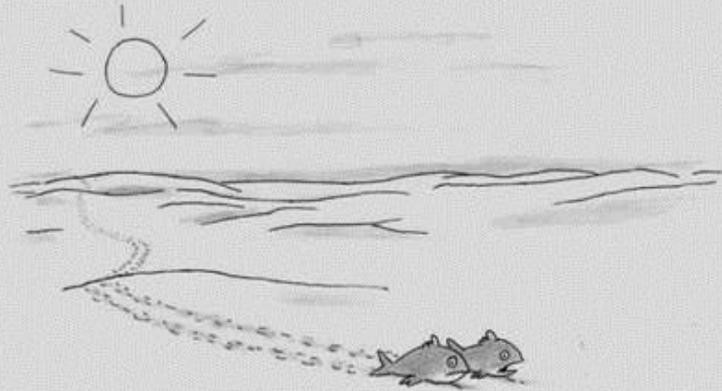


Effects of hatchery rearing and release practices on olfactory imprinting and homing



THE NEW YORKER



S. GROSS

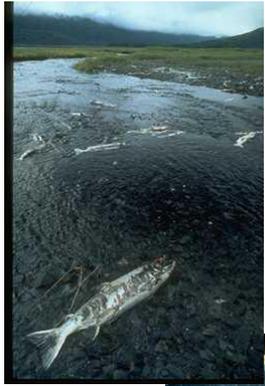
"Face it—we're lost."

Andrew Dittman¹
Darran May²
Ryan B. Couture³
David L.G. Noakes⁴
Paul Hoppe⁵

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2. School of Aquatic and Fisheries Sciences, University of Washington, Seattle, WA
3. Oregon Hatchery Research Center/ ODFW, Asea, OR
4. Fisheries and Wildlife, Oregon State University, Corvallis, OR
5. Ocean Associates Inc., Seattle, WA



Olfactory imprinting and homing



Fall

Spring

Spring

Fall

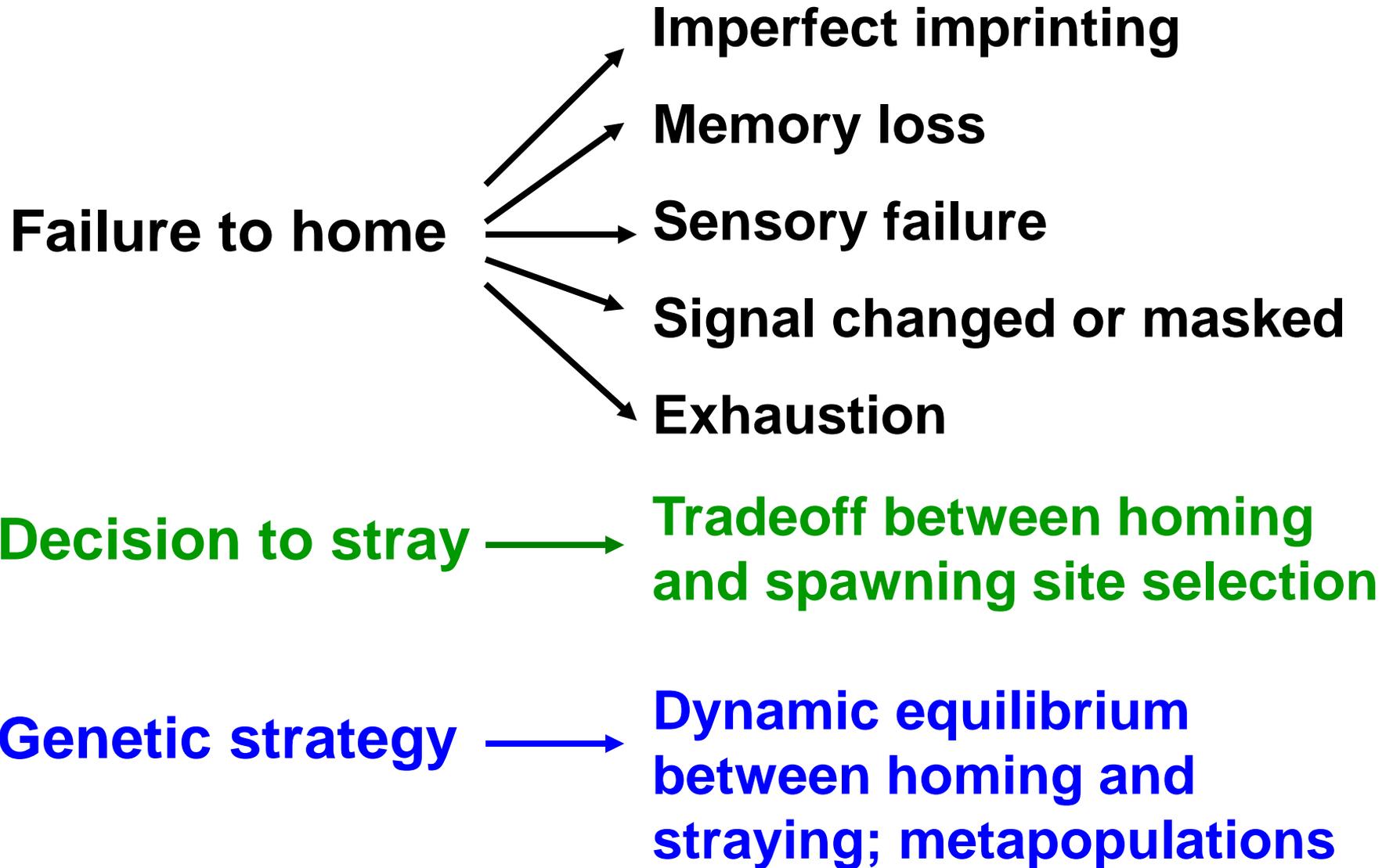
Ocean

Fall

Spring



Why do salmon stray?



Do hatchery salmon stray more?



Do hatchery salmon stray more?

Not necessarily



Species	Origin	UW returns	Issaquah returns
Coho	UW	3712	2
	Issaquah	1	737
Chinook	UW	5863	3
	Issaquah	1	542

Do hatchery salmon stray more?

