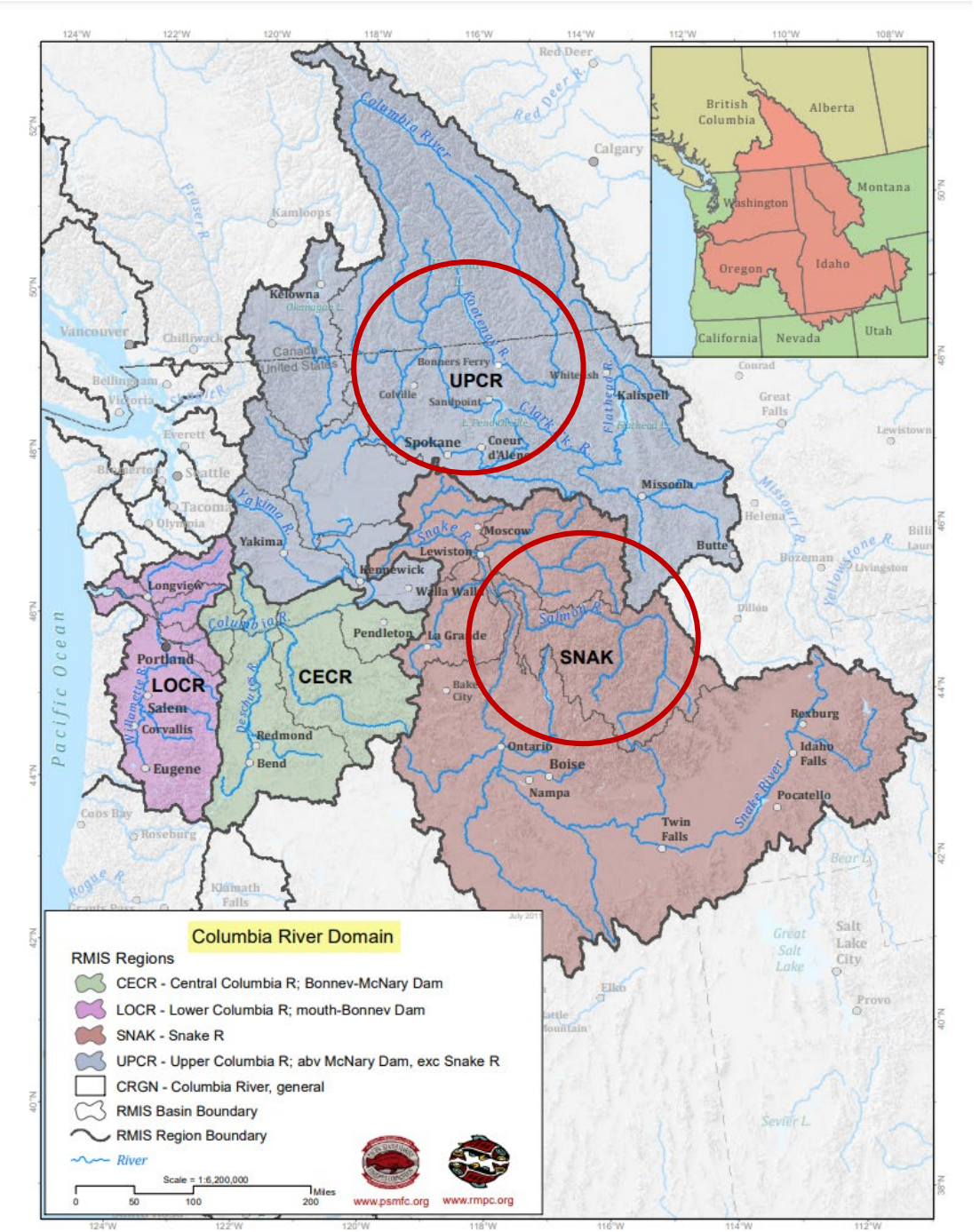
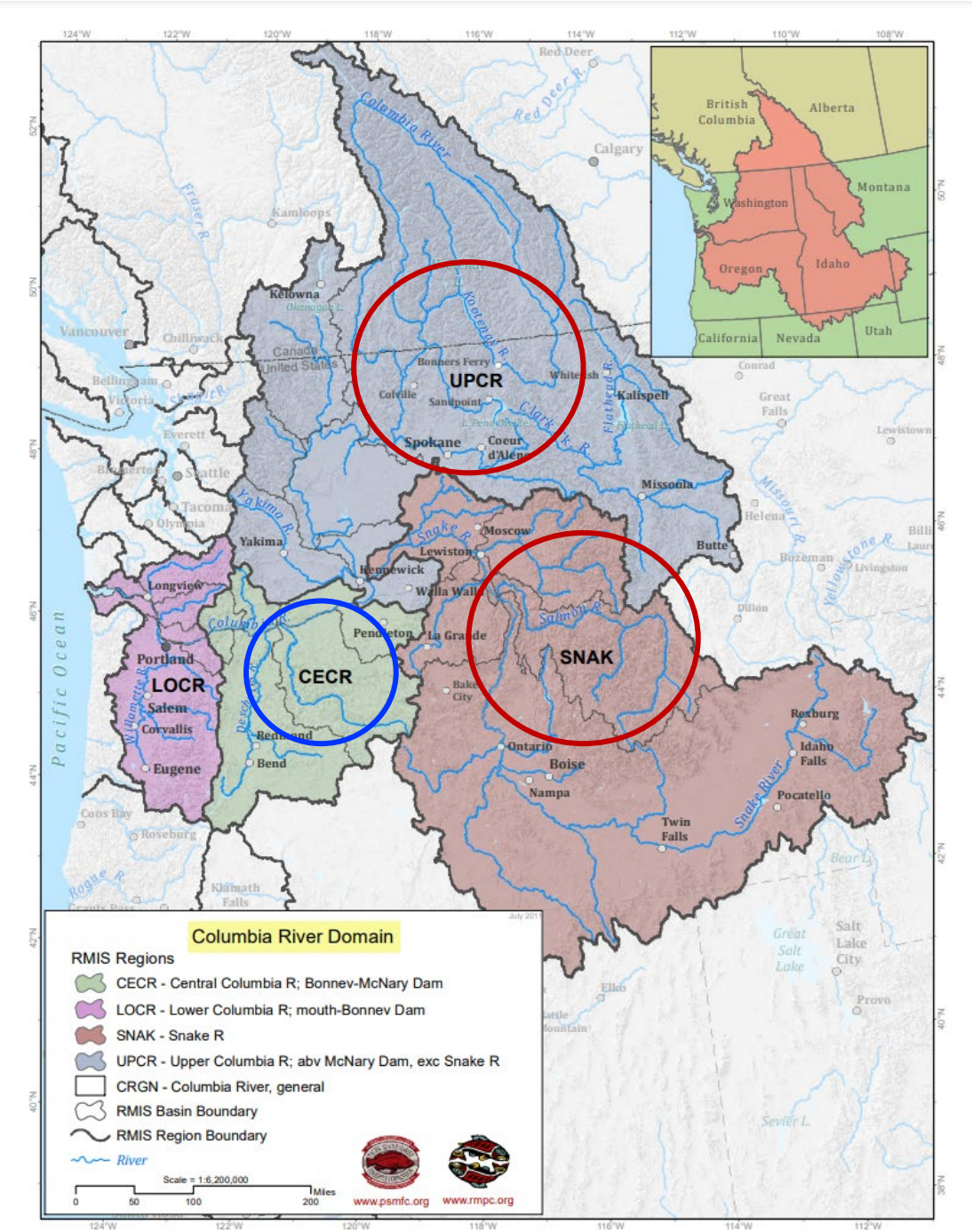


