


Emigration and survival of hatchery-reared Coho Salmon released as parr and smolts in a reintroduction program



William J. Bosch, Shubha N. Pandit, Todd Newsome, Andrew P. Matala, Chris Frederiksen, Zack Mays, David Lind, and Mark V. Johnston

Acknowledgements: átwai Melvin Sampson, Yakama Nation, MRS and Prosser staff, Coho techs, Charlie Strom, Daniel Brownlee, Michael Fiander, Daylen Isaac, Anneliese Myers, WDFW, NOAA, USFWS, BOR, CRITFC, PSMFC, and BPA



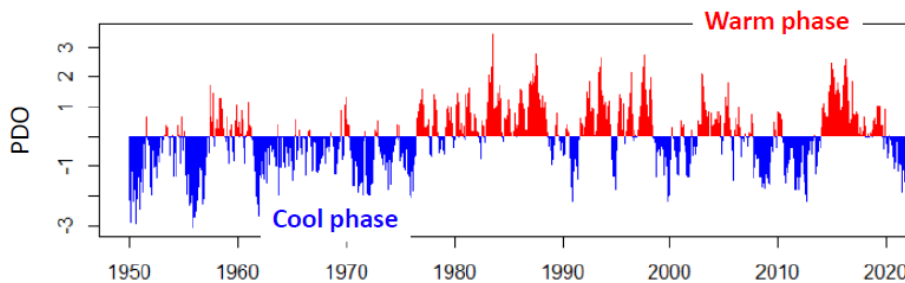


“We have been too content with turning out a nice looking report of the number of fish hatched, reared, and presumably planted; and not sufficiently concerned with what actually happened to the fish afterward” – WM Keil 1935.



Ecological implications of changing hatchery practices for Chinook salmon in the Salish Sea

BENJAMIN W. NELSON^{1,2,†} ANDREW O. SHELTON,³ JOSEPH H. ANDERSON,⁴
MICHAEL J. FORD,³ AND ERIC J. WARD³



Are current hatchery strategies designed to engage with future ocean variation?

(this will be very Chinook salmon-centric)

Brian Beckman
NWFS, NMFS, Seattle

Reared to become wild-like: addressing behavioral and cognitive deficits in cultured aquatic animals destined for stocking into natural environments—a critical review

Joacim Näslund

Bull Mar Sci. 97(4):489–538. 2021
<https://doi.org/10.5343/bms.2020.0039>

Can reducing the homogenization that hatchery-reared fish experience under present practices improve survival?

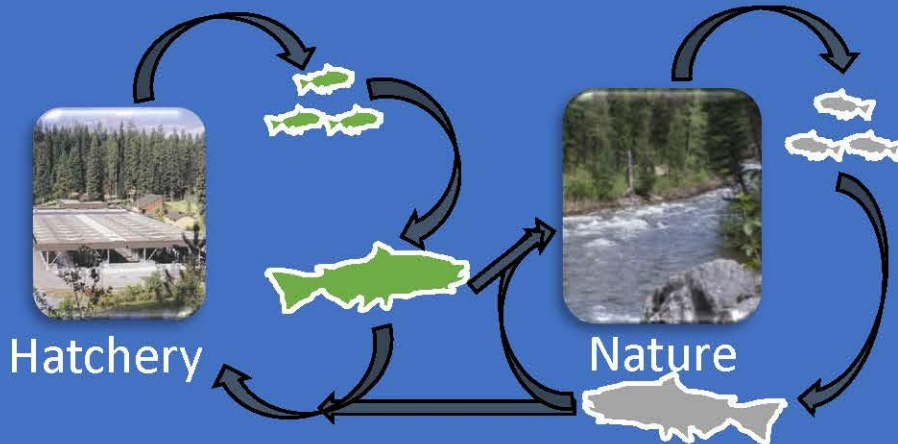
Management purpose of hatchery programs

Credit: M. Hess / B. Johnson

- 1.) Harvest Fishery – Fish for harvest
- 2.) Supplementation – Prevent extirpation, rebuild natural production
- 3.) Reintroduction – Restore extirpated populations

Two different management approaches

Supplementation & Reintroduction [Integrated management]

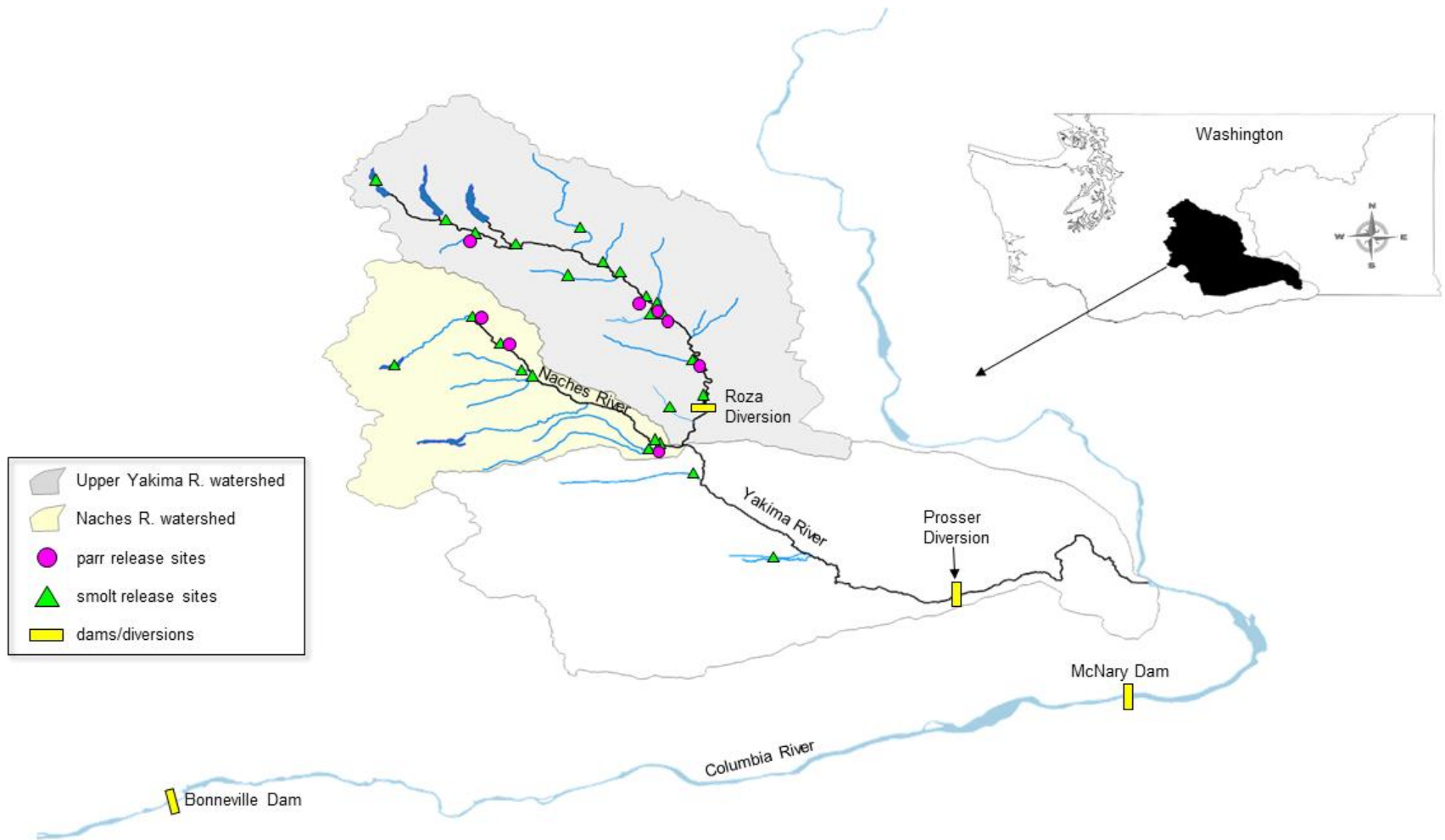


- Two environments, One population
- Support rebuilding natural production
- Prevent or restore extirpated populations

