

Vulnerability and Robustness in Pacific Salmon



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2019 – Jane Lubchenco and Steven D. Gaines

Historic



Current

*“The ocean is so vast,
it is simply too big to fail.”*

*“The ocean is massively and fatally
depleted and disrupted. The ocean is
simply too big to fix.”*

2019

– Jane Lubchenco and Steven D. Gaines

Historic

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Current

*“The ocean is massively and fatally
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Proposed

*“The ocean is so central to our future.
It’s too important to neglect.”*

What is the conservation narrative of Pacific salmon?



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What is the conservation narrative of Pacific salmon?



Is It Too Late to Save Wild Salmon?

Coho salmon: BC's canary in the coal mine

Climate Change Pushing Western Salmon Toward Extinction

To Save the Rivers and the Woods, Try Hurling a Few Dead Fish

What is the conservation ~~narrative~~ of Pacific salmon?

Science

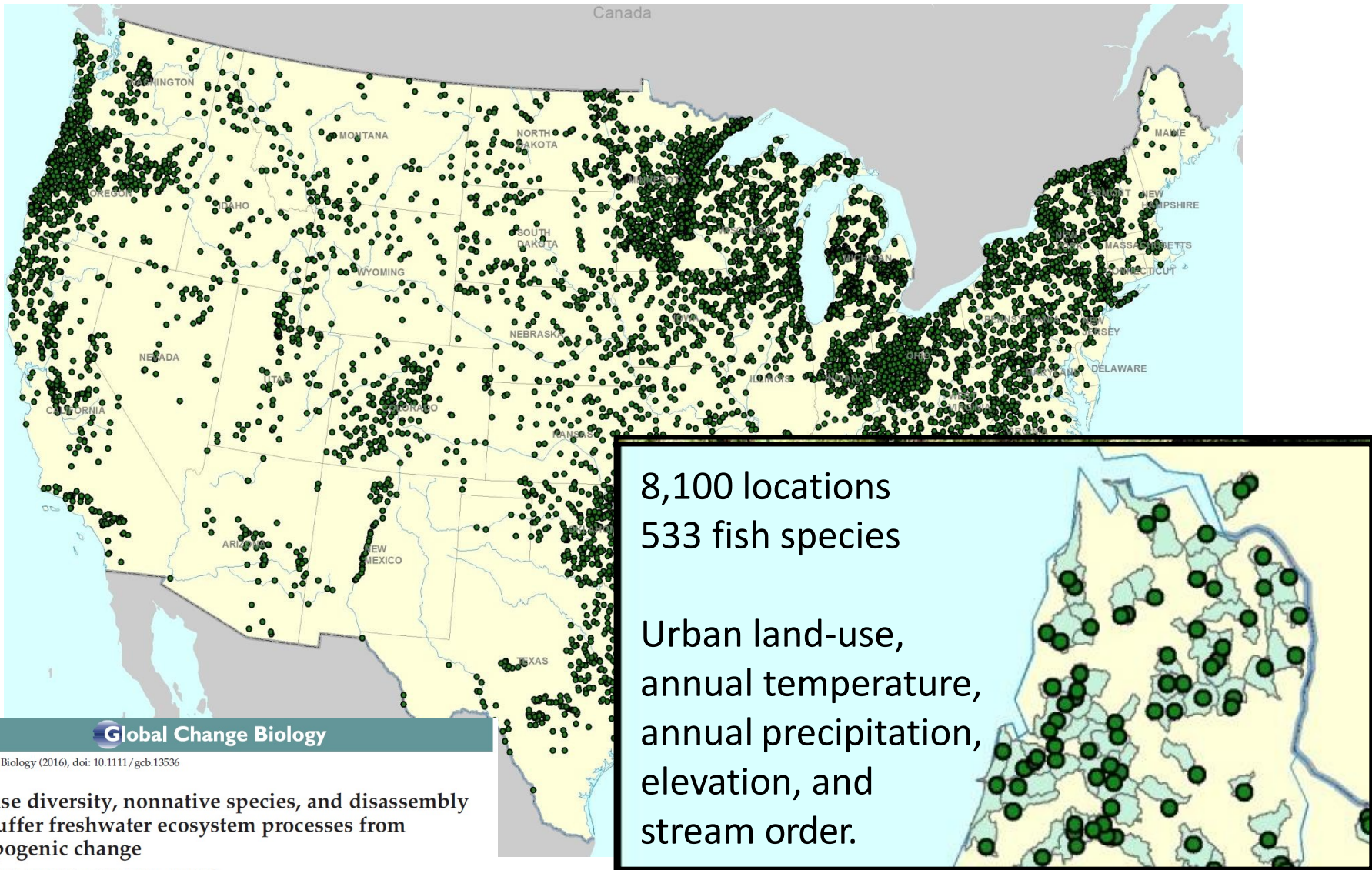


What is the conservation ~~narrative~~ of Pacific salmon?

