Colin J. Bailey, DC Braun, DJF McCubbing, JD Reynolds, B Ward, TD Davies, and JW Moore

Holy Smolts it's Time to GO!

SFU

PHOTO: WILL ATLAS

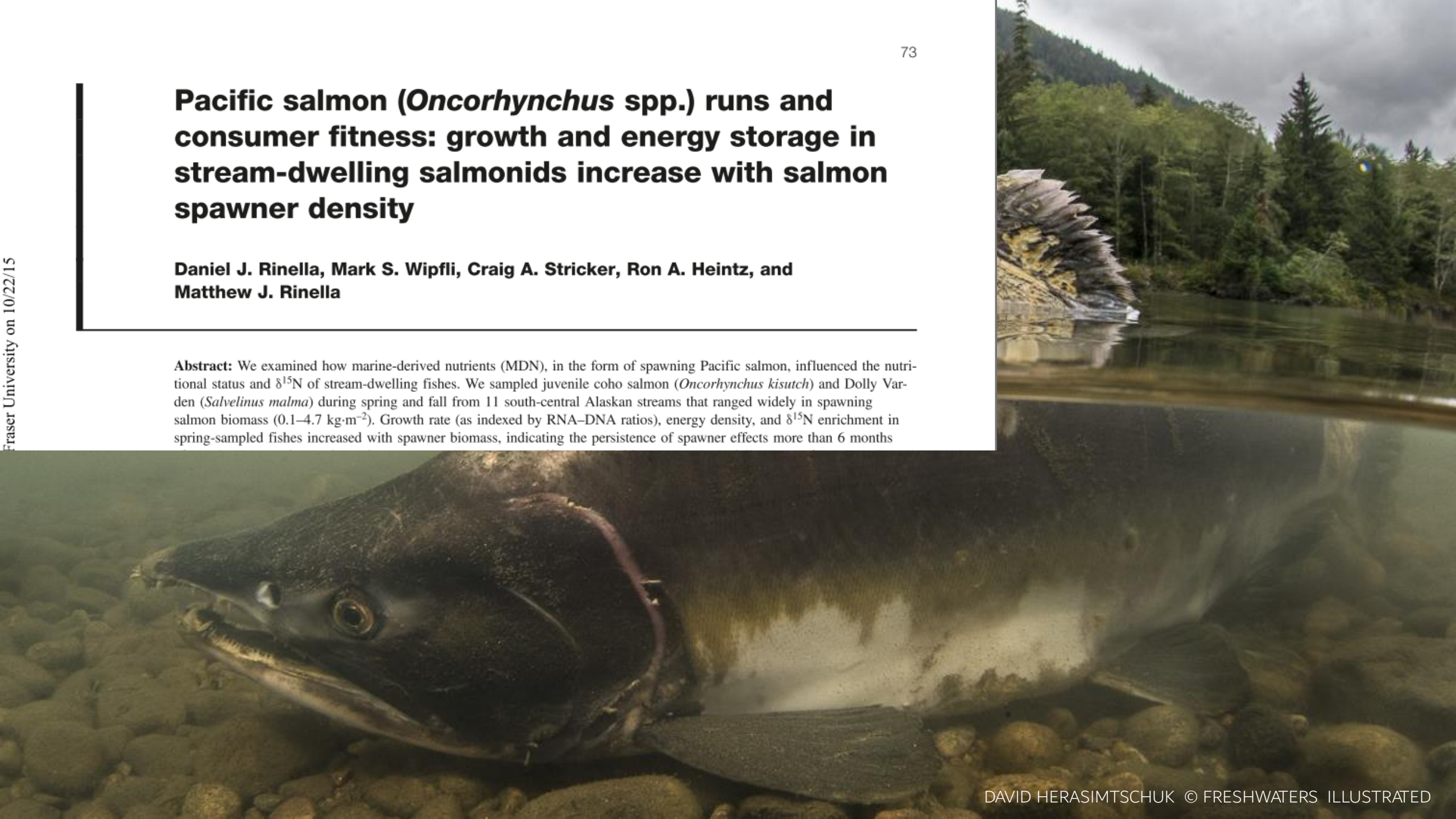
PHOTO: WILL ATLAS

PHOTO: DAVID HERASIMTSCHUK © FRESHWATERS ILLUSTRATED

Pacific salmon (*Oncorhynchus* spp.) runs and consumer fitness: growth and energy storage in stream-dwelling salmonids increase with salmon spawner density

Daniel J. Rinella, Mark S. Wipfli, Craig A. Stricker, Ron A. Heintz, and Matthew J. Rinella

Abstract: We examined how marine-derived nutrients (MDN), in the form of spawning Pacific salmon, influenced the nutritional status and $\delta^{15}N$ of stream-dwelling fishes. We sampled juvenile coho salmon (*Oncorhynchus kisutch*) and Dolly Varden (*Salvelinus malma*) during spring and fall from 11 south-central Alaskan streams that ranged widely in spawning salmon biomass (0.1–4.7 kg·m^{-2}). Growth rate (as indexed by RNA–DNA ratios), energy density, and $\delta^{15}N$ enrichment in spring-sampled fishes increased with spawner biomass, indicating the persistence of spawner effects more than 6 months



DAVID HERASIMTSCHUK © FRESHWATERS ILLUSTRATED

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Ecosystems (2002) 5: 399–417
DOI: 10.1007/s10021-001-0083-3

ECOSYSTEMS

MINIREVIEW

Pacific Salmon, Nutrients, and the Dynamics of Freshwater and Riparian Ecosystems

Robert J. Naiman,[1]* Robert E. Bilby,[2] Daniel E. Schindler,[3] and James M. Helfield[4]

[1]School of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, Washington 98195, USA; [2]Technology Center, Weyerhaeuser Company, P.O. Box 9777, Federal Way, Washington 98063, USA; [3]Department of Zoology, Box 351800, University of Washington, Seattle, Washington 98195, USA; and [4]College of Forest Resources, Box 352100, University of Washington, Seattle, Washington 98195, USA

ABSTRACT

Pacific salmon (*Oncorhynchus* spp.) accumulate substantial nutrients in their bodies as they grow to adulthood at sea. These nutrients are carried to

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Research

Cite this article: Hocking MD, Dulvy NK, Reynolds JD, Ring RA, Reimchen TE. 2013 Salmon subsidize an escape from a

Salmon subsidize an escape from a size spectrum

Morgan D. Hocking[1,2,3], Nicholas K. Dulvy[1], John D. Reynolds[1,2], Richard A. Ring[3,4] and Thomas E. Reimchen[3]

[1]Earth to Ocean Research Group, Department of Biological Sciences, and [2]Hakai Network for Coastal People, Ecosystems and Management, Faculty of Environment, Simon Fraser University, 8888 University Drive, Burnaby, British Columbia, Canada V5A 1S6
[3]Department of Biology, University of Victoria, PO Box 3020, STN CSC, Victoria, British Columbia, Canada V8W 3N5
[4]Royal BC Museum, 675 Belleville Street, Victoria, British Columbia, Canada V8W 9W2

A general rule in ecology is that the abundance of species or individuals in communities sharing a common energy source decreases with increasing body size. However, external energy inputs in the form of resource subsidies

Dynamics of Freshwater and Riparian Ecosystems

Robert J. Naiman,[1]* Robert E. Bilby,[2] Daniel E. Schindler,[3] and James M. Helfield[4]

[1]School of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, Washington 98195, USA; [2]Technology Center, Weyerhaeuser Company, P.O. Box 9777, Federal Way, Washington 98063, USA; [3]Department of Zoology, Box 351800, University of Washington, Seattle, Washington 98195, USA; and [4]College of Forest Resources, Box 352100, University of Washington, Seattle, Washington 98195, USA

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Salmon subsidize an escape from a size spectrum

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esa

ECOSPHERE

Foraging and growth responses of stream-dwelling fishes to inter-annual variation in a pulsed resource subsidy

KALE T. BENTLEY,[1,†] DANIEL E. SCHINDLER,[1] JONATHAN B. ARMSTRONG,[1] RUI ZHANG,[2] CASEY P. RUFF,[1,3] AND PETER J. LISI[1]

[1]*School of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, Washington 98195 USA*
[2]*Department of Biostatistics, Box 357232, University of Washington, Seattle, Washington 98195 USA*
[3]*Skagit River System Cooperative, 11426 Moorage Way, La Conner, Washington 98257 USA*

Citation: Bentley, K. T., D. E. Schindler, J. B. Armstrong, R. Zhang, C. P. Ruff, and P. J. Lisi. 2012. Foraging and growth responses of stream-dwelling fishes to inter-annual variation in a pulsed resource subsidy. Ecosphere 3(12):113. http://dx.doi.org/10.1890/ES12-00231.1

Abstract. Pulsed resource subsidies generate ephemeral fluxes of nutrients and energy among ecosystems. The effects of pulsed subsidies should depend on the magnitude of the pulse, the in situ productivity of the recipient system, and the ability of consumers to capitalize on the resources, yet

systems

Daniel E. Schindler,[3] and
ld[4]

