THE WILD FISHES SURROGATE PROJECT: WHERE WE HAVE BEEN, ARE, AND WILL BE

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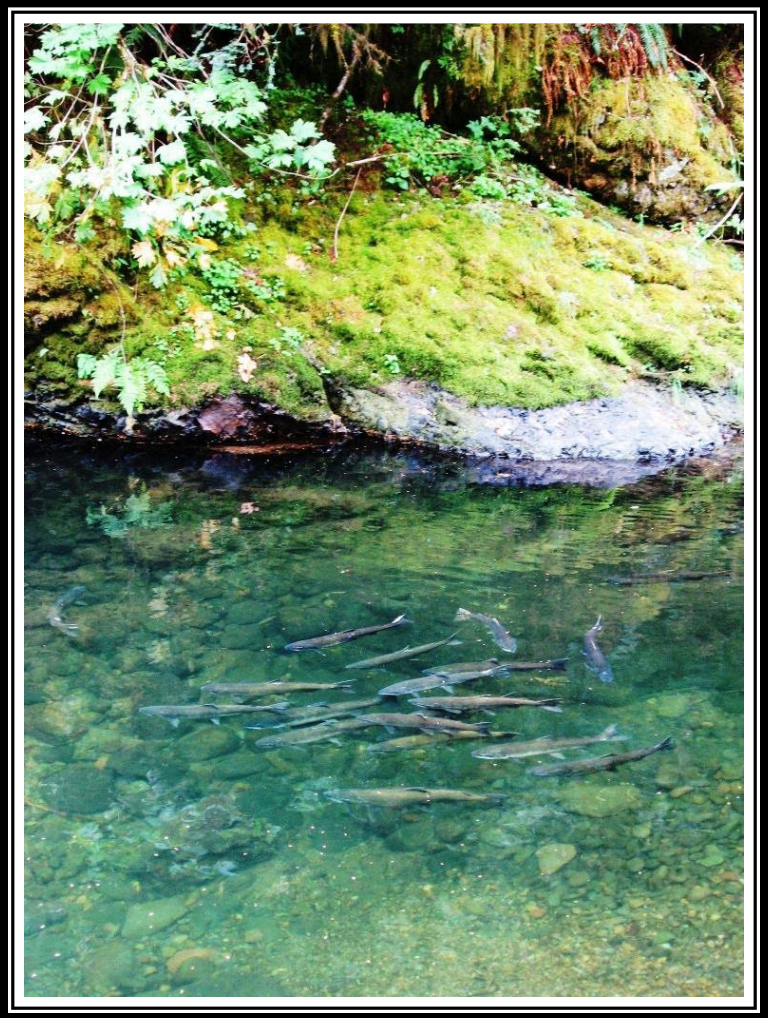
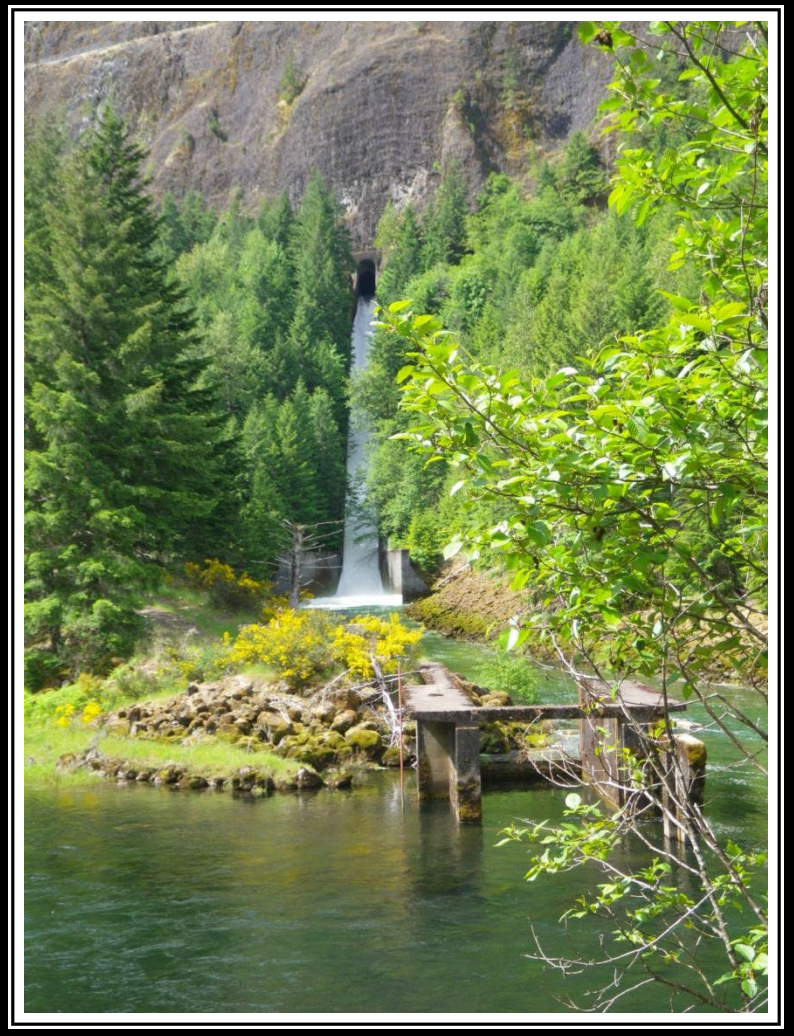
USGS science for a changing world