Science

Vulnerability \sim Exposure * Sensitivity
- Resilience

Fish and Environment Data

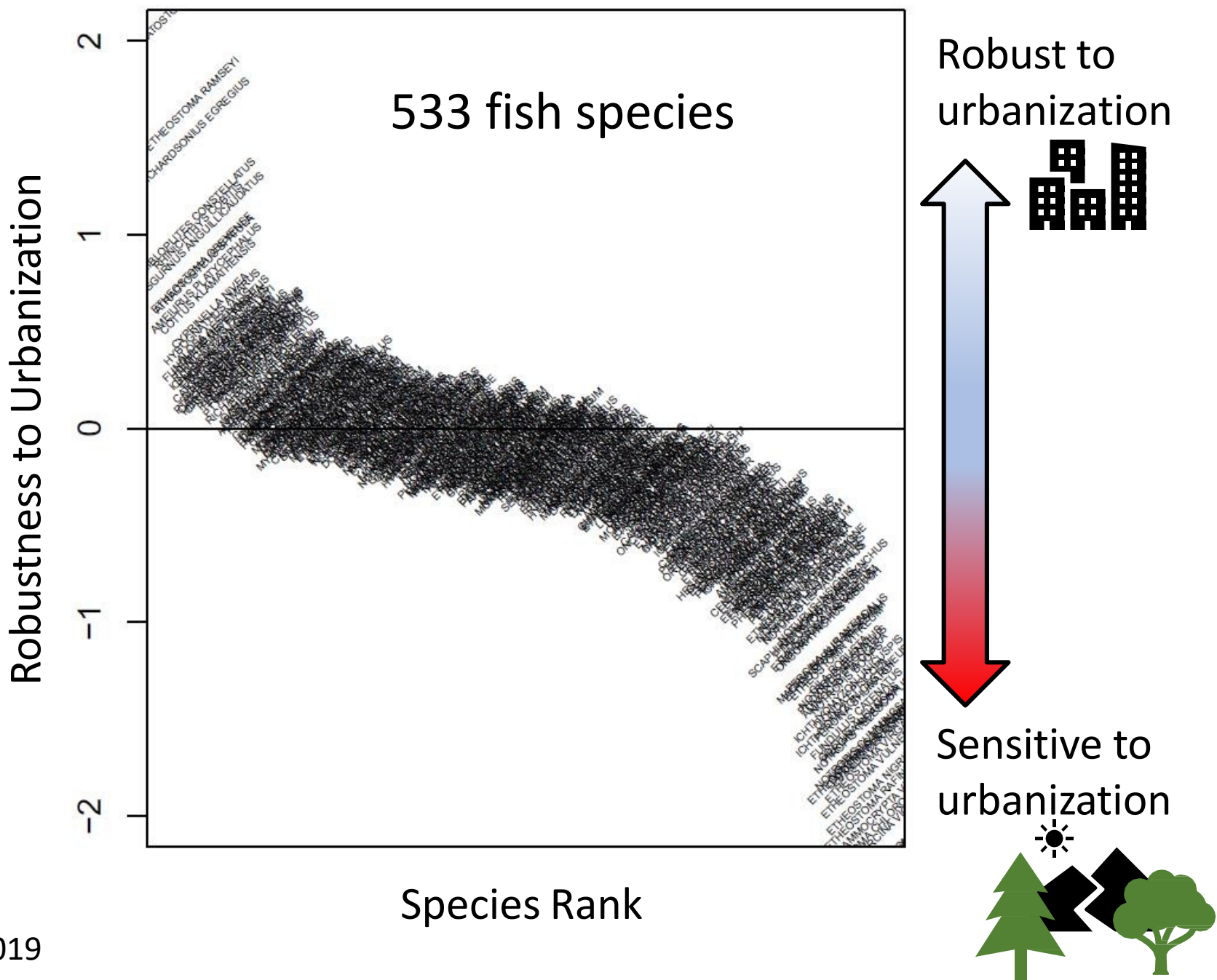


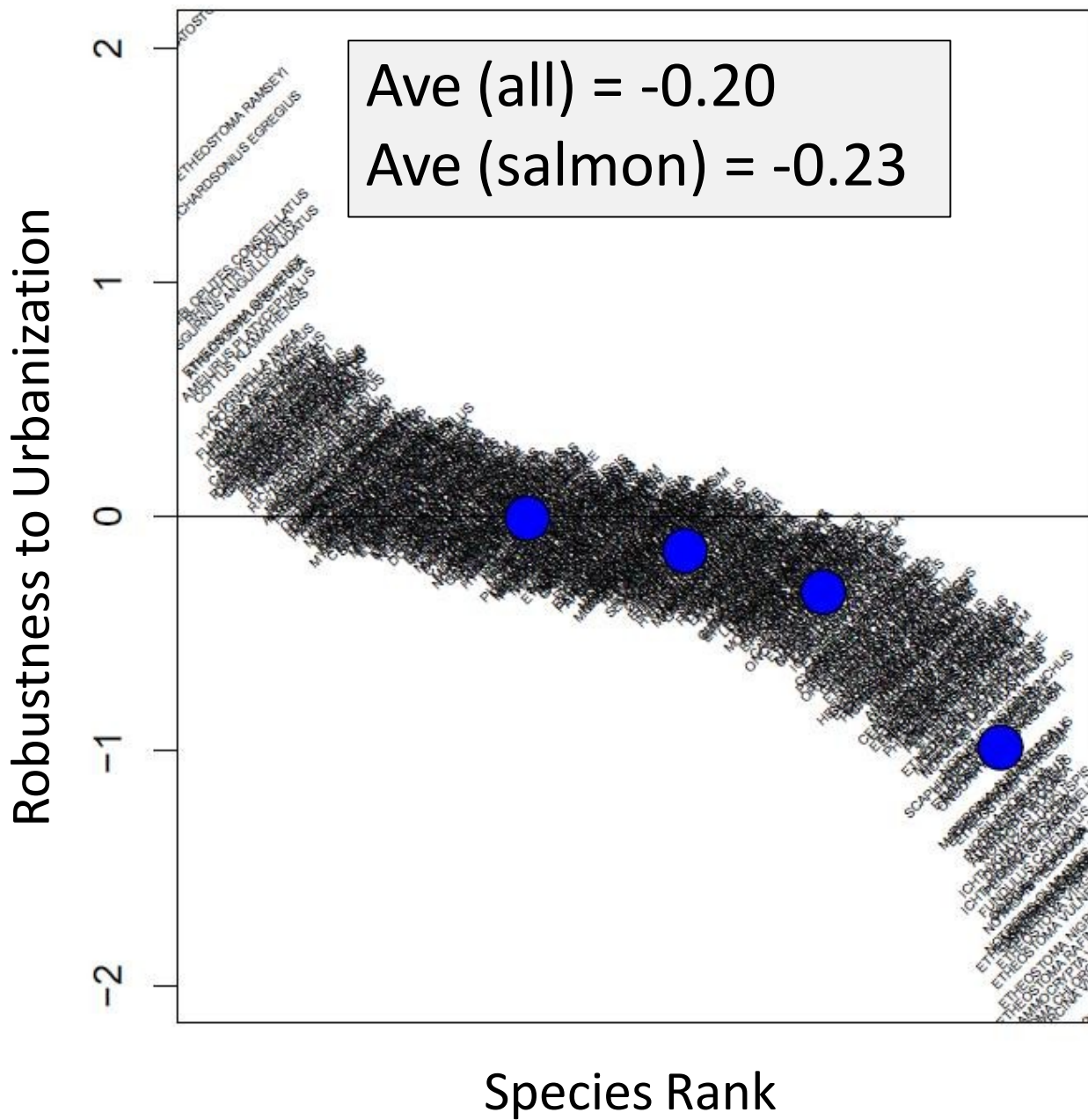
Global Change Biology

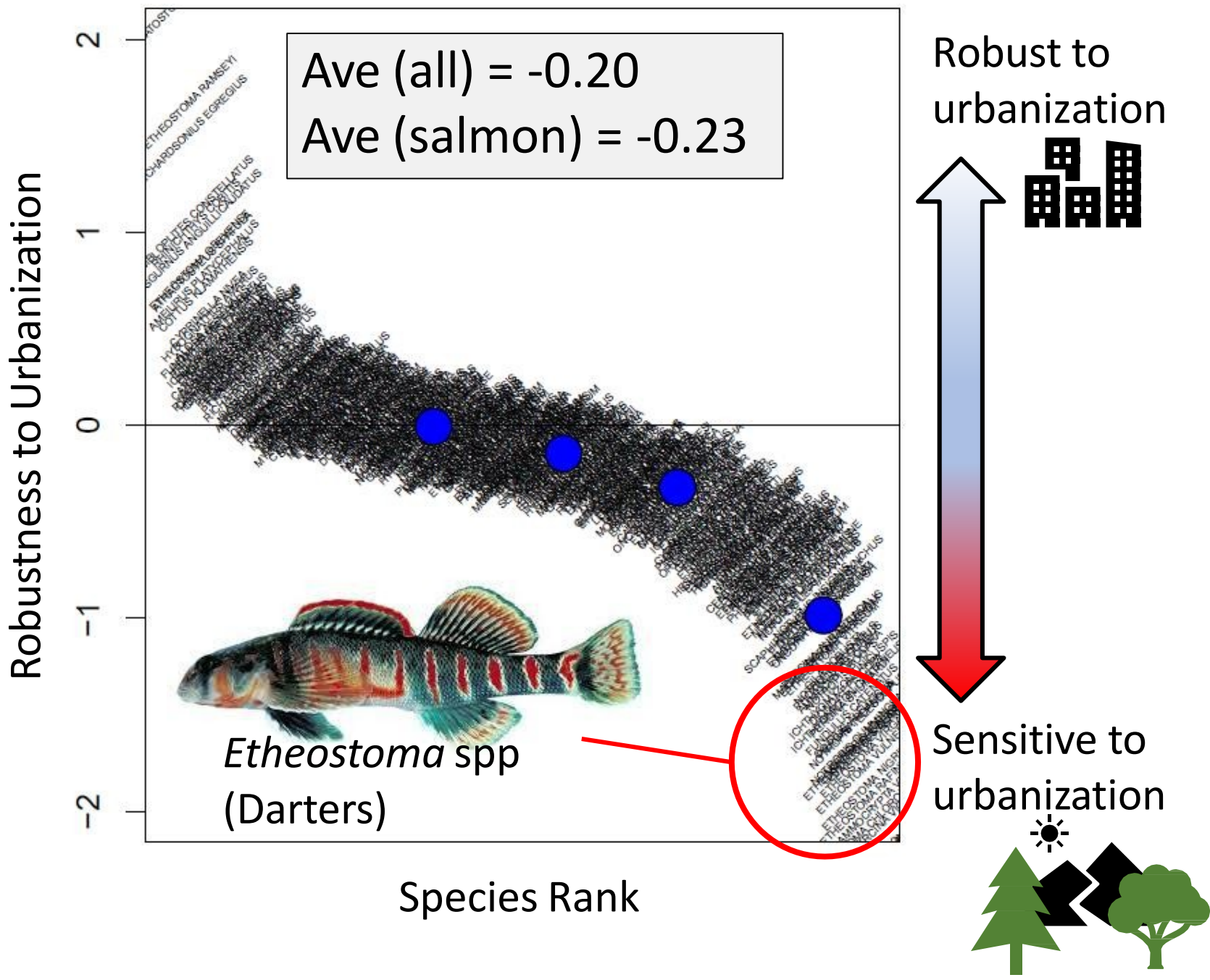
Global Change Biology (2016), doi: 10.1111/gcb.13536