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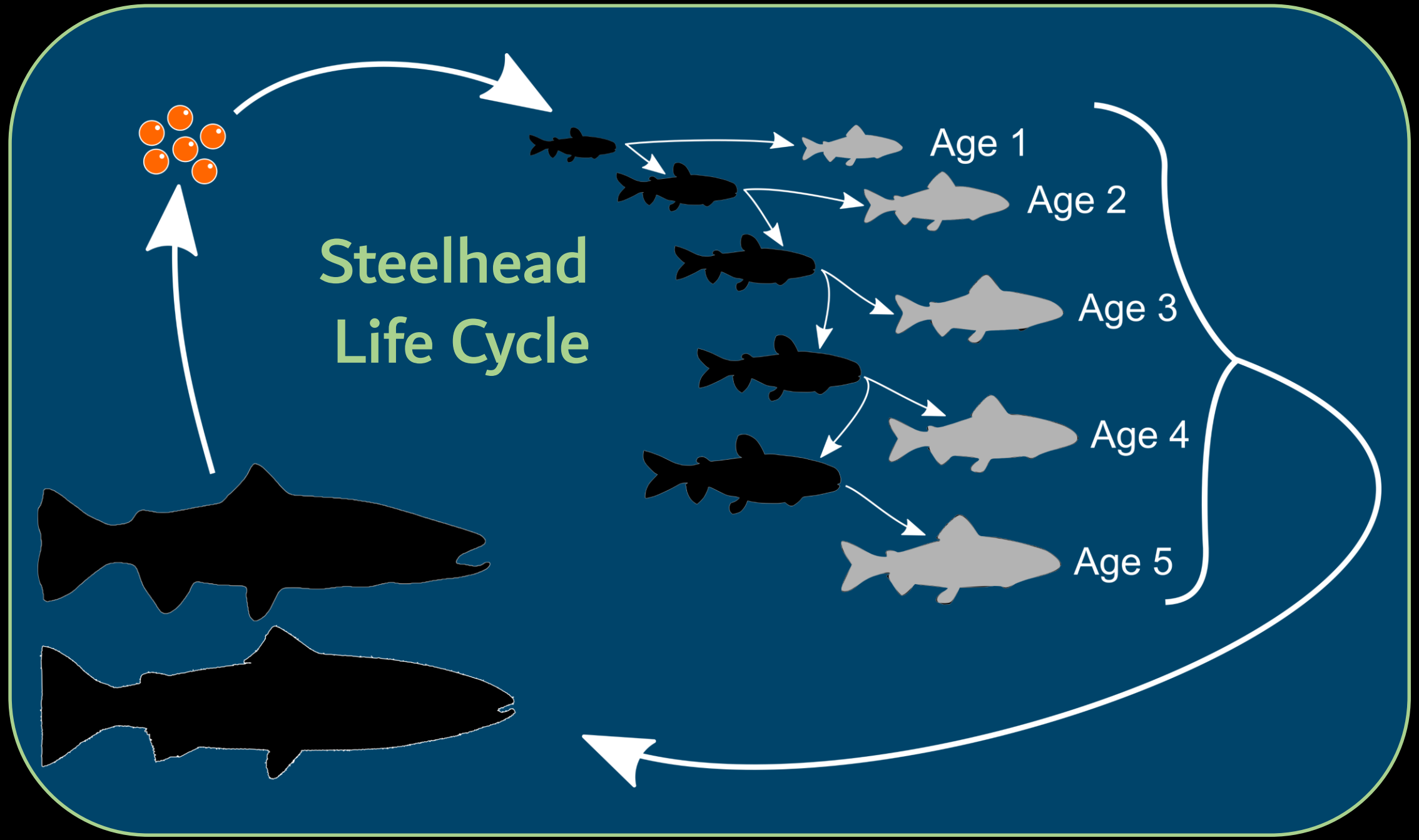
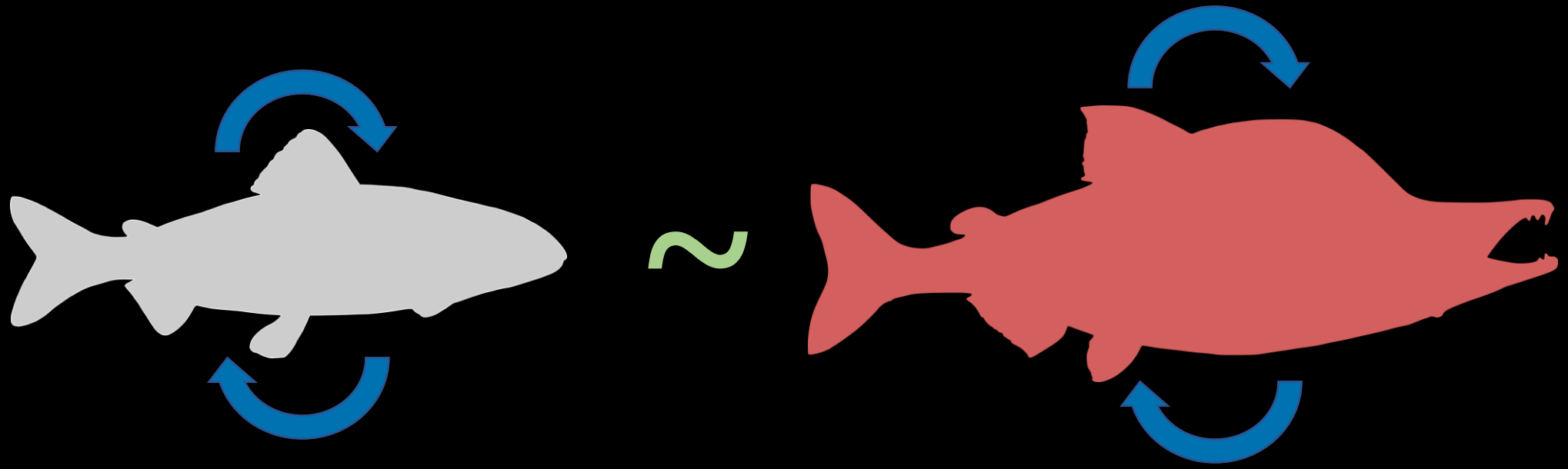
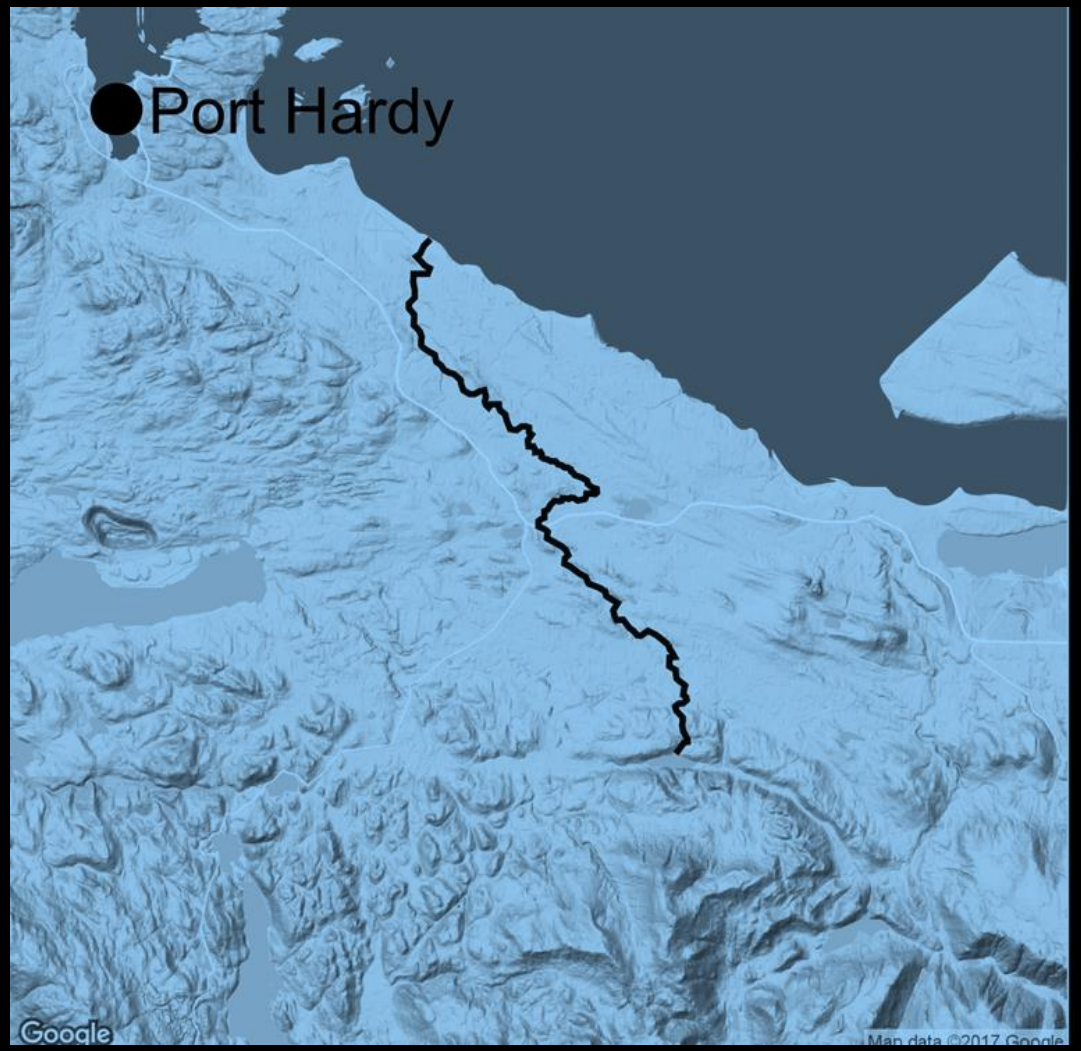
Could salmon subsidies affect life history expression?