US Army Corps of Engineers.

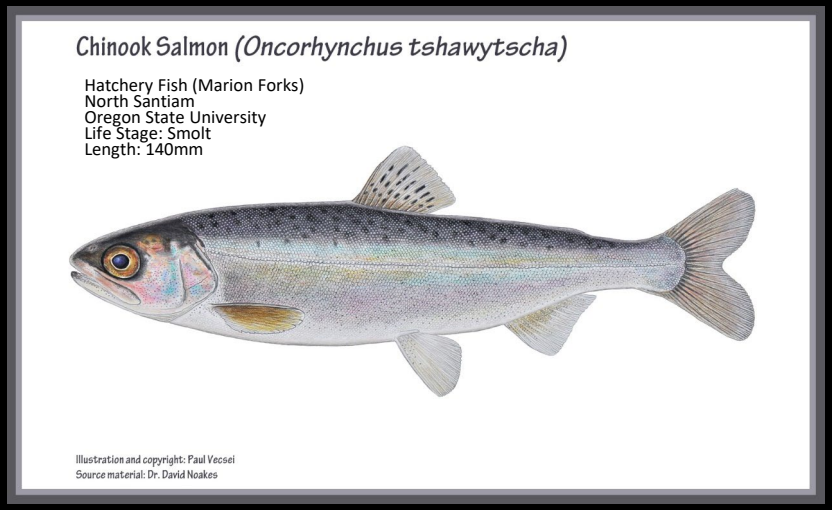
Oregon Cooperative Fishery Research Unit — Semper Catostomus