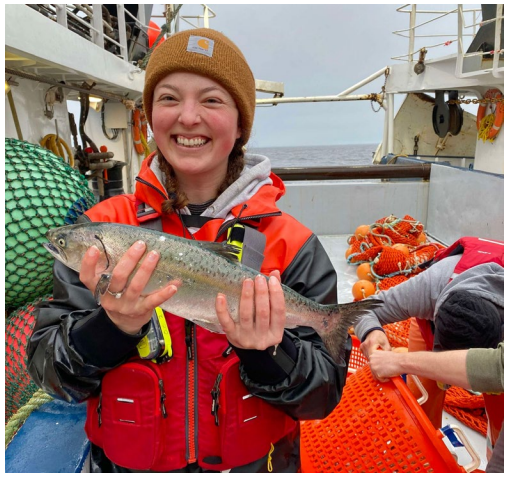
Interior Columbia River Spring Chinook Salmon (*Oncorhynchus tshawytscha*)

- Upper Columbia River Spring ESU – **Endangered**
- Snake River Spring/Summer ESU – **Threatened**
- Mid Columbia River Spring ESU – **Unlisted**



The Juvenile Salmon Ocean Ecosystem Survey (JSOES)

- Conducted twice a year in May and June
- Targets juvenile salmonids
- Increase usage of parentage-based-tagging
    - Can now trace catch back to origin
- **90%** of juvenile salmonids caught are of hatchery origin



Bonneville POWER ADMINISTRATION

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

Objectives

2015-2019 and 2021:

(1) Compare size and condition between hatchery and wild individuals

(2) Determine whether hatchery-specific size and condition at catch explains inter- and intra-annual variation in SARs

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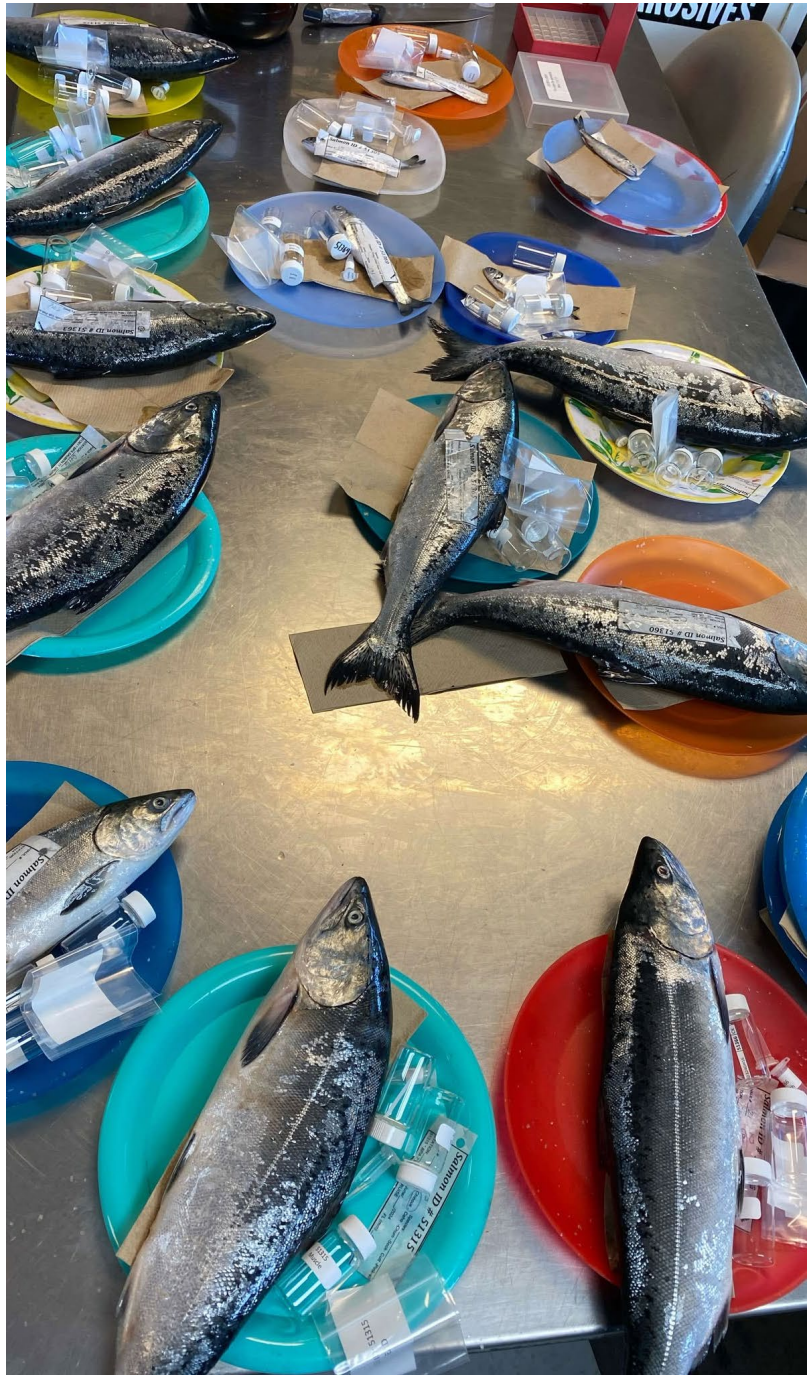
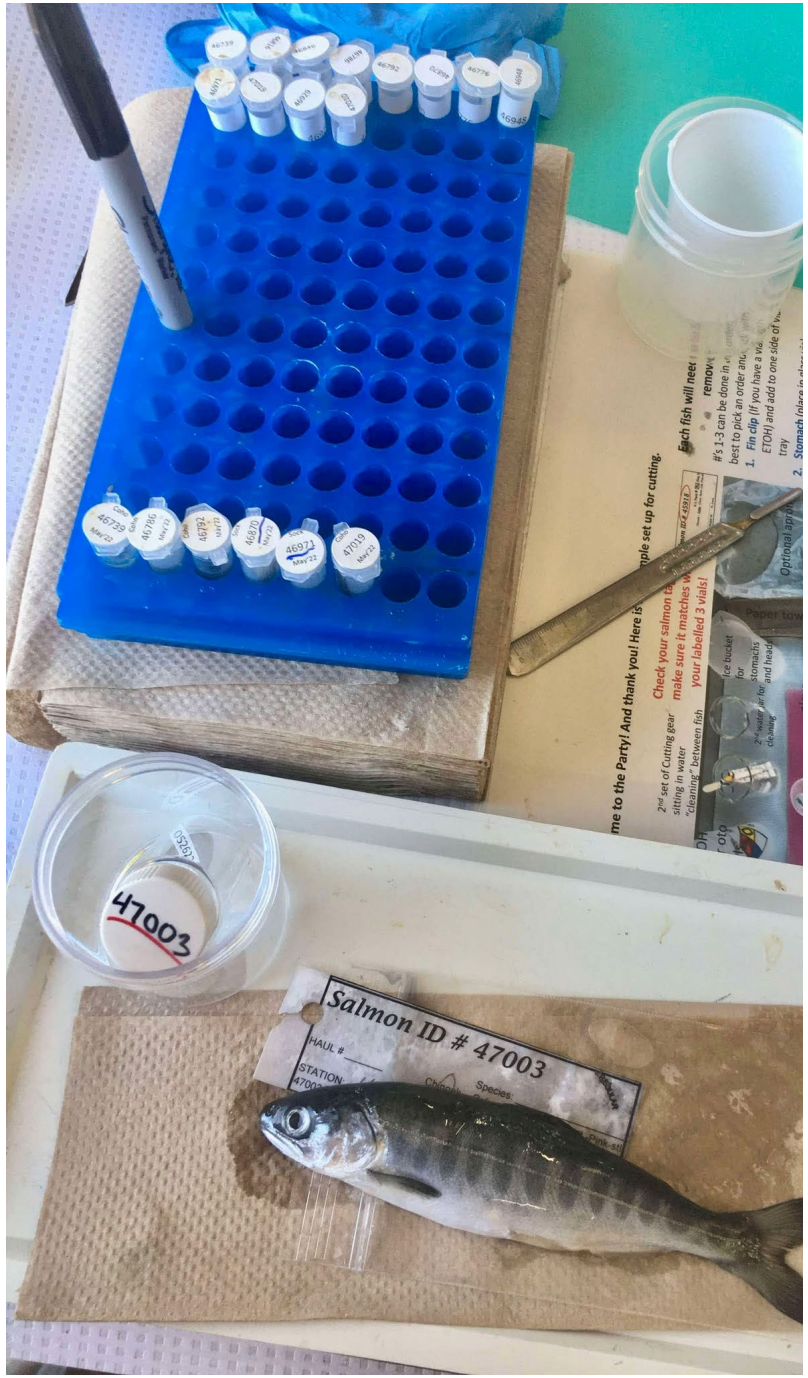
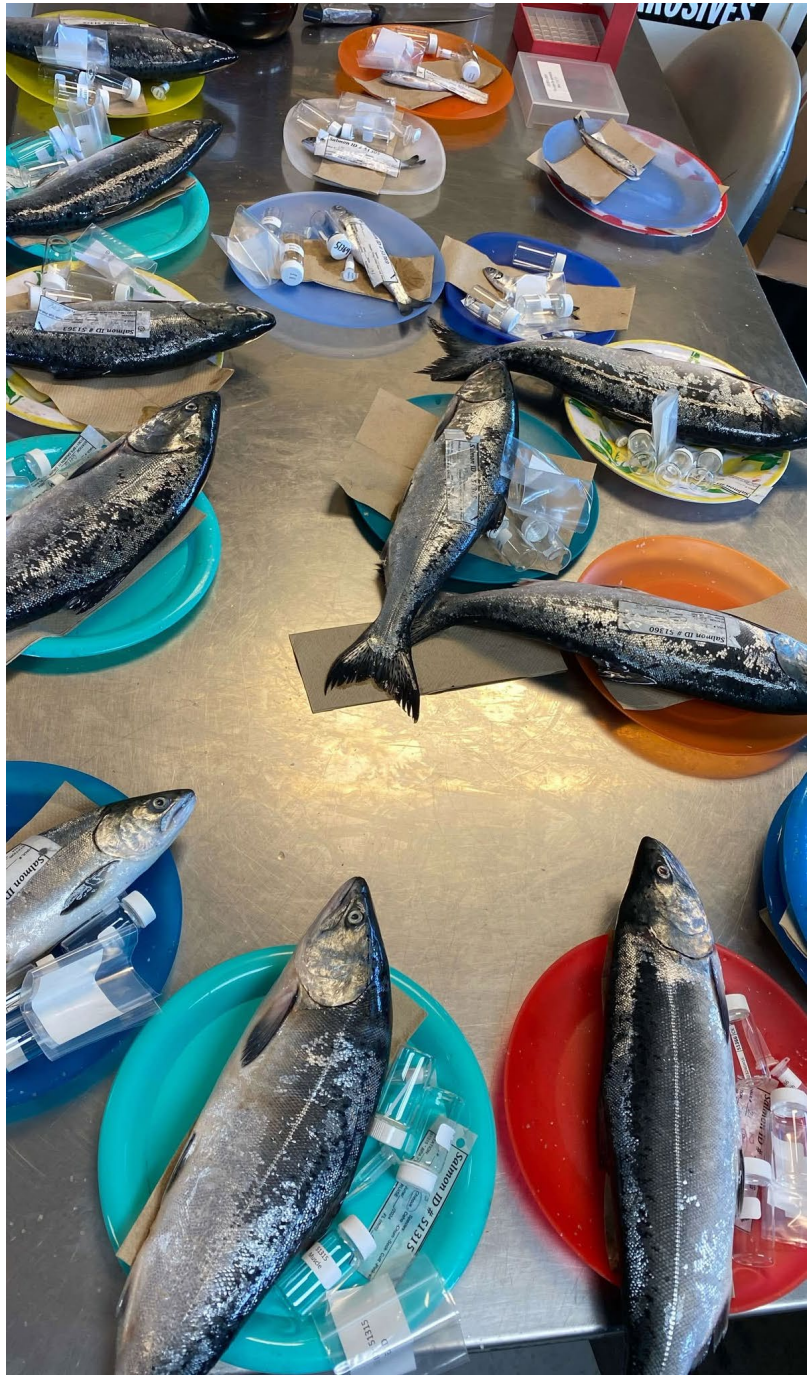
2021:

