

Precocious male maturation in Cle Elum Spring Chinook Salmon: Update.

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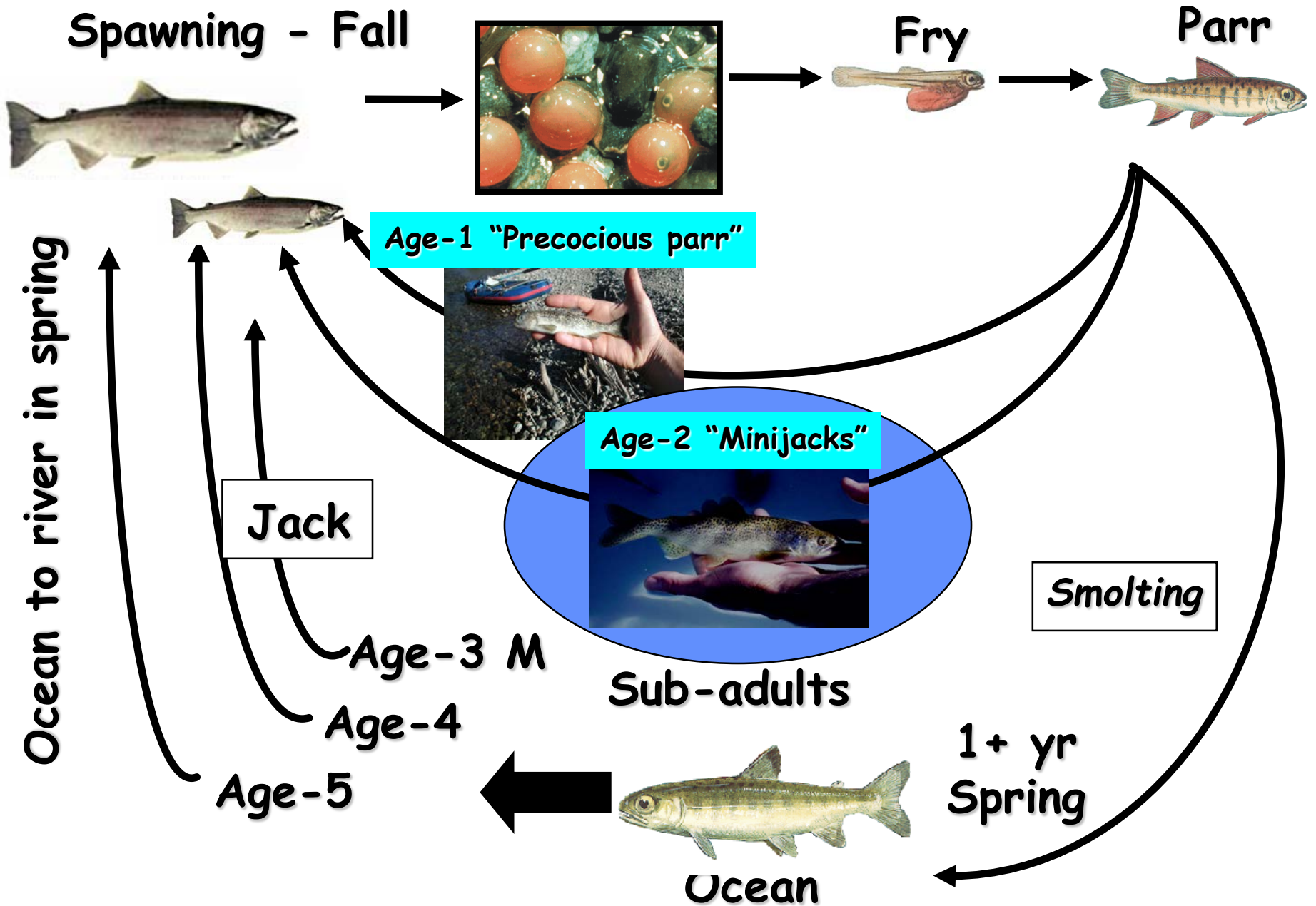
Dave Fast, Charles Strom, Mark Johnston, - Yakama Nation Fisheries



Acknowledgments

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- **Nez Perce Tribe**
- **Bonneville Power Administration, NOAA Biop Funding**

Spring Chinook Salmon



Variation in Age of Male Maturity



Mature male salmon

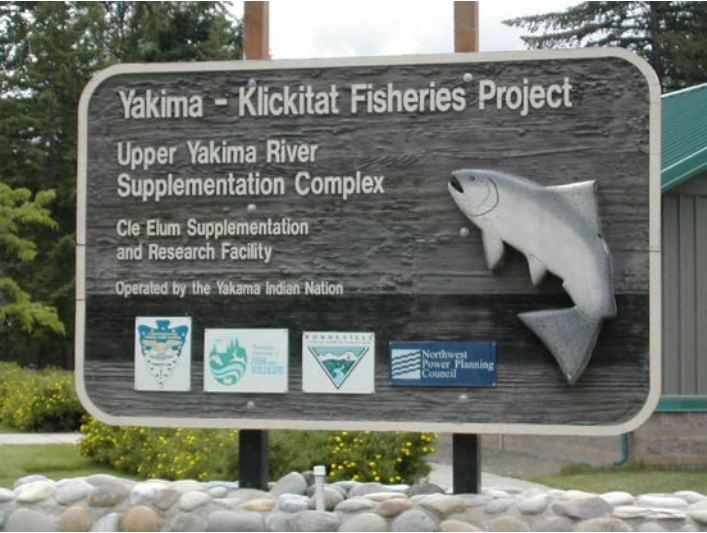
Factors Affecting Age of Maturation

- ✓ Genetics
- ✓ Environment
 - temperature
 - food availability
 - food quality



The Hatchery environment can significantly influence age of maturation

We've been monitoring the physiology of Cle Elum Hatchery Spring Chinook since implementation in 1997



On average 50% of male Cle Elum hatchery spring Chinook precociously matured at age-2

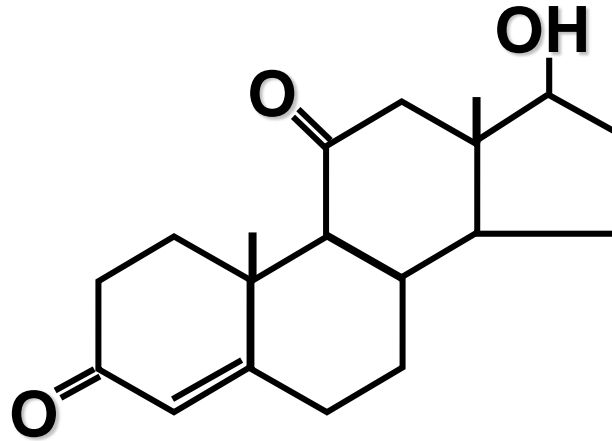
<u>BY</u>	<u>Release #</u>	<u>% of males</u>	<u># Minijacks</u>
1997	386,048	44%	84,931
1998	589,683	72%	211,107
1999	758,789	50%	189,697
2000	834,285	37%	153,508
2001	370,236	<u>52%</u>	95,520

Avg. 50%

Larsen, D.A., Beckman, B.R., Cooper, K.A., Barrett, D., Johnston, M., Swanson, P., and Dickhoff, W.W. (2004). Assessment of high rates of precocious male maturation in a spring Chinook salmon supplementation hatchery program. Transactions of the American Fisheries Society. 133, 98-120.