Need for wild surrogates for studies for the Willamette Valley Project RME Plan





Wild Fish Surrogates



Hatchery origin

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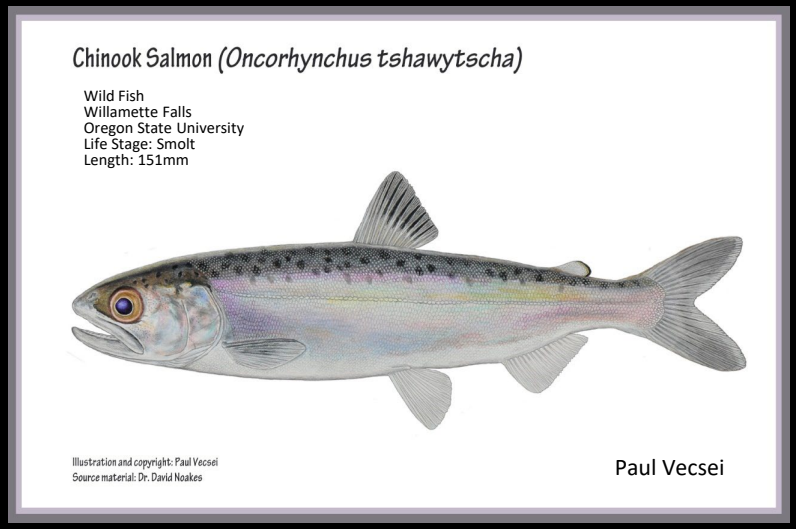


Natural origin

Physiology, Morphometrics, Behavior, Genetics, Release studies

Upper Willamette River wild surrogates

Objectives

- provide wild fish surrogates for researchers
- conduct experiments to optimize performance of wild fish surrogates
- describe phenotypes of hatchery-reared fish to determine the effects of conventional hatchery protocols

Research facilities


Fish Performance and Genetics Lab


Oregon Hatchery Research Center

Providing wild fish surrogates for researchers

Requires close coordination

1-2 years prior to fish needs

Information required from researchers

- Brood stock
- Brood year
- Time of release
- Target size at release

Since inception

- ~400,000 juvenile spring Chinook salmon
- ~13,000 juvenile winter steelhead

Chinook salmon 2022 deliveries

Location	Brood Year	Target type	# fish	Status
Foster/Green Peter	20	Yearling	1,461	RT and PIT tagged at FPGL Spring 2022
McKenzie	20	Yearling	1600	Screw trap efficiency delivered Spring 2022
Foster	21	Sub-yearling	750	RT and PIT tagged at FPGL Fall 2022
North Santiam	21	Sub-yearling	4,750	Screw trap efficiency delivered Fall 2022
McKenzie	21	Sub-yearling	6,650	Screw trap efficiency delivered Fall 2022
South Santiam	21	Sub-yearling	5,500	Screw trap efficiency delivered Spring 2022
Molalla	21	Sub-yearling	1,800	ODFW Molalla reintroduction project

Chinook salmon upcoming requests

Location	Brood Year	Deliverable type	#	Target date	Target size (mm)
Foster	21	Yearling	1,500	Spring 2023	200
Foster	22	Sub-yearling	500	Fall 2023	200
Green Peter	21	Yearling	3,500	Spring 2023	200
Green Peter	22	Sub-yearling	1,000	Spring 2023	100
Green Peter	22	Sub-yearling	800	Fall 2023	200
Lookout Point	22	Sub-yearling	4,000	Fall 2023	200
Lookout Point	22	Yearling	4,000	Spring 2024	200
Foster	22	Yearling	2,000	Spring 2024	200
Foster	23	Sub-yearling	1,000	Fall 2024	200
Green Peter	22	Yearling	4,000	Spring 2024	200
Green Peter	23	Sub-yearling	2,000	Fall 2024	200

Winter Steelhead 2022 deliveries

Location	Brood Year	Target type	# fish	Status
Foster	20	2-yr smolt	1,150	RT and PIT tagged at FPGL Spring 2022

Winter Steelhead upcoming requests

Location	Brood Year	Deliverable type	#	Target date	Target size (mm)
Foster	22	1-yr smolt	2,500	Spring 2023	110
Foster	22	1+-yr smolt	2,000	Fall 2023	110
Foster	22	2-yr smolt	2,500	Spring 2024	160
Foster	23	1-yr smolt	2,500	Spring 2024	110
Foster	23	1+-yr smolt	2,000	Fall 2024	110
Foster	23	2-yr smolt	2,500	Spring 2025	160

Recent experimental research

Stress Test Experiment

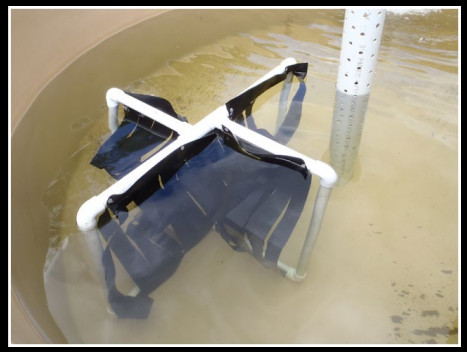
Can surrogate rearing protocols mitigate the stress response in juvenile Chinook Salmon and Steelhead Trout?