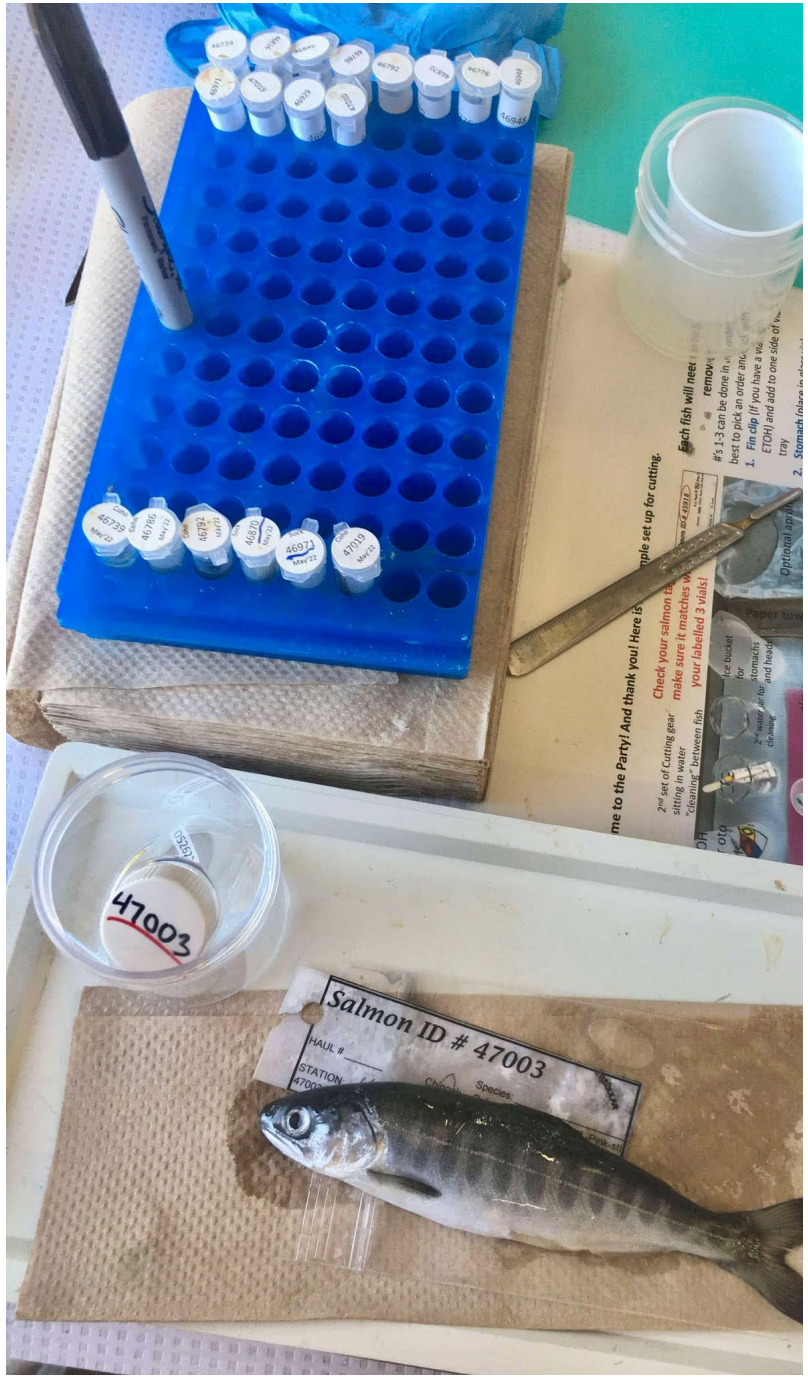
(3) Evaluate ocean entry timing and early marine growth for hatchery and wild individuals through otolith structural and chemical analysis