Steelhead
Life Cycle
Age 1
Age 2
Age 3
Age 4
Age 5

Hypothesis



The Keogh River



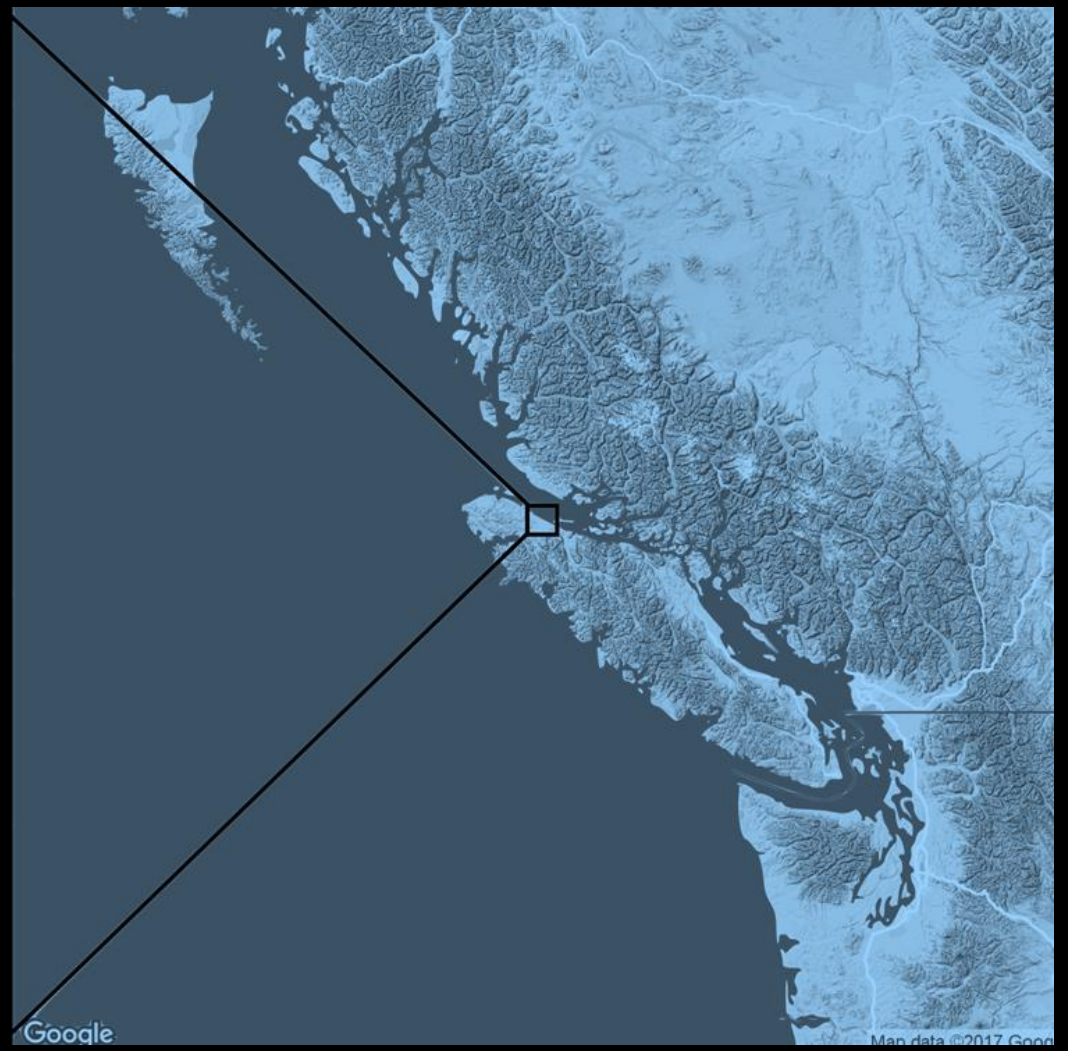
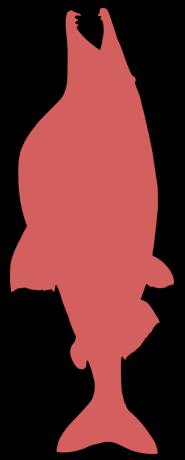
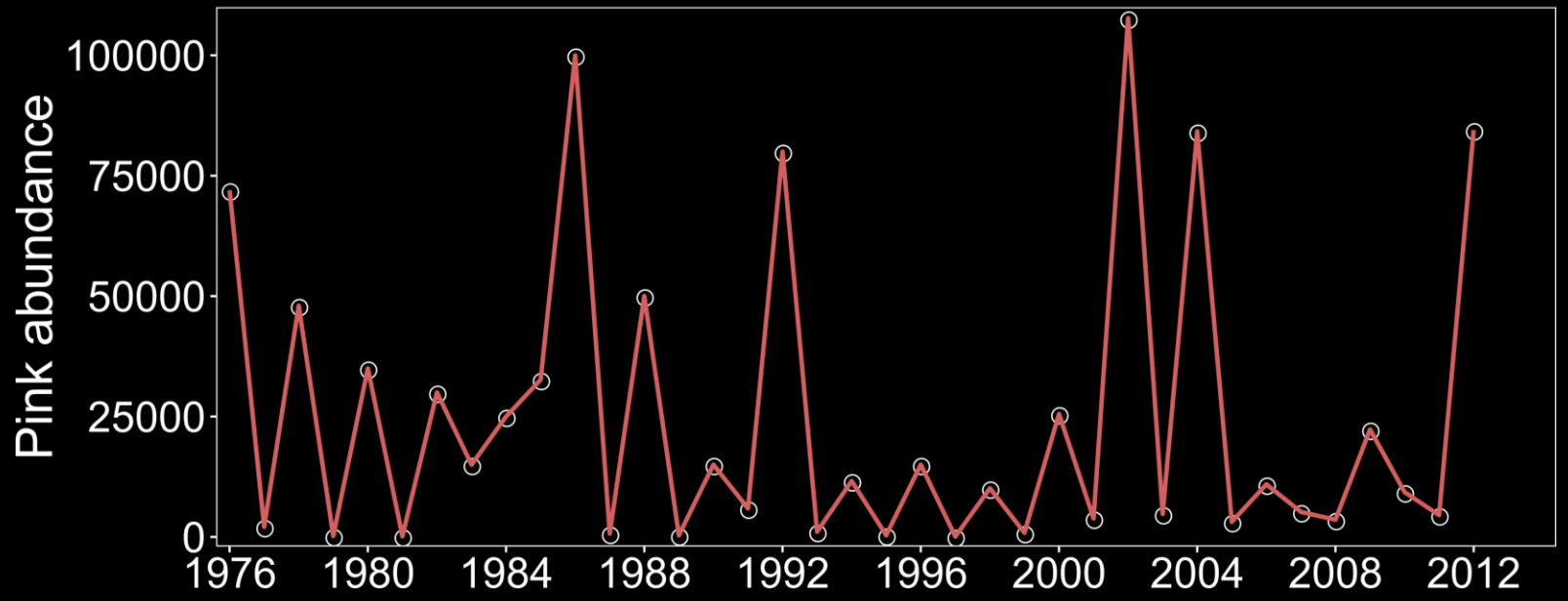


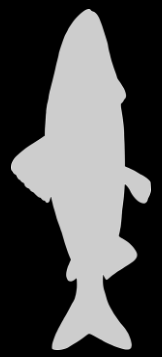
PHOTO: CHRIS PAN

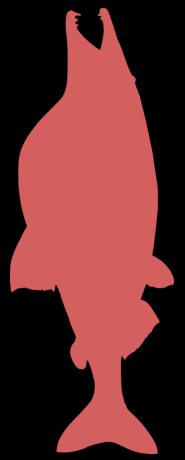
The Data

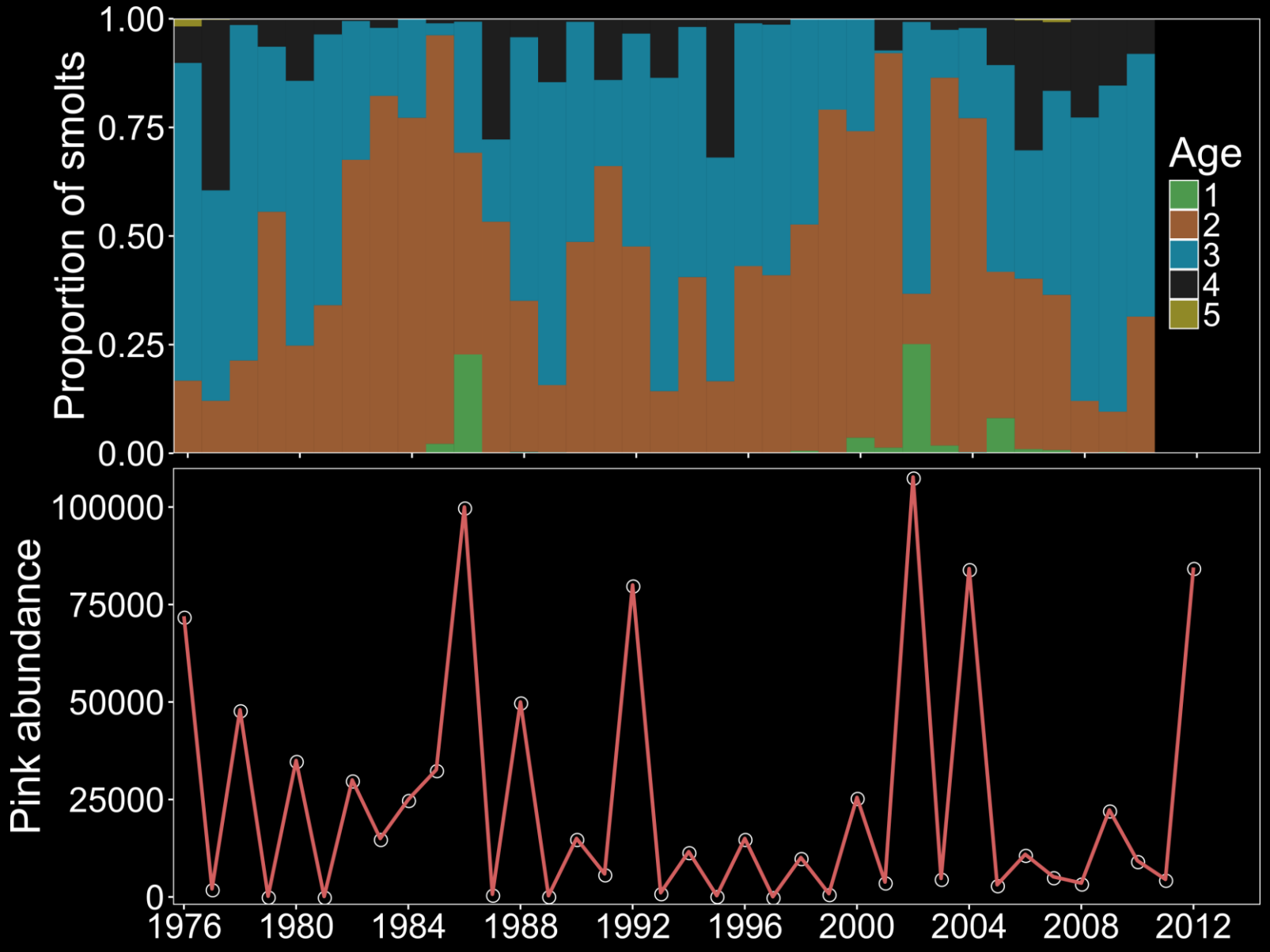



Pink abundance
100000
75000
50000
25000
0
1976
1980
1984
1988
1992
1996
2000
2004
2008
2012