Four treatments

*Fish density: Low vs High

X

Tank structure: Yes vs No



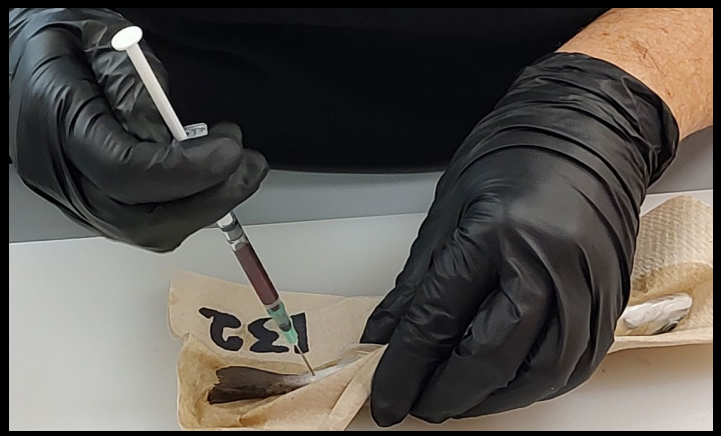
*Chinook only

Stress Test Methods

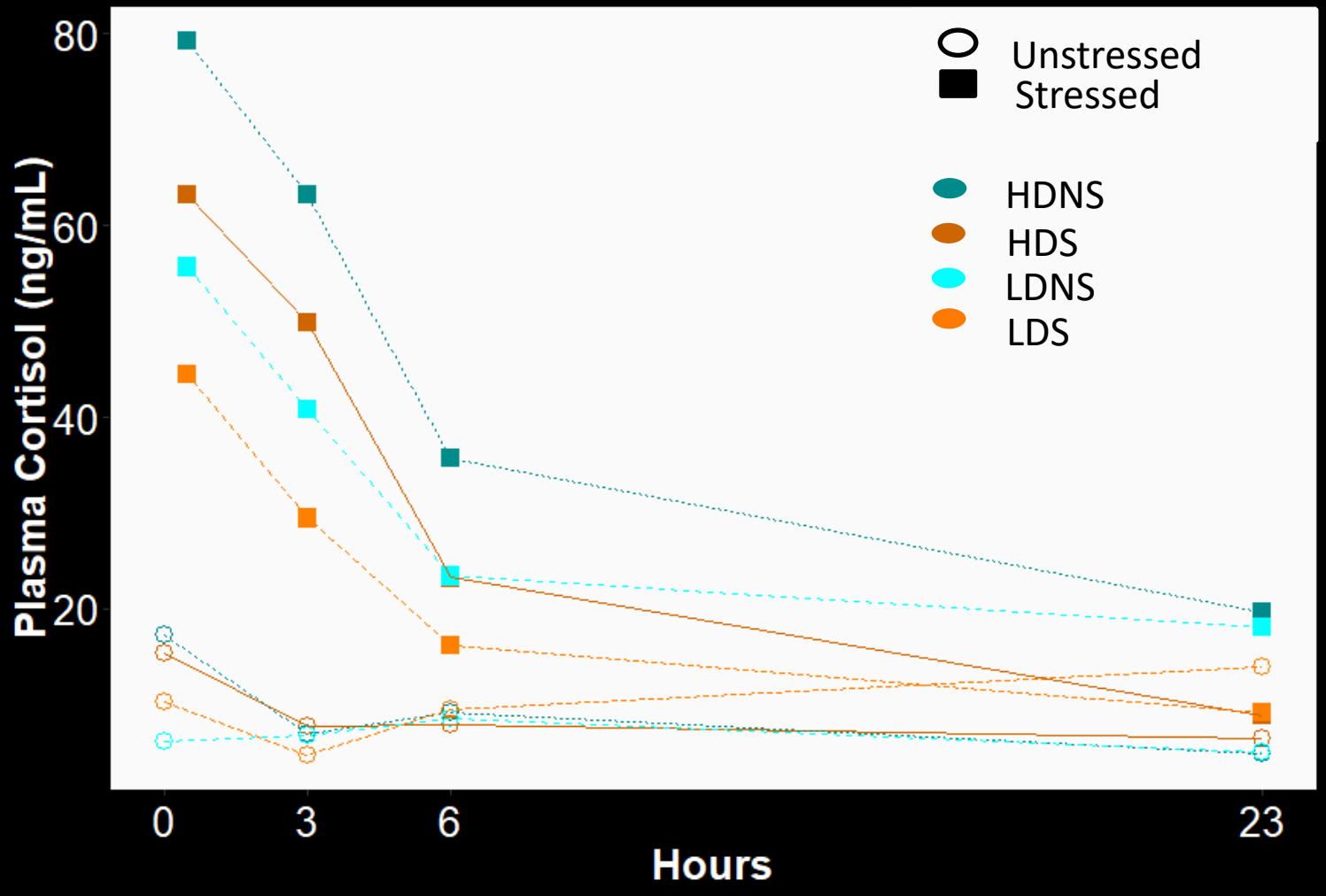
= Unstressed