Salmon ID # 47003
47003


Salmon ID # 50063
Salmon ID # 50081
50081
Muscle

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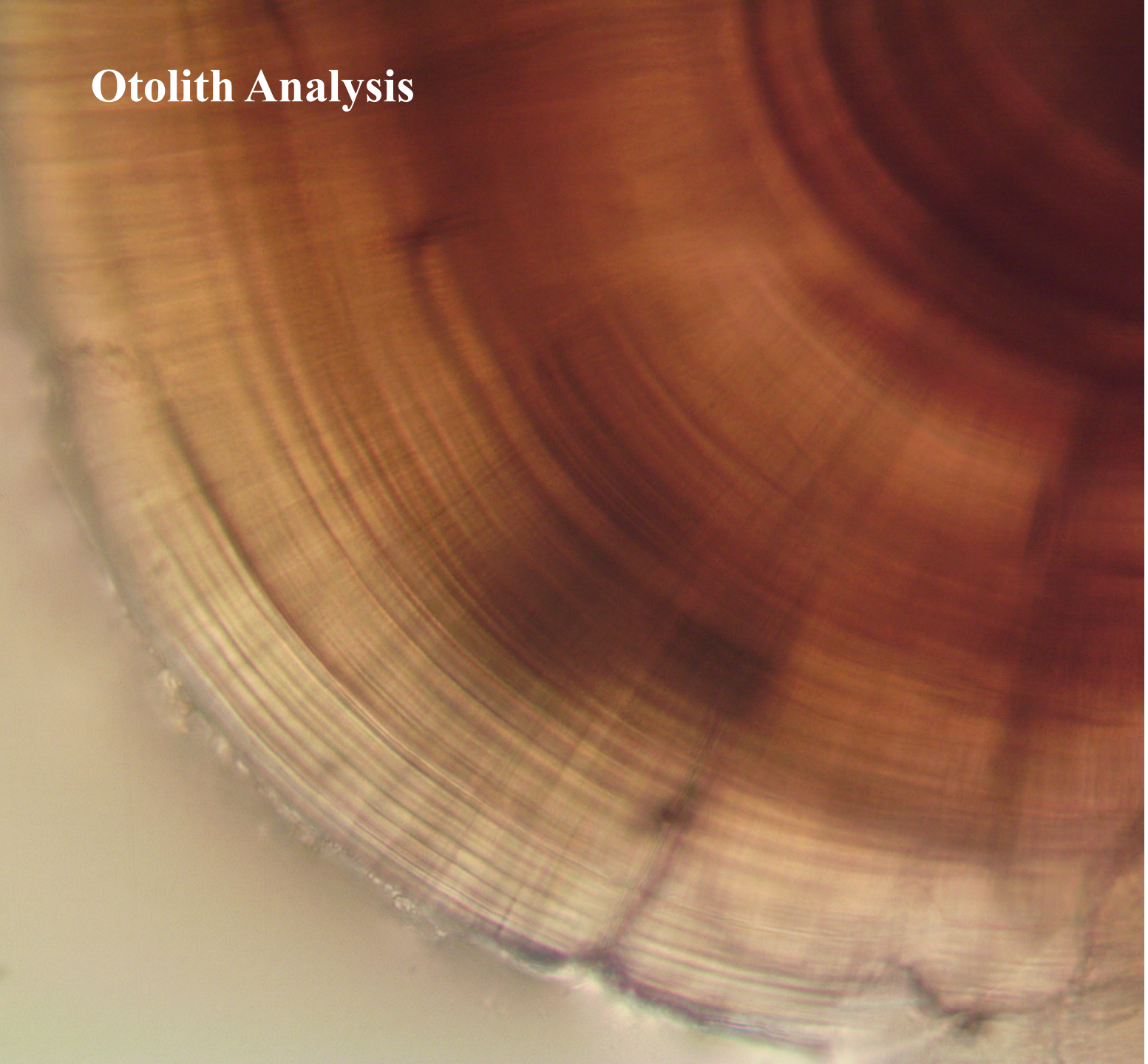
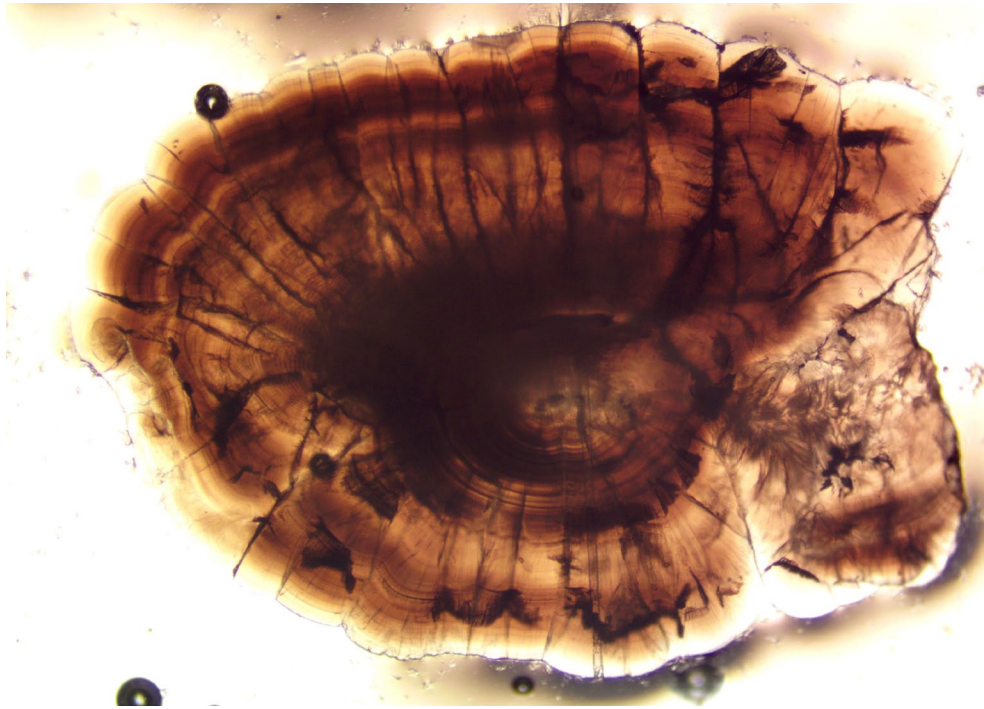
Otolith Analysis