Response diversity, nonnative species, and disassembly rules buffer freshwater ecosystem processes from anthropogenic change

JONATHAN W. MOORE¹ and JULIAN D. OLDEN²



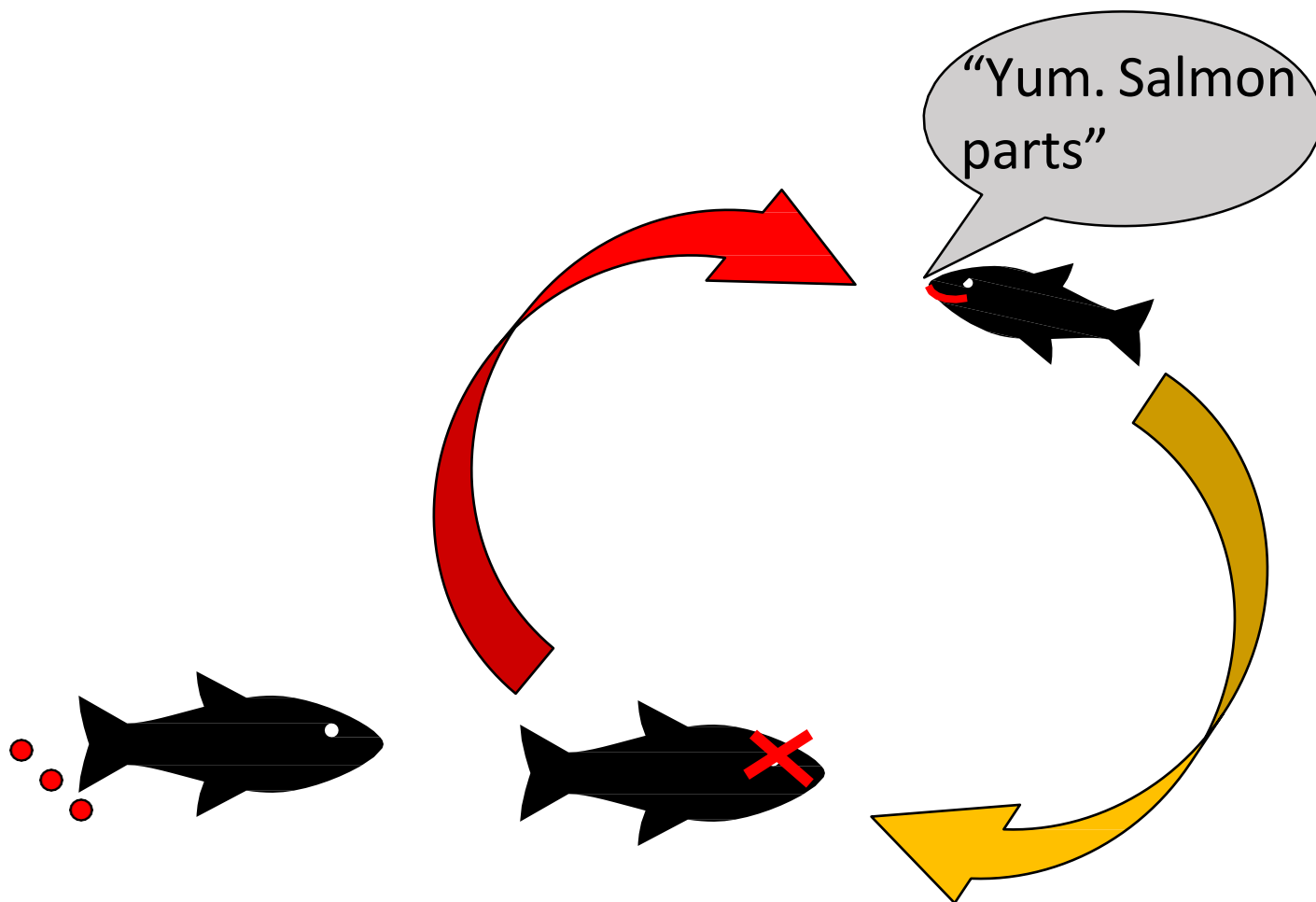




What is the conservation ~~narrative~~ of Pacific salmon?

Science

To Save the Rivers and the Woods, Try Hurling a Few Dead Fish



What is the conservation ~~narrative~~ of Pacific salmon?

Science

Is It Too Late to Save Wild Salmon?

Vulnerability \sim Exposure * Sensitivity
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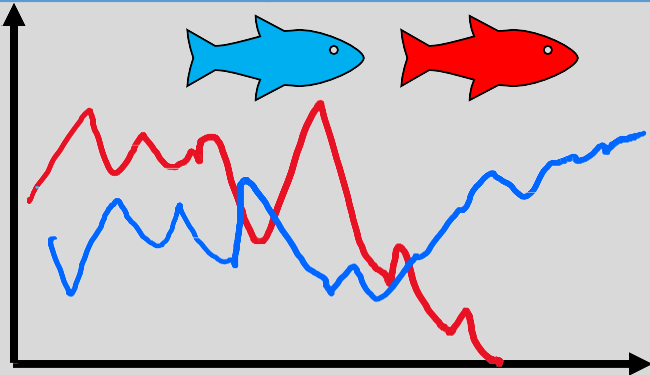
Homing and straying

None

High



+	-
Location adaptation	No metapop'n

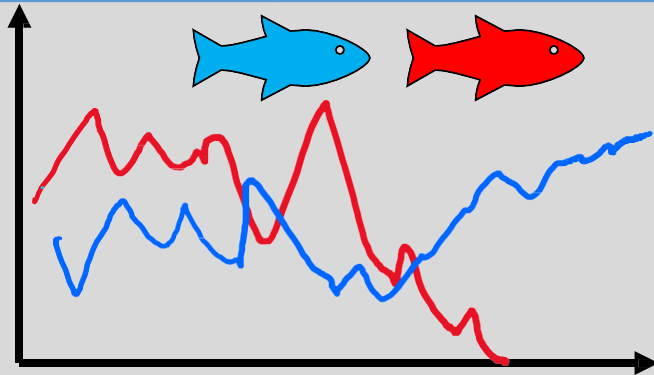


Homing and straying

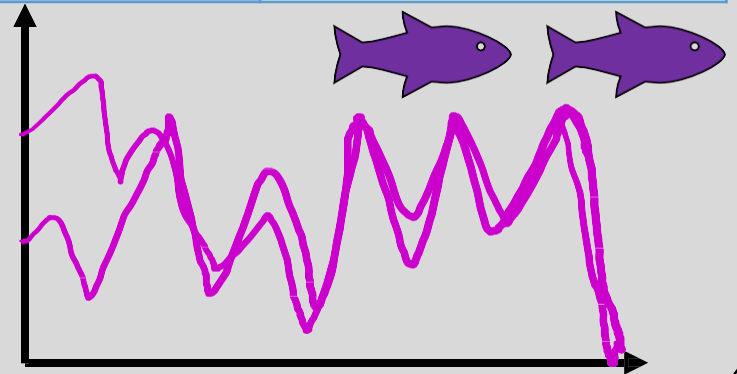
None

High

+	-
Location adaptation	No metapop'n



+	-
Metapop'n processes	Homogenization
	Synchronized collapse



'Goldilocks' straying?

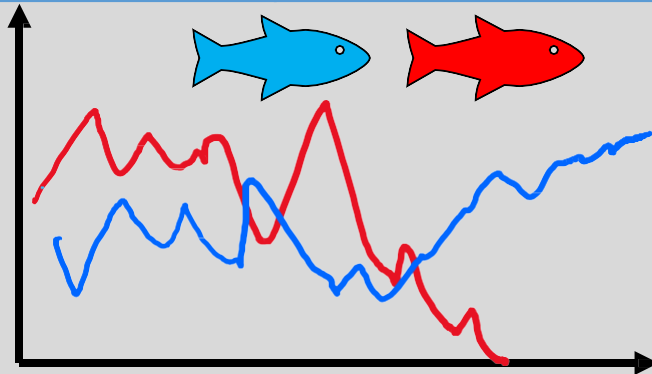
Just right. . .