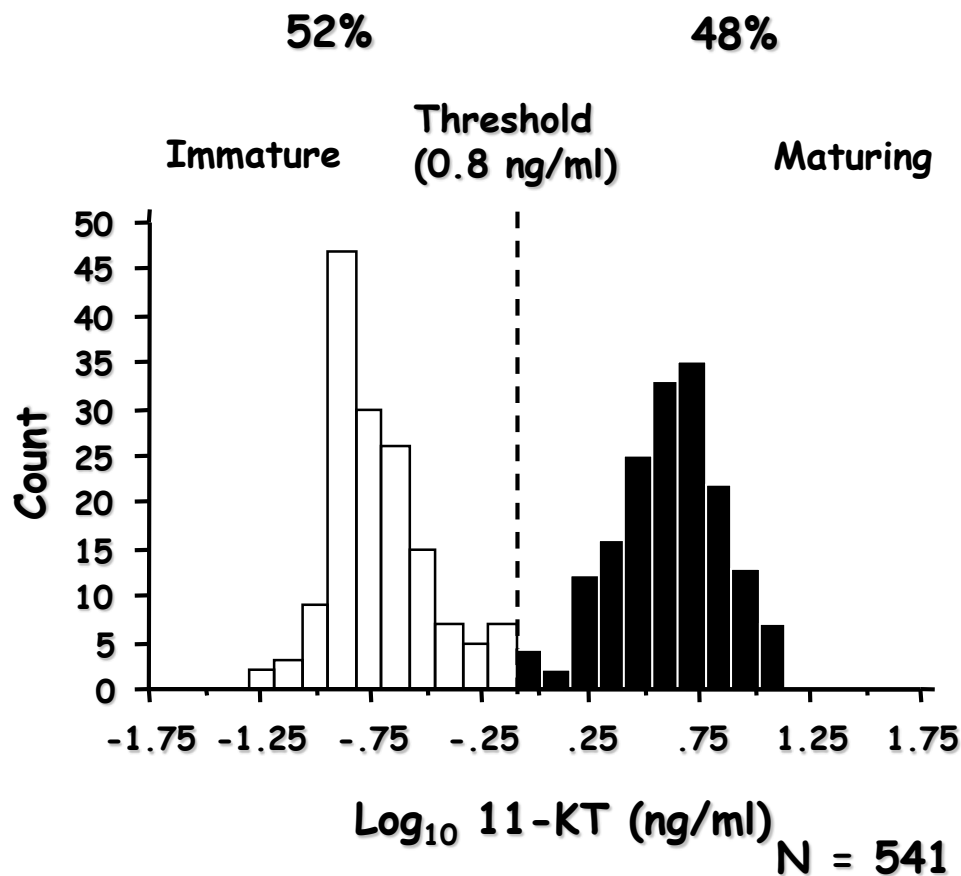
How do we assess precocious male maturation?

Plasma 11-ketotestosterone (11-KT)



- Major androgen in teleost fish
- Instrumental in the regulation of spermatogenesis

Every March the Cle Elum Chinook are screened for pathology just prior to volitional release

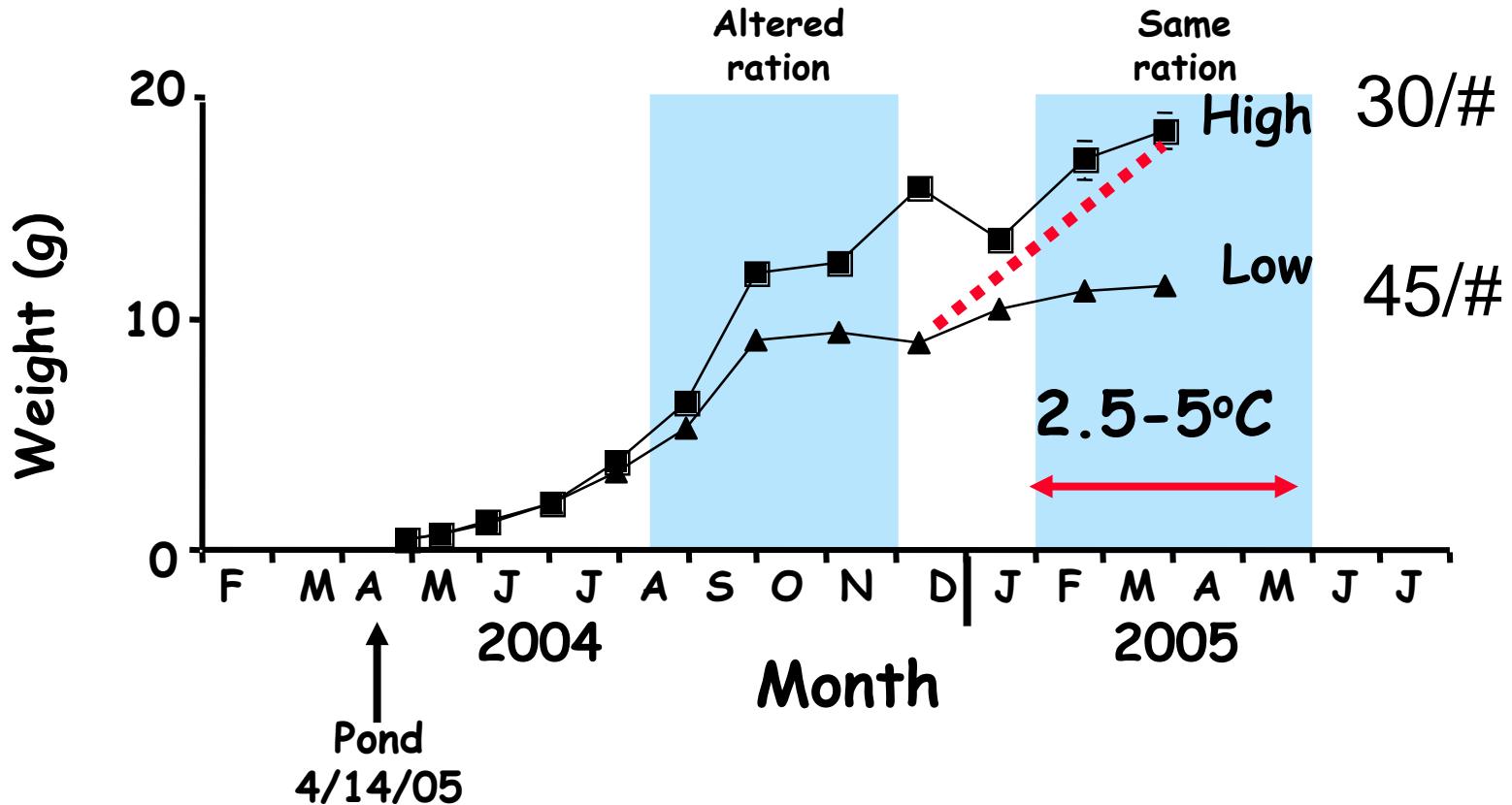


Consequences of high levels of precocious maturation

- Ecological impacts
- Genetic impacts
- Increased straying
- Skewed gender ratio
- Alters accuracy of SAR
- Loss of adult production



A Production Scale Growth Modulation Experiment (BY 2002-2004)