Harvest Fishery [Segregated management]

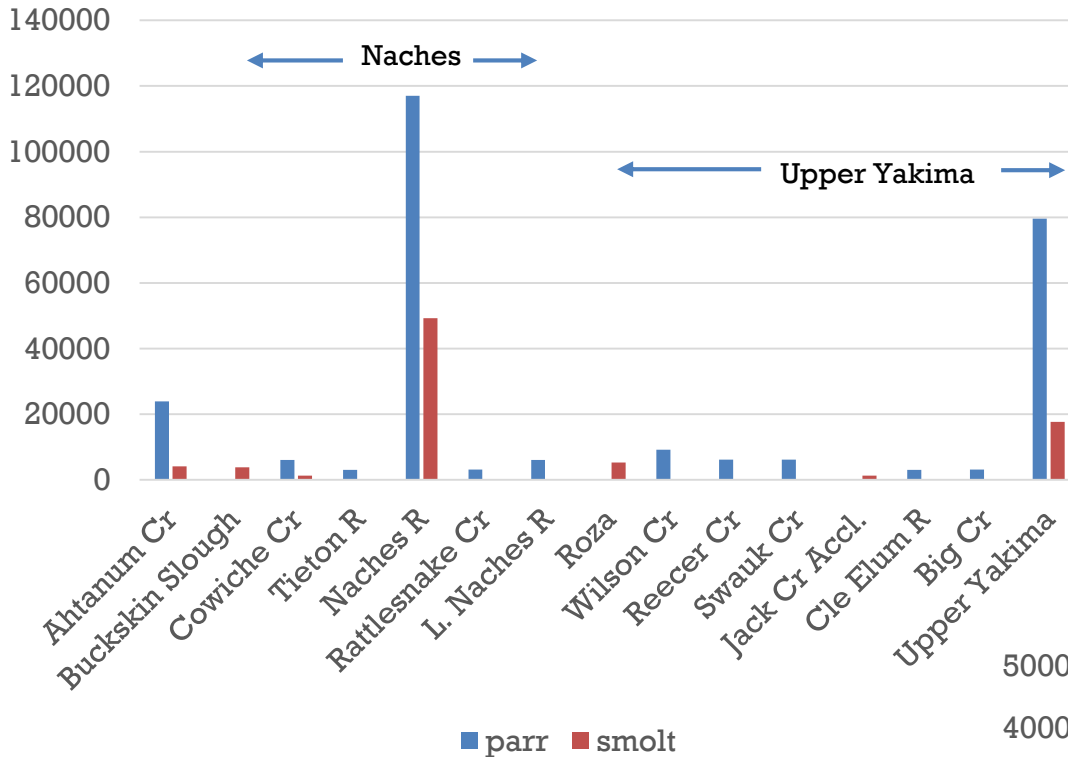


- Two environments, Two populations
- Promotes harvest of hatchery fish
- Managed to not impede recovery of natural populations

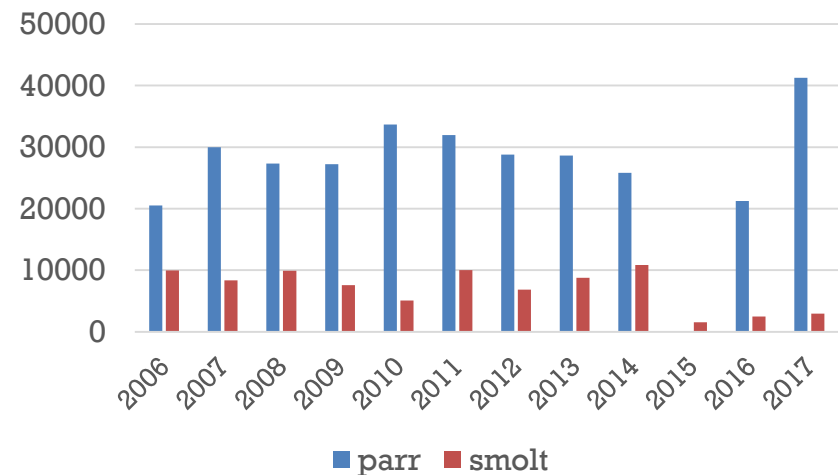


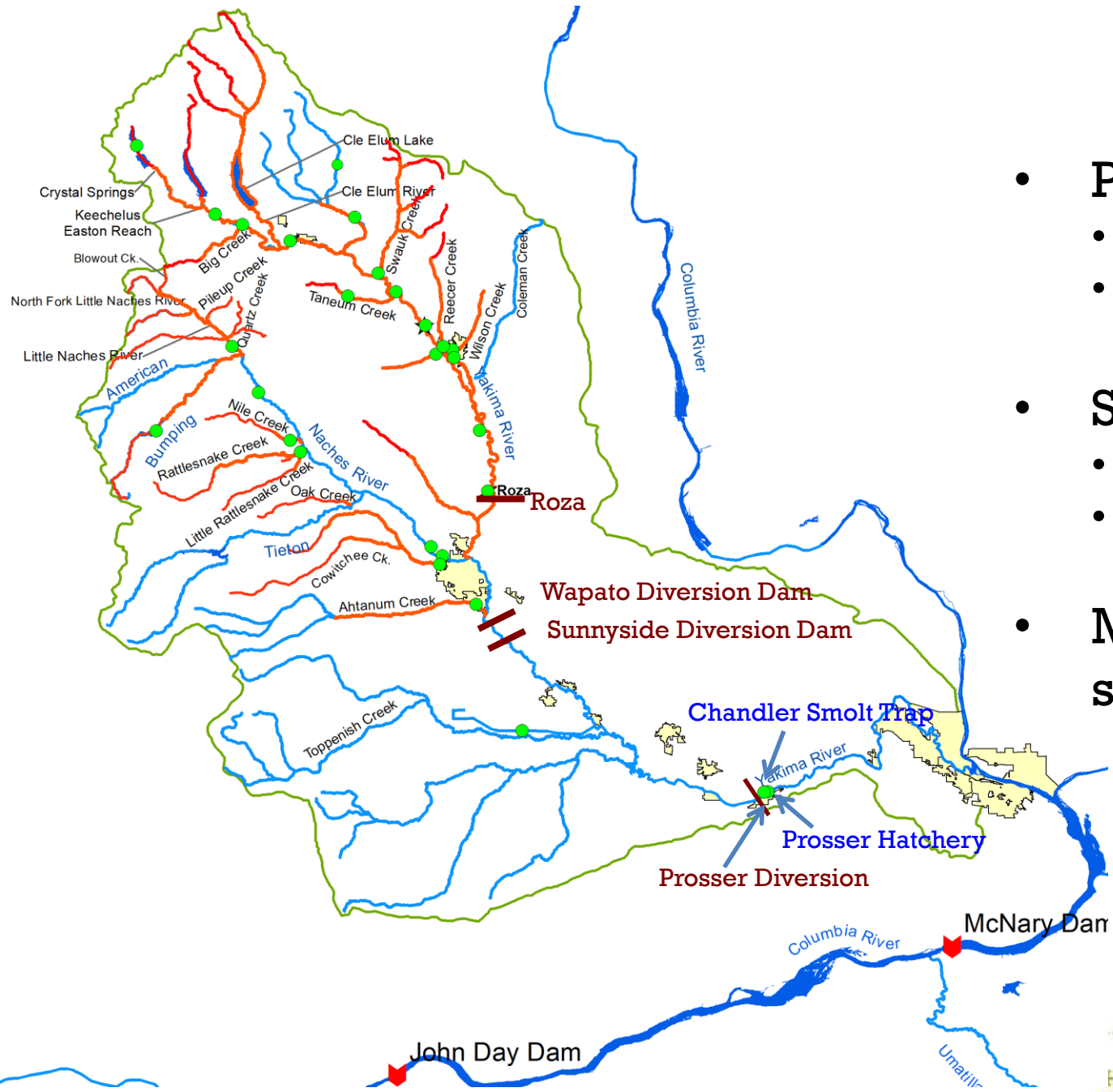
- Targeted Tributaries upstream of Union Gap
- Smolt and Parr Releases
- Brood Years 2006-2017