Not necessarily

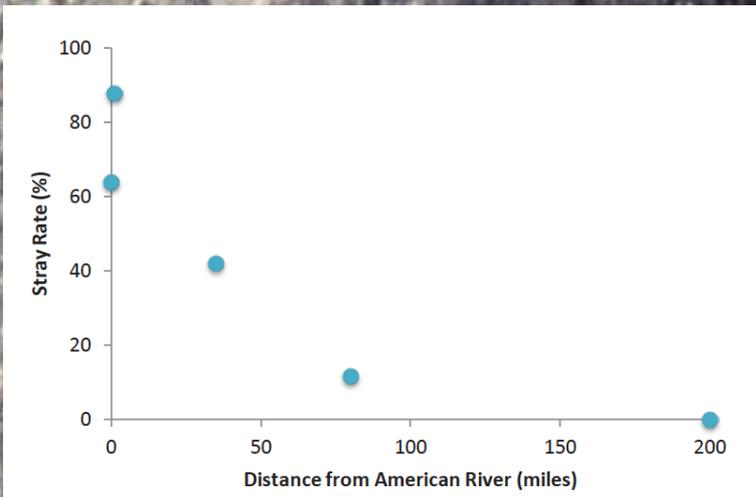
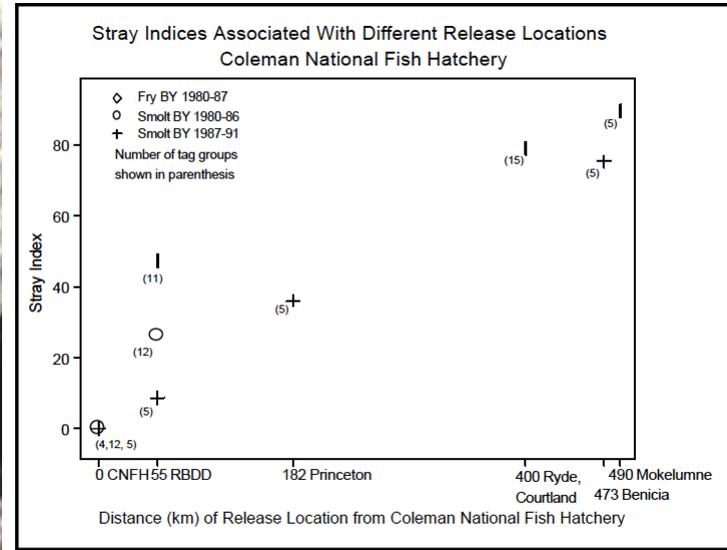
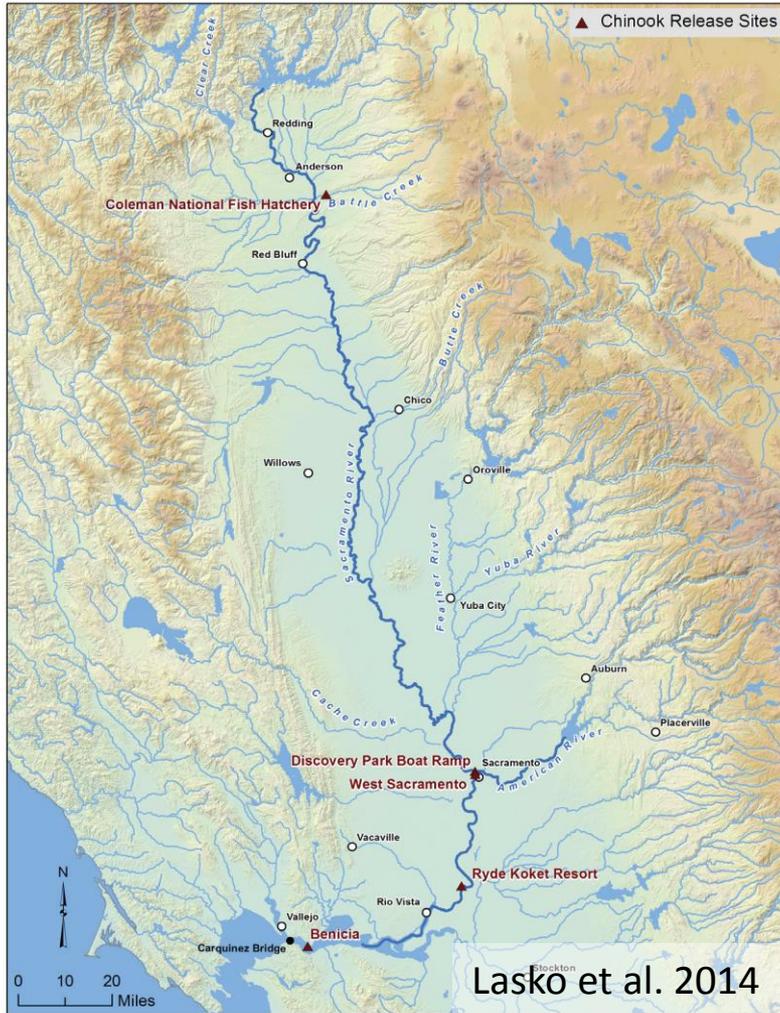
But the things we do can definitely increase straying

- Transport and release away from the natal hatchery
- Release at inappropriate developmental stages
- Acclimation strategies
- Release into inappropriate habitat
- Rearing environment
 - Environmental complexity
 - Developmental/epigenetic processes

Do hatchery salmon stray more?

Not necessarily, but.....