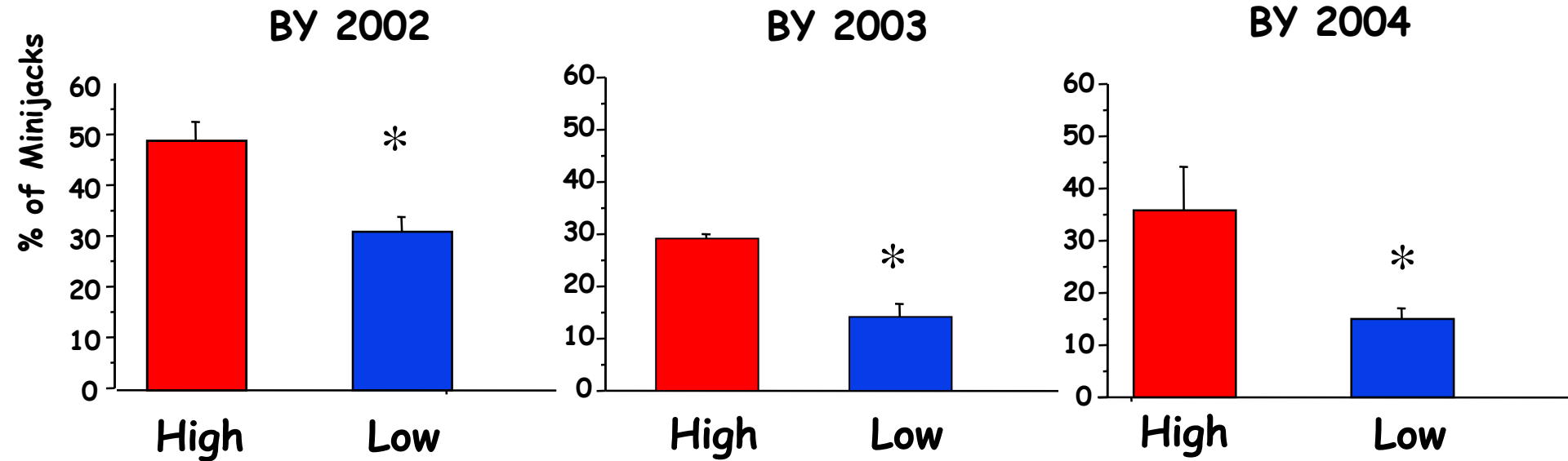


* Each treatment differentially tagged

Did growth modulation reduce the minijack rate?

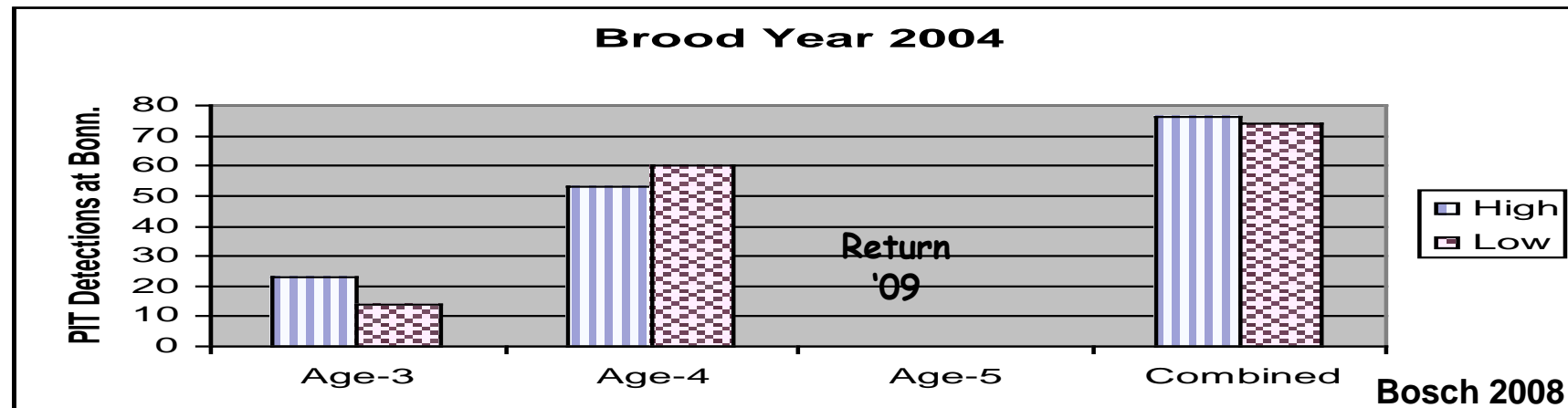
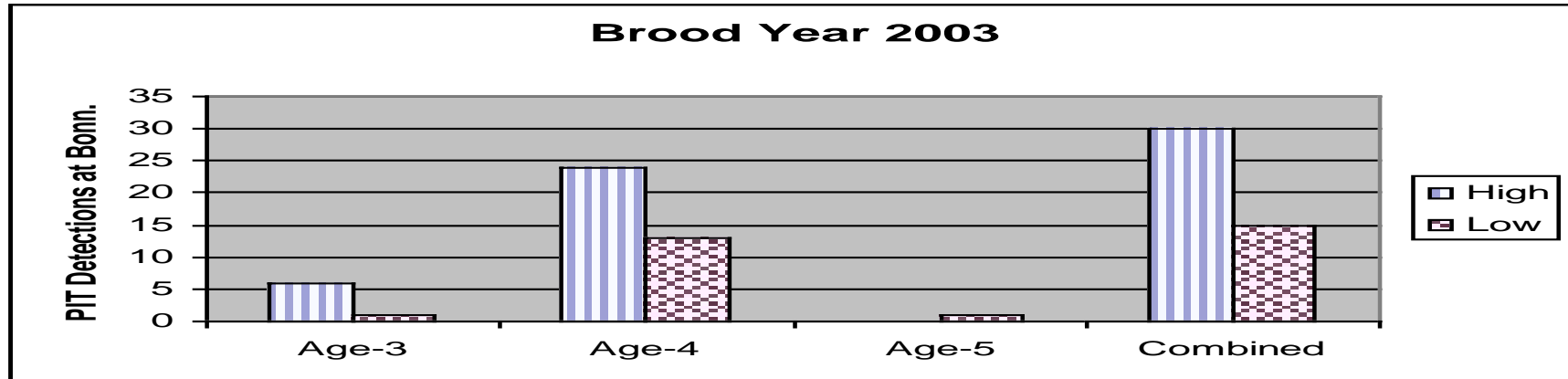
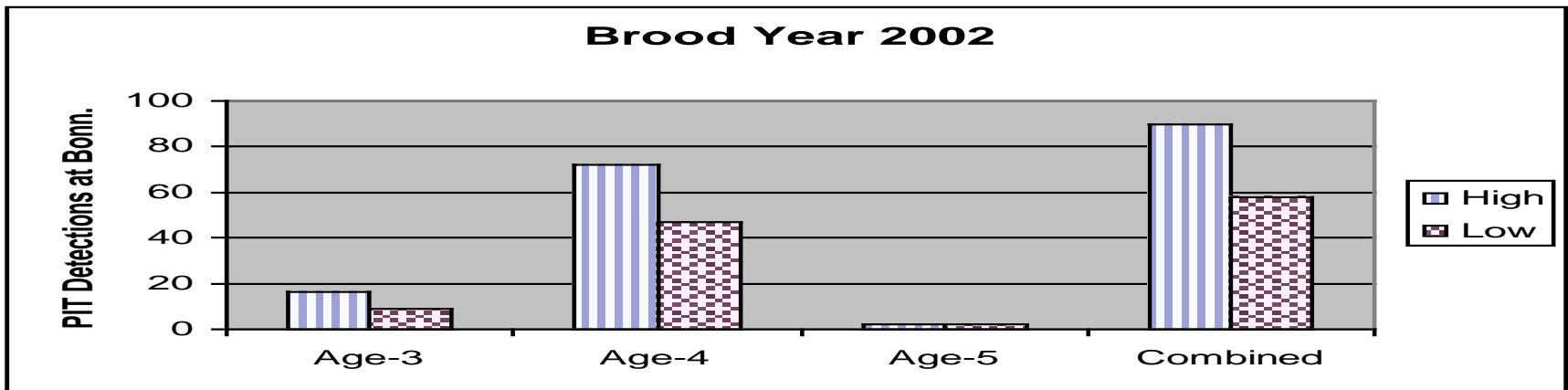