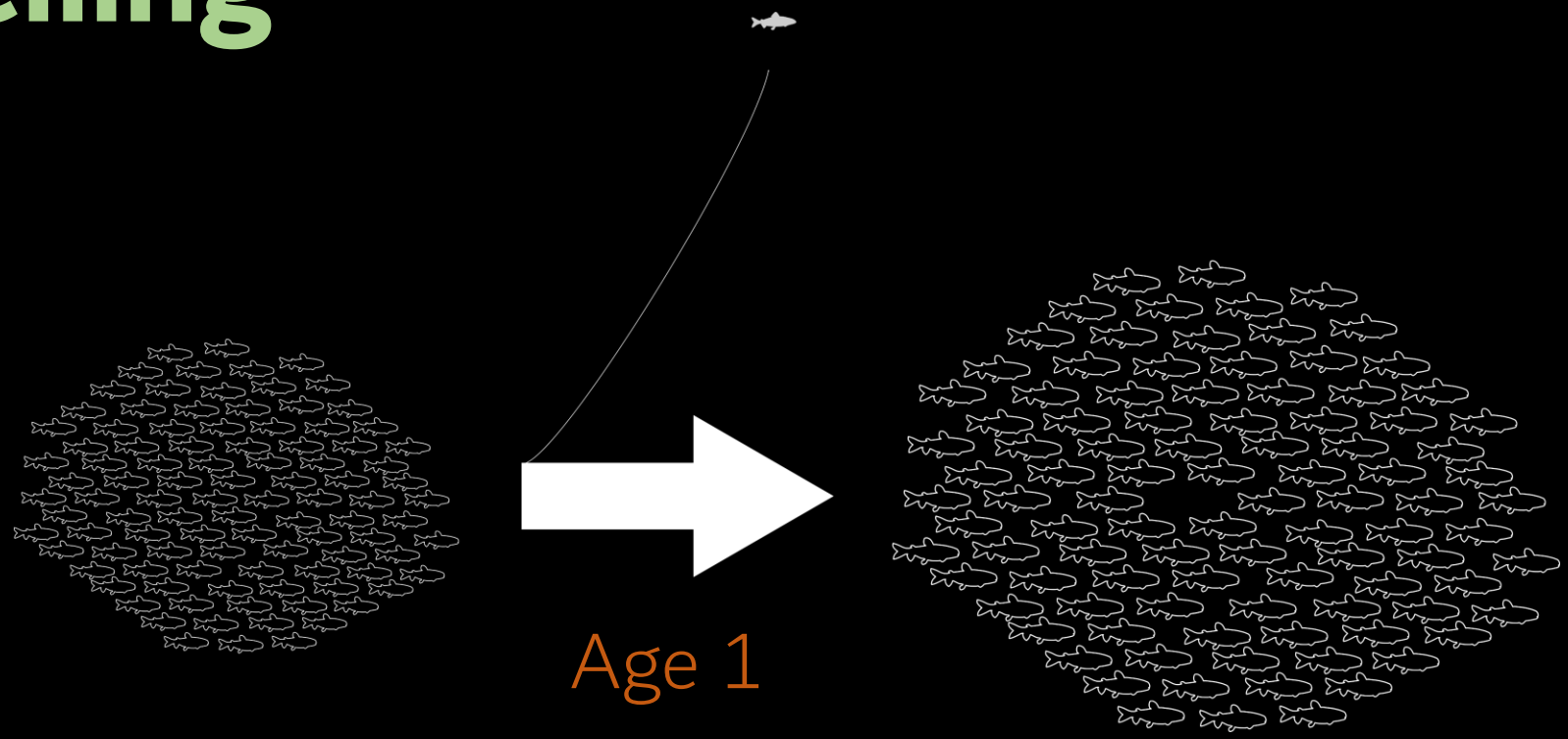
The Data



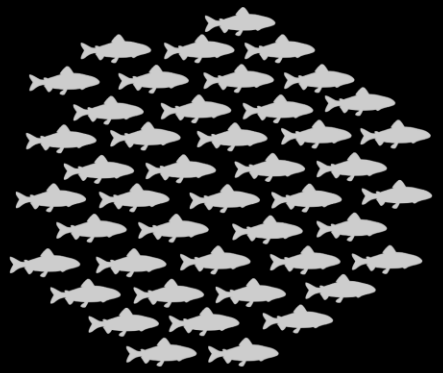


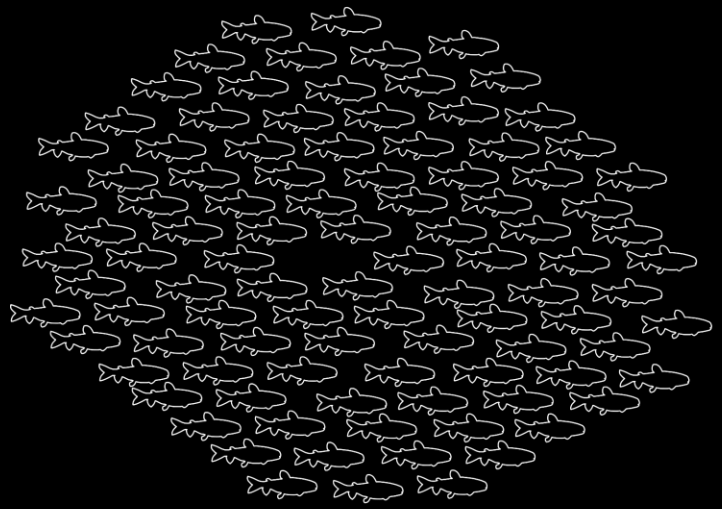

Proportion of smolts
1.00
0.75
0.50
0.25
0.00
Age
1
2
3
4
5
Pink abundance
100000
75000
50000
25000
0
1976
1980
1984
1988
1992
1996
2000
2004
2008
2012