Transport and release away from the natal hatchery

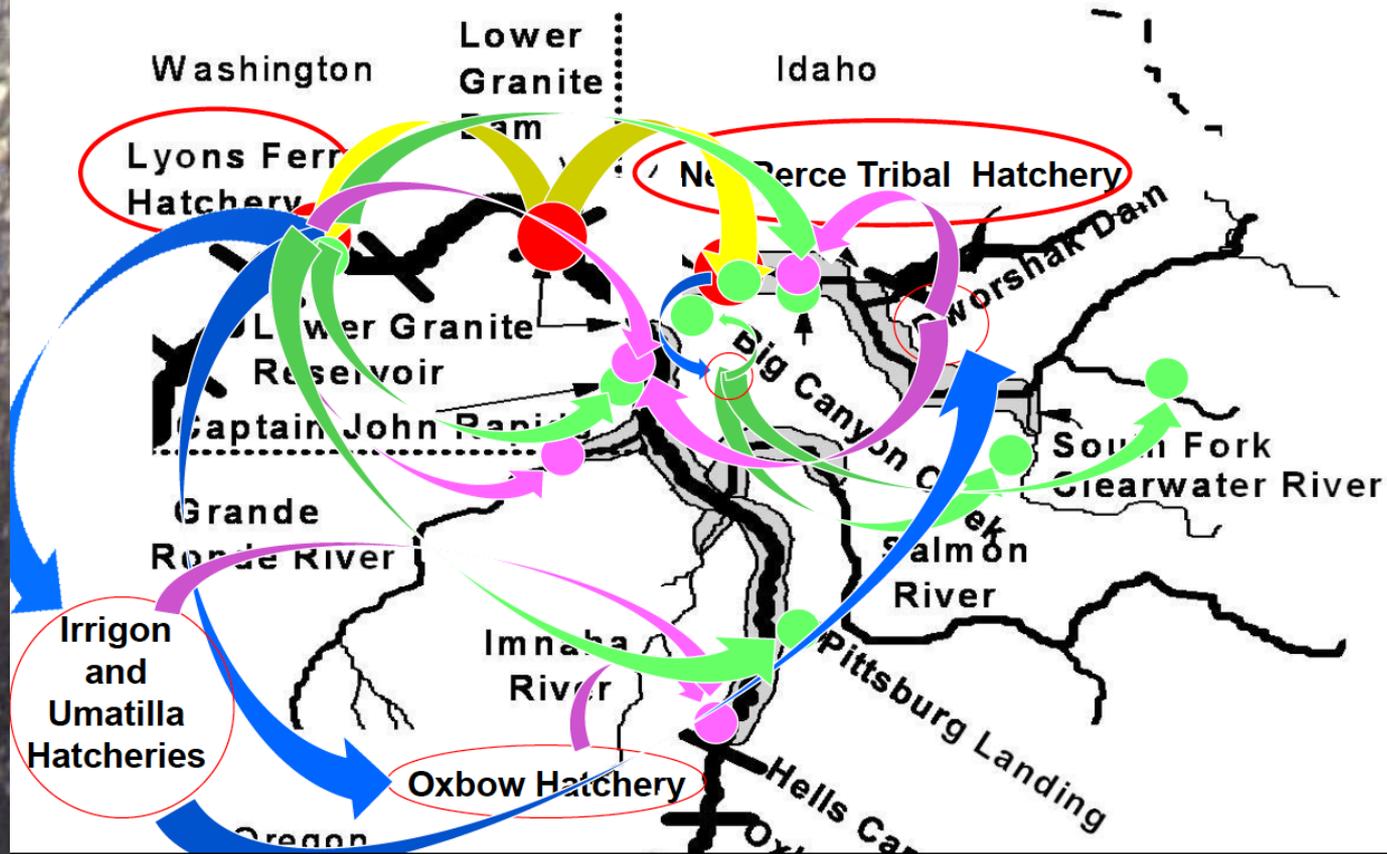


Do hatchery salmon stray more?

Not necessarily, but.....

Transport and release away from the natal hatchery

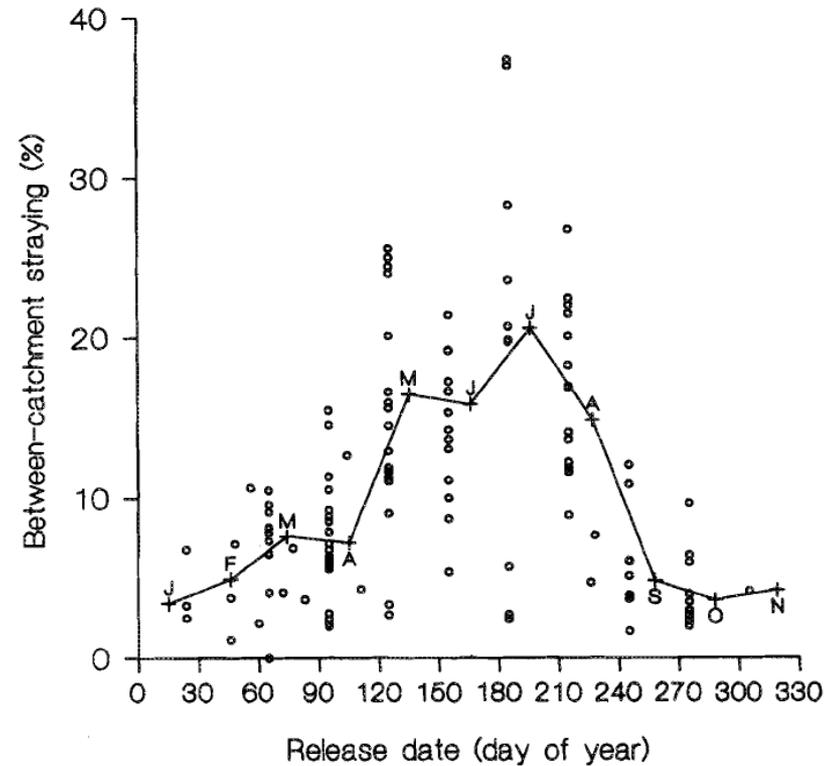
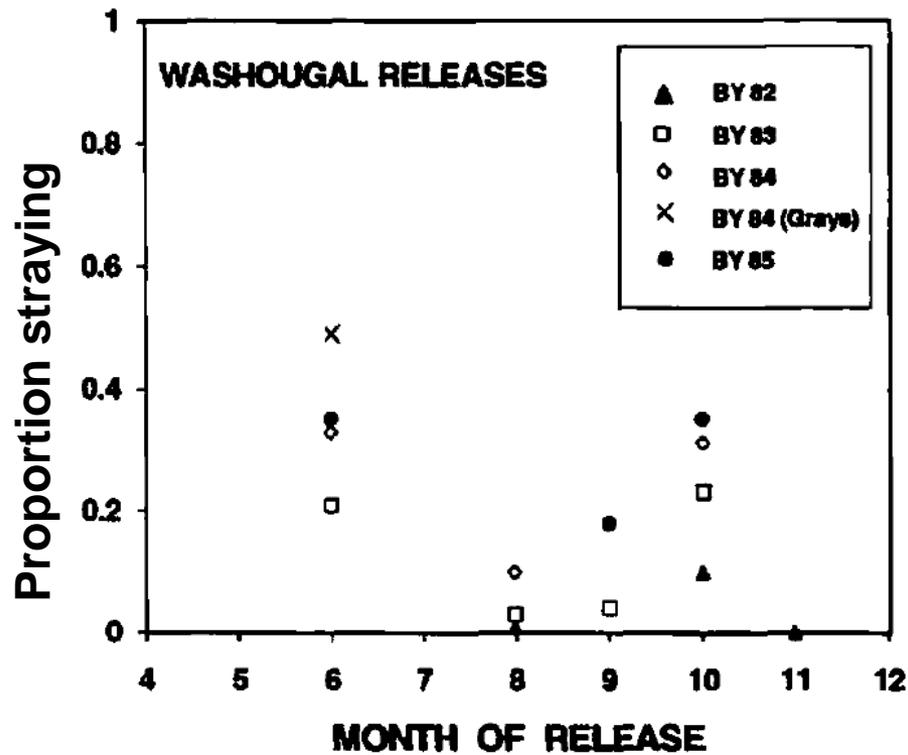
Hatchery Facilities and Release Locations



Do hatchery salmon stray more?