Minijack rates before release were consistently lower in the Low growth Trt.

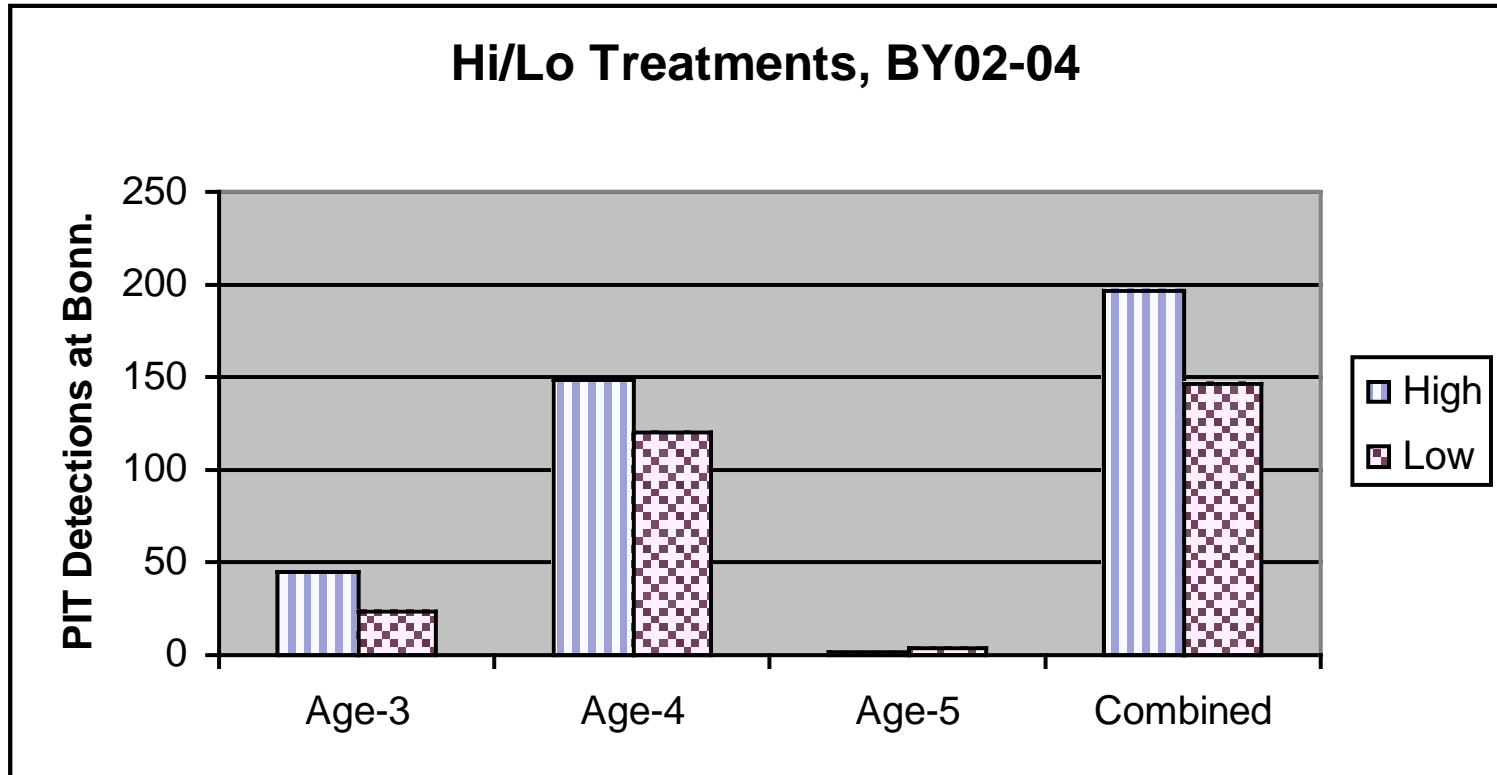


What happened to juvenile and adult survival?

Adult Return, is "mostly" lower for Low Growth Trt.



All Years Combined



On average 50% of male Yakima hatchery spring Chinook precociously matured at age-2

<u>BY</u>	<u>Release #</u>	<u>% of males</u>	<u># Minijacks</u>
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Avg. 50%