Methods – PIT-tagged Coho Releases



	Parr	Smolt
Ahtanum	9%	5%
Naches	50%	68%
Upper YR	41%	27%
Total PITs	316,414	84,372





- **Parr**
 - 90mm FL
 - Jun-Aug release
- **Smolts**
 - 113mm FL
 - Mar/Apr release
- **Migrate to sea in same year**

Methods – Downstream PIT Detects



Complete Tag History for

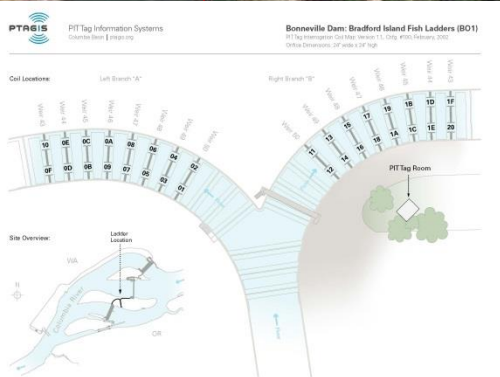
3D9.1C2CF08FFD

Mark and Release Information		File and Project Information	
Species	Hat. Coho	MRR Project	DTL - David Lind Projects
Mark Date	07/28/2009	Coordinator	Daylen Isaac
Mark Site	YAKIM1 - Yakima River - mouth to Naches River (km 0-187)	File Name	DTL-2009-209-PLN.xml
Mark Site Type	River Segment	Session Message	COHO PARR PLANTS MY2010: LITTLE NACHES R
Release Date	08/08/2009	Tag Distribution Information	
Release Site	NATCHR - Natches River	Tag Distributed By	PTAGIS
Release Site Type	River	FWP Project	1995-063-25 - YKFP - Monitoring And Evaluation
Release Site RKM	539.187.072	Project Contact	Mel Sampson
Event Capture Method	Dip Net	Tag Recipient	Ida Ike
Length (mm)	87	Ship Date	12/04/2008
Weight (g)		Tag Type	12 millimeter PIT tag
Conditional Comments		Tag Model	TX1400SST
Text Comments			

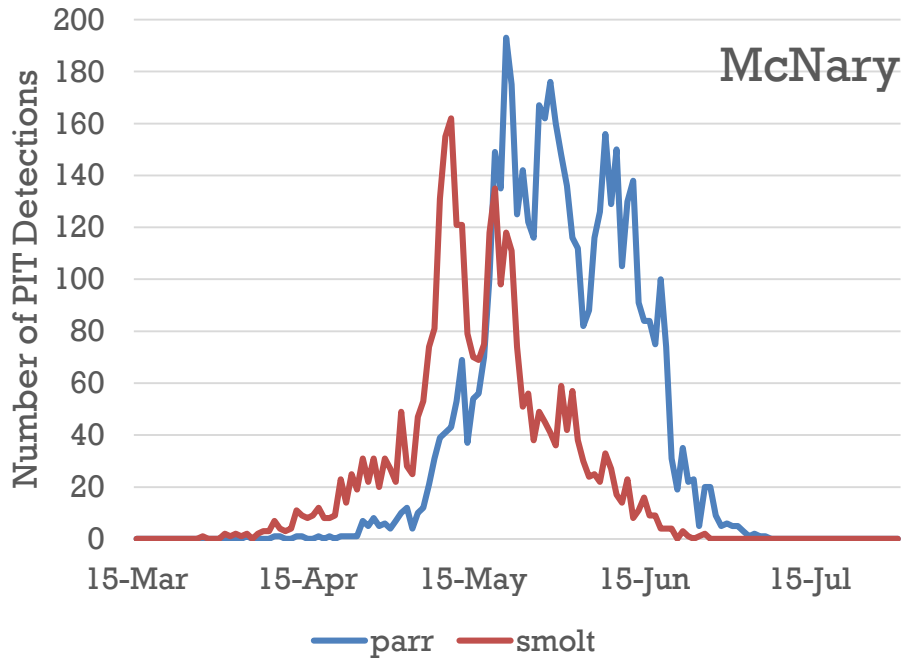
Event Summary

Tag	Event Date	Event Type	Event Site	Event Site RKM	Event Release Date	Event Release Site	Event Release RKM
3D9.1C2CF08FFD	07/28/2009	Mark	YAKIM1	539	08/08/2009	NATCHR	539.187.072
	05/27/2010	Observation	PRO	539.076			
	06/02/2010	Observation	BCC	234			
	09/17/2011	Observation	BO1	234			
	09/18/2011	Observation	BO1	234			
	09/27/2011	Observation	MC1	470			
	10/12/2011	Observation	PRO	539.076			

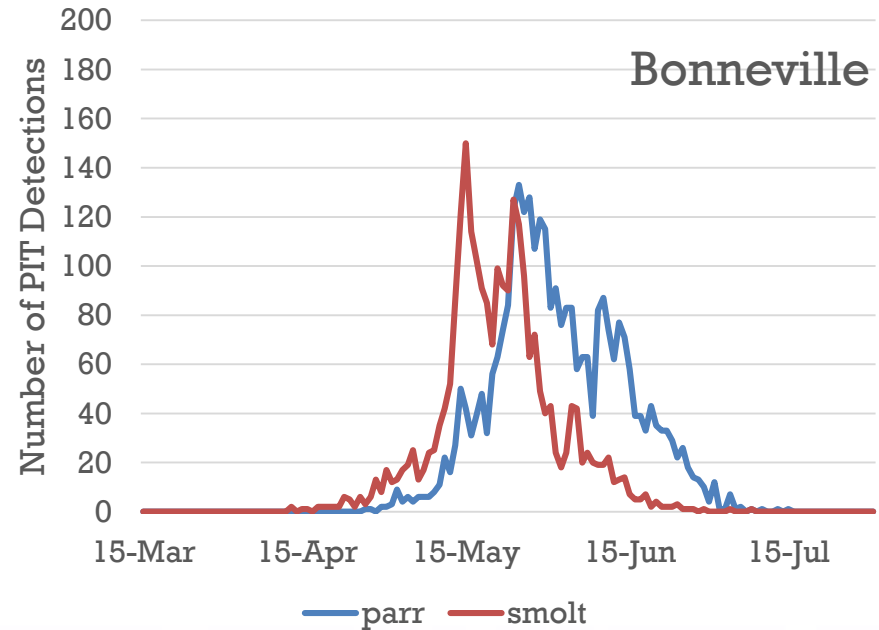
- Emigration Timing – McNary and Bonn.
- Release to Bonn. adult survival
- Bonn. juv. to Bonn. adult survival
- Age-at-return