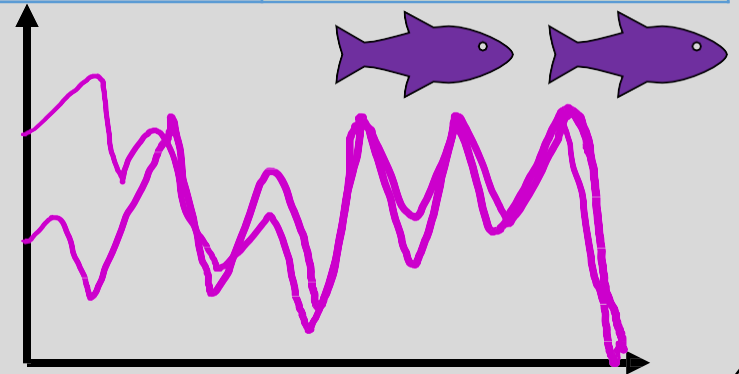
None

High

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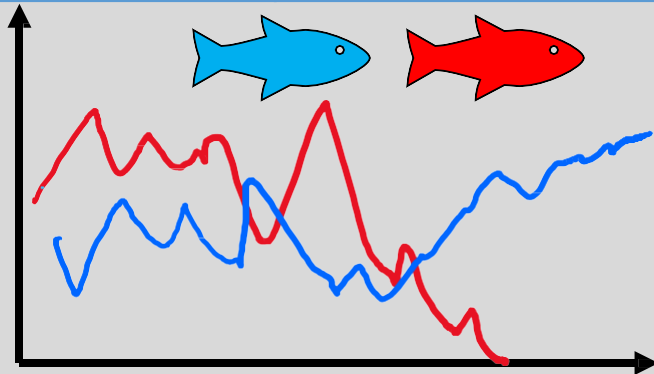


Eco-evolutionary dynamics, density-dependent dispersal, and collective behaviour:
implications for salmon metapopulation robustness

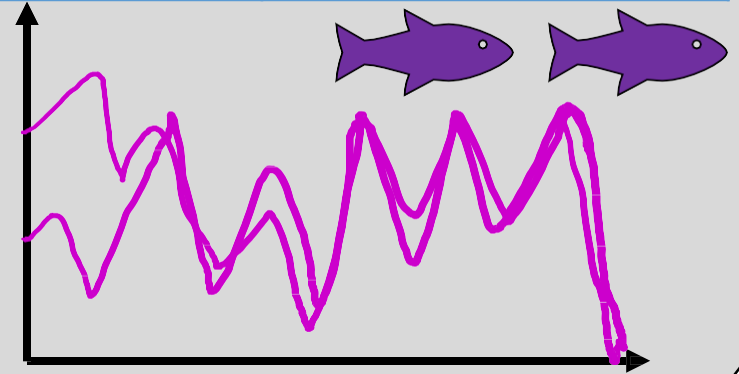
None

High

+	-
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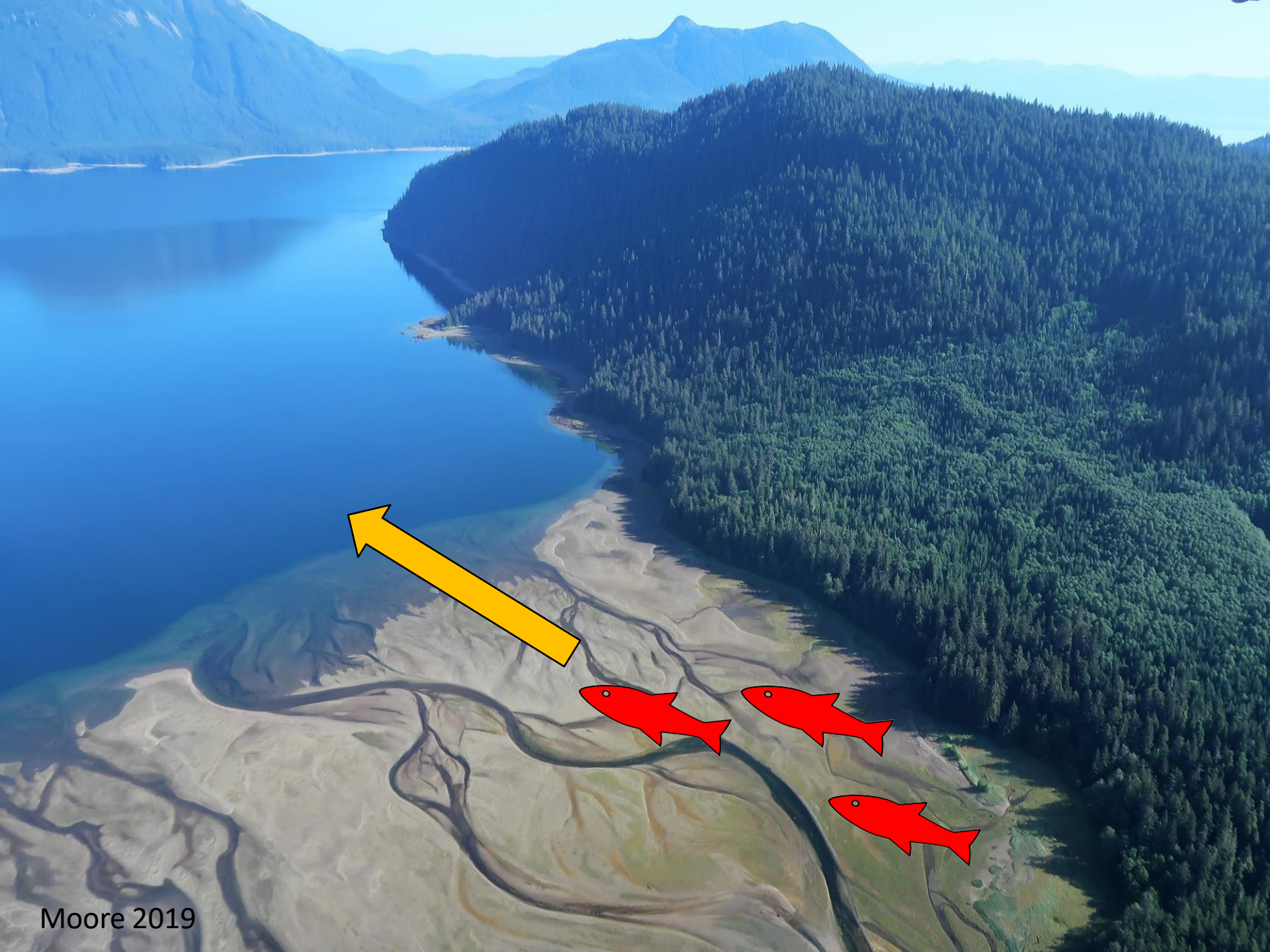
+	-
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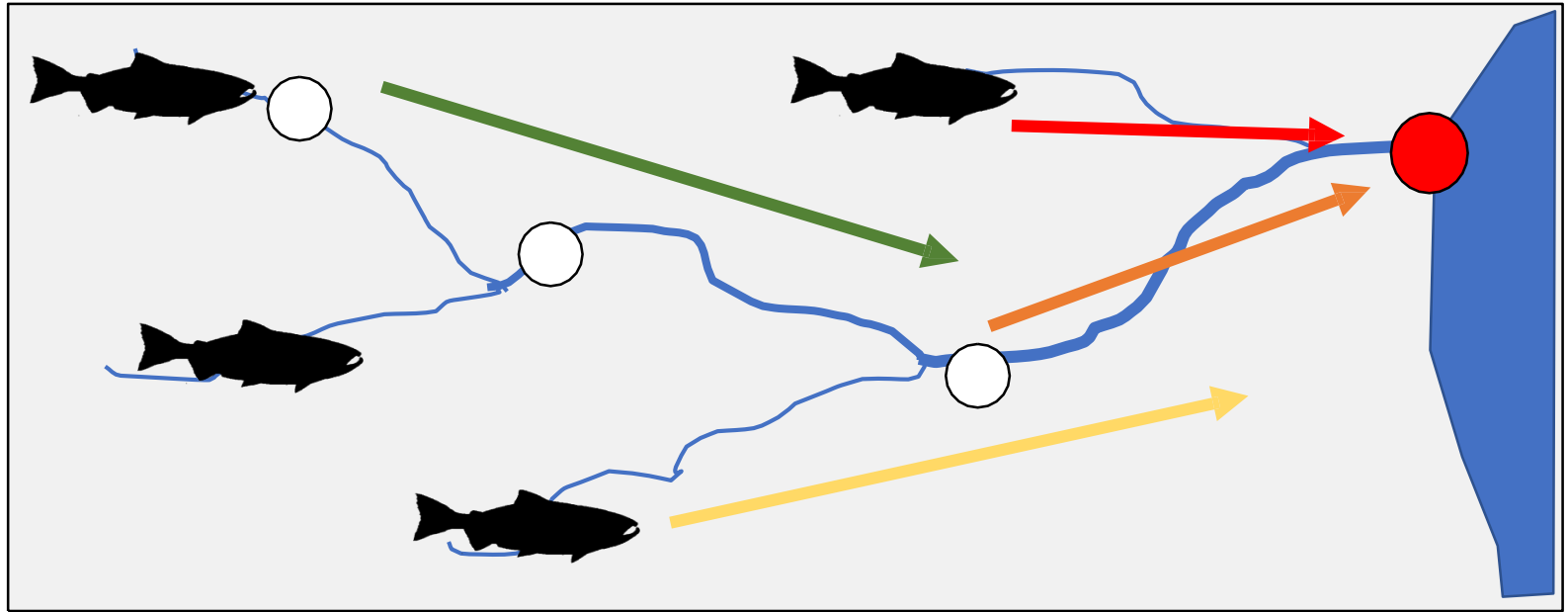
What is the conservation ~~narrative~~ of Pacific salmon?