= Stressed

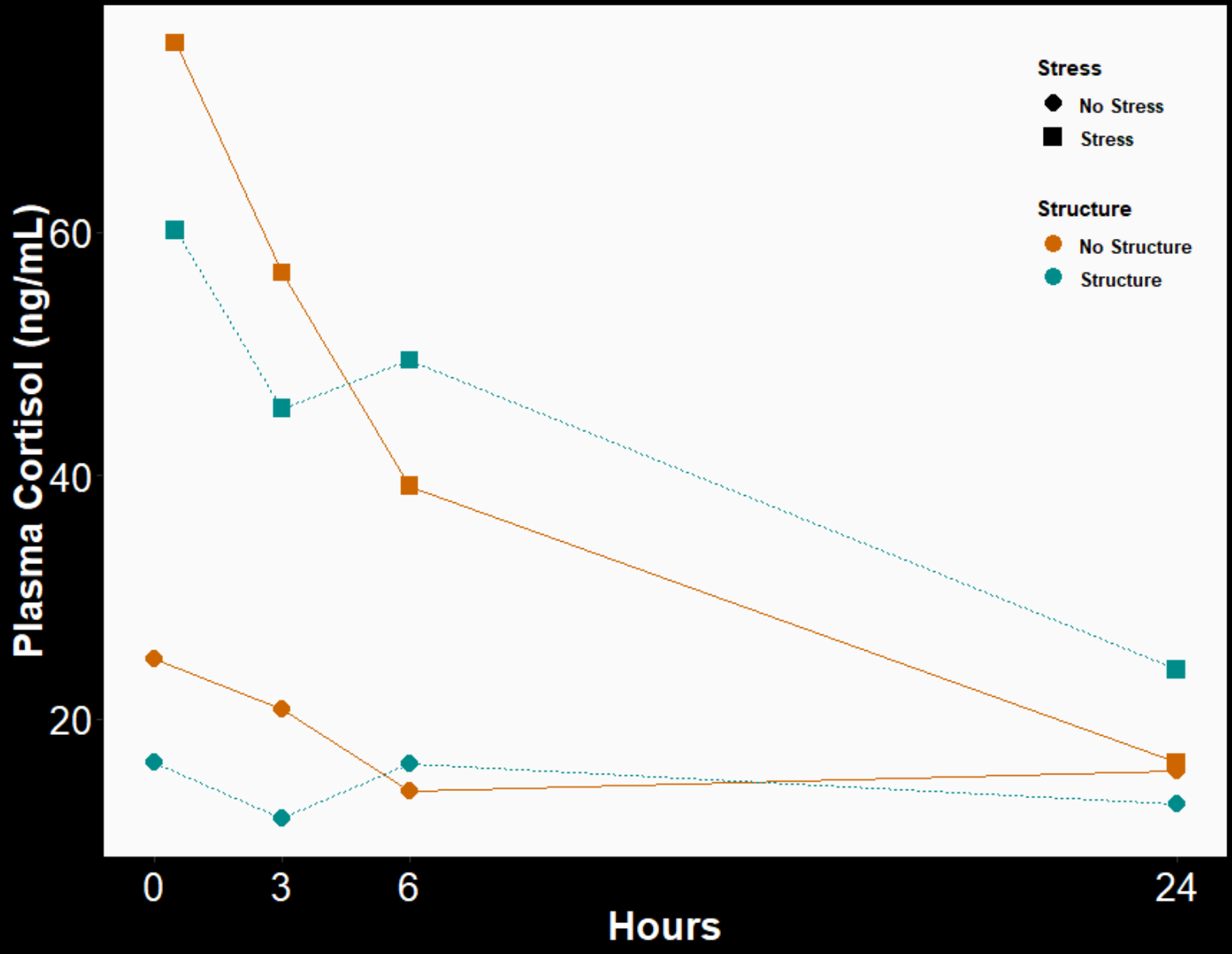
Stressor



Chinook Stress Test Results

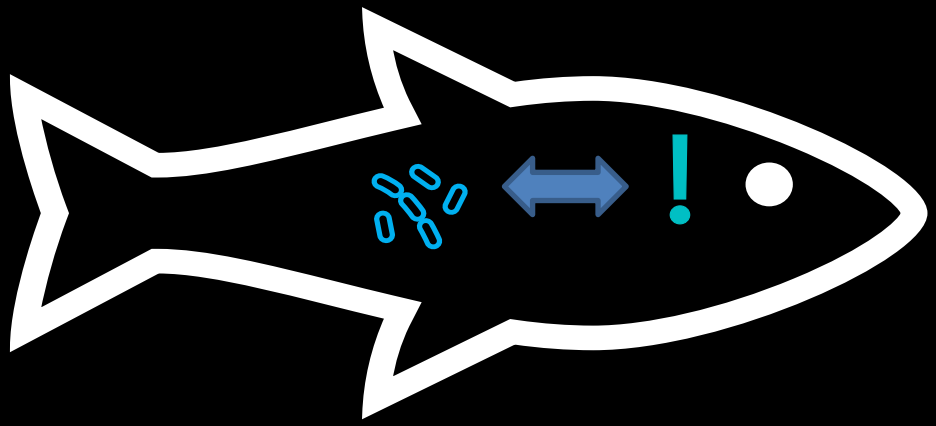


Steelhead Stress Test



The microbiome, stress physiology & immunity

- Gut microbiome is closely linked to immunity – bidirectional
- Stress physiology has a large impact on immune function
- The microbiome could be an indicator of stress/immune dysfunction