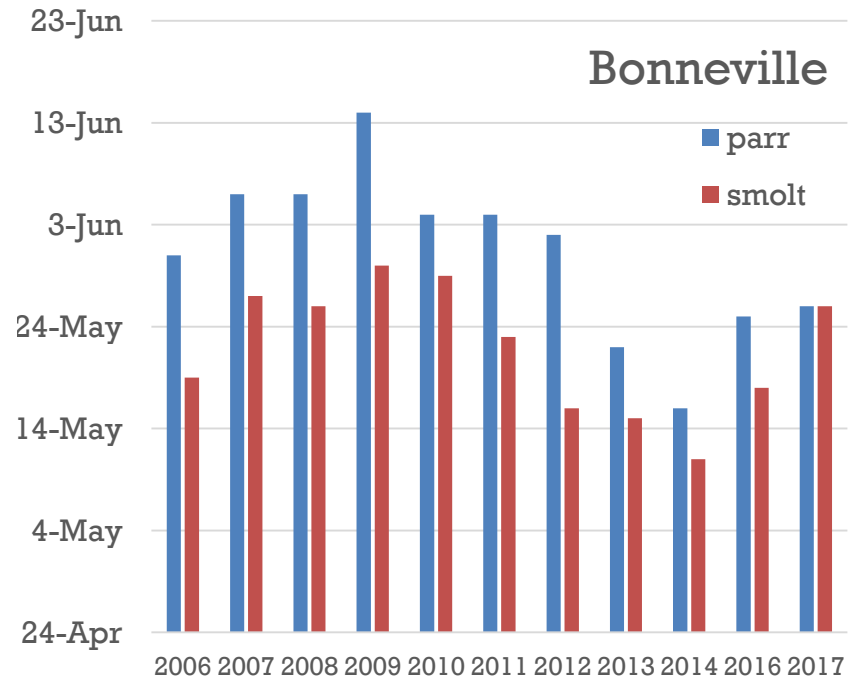
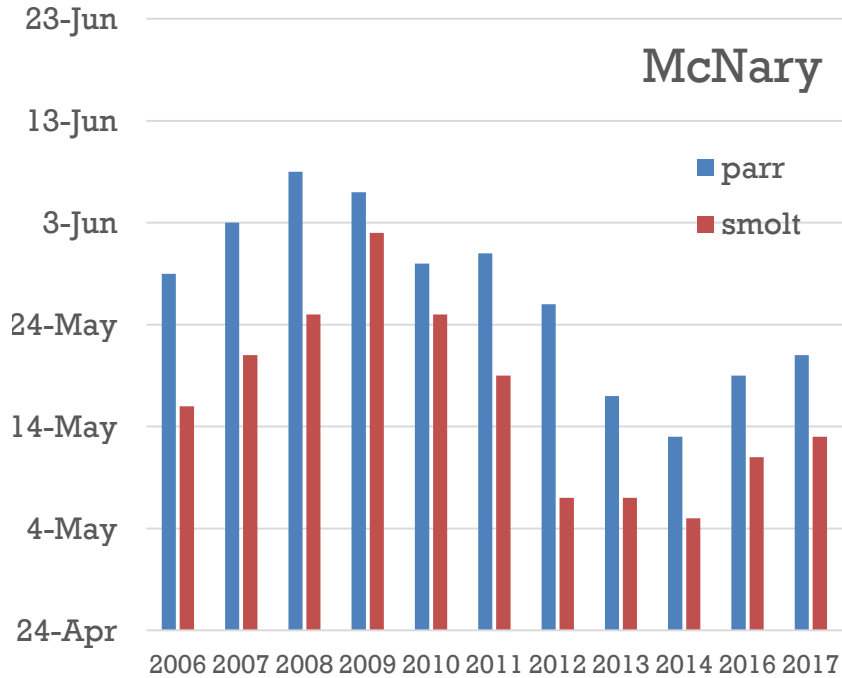
Results – Juvenile Emigration Timing



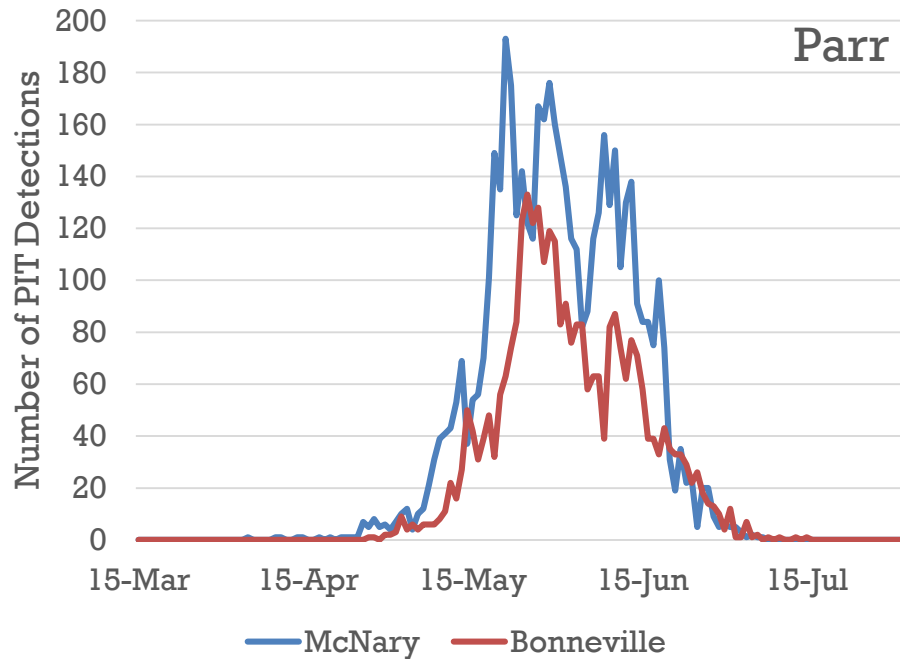
	Parr	Smolt
McN	30-May	16-May
Bonn	1-June	21-May