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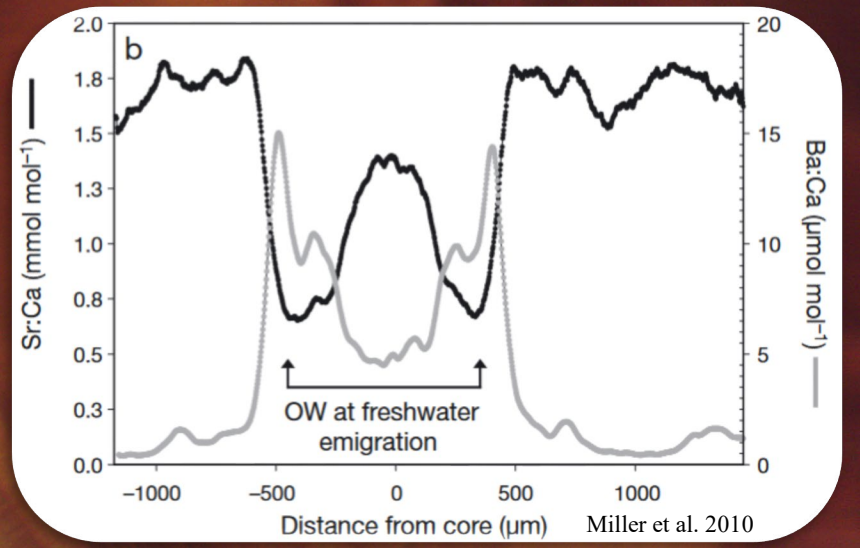
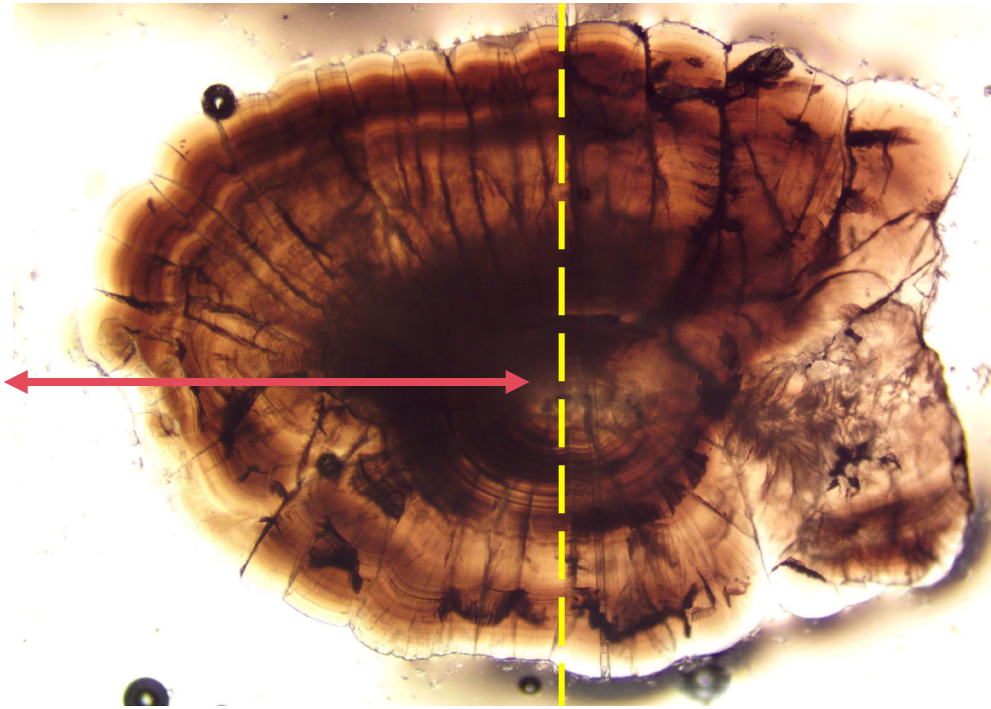


Miller et al. 2010



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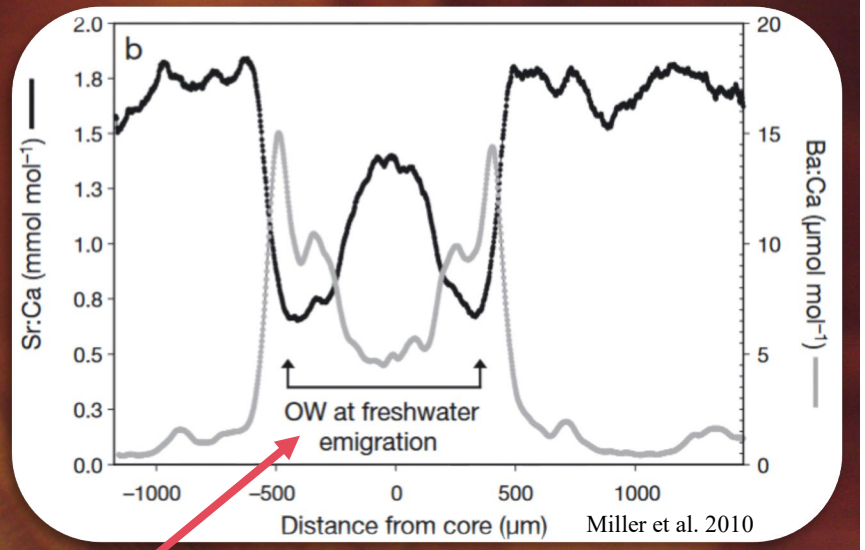
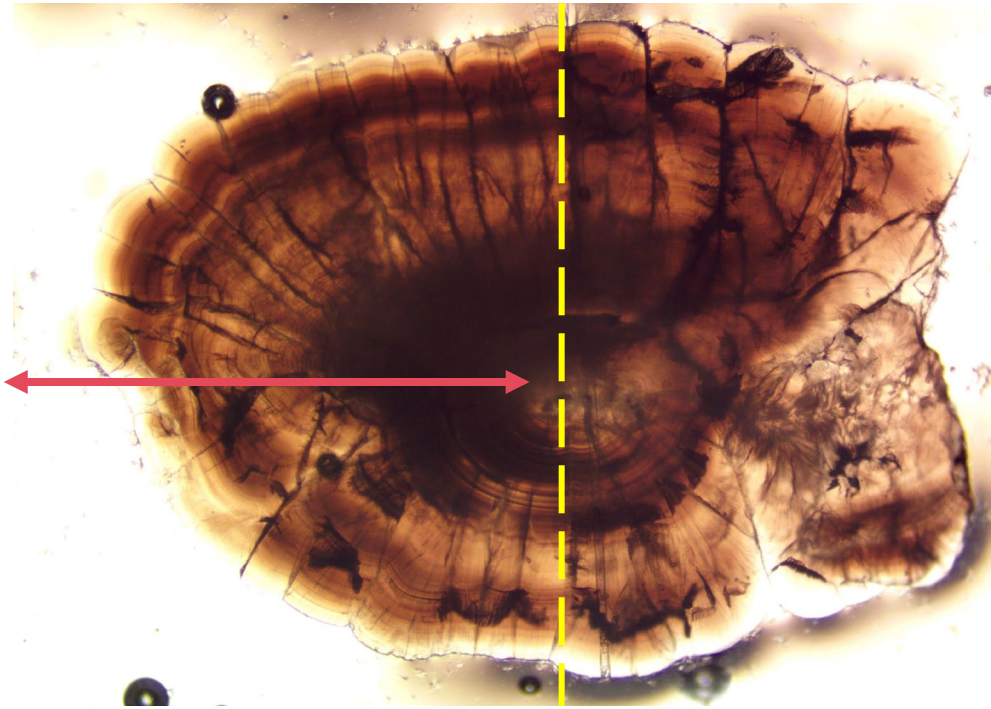