Not necessarily, but.....

Release at inappropriate developmental stages



Pascual et al. 1995

Unwin and Quinn. 1993

Do hatchery salmon stray more?

Not necessarily, but.....

Acclimation strategies/Release into inappropriate habitat

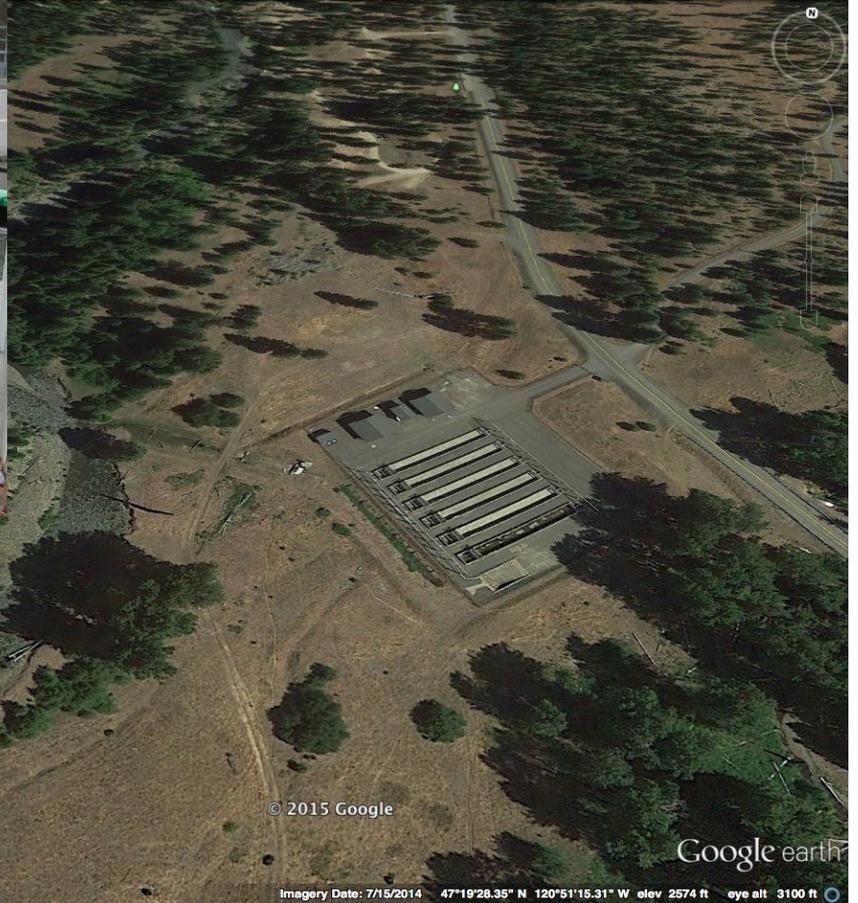
Acclimation: location, timing, duration



IF YOU BUILD IT,
THEY WILL COME.



IF YOU BUILD IT, THEY MAY OR MAY NOT COME.



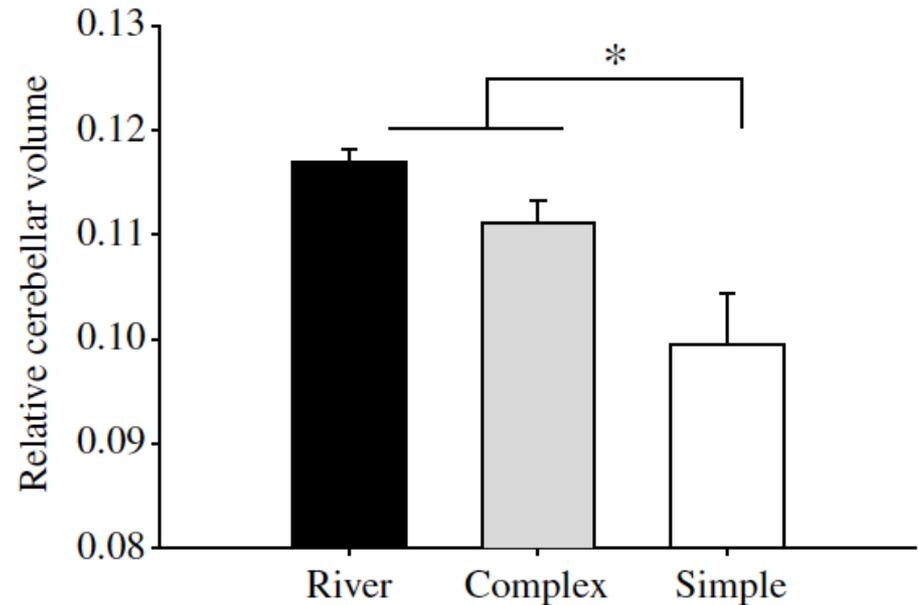
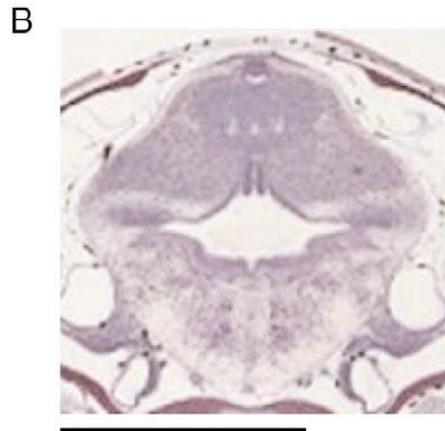
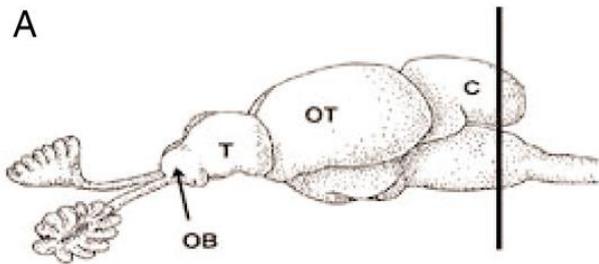
Do hatchery salmon stray more?

Not necessarily, but.....