Results – Juvenile Emigration Timing

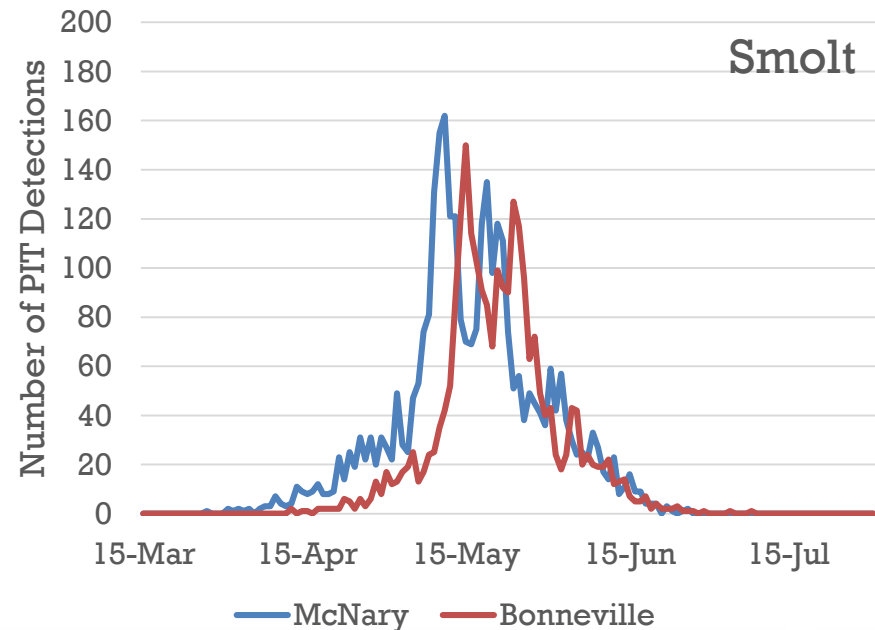


Results – Juvenile Travel Times



McN-Bonn Travel Days

	Mean	SE
parr	4.06	± 0.09
smolt	4.67	± 0.09

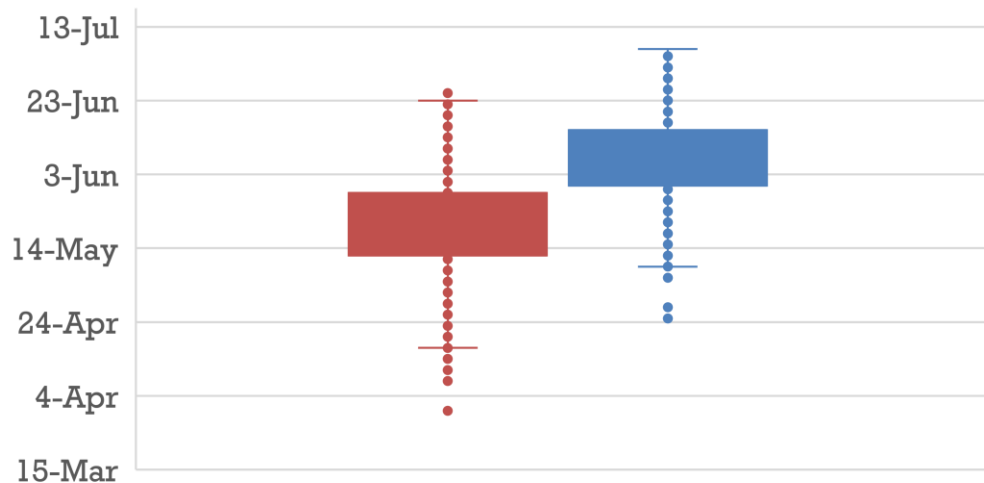


Results – Juvenile Emigration Timing to McN



Naches

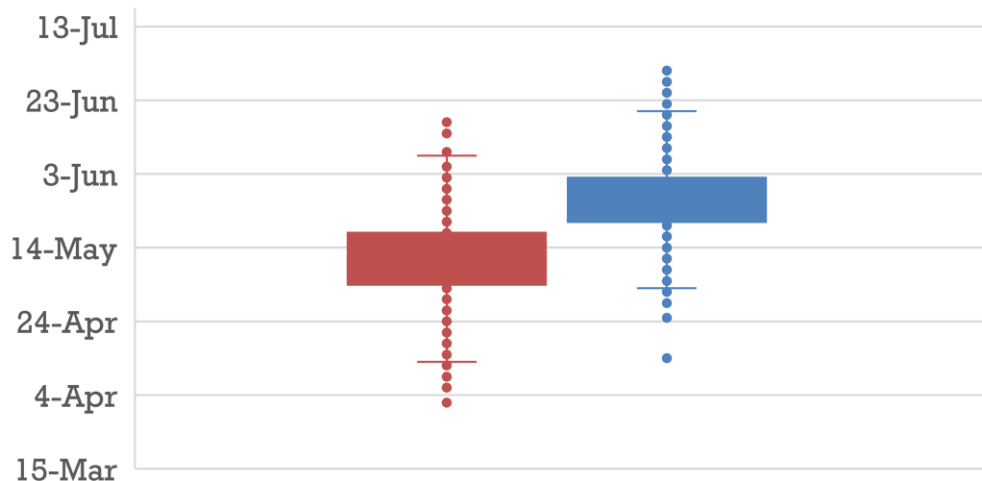
■ smolt ■ parr



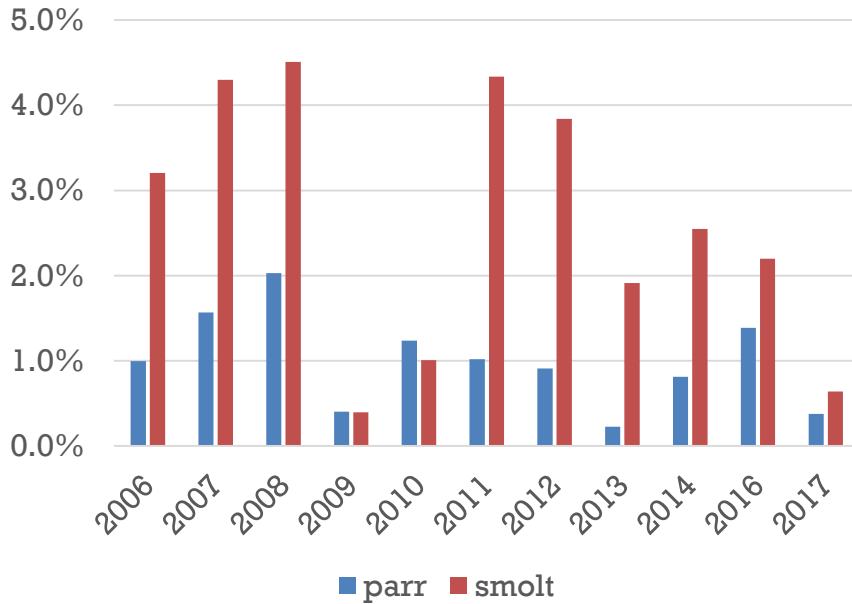
	Parr	Smolt
Naches	04-Jun	17-May
UppYak	25-May	10-May