Miller et al. 2010

Ocean Entry

Marine Growth



Fish caught with PBT data: 2015-2019, 2021

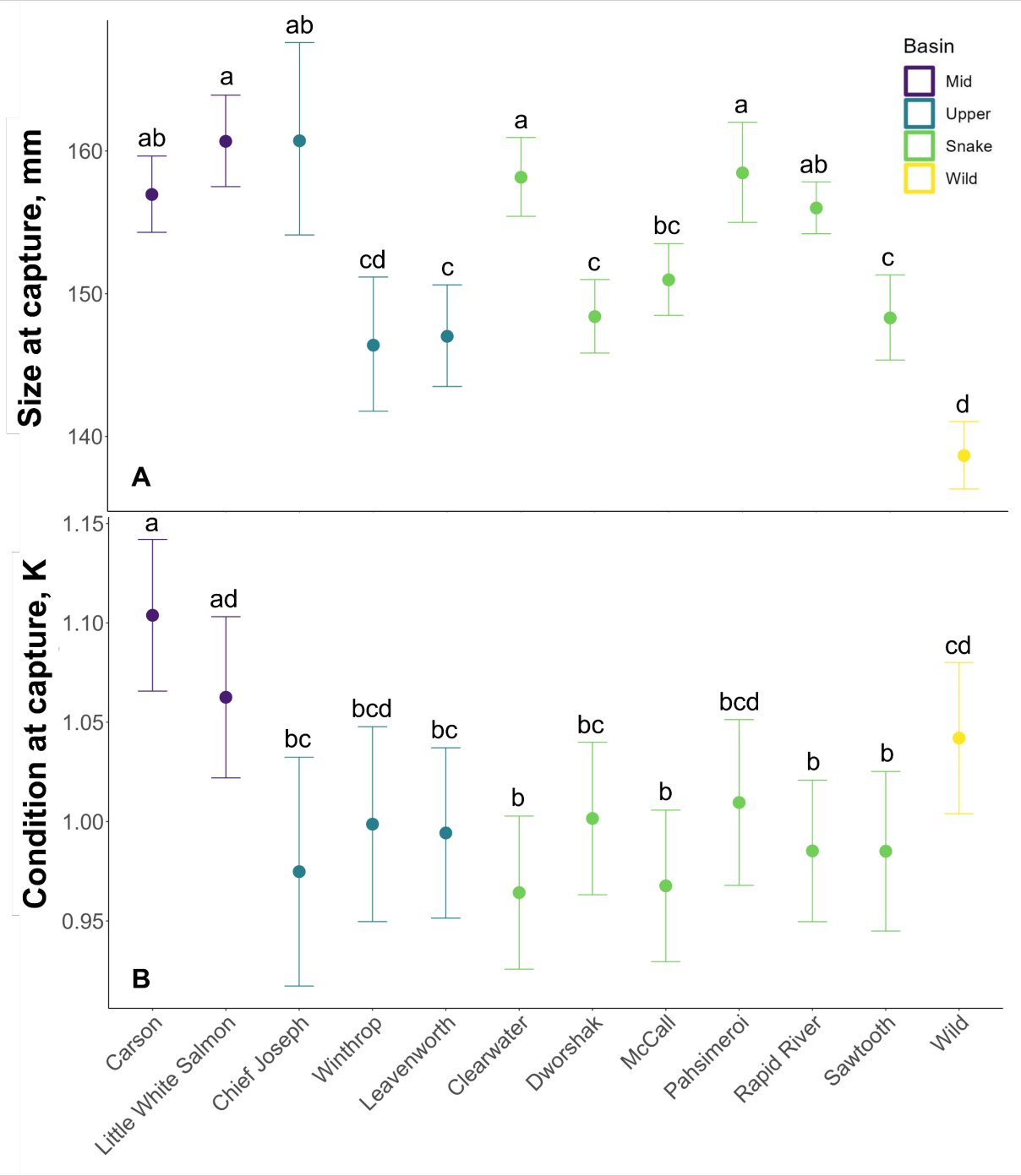
Basin	Hatchery	2015	2016	2017	2018	2019	2020	2021	Total
Mid-Columbia River	**Carson**	10	12	6	24	5	No catch data due to COVID-19	46	**103**
	Cle Elum		3	1				4	**8**
	Klickitat	2			12			1	**15**
	Little White Salmon	3	6	4		4		58	**75**
	Parkdale	2	2	1	5	1		8	**19**
	Round Butte	2			2				**4**
	Umatilla	2	1		3				**6**
	Walla Walla							11	**11**
	Warm Springs		10	1	1				**12**
Upper-Columbia River	**Chief Joseph**		2		8			7	**17**
	Leavenworth	10	17		16	3		6	**52**
	Methow	2	7						**9**
	Winthrop	15	3		2	2		7	**29**
Snake River	**Clearwater**	9	34		5	15		35	**98**
	Dworshak	8	21	3	24	6		37	**99**
	Lookingglass	14	25		9				**48**
	Lyons Ferry	3							**3**
	McCall	31	42	1	19	6		9	**108**
	Nez Perce	2	2		4				**8**
	Pahsimeroi	3	35	1	19	2		1	**61**
	Powell		1	2				2	**5**
	Rapid River	49	68	3	47	14		39	**220**
	Sawtooth	21	18	1	25	2		7	**74**
Unmarked		15	35	7	34	5		29	**125**
Total		**203**	**344**	**31**	**259**	**65**		**307**	**1,209**

How does size and condition vary across

hatcheries & between hatchery and wild origin?

2015 - 2019 & 2021

Length and condition at capture: 2015-2019, 2021

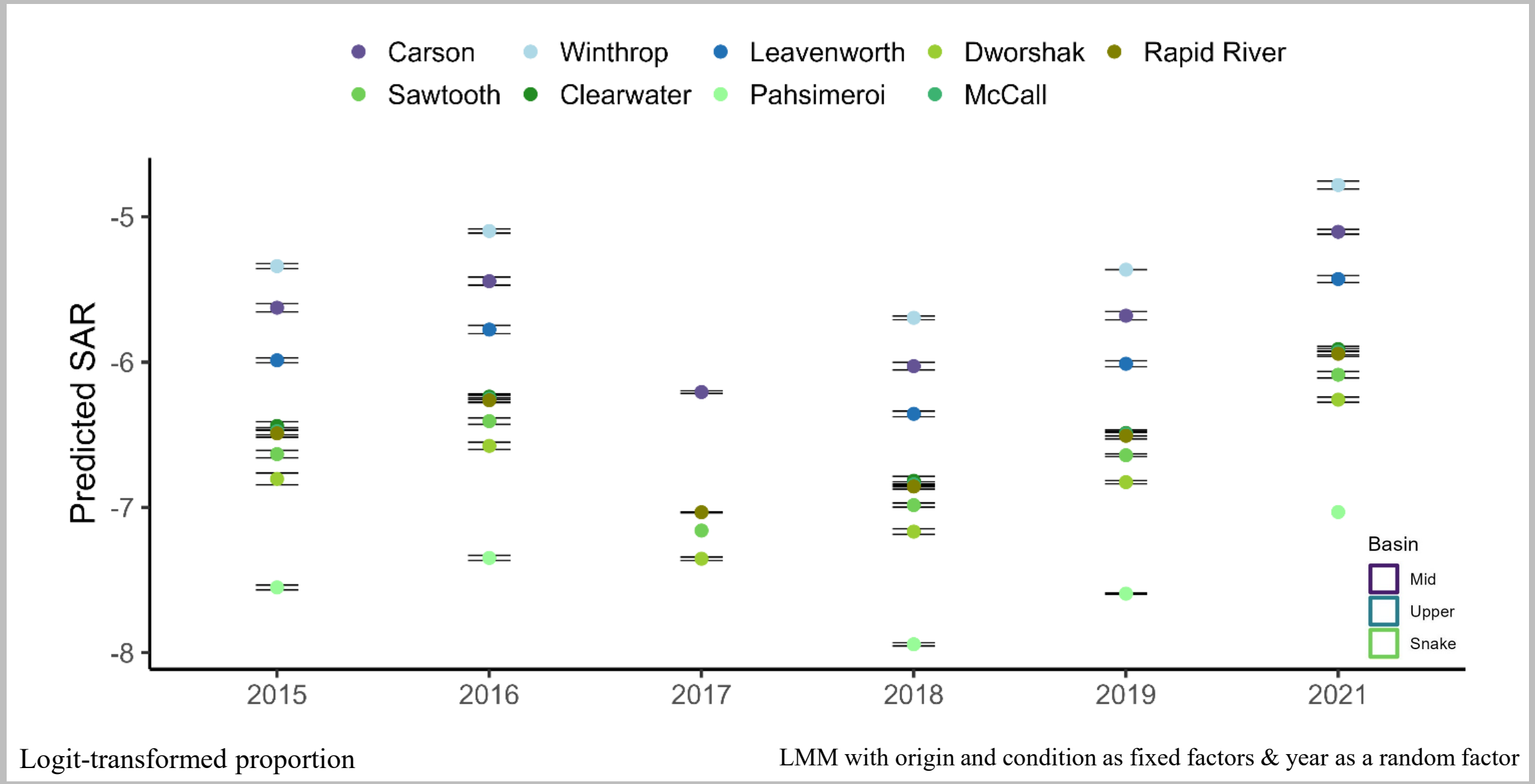


Does hatchery-specific size and condition explain

inter- and intra-annual variation in SARs?