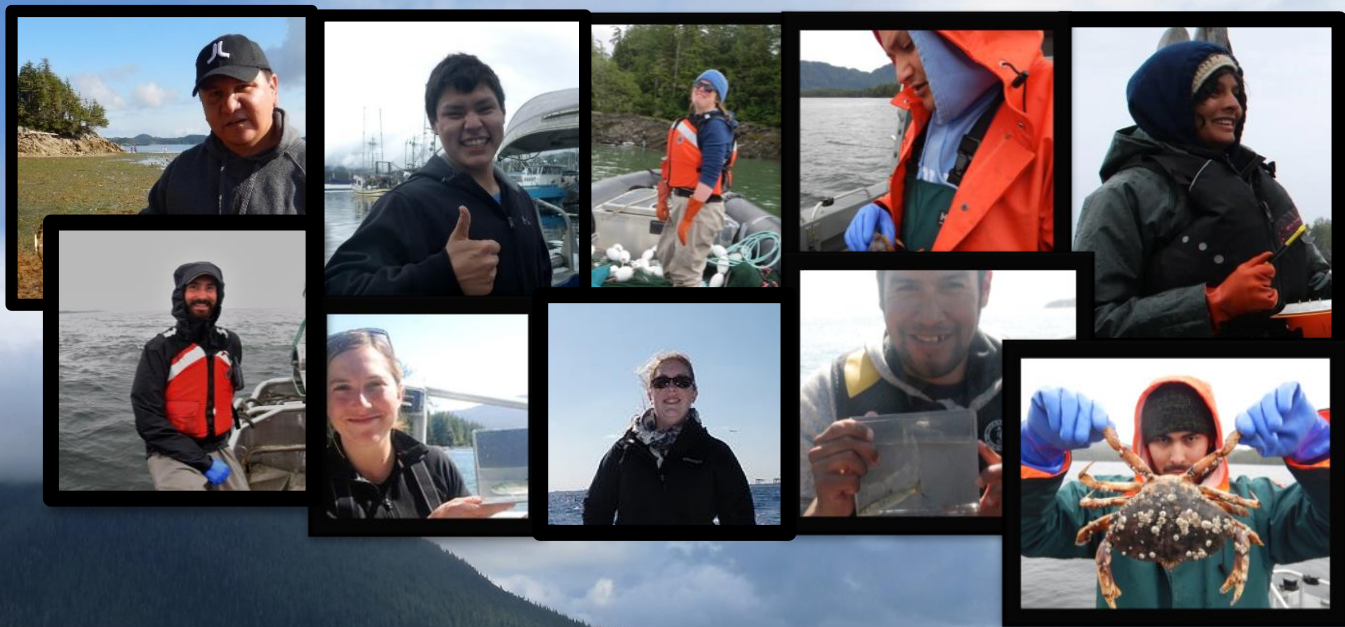
Science

Vulnerability \sim Exposure * Sensitivity
- Resilience



Phenological diversity





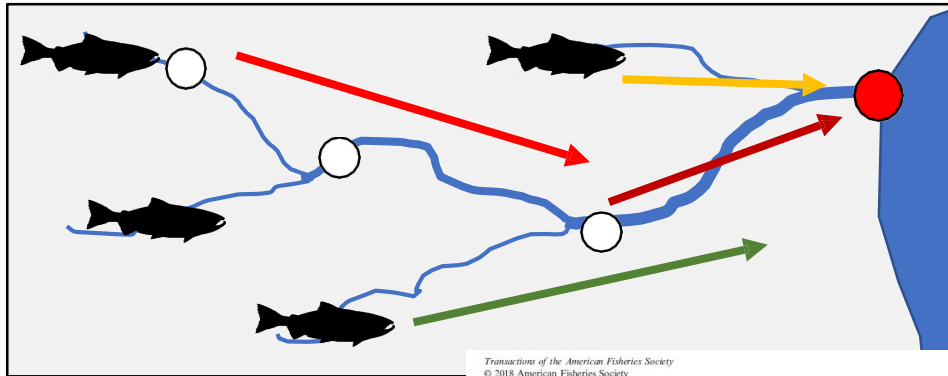
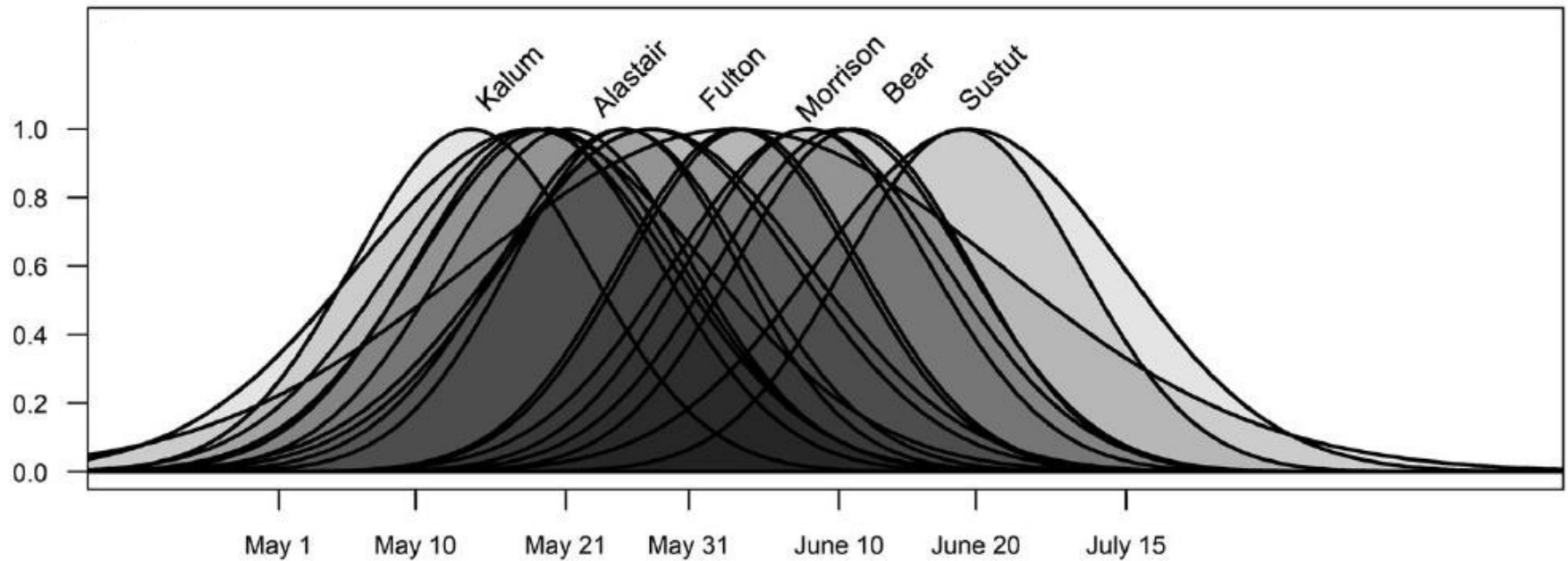
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Phenological diversity