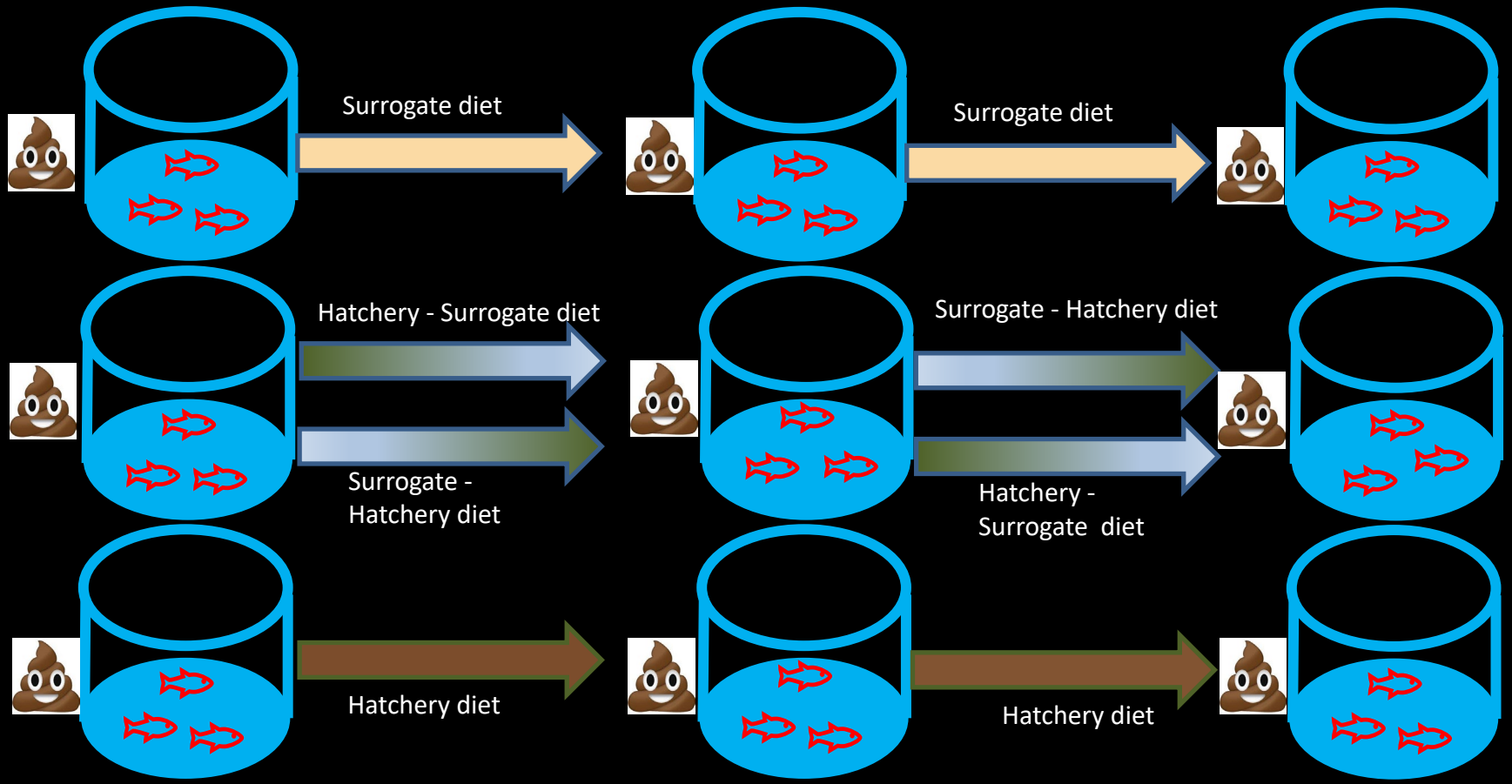


Diet, microbiome and immunity

Can we alter the microbiome-immune axis through diet to reduce disease susceptibility?