2015 - 2019 & 2021

Predicted SARs by Year

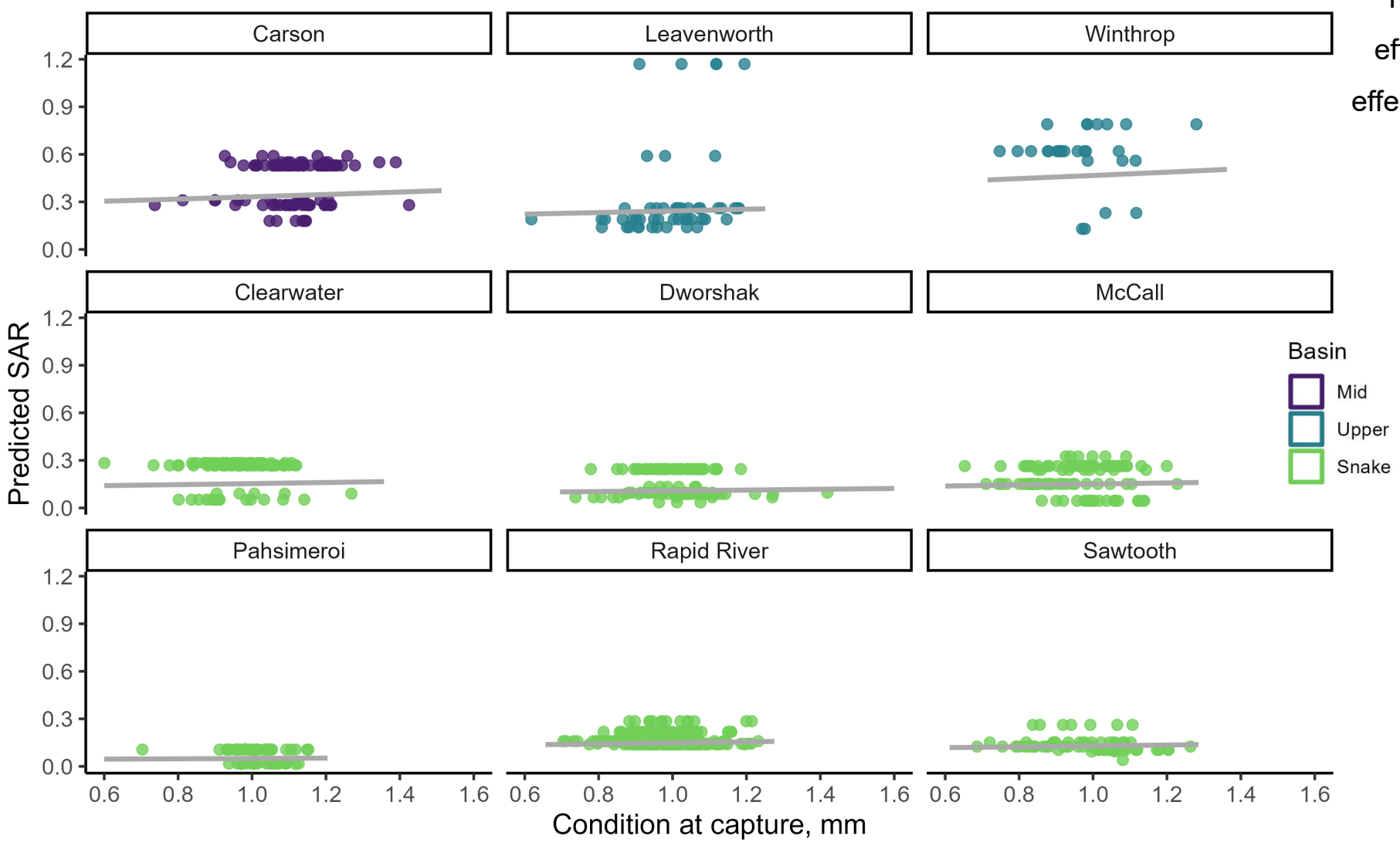


Logit-transformed proportion

LMM with origin and condition as fixed factors & year as a random factor

Forney et al. 2025 *(In prep.)*

Predicted SARs by origin and condition at capture



Results from linear mixed effect model to examine the effect of origin and condition on Smolt-to-Adult return.

Marginal R^2 = 0.432

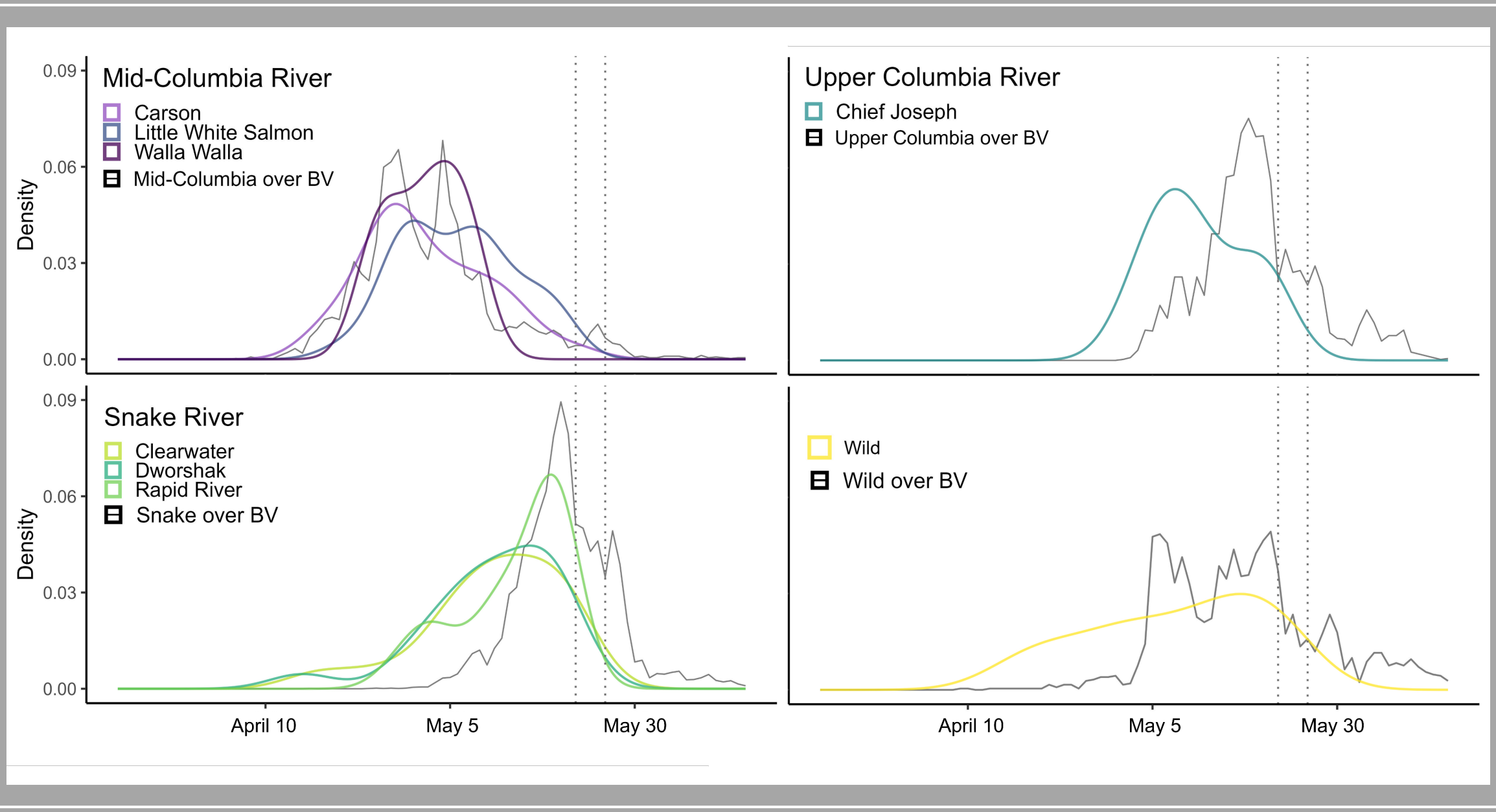
Conditional R^2 = 0.720

Forney et al. 2025 *(In prep.)*

How does ocean entry timing and early marine growth differ across hatcheries and between hatchery and wild origin?