FEATURED PAPER

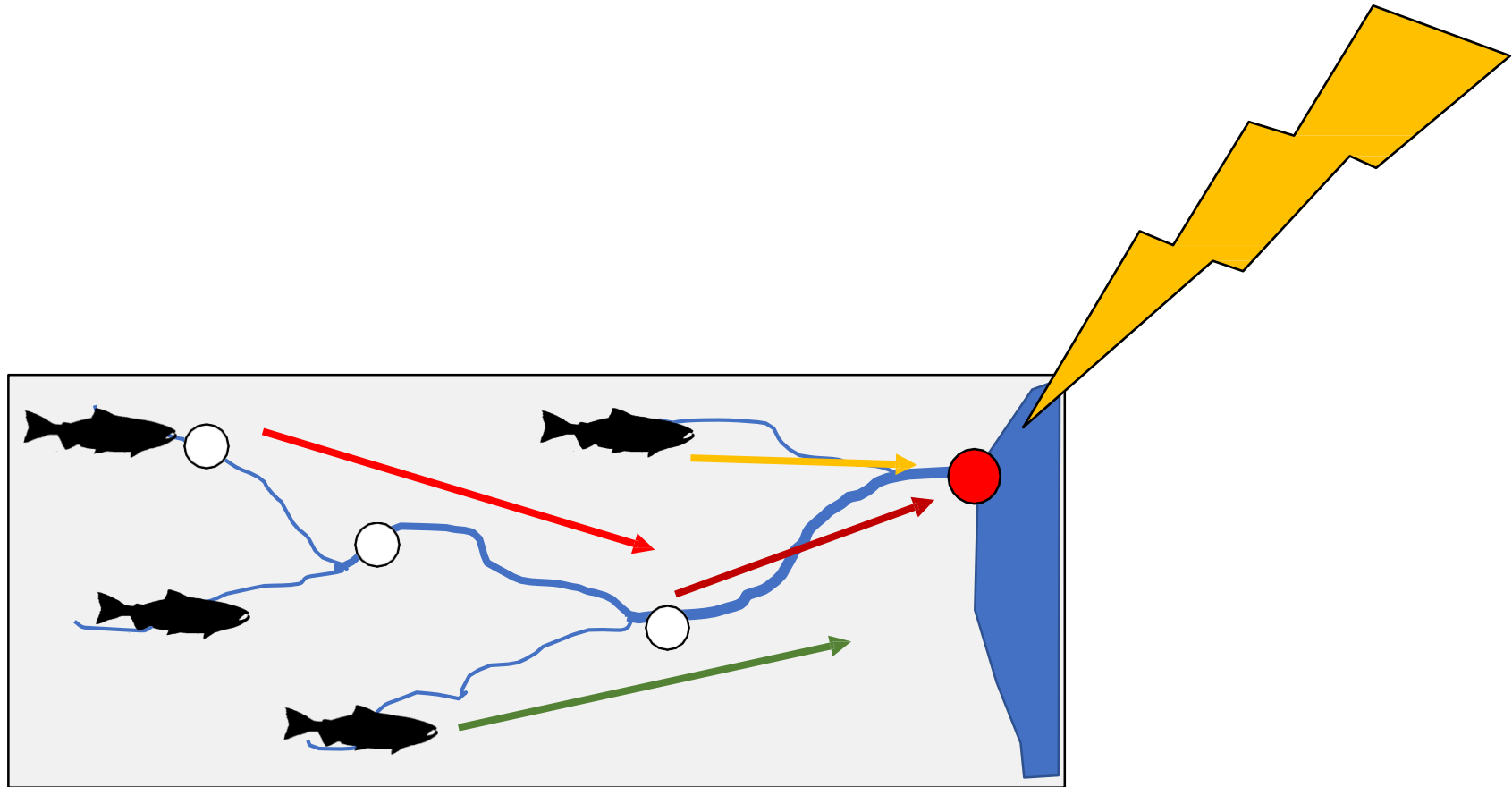
Phenological Diversity of Salmon Smolt Migration Timing within a Large Watershed

Charmaine N. Carr-Harris*

Moore 2019



.. But vulnerability of migratory bottlenecks





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Skeena River Estuary

Skeena River

Lelu Island

Flora Bank



Pacific NorthWest LNG





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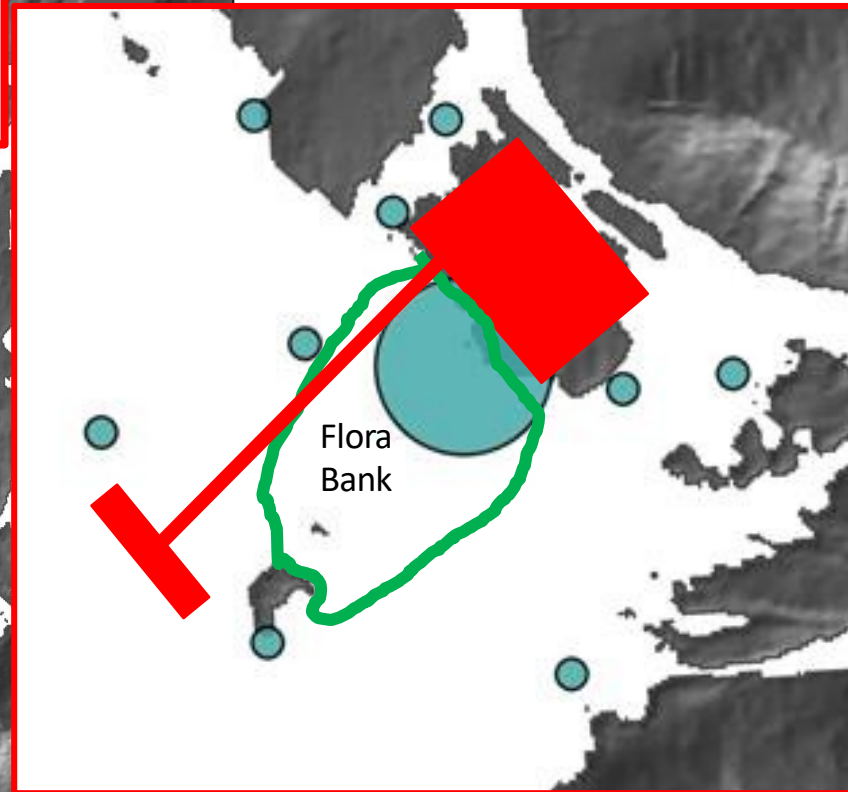
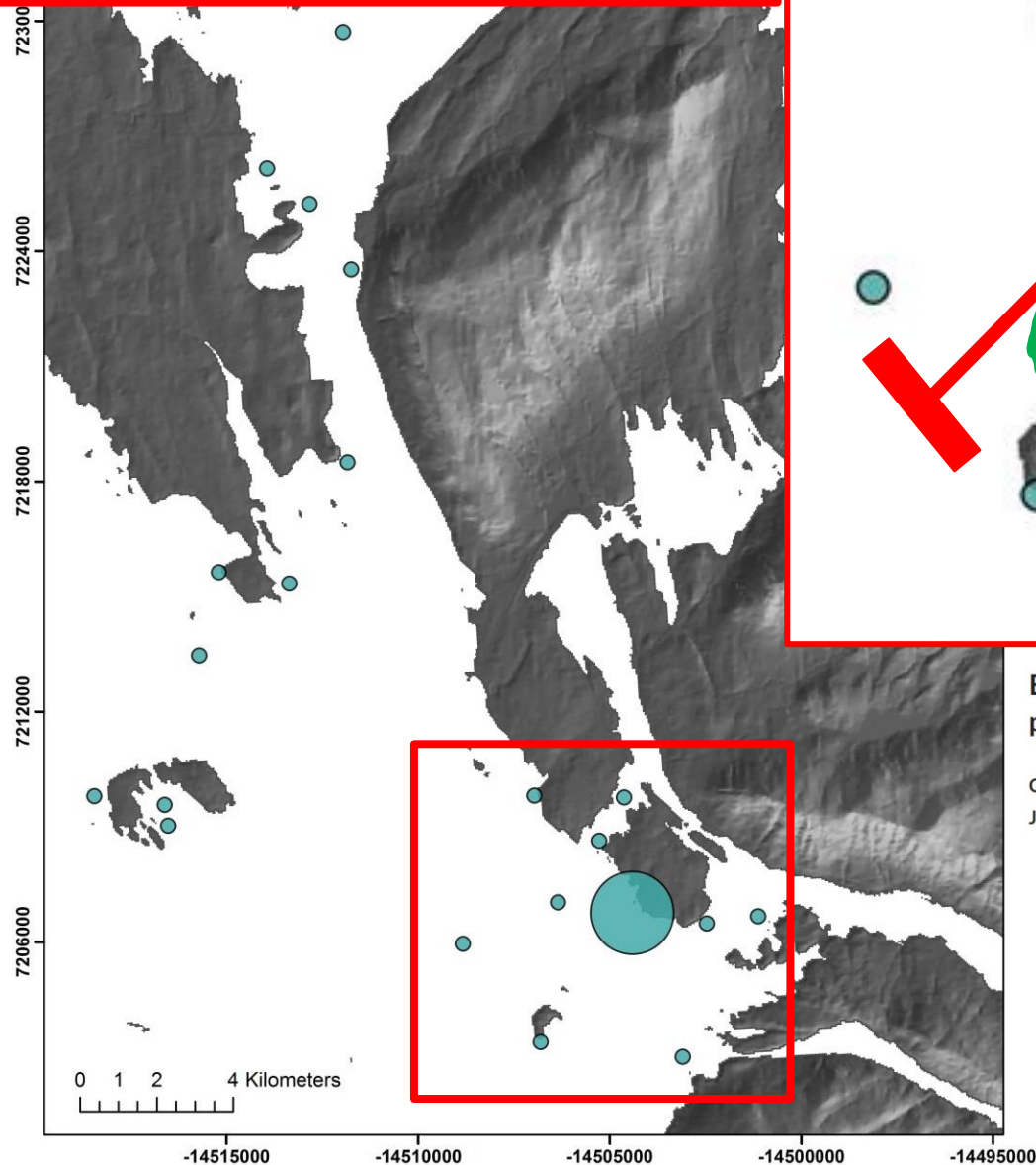
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Petronas Hoping To Buy First Nations Tribes' Support For \$1 Billion