Upper Yakima

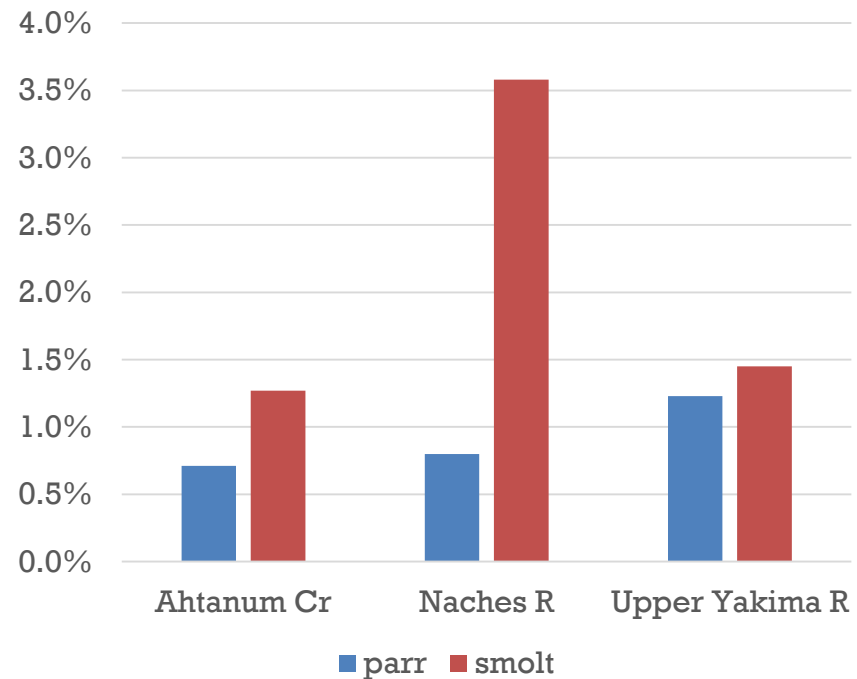
■ smolt ■ parr



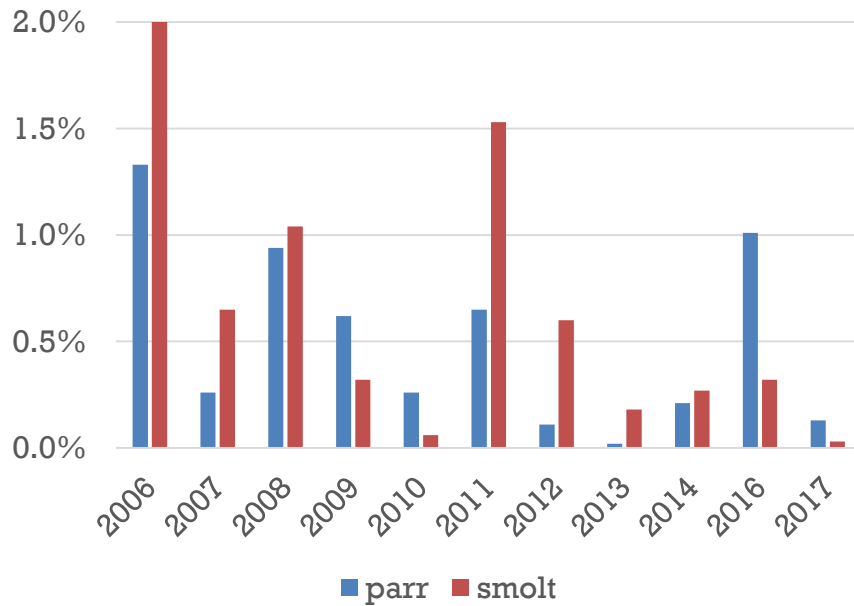
Results – Bonn. Juv. Detection* Rates



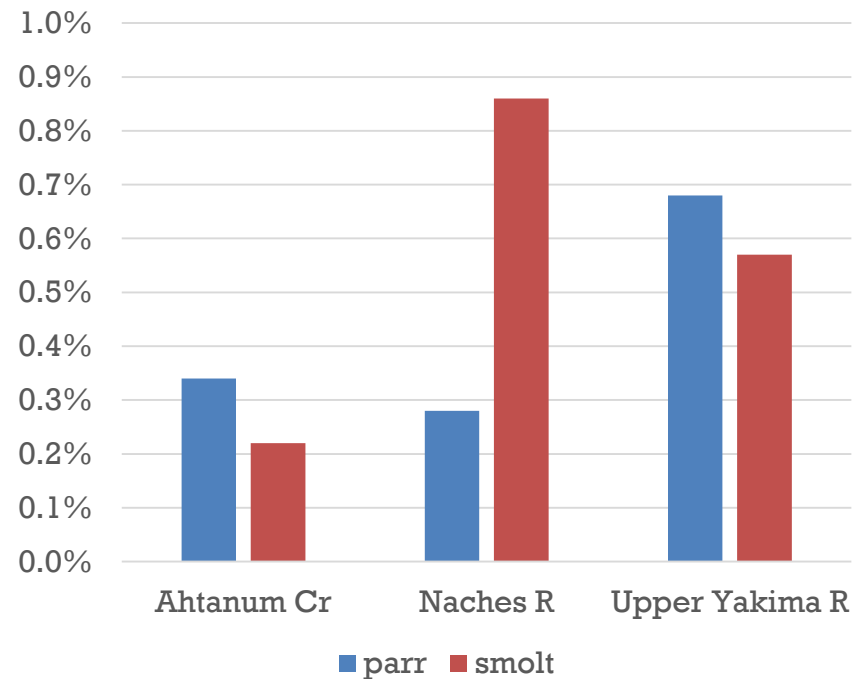
P = 0.003	Parr	Smolt
Mean	1.00%	2.63%
± SE	0.16%	0.46%



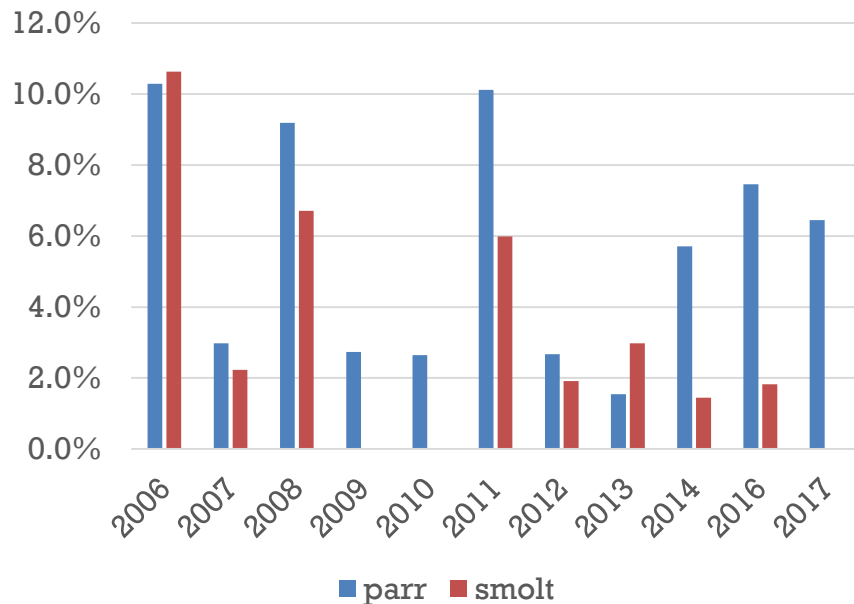
Release to Bonn. Adult Returns



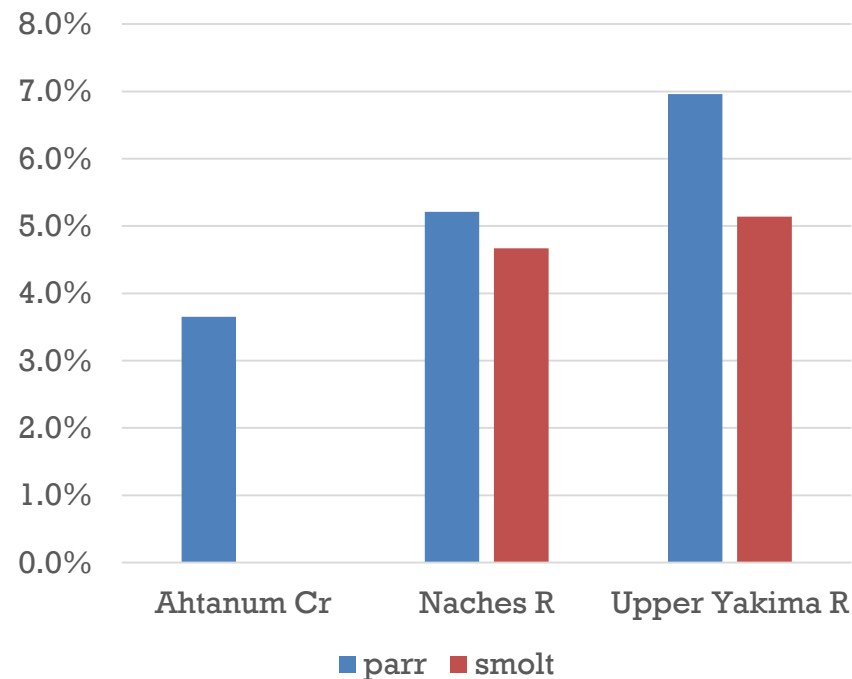
P = 0.57	Parr	Smolt
Mean	0.50%	0.64%
± SE	0.13%	0.19%