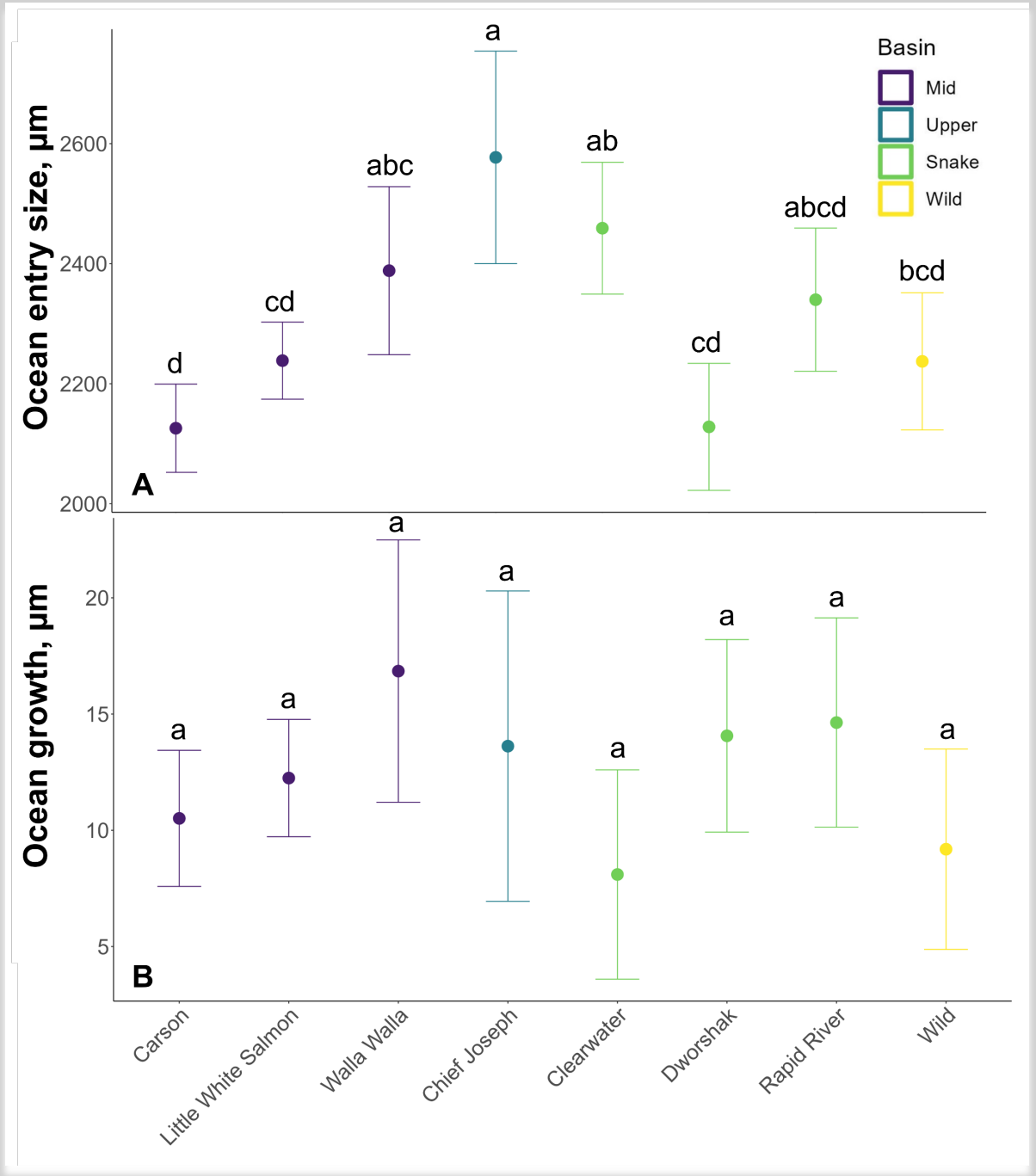
2021

Ocean Entry Timing: 2021

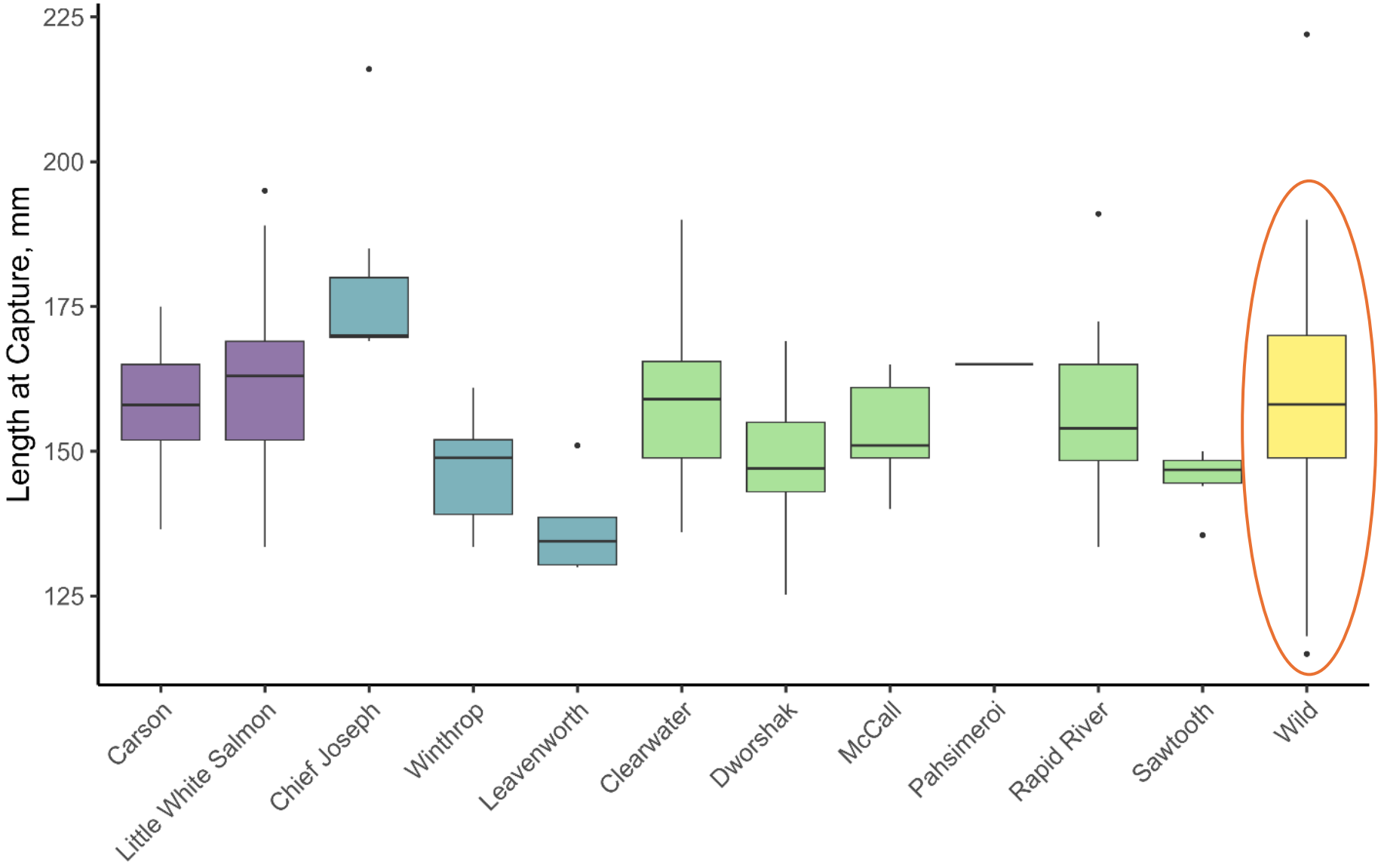


Forney et al. 2025 *(In prep.)*

Ocean size & growth: 2021



Length at Capture: 2021



Conclusions

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- ★ The interaction between origin and condition accounts for 72% of the variation in survival

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- ★ Persistent inter- and intra-annual patterns among hatcheries
- ★ The interaction between origin and condition accounts for 72% of the variation in survival
- ★ Migration timing and size at ocean entry varied, but growth rates were similar

Management Implications

- Are there hatchery practices that we should be aware of to inform our analysis?
- Size at release data reliability
- How can our data be of use for you!
- Are hatchery fish a good surrogate for wild fish?

Questions

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