Pacific Northwest LNG Proposed for Skeena estuary



Estuary habitat associations for juvenile Pacific salmon and pelagic fish: Implications for coastal planning processes

Ciara Sharpe¹  | Charmaine Carr-Harris^{2†} | Michael Arbeider^{1†} | Samantha M. Wilson¹ | Jonathan W. Moore¹





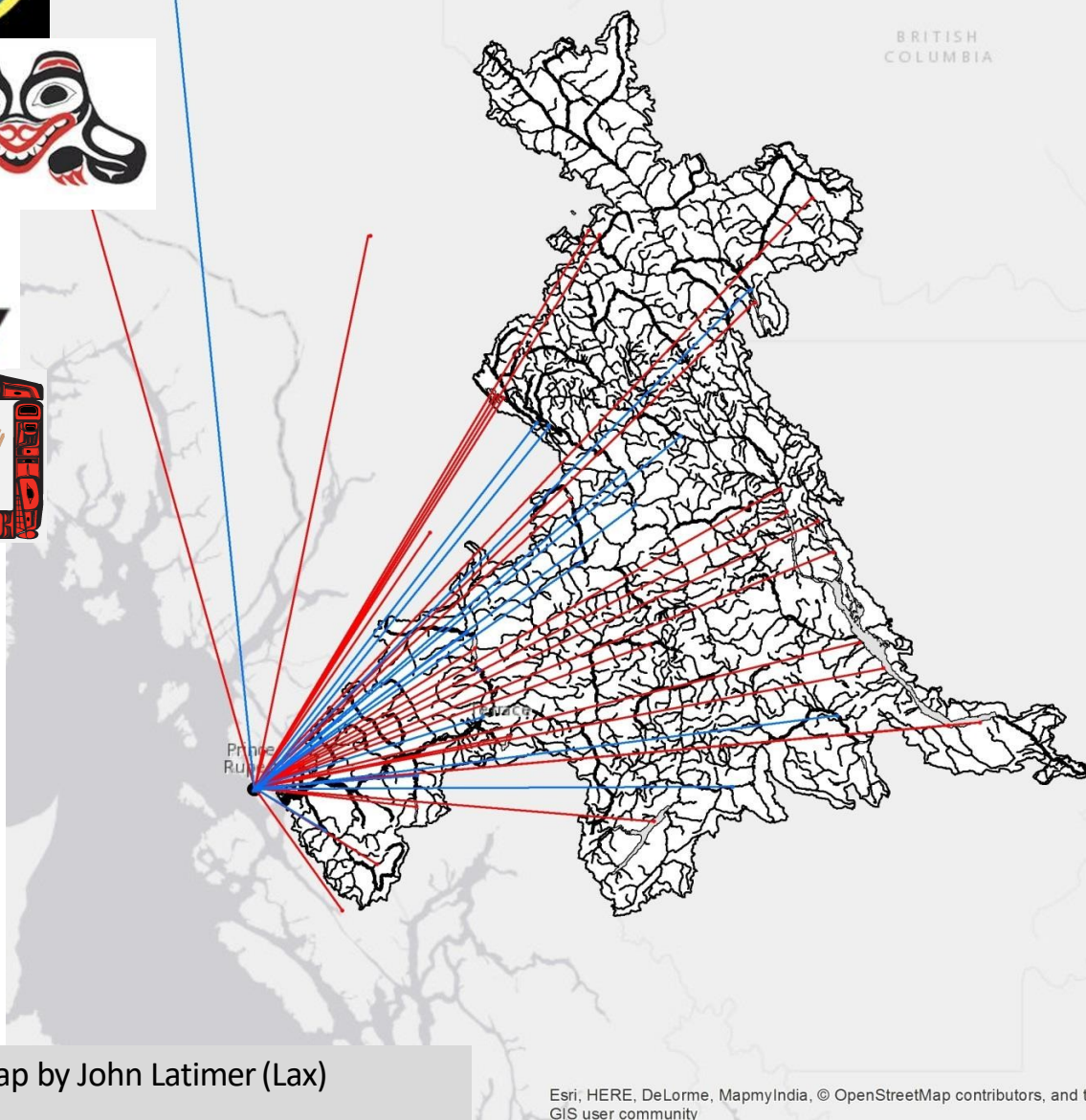
sciencemag.org **SCIENCE**

596 7 AUGUST 2015 • VOL 349 ISSUE 6248

Jonathan W. Moore,^{1*} Charmaine Carr-Harris,² Allen S. Gottesfeld,² Donna MacIntyre,³ David Radies,⁴ Mark Cleveland,⁵ Chris Barnes,^{2,6†} Walter Joseph,⁷ Glen Williams,⁵ Jennifer Gordon,⁸ Bill Shepert⁸

¹Earth2Ocean Research Group, Department of Biological Sciences, Simon Fraser University, Burnaby, BC V5A 1S6, Canada. ²Skeena Fisheries Commission, Kispiox, BC V0J 1Y4, Canada. ³Lake Babine Nation, Burns Lake, BC V0J 1E0, Canada. ⁴Takla Lake Nation, Prince George, BC V2L 2Y9, Canada. ⁵Gitanyow, Kitwanga, BC V0J 2A0, Canada. ⁶Gitxsan Watershed Authorities, Hazelton, BC V0J 1Y0, Canada. ⁷Wet'suwet'en, Smithers, BC V0J 2N1, Canada. ⁸Lax Kw'alaams Fisheries, Lax Kw'alaams, BC V0V 1H0, Canada.