Rearing environment:

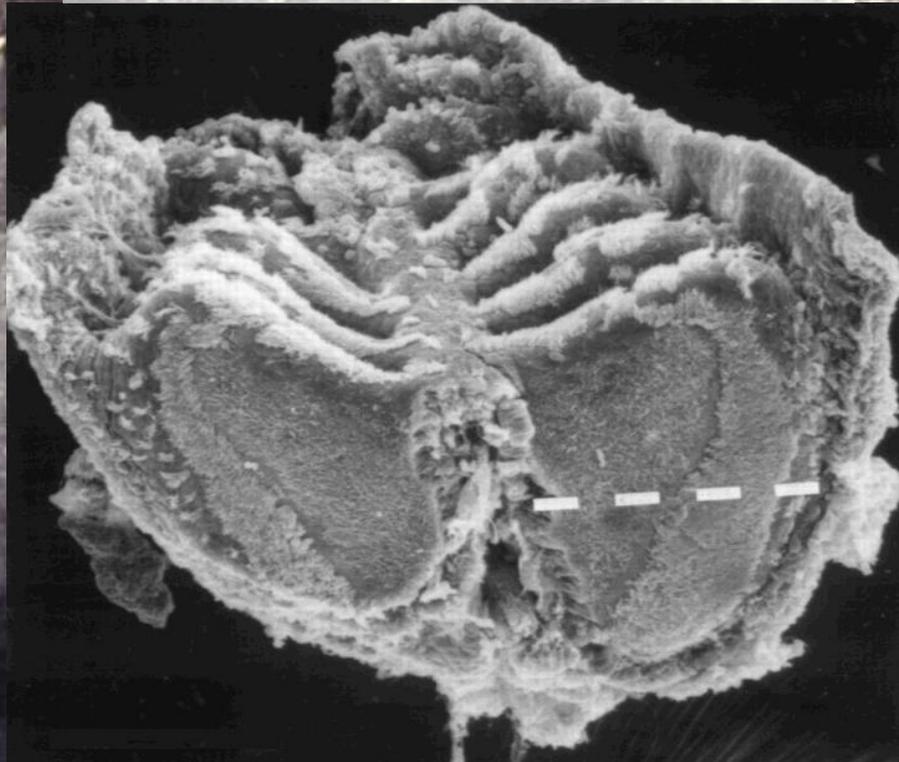
Environmental complexity/developmental/epigenetic processes

Does hatchery rearing affect the olfactory system?



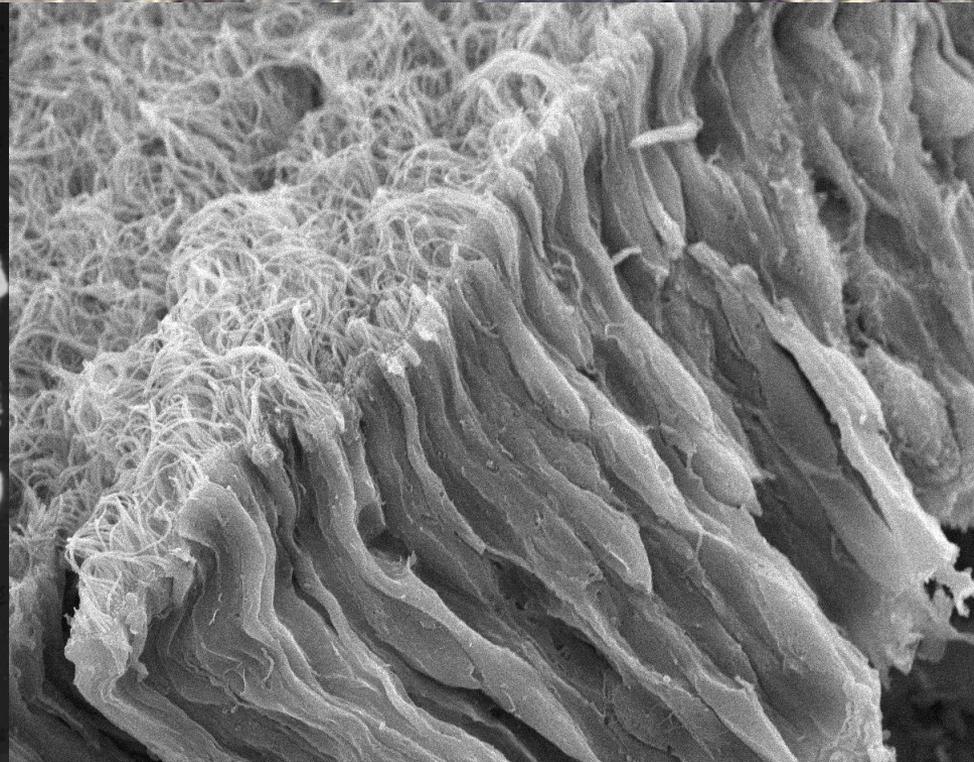
Does hatchery rearing affect the olfactory system?

Olfactory Rosette



from Weth et al. 1996

Olfactory Epithelium



Carla Stehr

Does it matter what water source salmon are reared in?



Smolting-associated changes in odorant receptor expression

Walla Walla Hatchery steelhead



Reared to yearling stage at Big Beef Creek hatchery in well water



Initiate surface water experiment Jan. 20
2 tanks well water
2 tanks surface water