Results – Bonn. smolt to Bonn. adult returns



P = 0.03*	Parr	Smolt
Mean	5.15%	2.31%
± SE	0.97%	0.75%

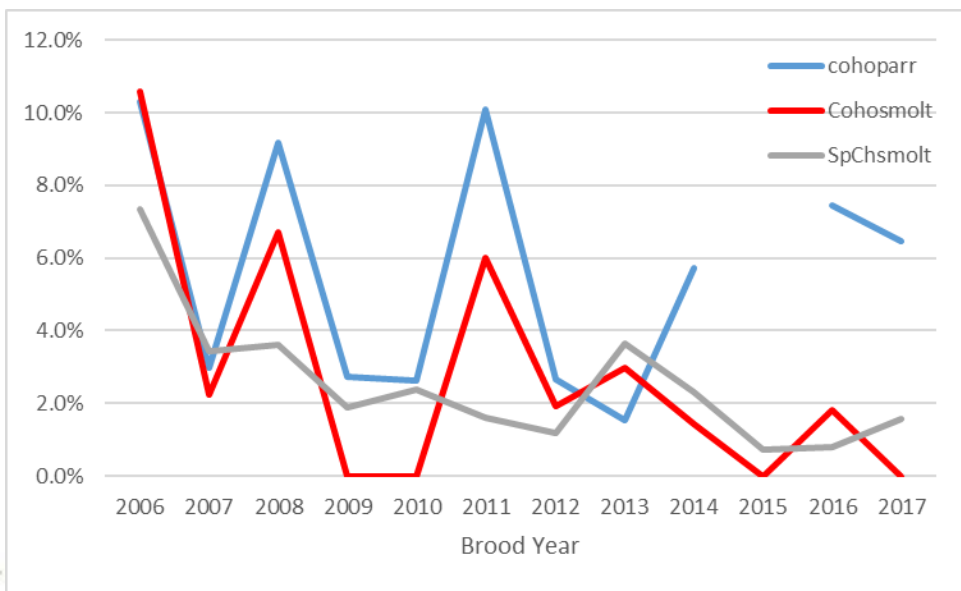
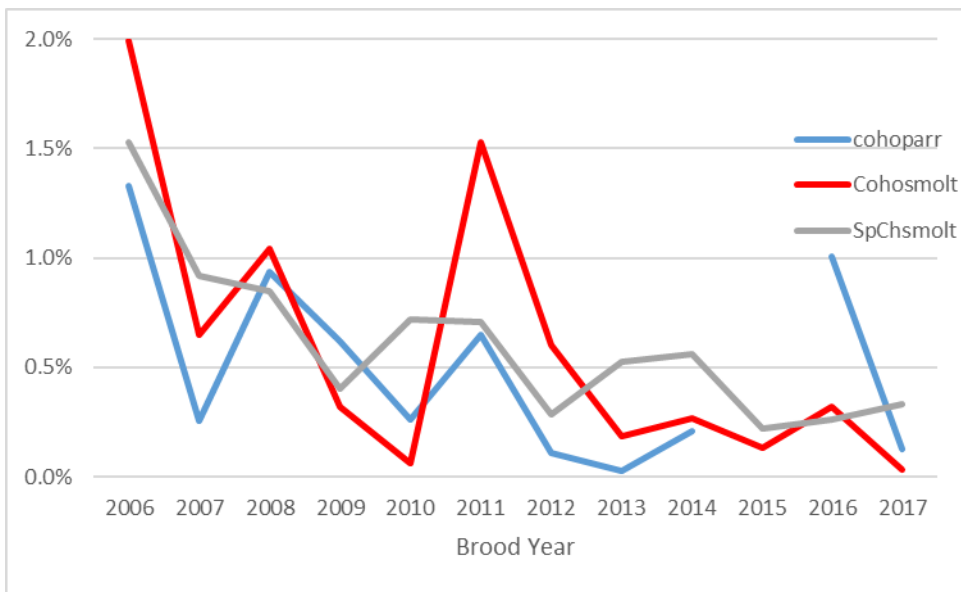


SARs with Spring Chinook



Release to
Bonn. Adult

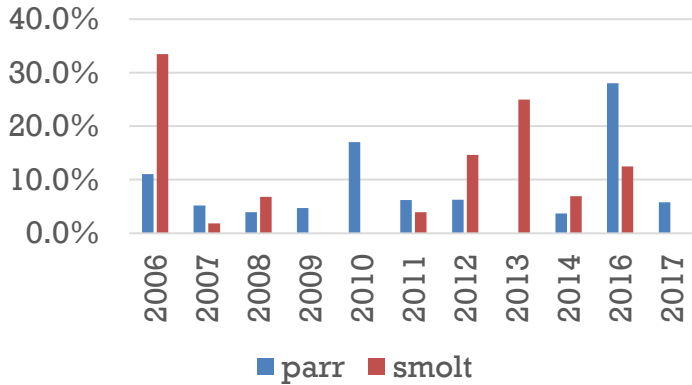
Bonn. Juv.
Bonn. Adult
(marine index)