Decision Modelling

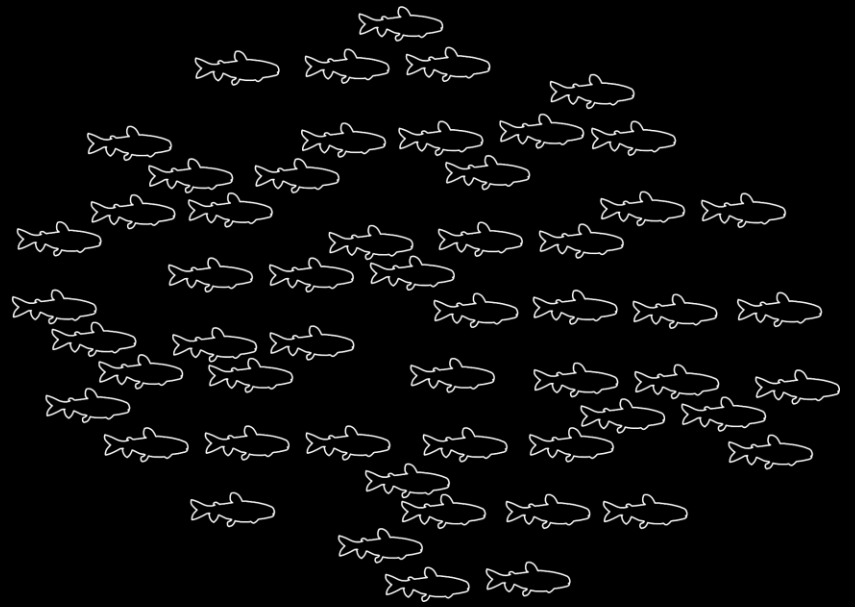


Decision Modelling

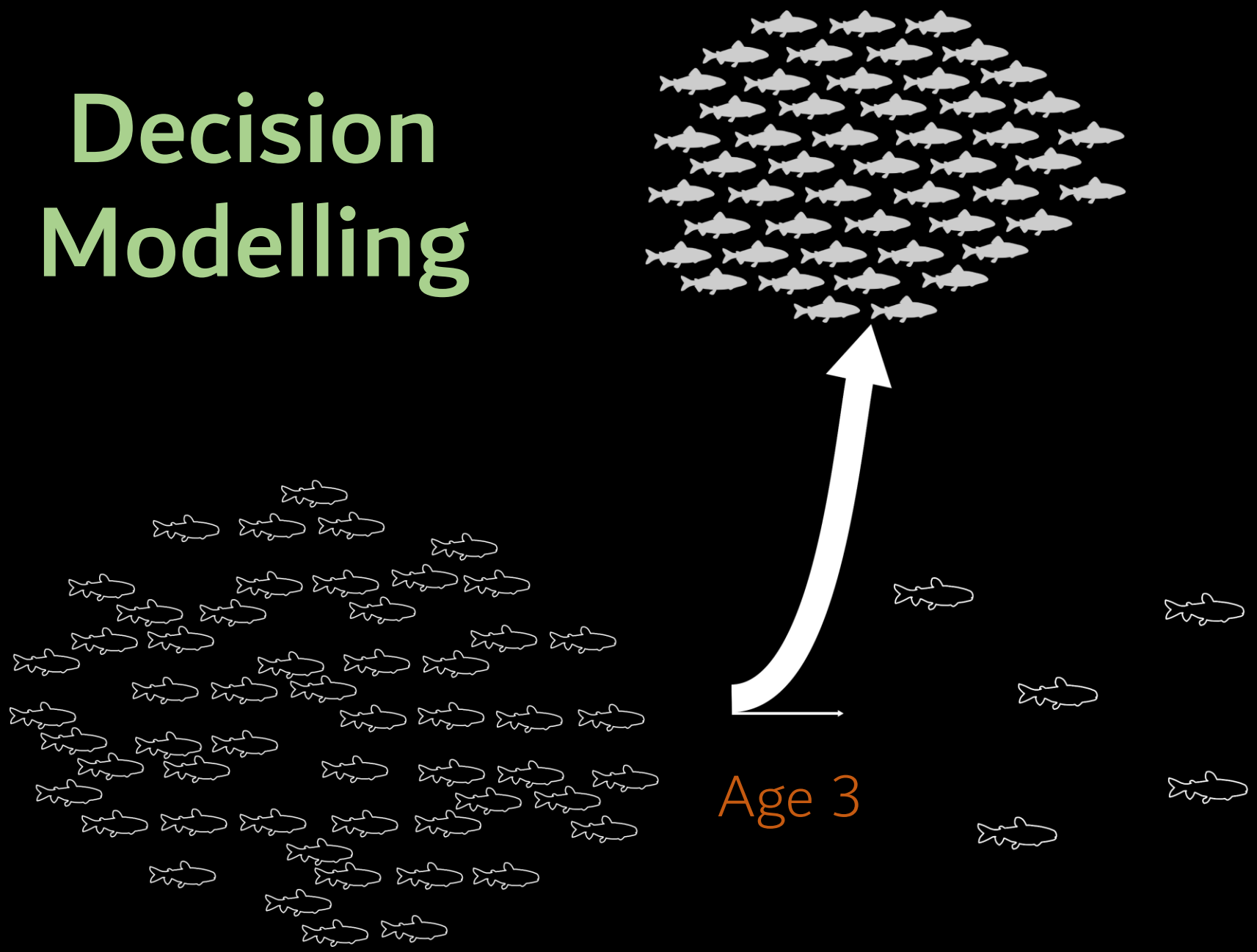




Age 2



Decision Modelling



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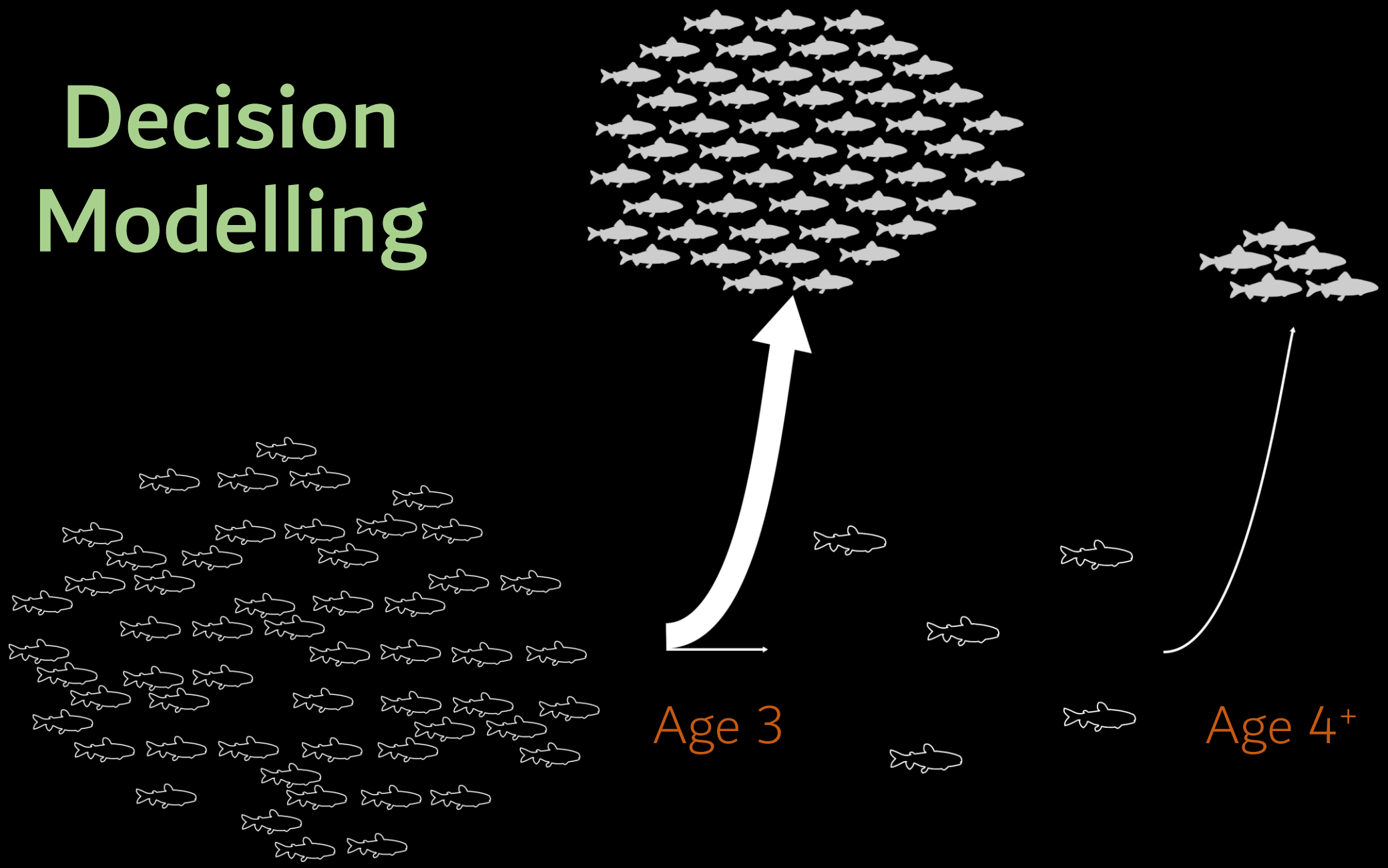

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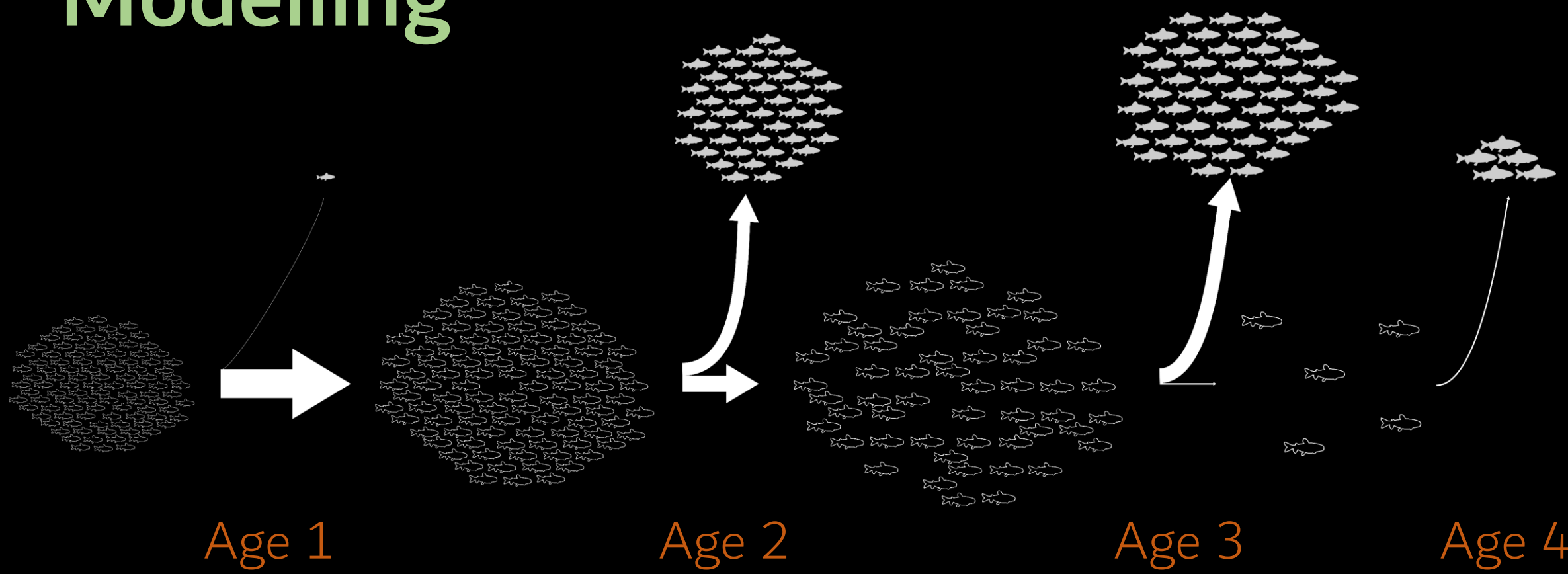
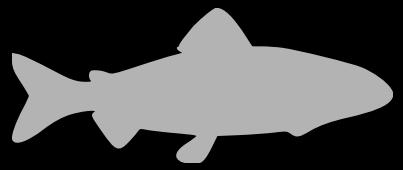
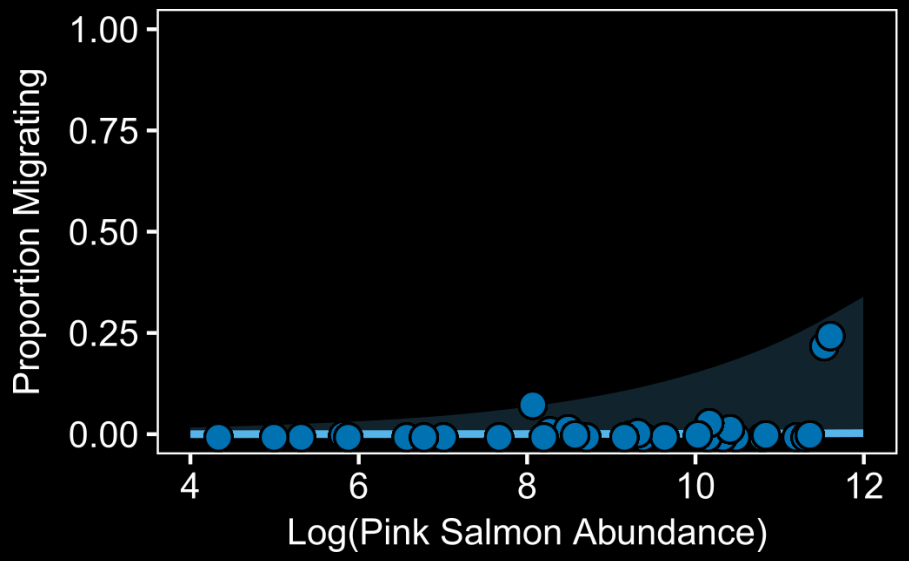