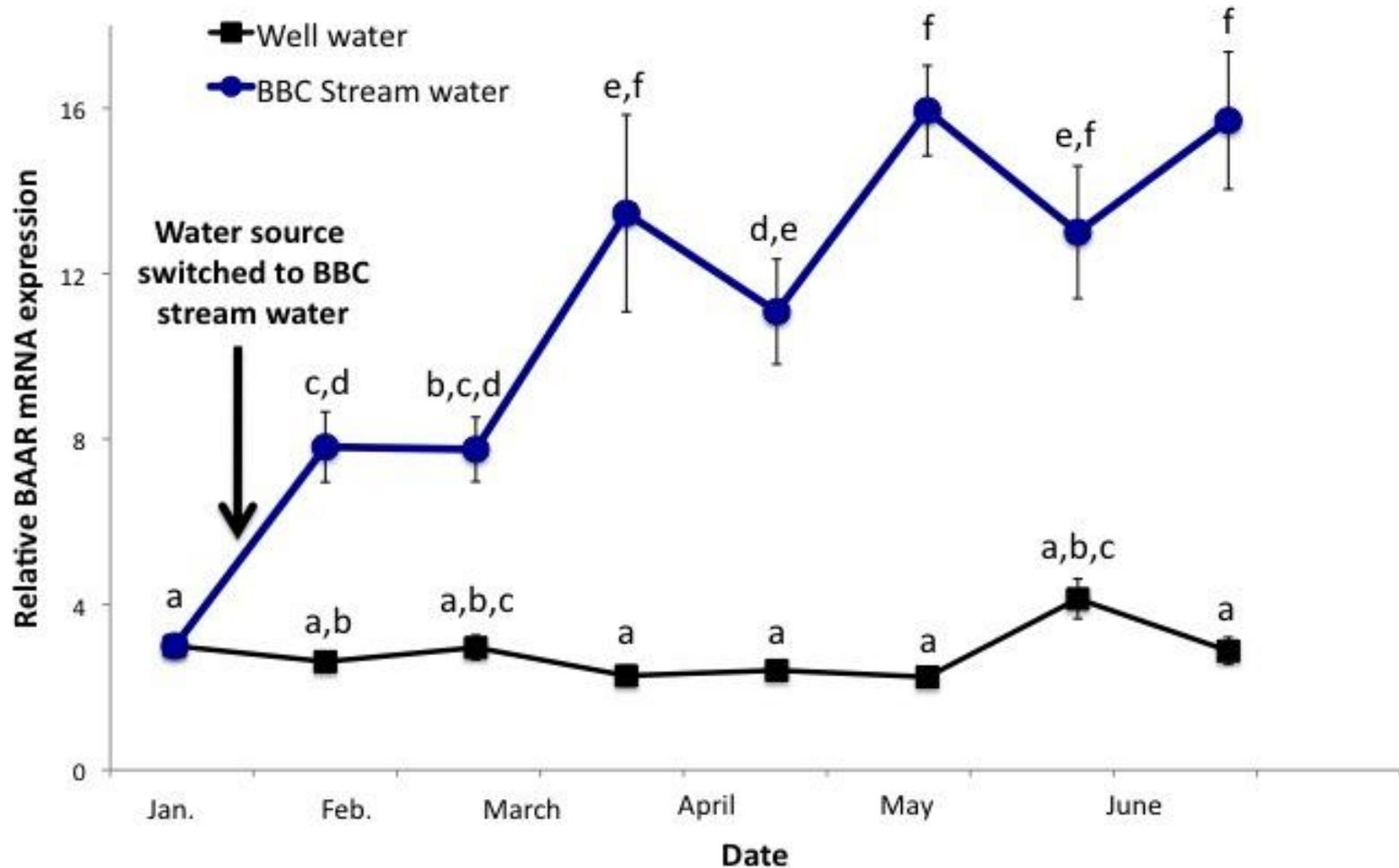
Sample fish for olfactory tissue every 3 weeks



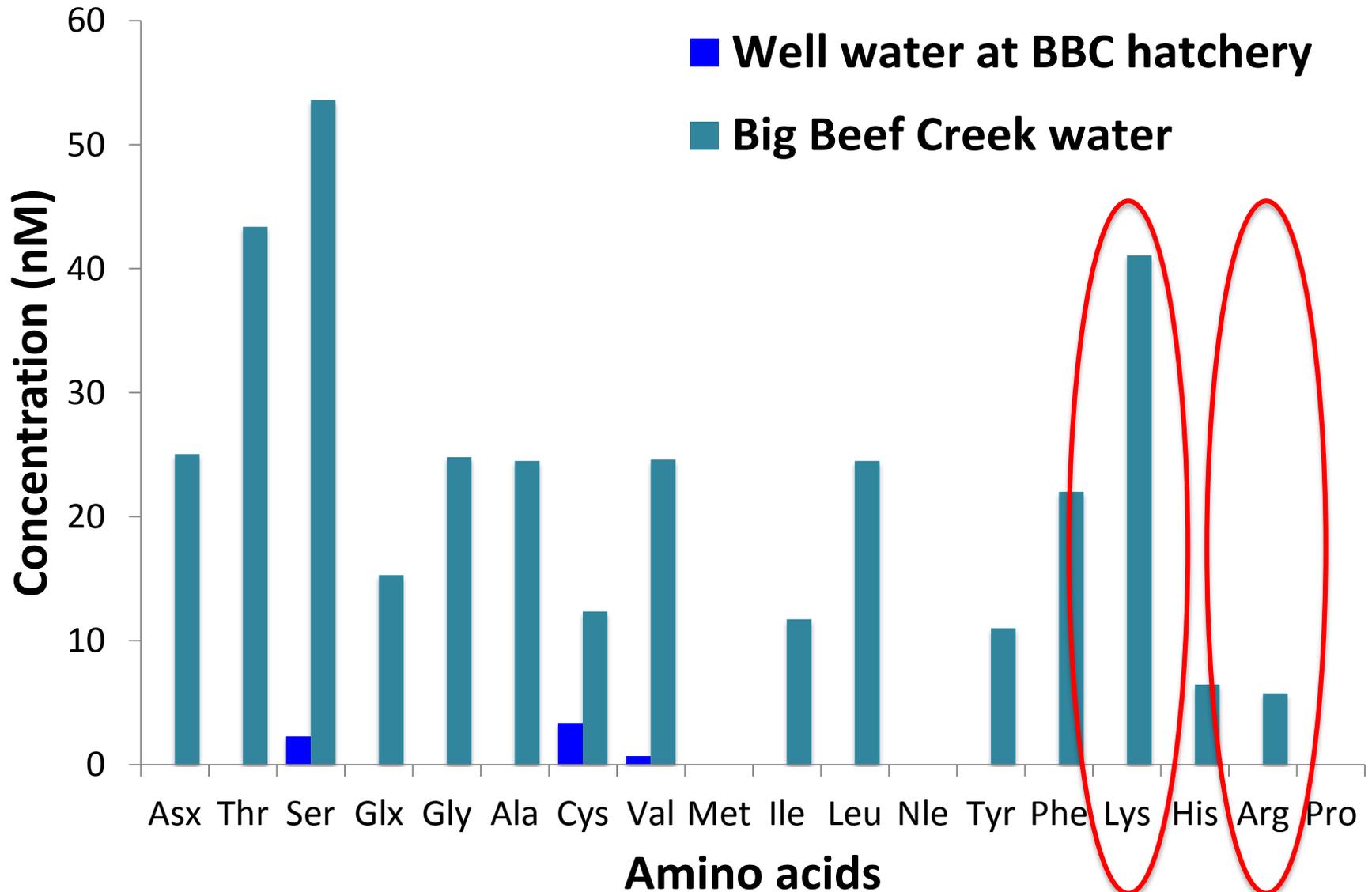
Analyze olfactory development (OR expression)