Over 50 populations of salmon from over 10 First Nation territories



Map by John Latimer (Lax)

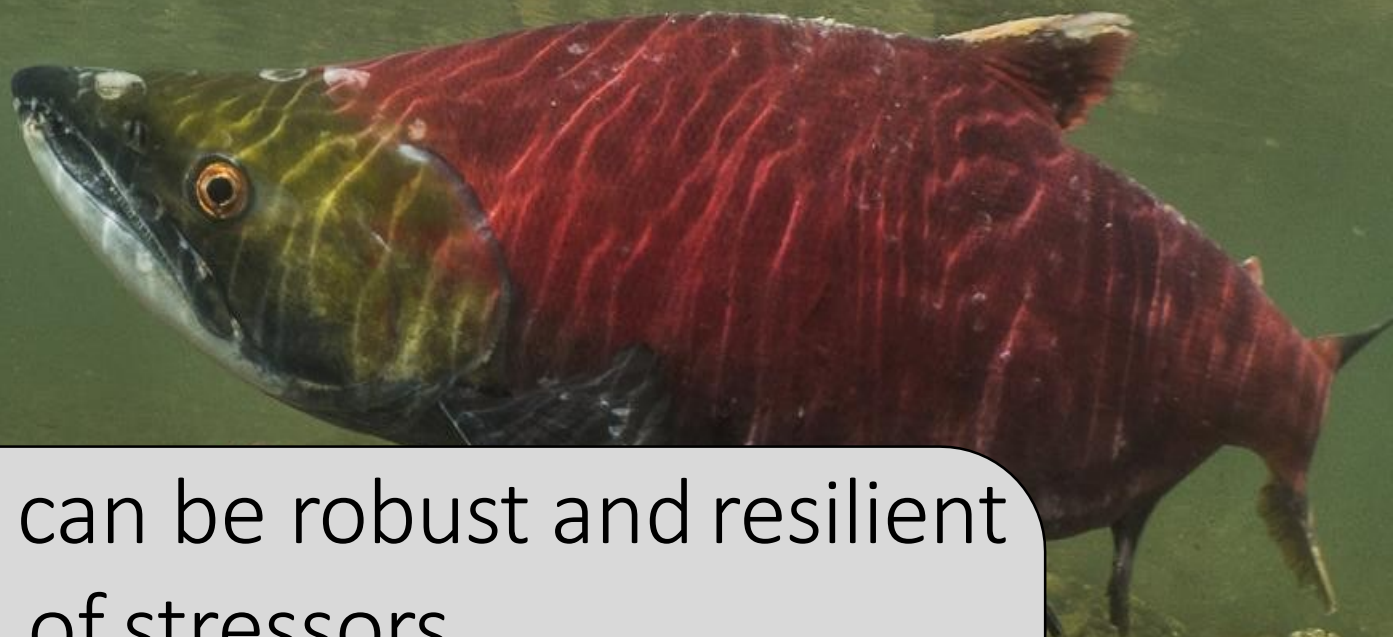
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What is the conservation ~~narrative~~ of Pacific salmon?

Science



Vulnerability \sim Exposure * Sensitivity
- Resilience



1. Salmon can be robust and resilient
2. But lots of stressors
3. And resilience processes are being undermined
4. As the world is rapidly changing

A new narrative for the ocean

– Jane Lubchenco and Steven D. Gaines

Historic

*“The ocean is so vast,
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*“The ocean is massively and fatally
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Proposed

*“The ocean is so central to our future.
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~~Science~~ ~~A new narrative for the ocean~~ based [^] S Salmon

Historic



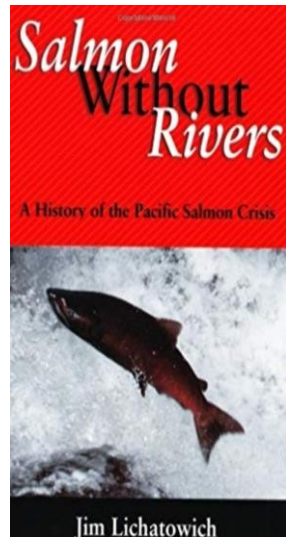
Current



Proposed

Inexhaustible and improvable

"We assumed we could control the biological productivity of salmon and 'improve' upon natural processes that we didn't even try to understand."



~~Science~~ ~~A new narrative for the ocean~~ ~~Salmon~~ based [^]S

Historic

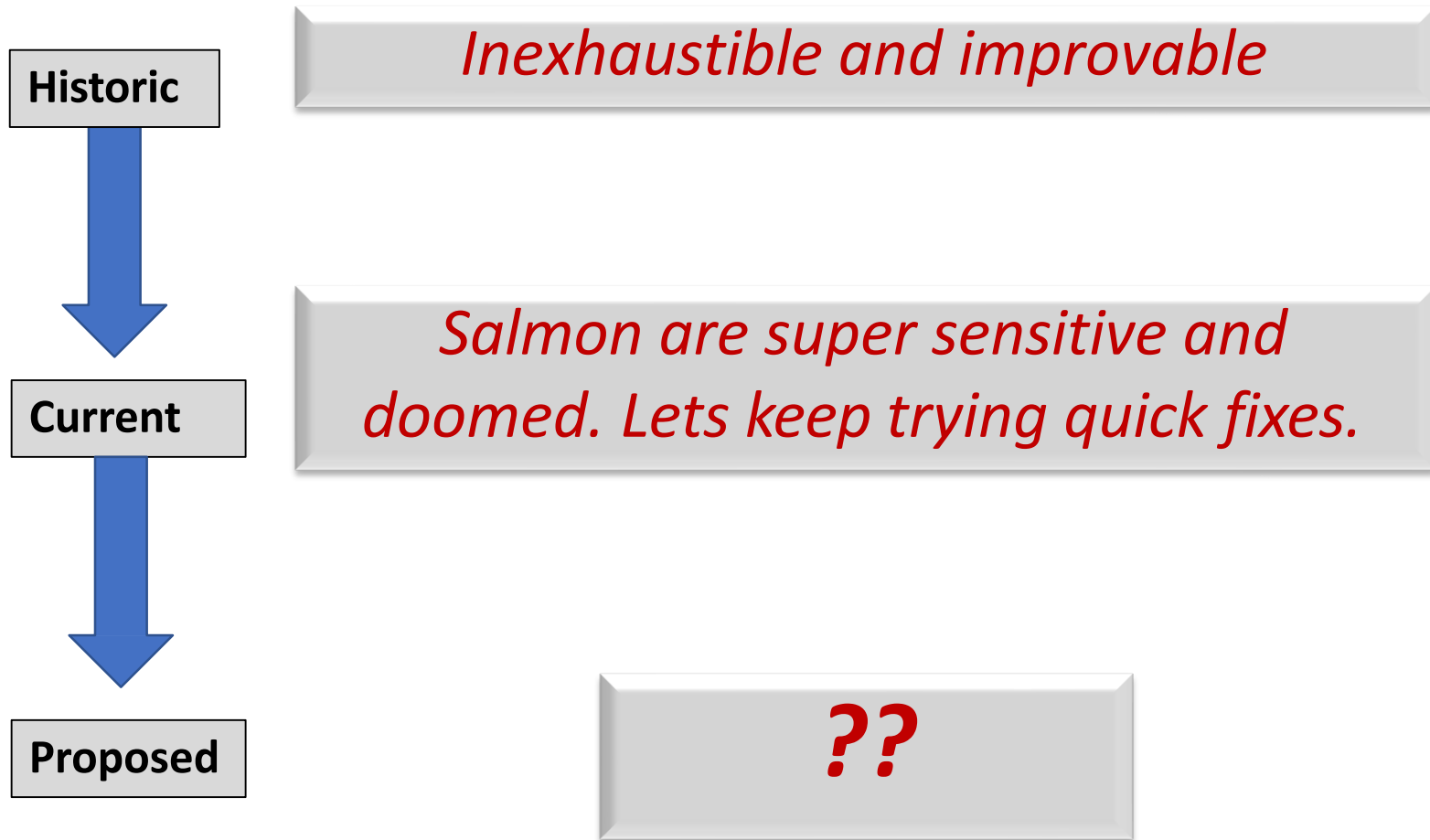
Inexhaustible and improvable

Current

Salmon are super sensitive and doomed. Lets keep trying quick fixes.

Proposed

~~Science-based~~ ~~A new narrative for the ocean~~ ~~Salmon~~



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