Results

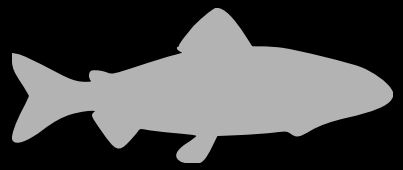
Age 1



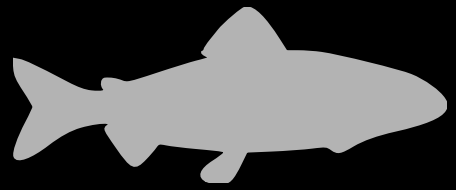


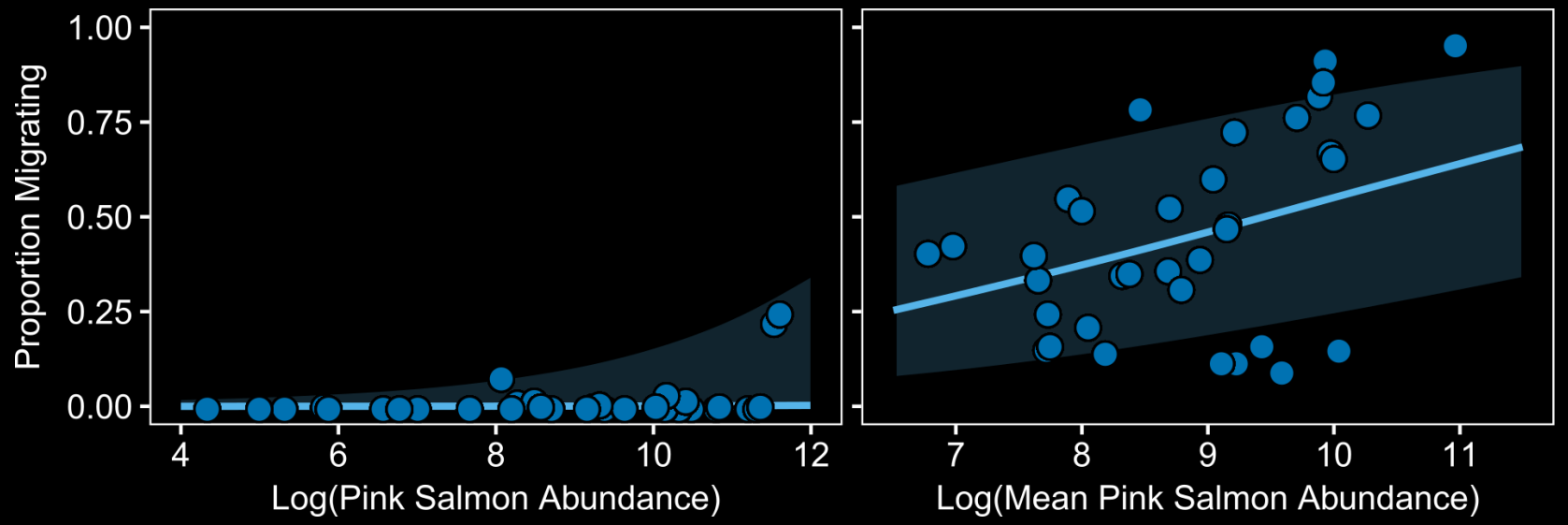
Results

Age 1



Age 2





Results

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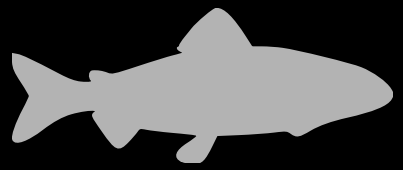
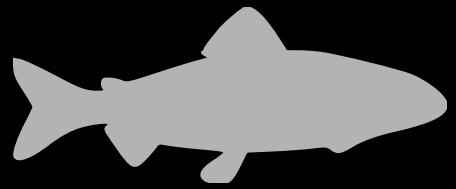
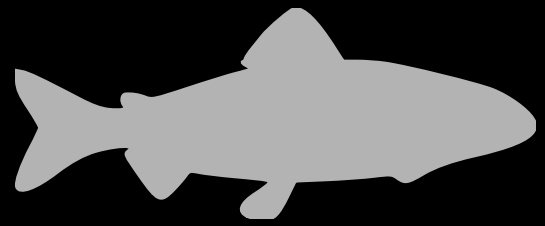
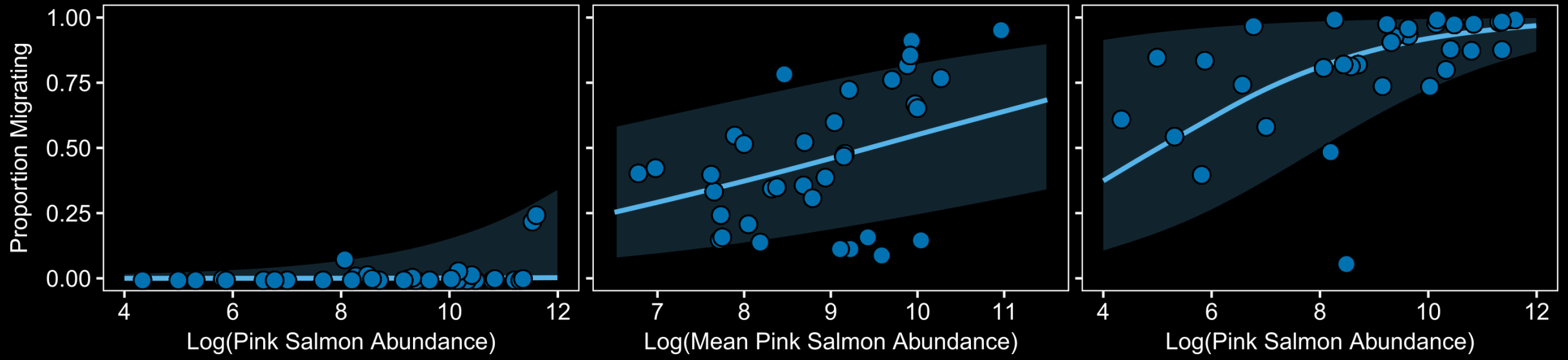