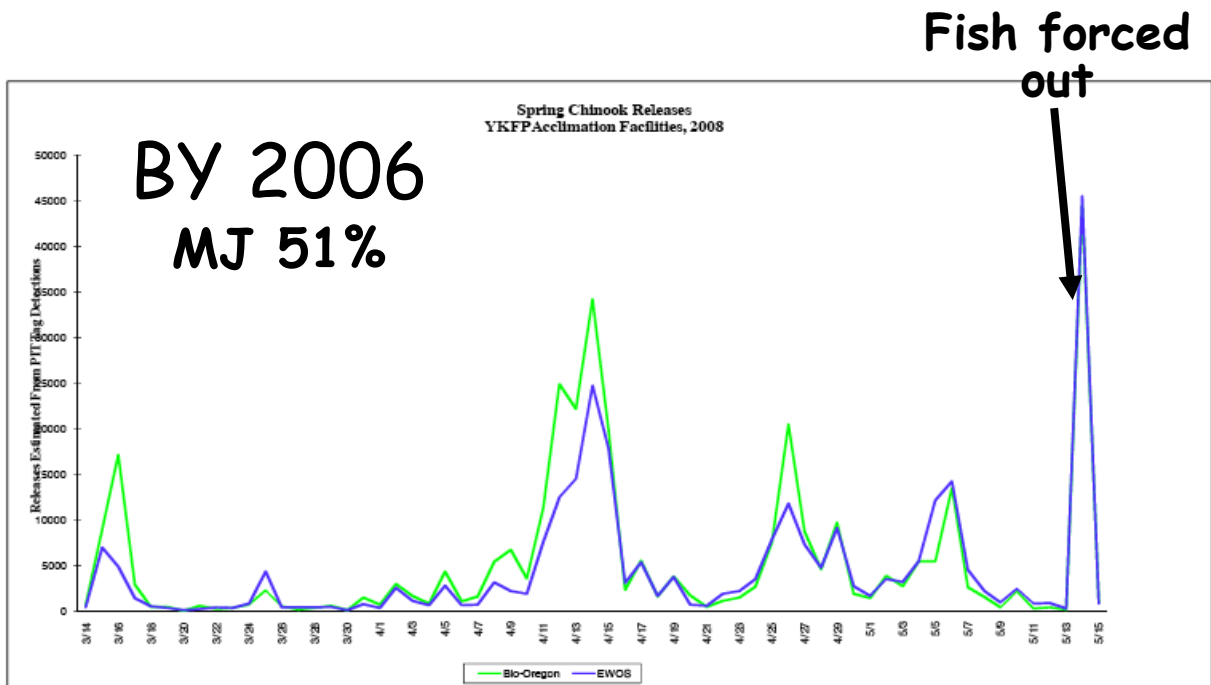
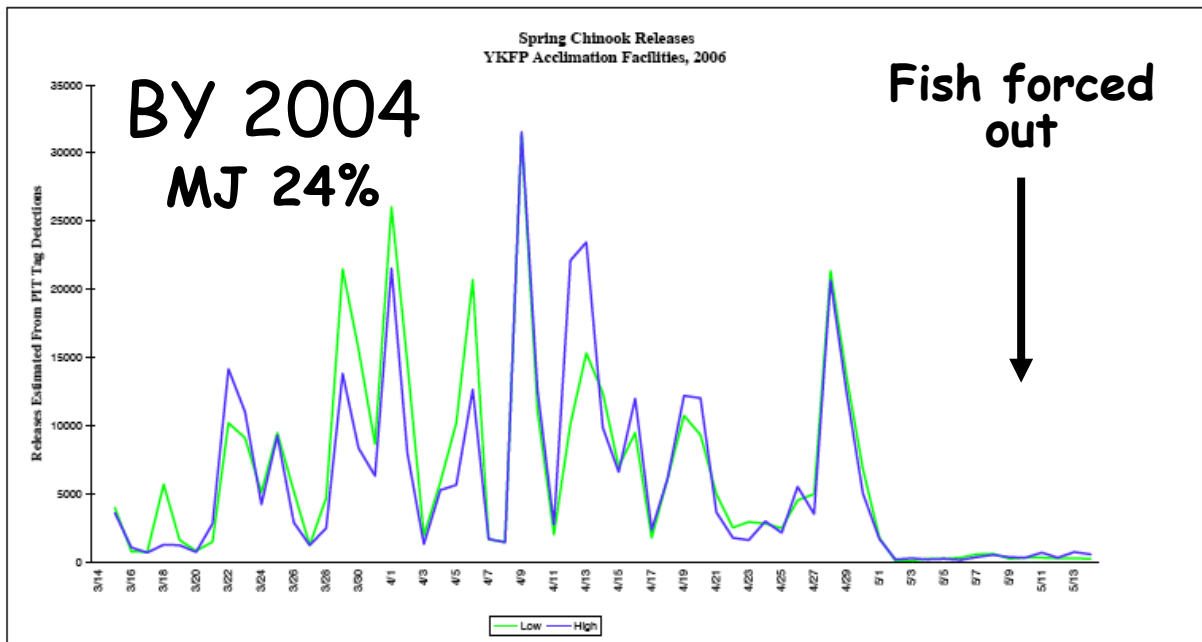
Growth / Domestication Expt.

2002	841,233	37%	122,799
2003	827,915	20%	83,527
2004	786,506	24%	93,323
2005	861,204	29%	122,805
2006	644,031	51%	164,228

Avg. 27%

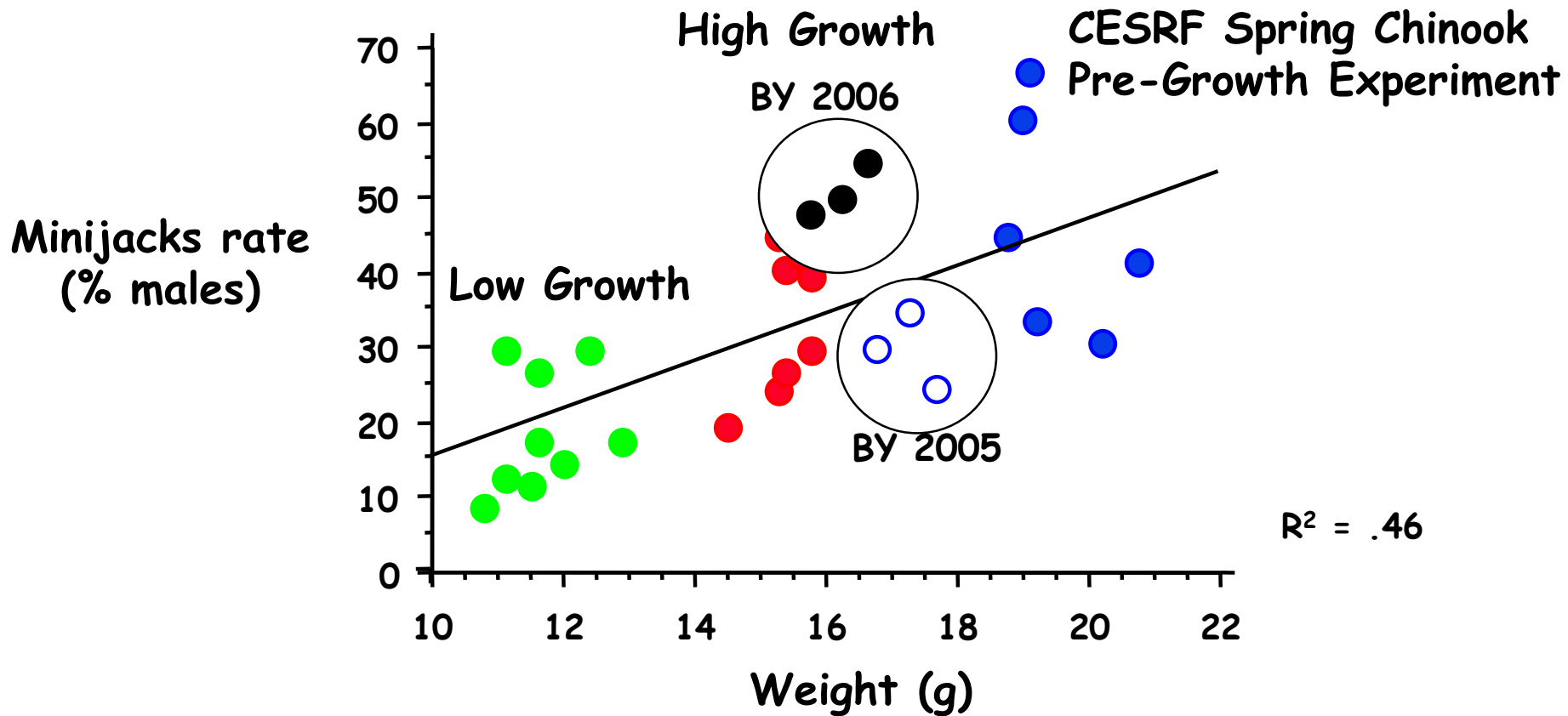


Higher raceway residualism with higher minijack rates



The bigger they are at release, the higher the minijack rate

(BY X acc.site, BY 2000-BY 2006)