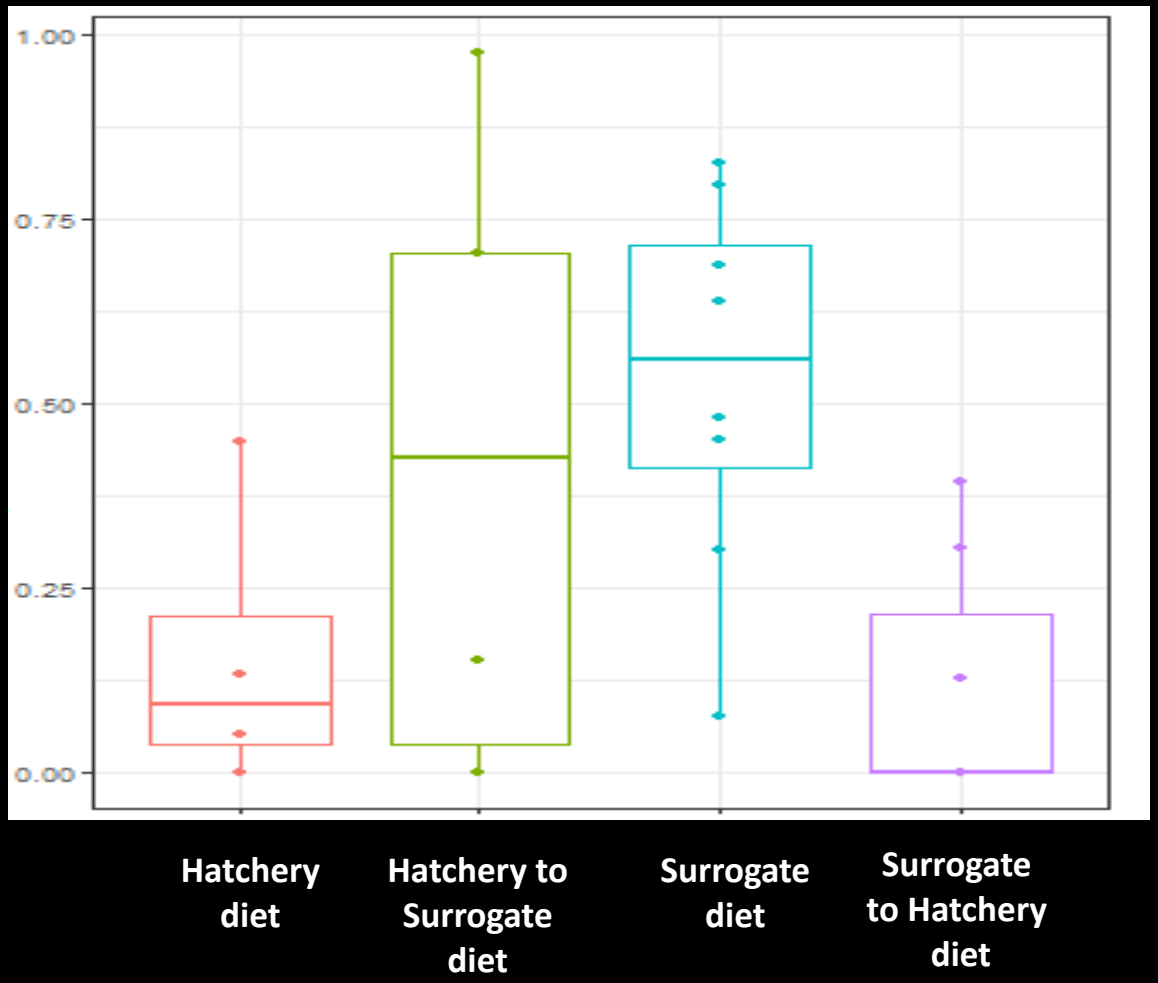
1. Can wild surrogate diet (low-lipid) create a wild-like microbiome?
2. Does diet influence the microbiome-immune system?
3. What are the consequences for disease susceptibility?

Experimental design



Preliminary results: innate immunity

- Surrogate, wild-like diet enhanced innate immunity
- Related to microbiome?



Ongoing/ future research

Fin damage experiment

Can the Surrogate rearing method can prolong, reduce, and/or mitigate onset and severity of damage?

Fasting experiment

Can we prevent negative effects of experience fasting upon release in Chinook salmon?

Microbiome experiment

Do diet-driven microbiome/immune changes affect disease susceptibility?

Thank you

<u>Surrogate Project</u>
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Questions