Age 2

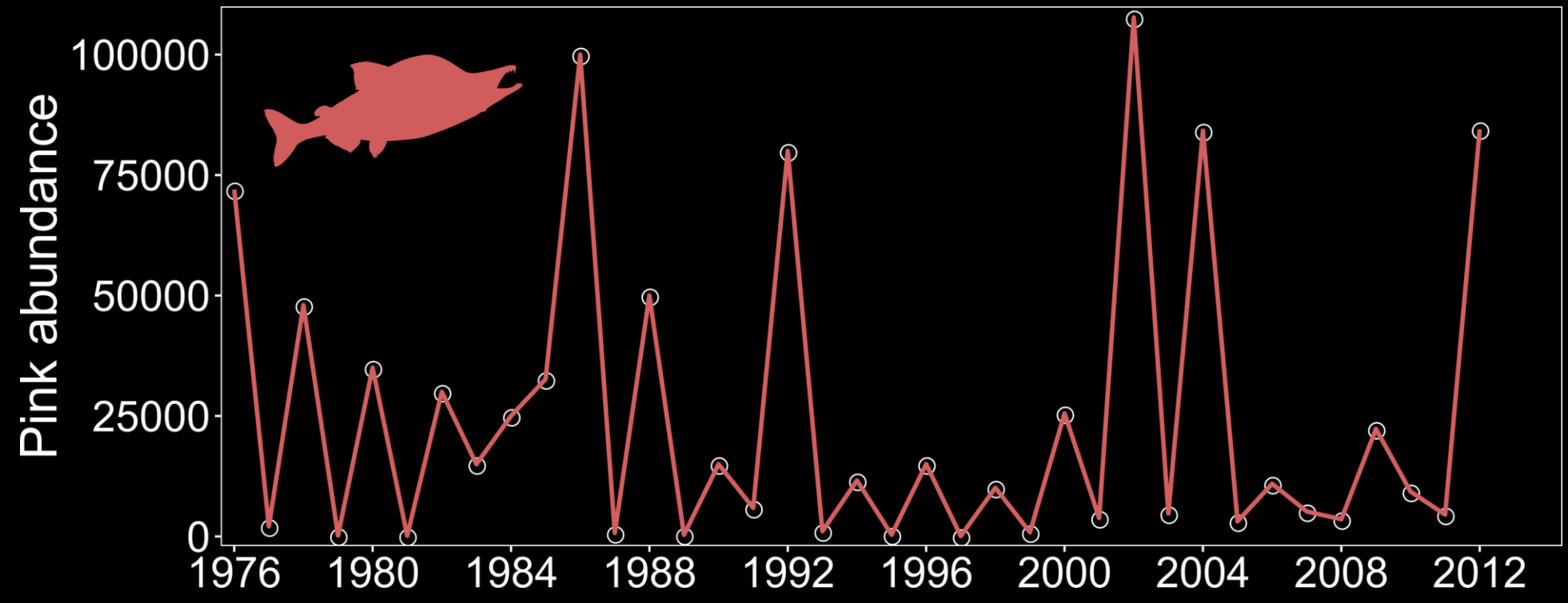


Age 3

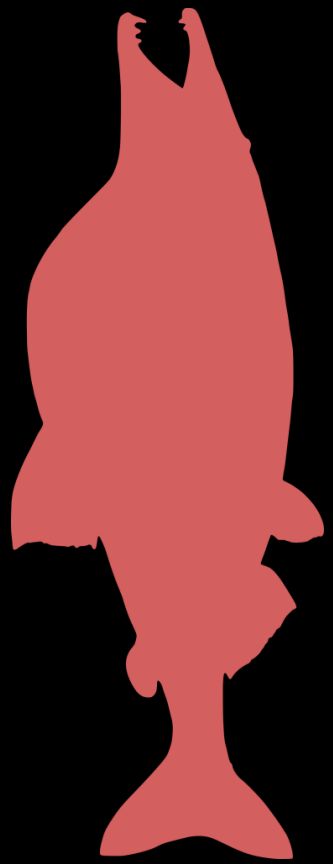




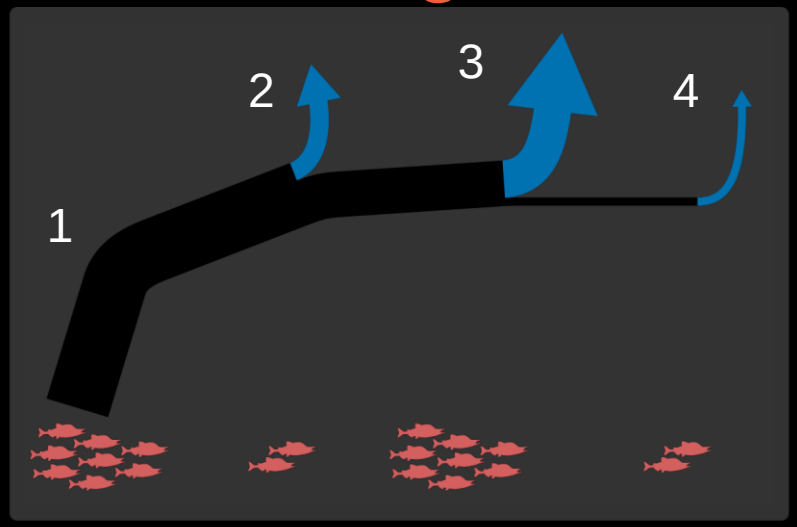
Implications



Implications

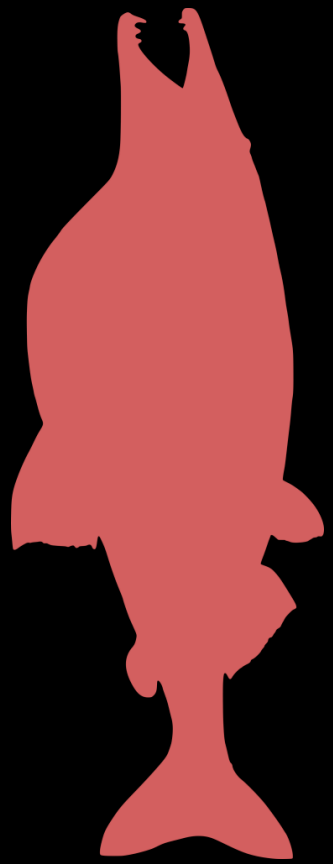


Born on a Big Pink Year



Pink Salmon Abundance Cycle

Implications



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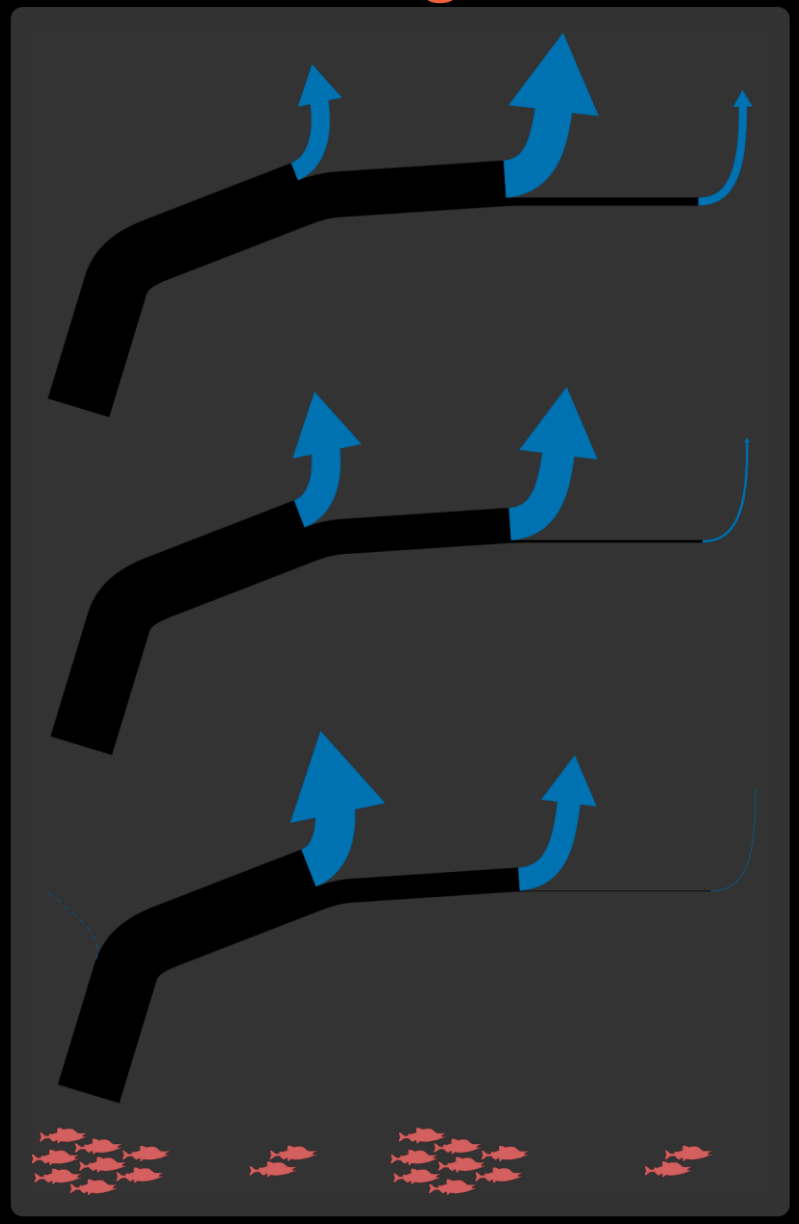
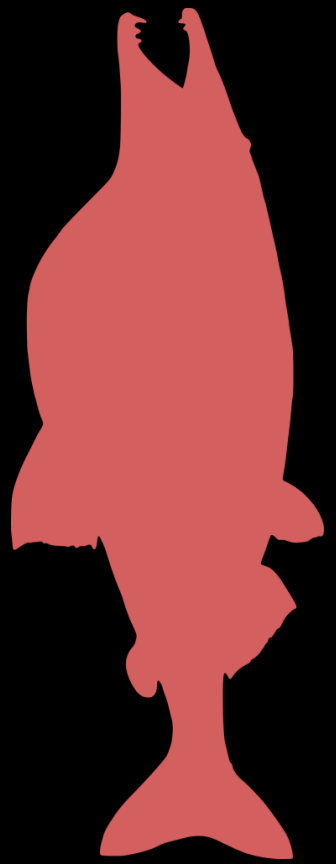


Pink Salmon Abundance Cycle

Implications



Low

Mean

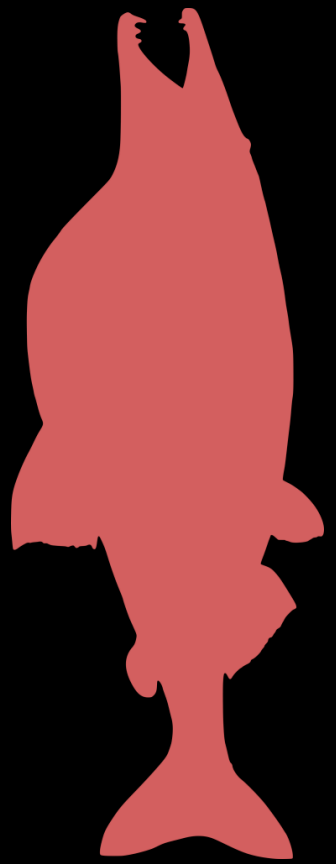
High

Born on a Big Pink Year

Born on a Small Pink Year

Pink Salmon Abundance Cycle

Implications



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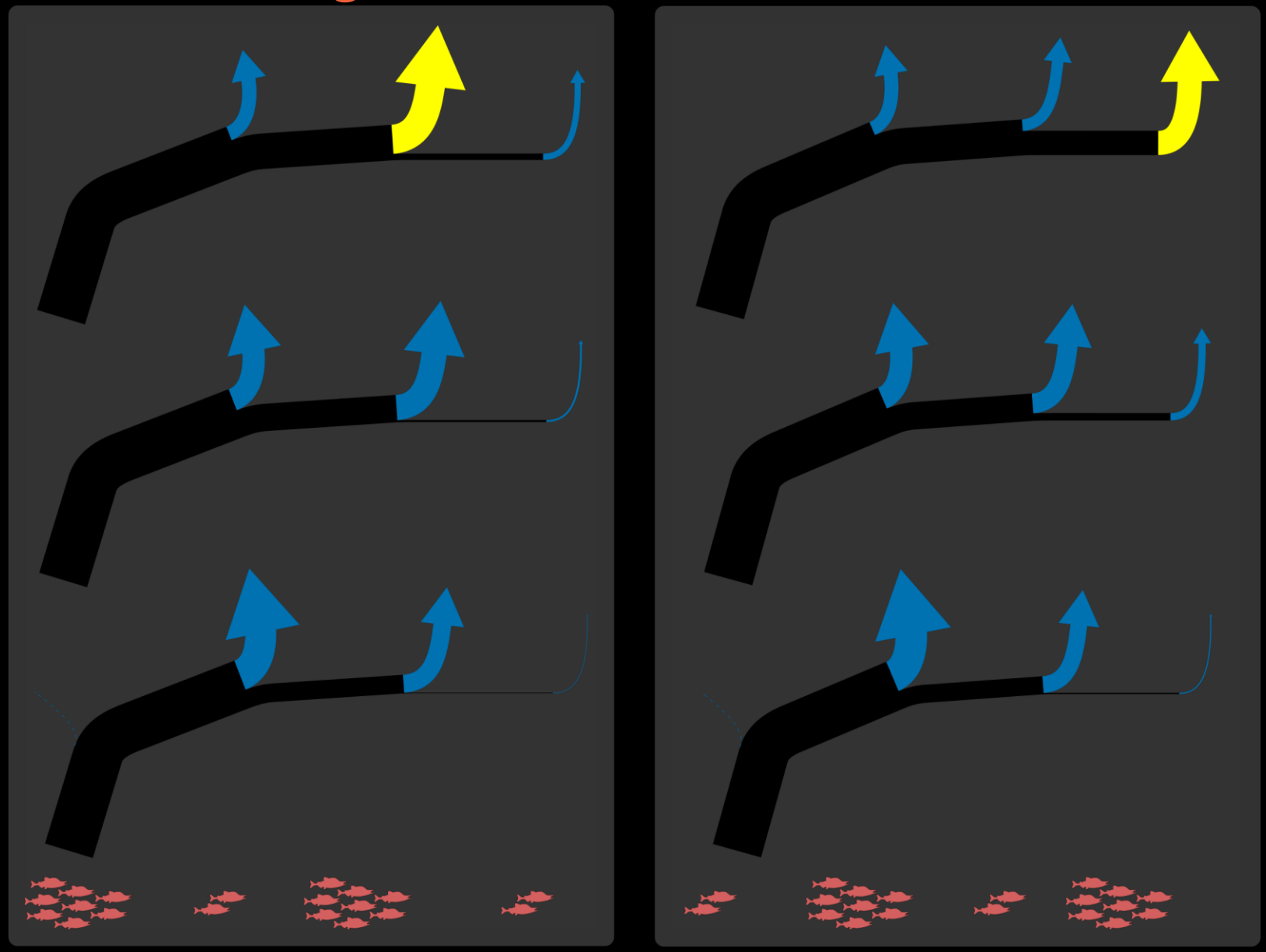
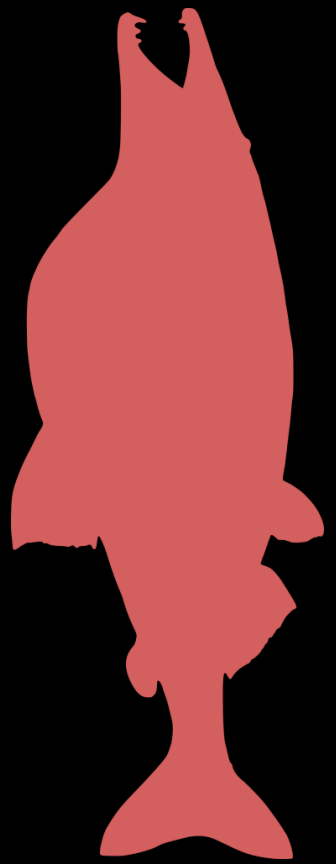