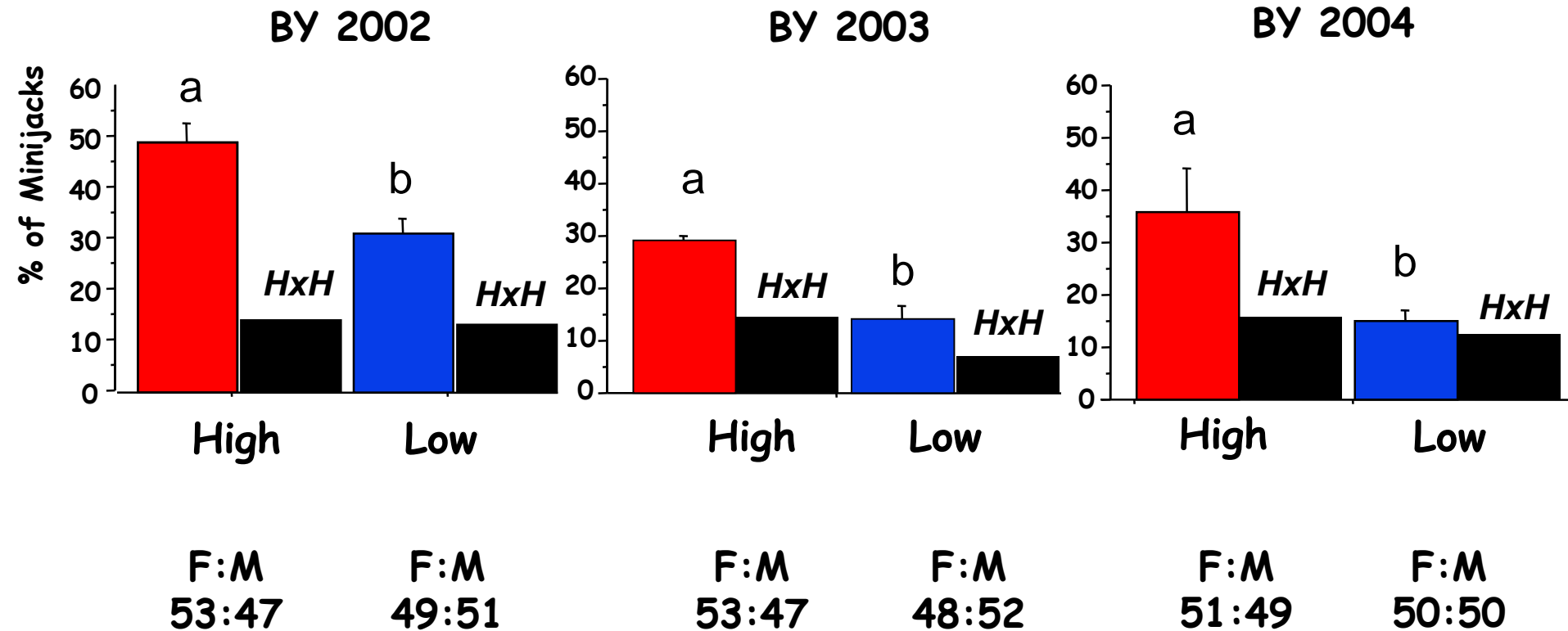


Why are minijack rates up again in BY 06 fish?

- Sampling error - 1200 fish sampled, size is actually smaller this year than last.
- Natural variation
- New Bio-Oregon diet used starting this BY.
- Other ideas?

**What about the minijack rates
between the Supplemented and
Domesticated lines at Clark Flat?**

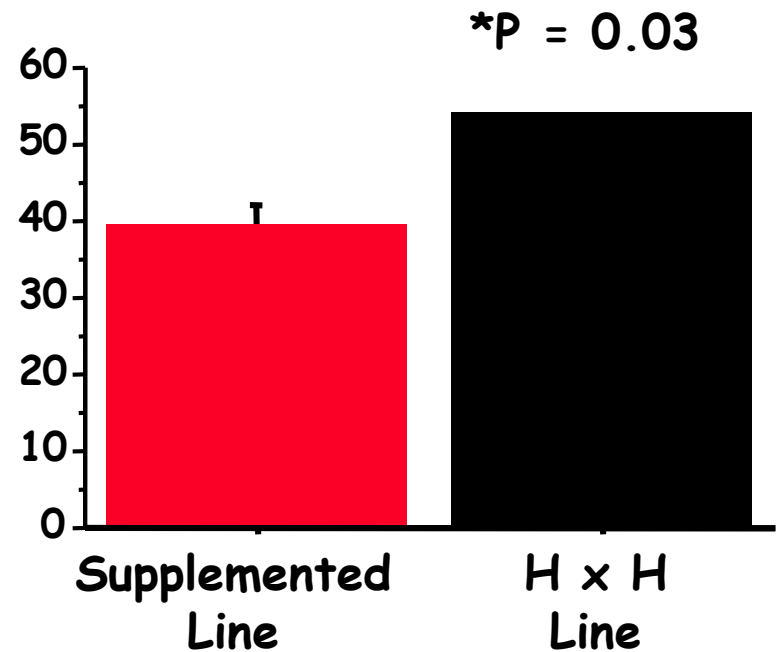
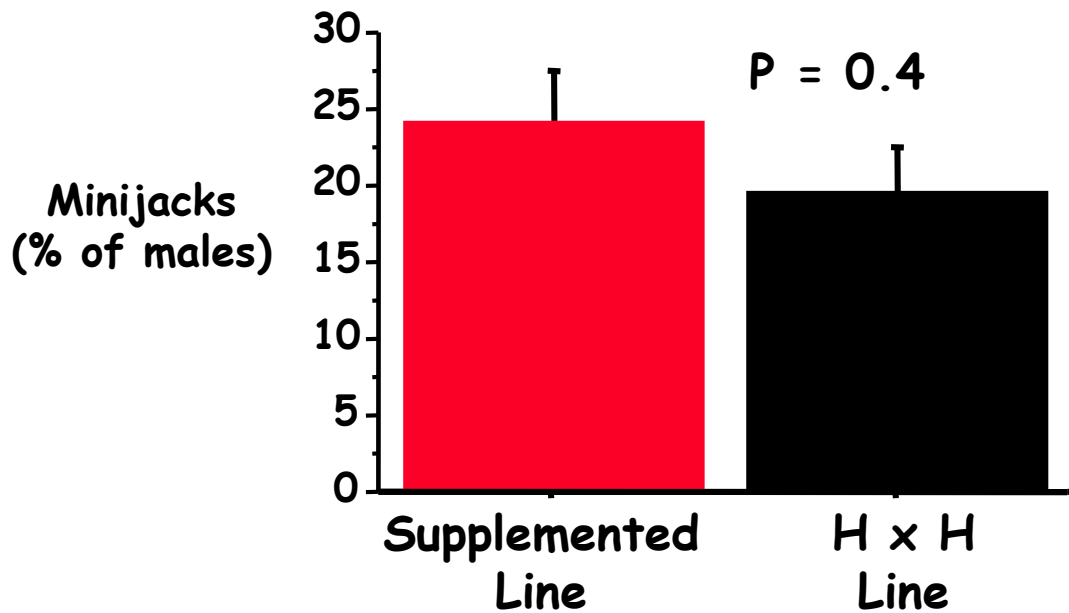
Minijack rates before release were consistently lower in the Low growth Trt.