Smolting-associated changes in odorant receptor expression

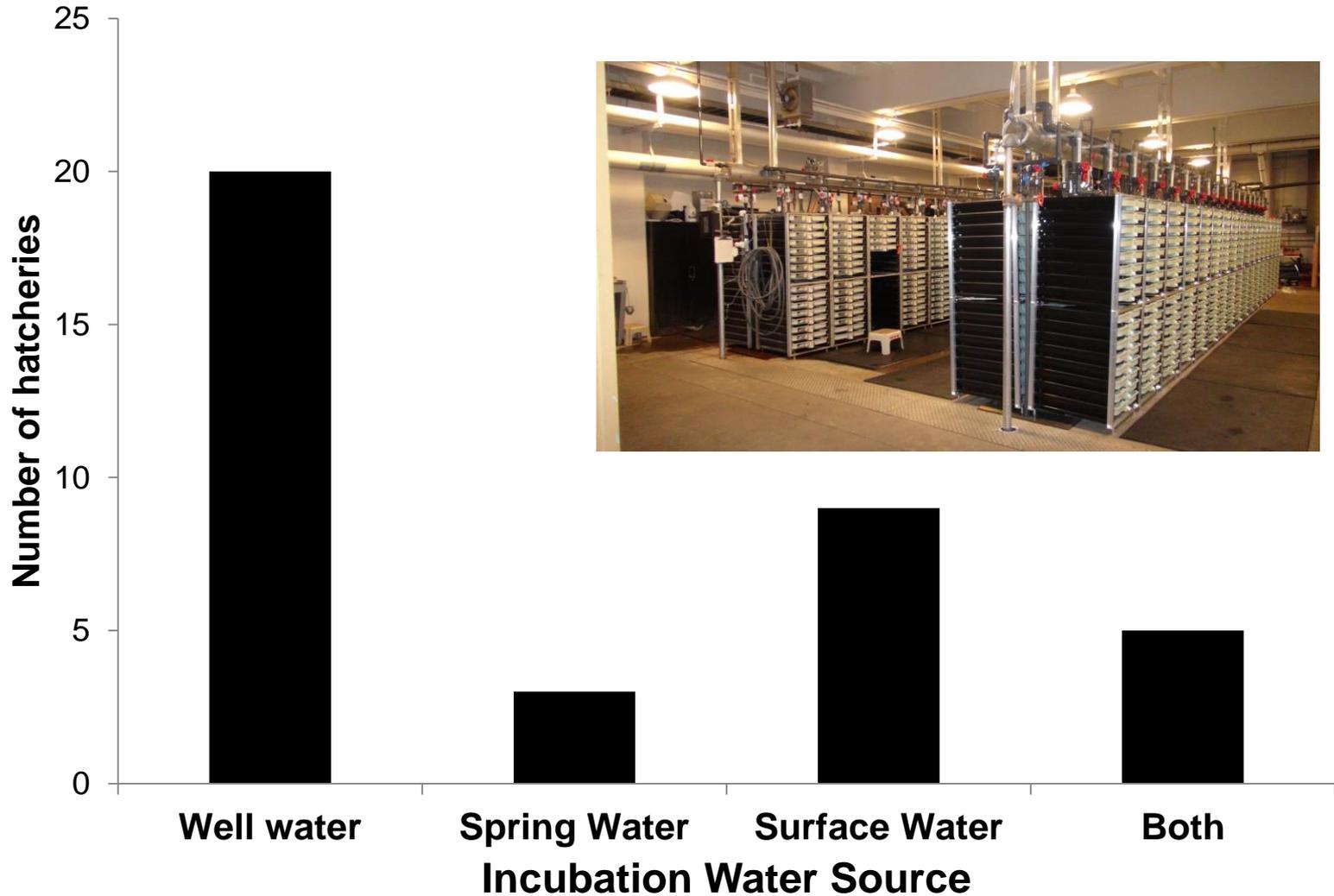


Amino acid profile of well water vs. stream water

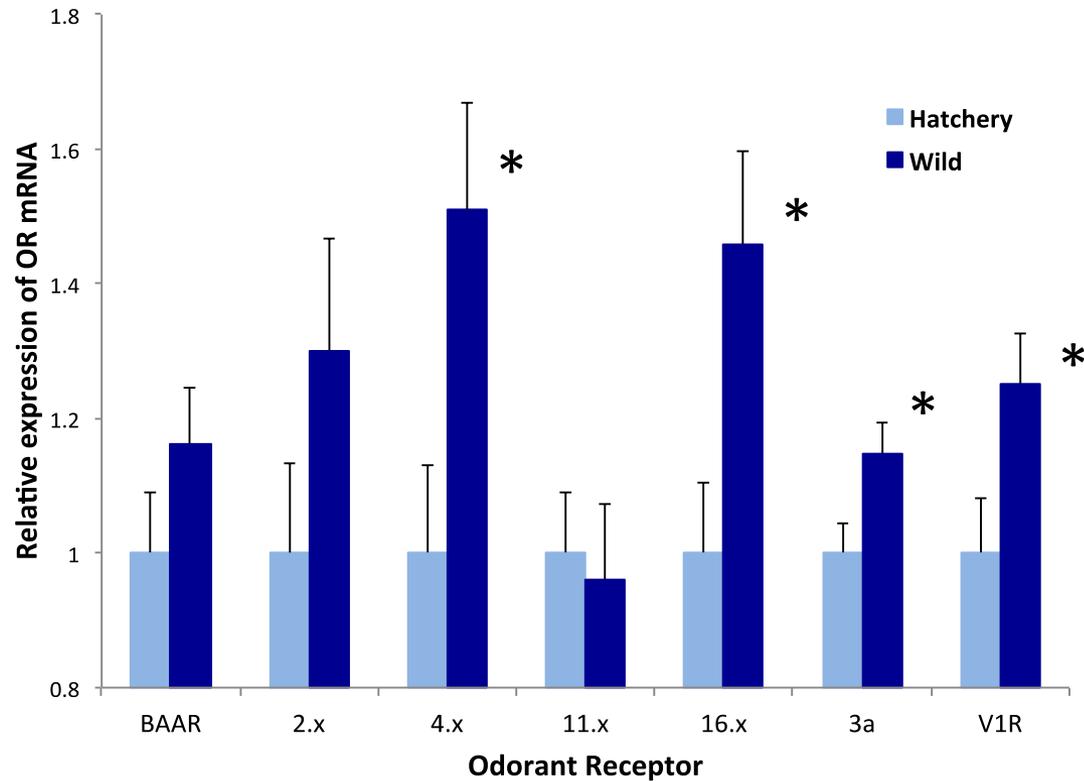


Does hatchery rearing affect the olfactory system?