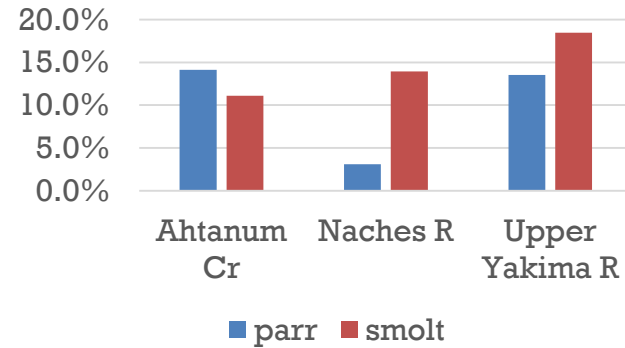
Results – Age at adult return



Age-2



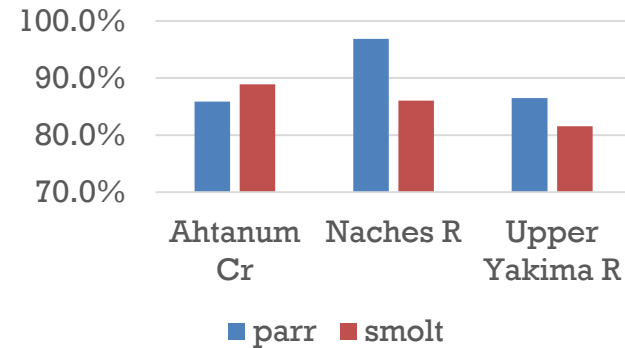
Age-2



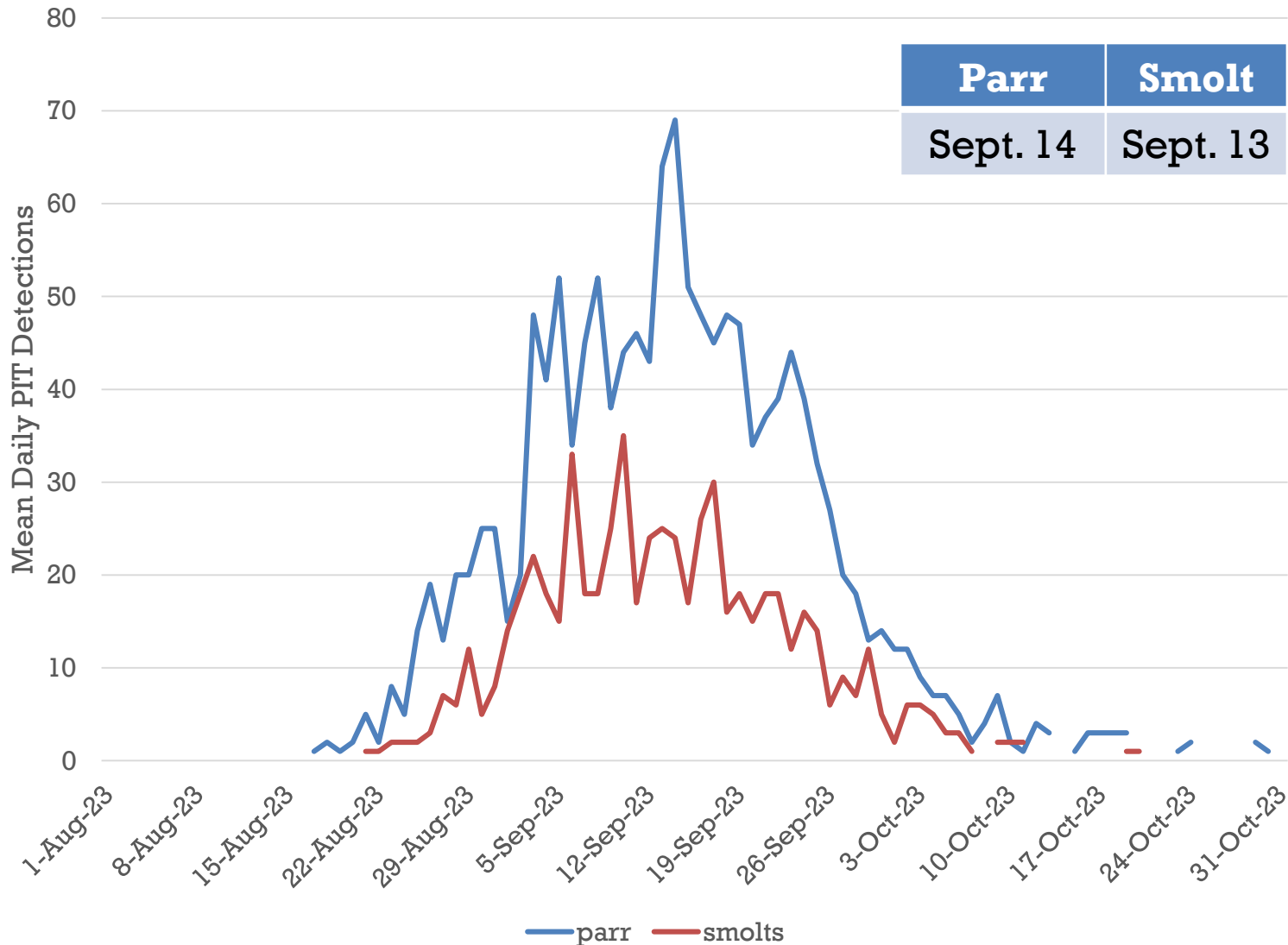
Age-3



Age-3



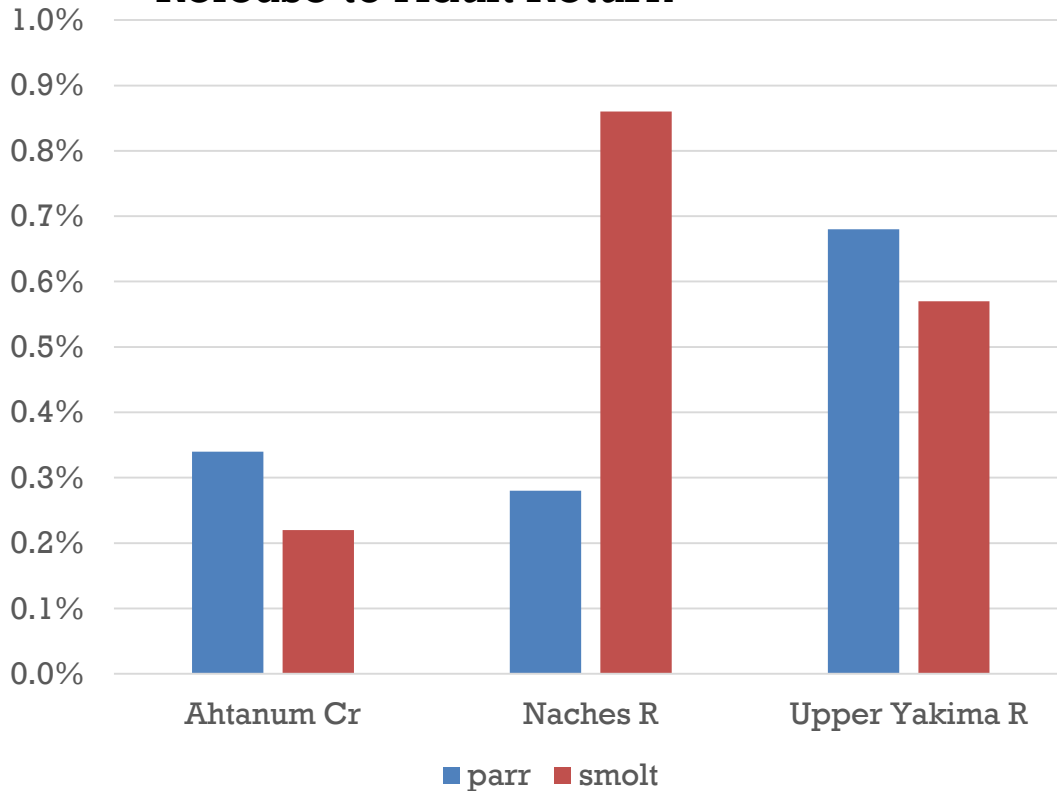
Bonneville Adult Return Timing



Discussion – Differential Effects



Release to Adult Return



McNary Arrival Times

	Parr	Smolt
Naches	04-Jun	17-May
UppYak	25-May	10-May

- Emigration Timing
- Water Management
- Overwinter cond.
- Predation

Discussion

- **Learned behavior/‘wildness’ in parr?**
- **Differential predation effects?**
- **Differential estuary survival?**
- **Different ocean distributions?**
- **Differential tag shedding?**

Adaptive Management Considerations

- **Smolt and adult releases only in Naches?**
- **Adults and parr only in Upper Yakima?**
- **CESRF Spring Chinook – fall release?**
- **Other ideas?**



Summary / ???

- Times are changing; not as simple as setting target release number and fish size
- Reducing homogenization of hatchery releases may produce survival and diversity benefits
- Applications to other species and programs??
- Your comments ...

More info:

Bill_Bosch@yakama.com

Todd_Newsome@yakama.com

Shubha_Pandit@yakama.com

Discussion – Flow/Spill Effects?

Bonneville, Migration Years 2010-2019