Supplemented vs. Domesticated Lines

BY 2005
released in 2007

BY 2006
released in 2008

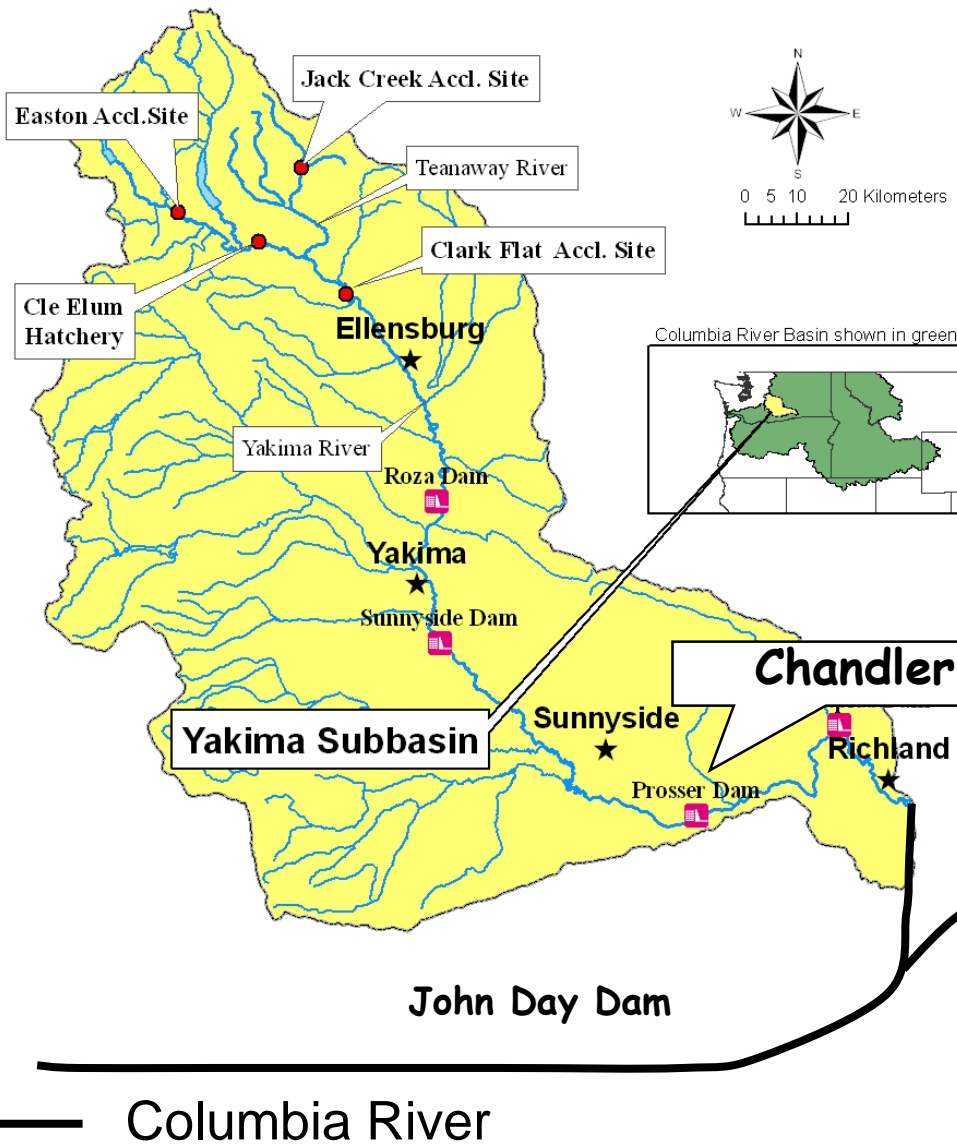


We are currently conducting a replicated “common garden” rearing experiment in Seattle with these two genetic lines of fish to clarify these results

QuickTime™ and a
decompressor
are needed to see this picture.

- **Where do the minijacks go?**
- **How do hatchery rates compare with wild rates?**

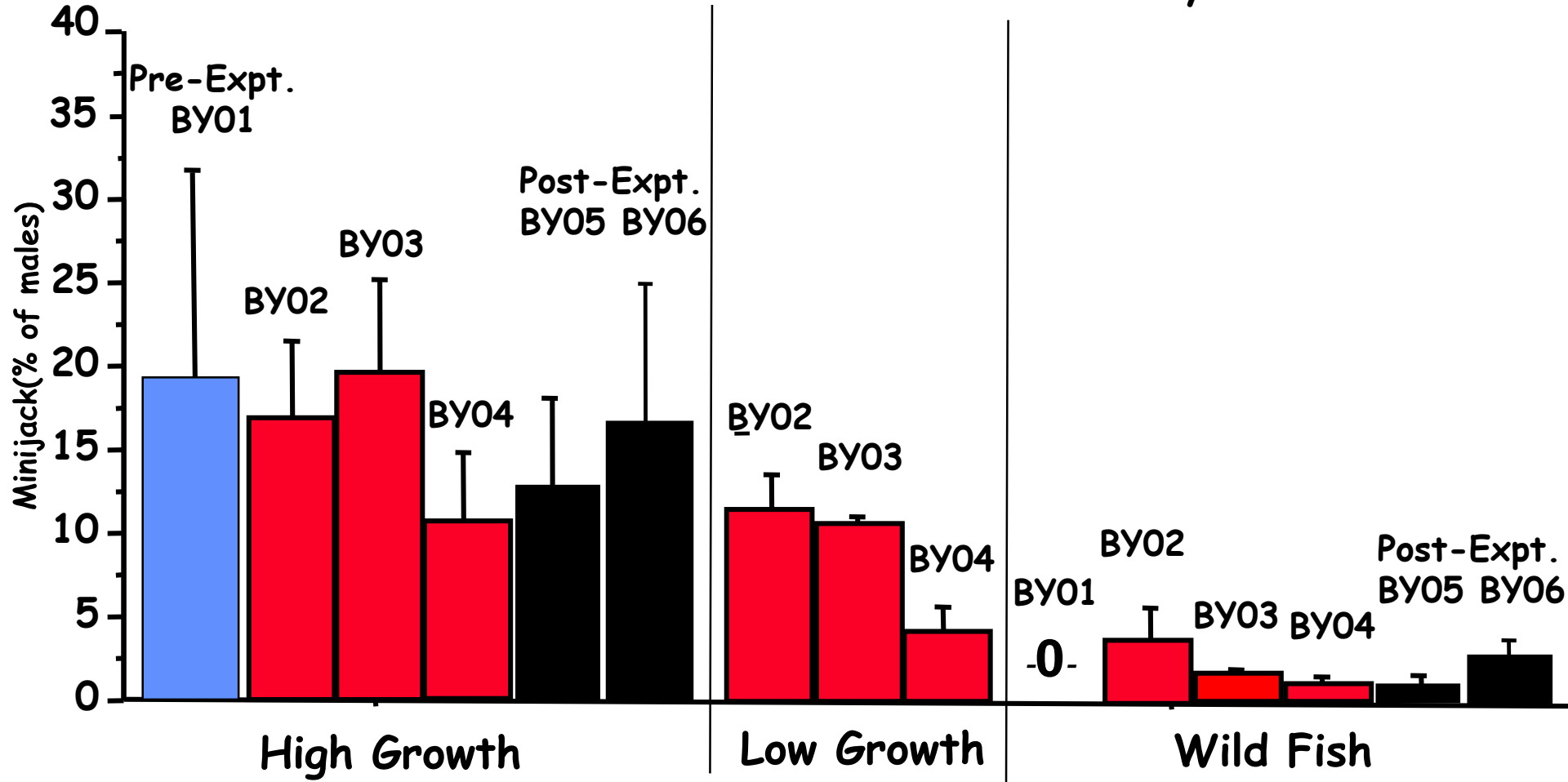
The Yakima River Basin



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Minijack rates of migrating hatchery and wild fish - Chandler smolt bypass facility