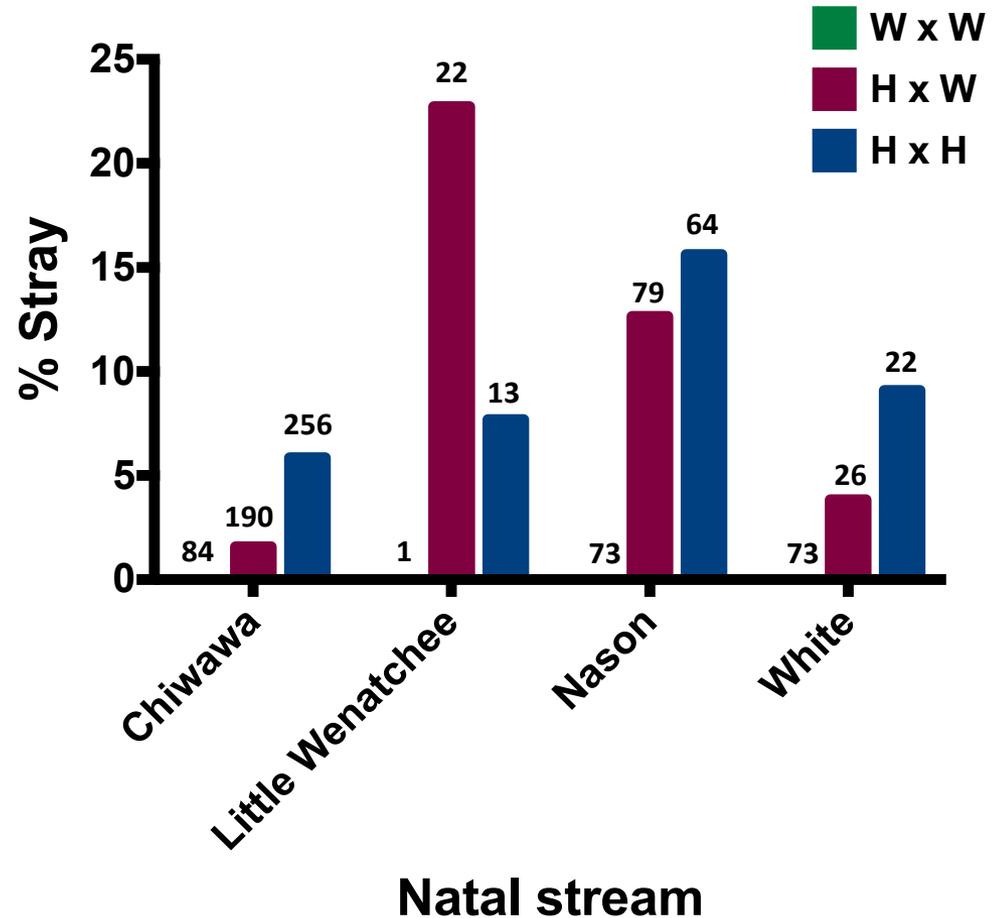
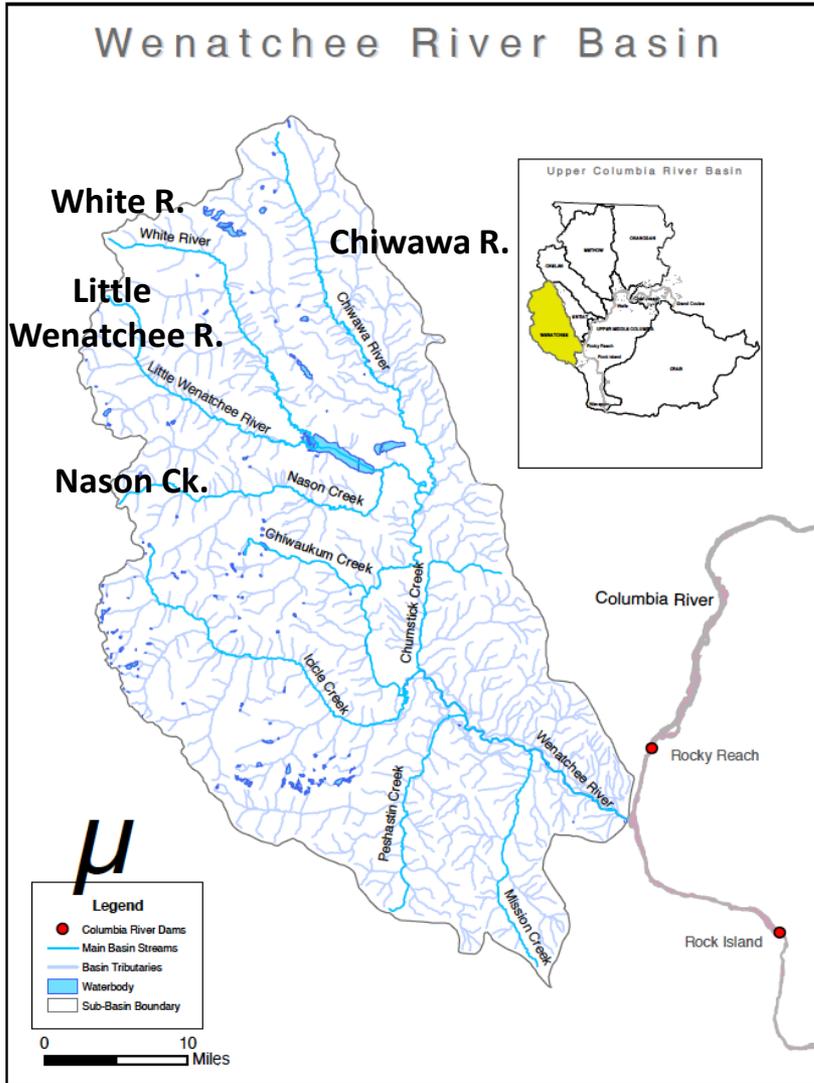
Incubation water in Columbia River hatcheries



Does hatchery rearing affect the olfactory system?



Effects of origin on straying by naturally spawned salmon



Effects of hatchery rearing on olfactory system and olfactory imprinting

- **We observed differences in imprinting-associated olfactory gene expression in steelhead reared in different water sources.**
- **We observed differences in olfactory gene expression in naturally migrating hatchery vs. wild steelhead.**
- **In future studies, we hope to assess these differences in a controlled experiment and assess mechanisms.**
- **We have developed effective physiological tools to assess anthropogenic effects (e.g. transport, hatchery practices, etc) on olfactory imprinting.**

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