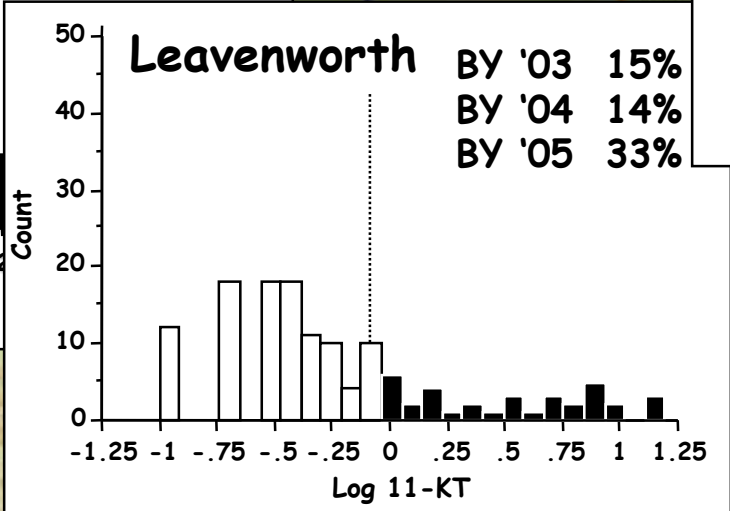
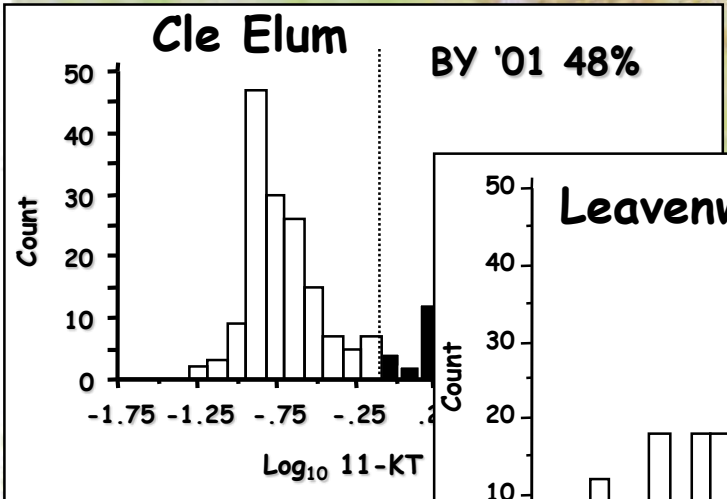
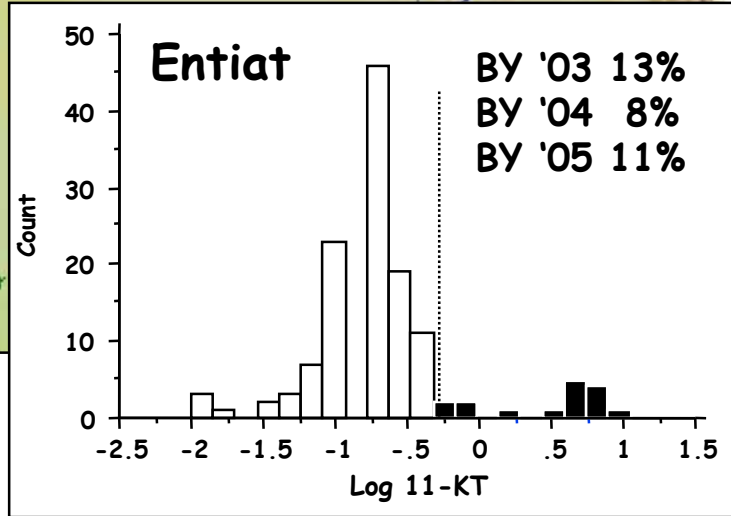
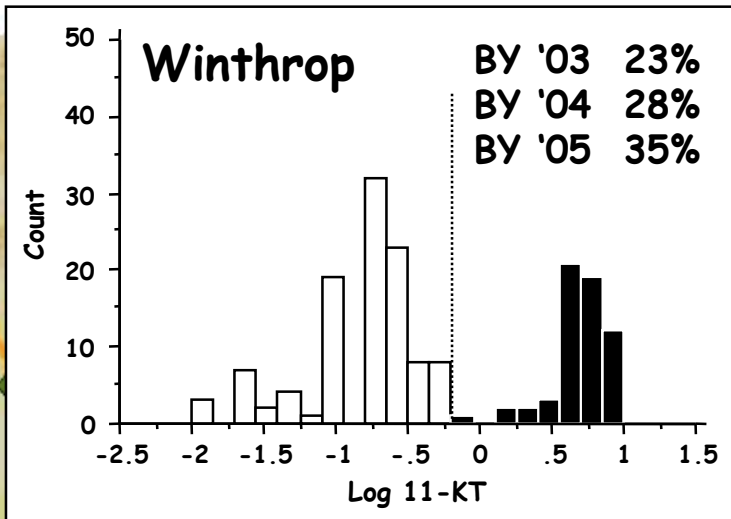
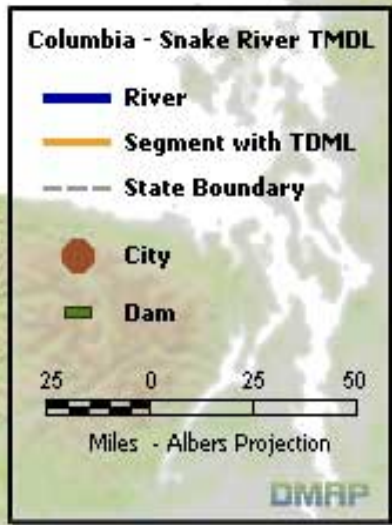
Minijack rates of wild fish are approx. 8-20 fold lower than that of hatchery fish



How unique is this issue to Yakima Spring Chinook?

Canada

Washington



Conclusions

- Precocious maturation is a viable life-history strategy, but hatchery rearing practices can significantly increase rates
- Minijack rates at Cle Elum Hatchery have returned to 50%.
- Minijacks are ubiquitous throughout the Columbia Basin.
- Growth modulation can be used to reduce rates, but water temperatures may present limitations.
- Salmon conservation hatchery programs must balance trade-offs between maintenance of “wild-like” phenotype and survival advantages of larger smolt size

A large group of people is shown from the chest up, with their hands raised in a gesture of participation or voting. The scene is dramatically lit with a strong red light, creating a vibrant, monochromatic atmosphere. The individuals are packed closely together, and their faces are partially visible, some looking towards the camera. The background is dark, making the red-lit figures stand out prominently.

Questions?