Pink Salmon Abundance Cycle

Implications



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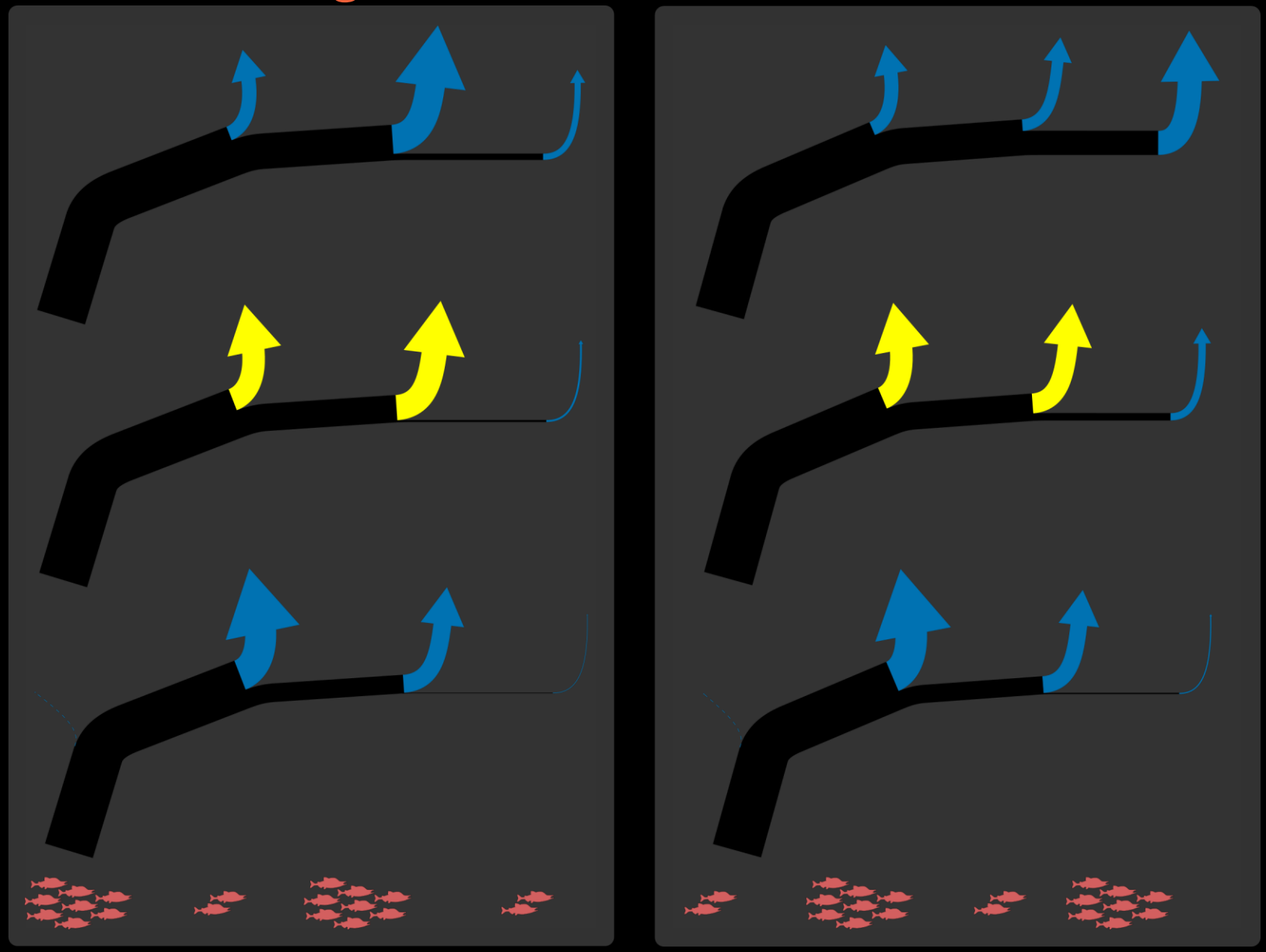
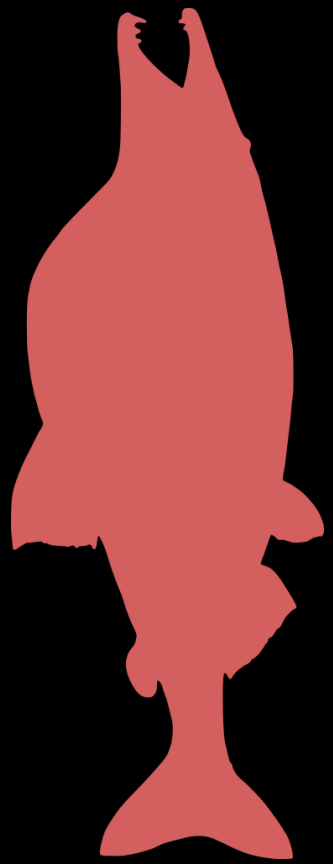


Pink Salmon Abundance Cycle

Implications



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Mean

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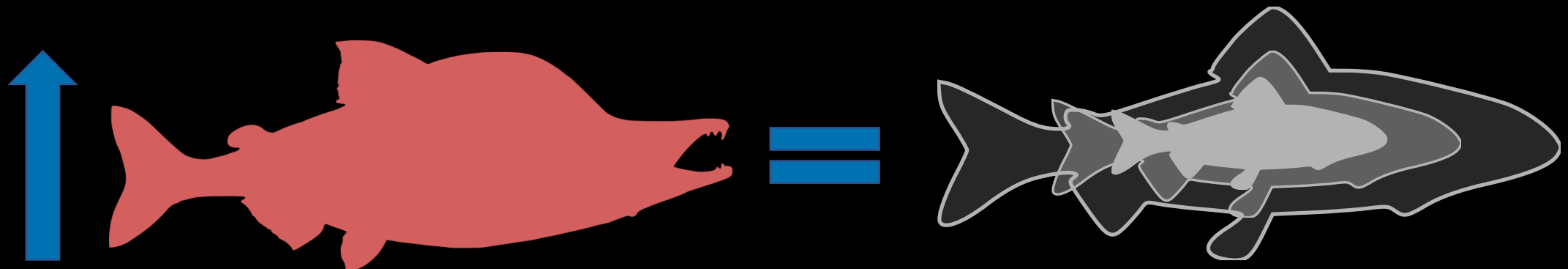
Pink Salmon Abundance Cycle

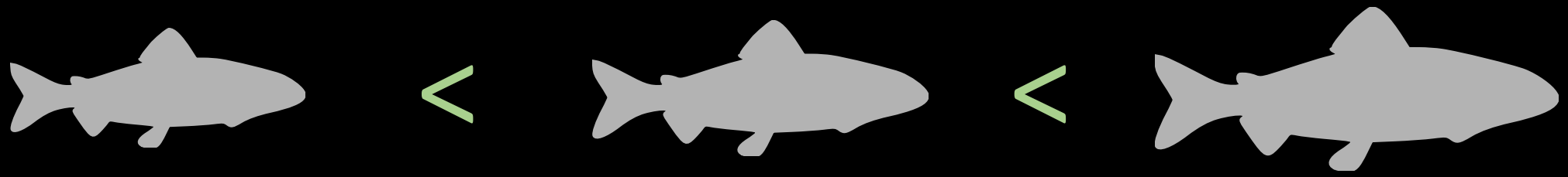
Implications



Shrinkage!

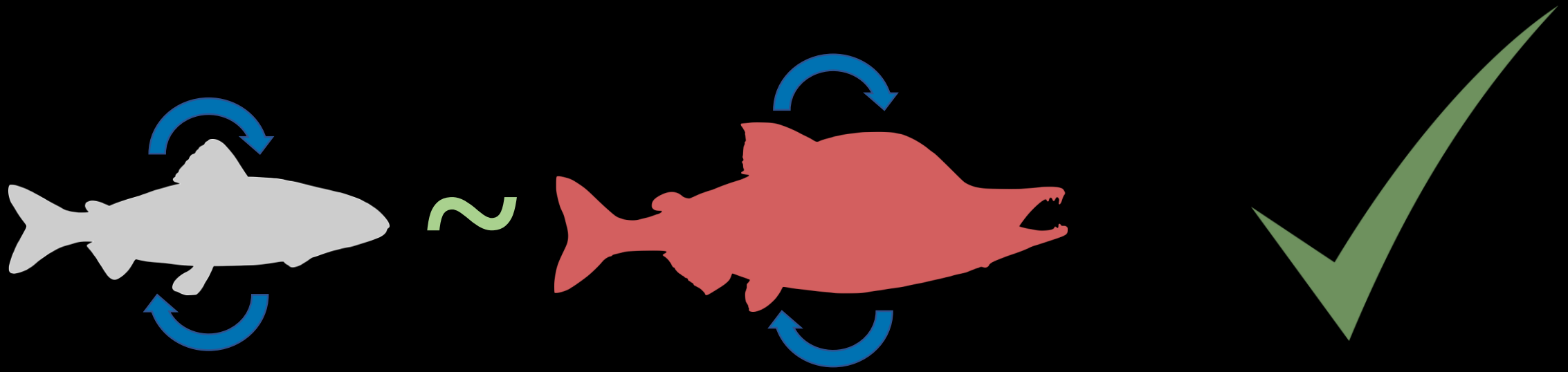
Implications

Larger smolts survive to spawn more often…

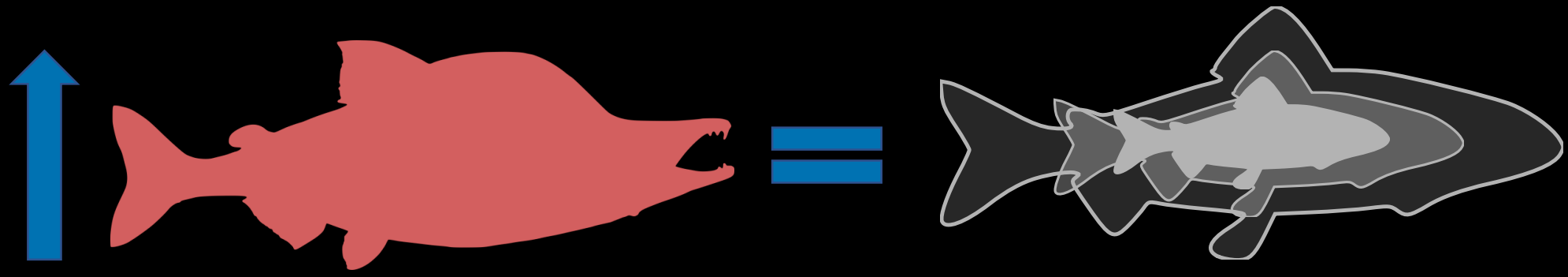


Holtby et al. 1990, Bond et al. 2008, Osterback et al. 2014

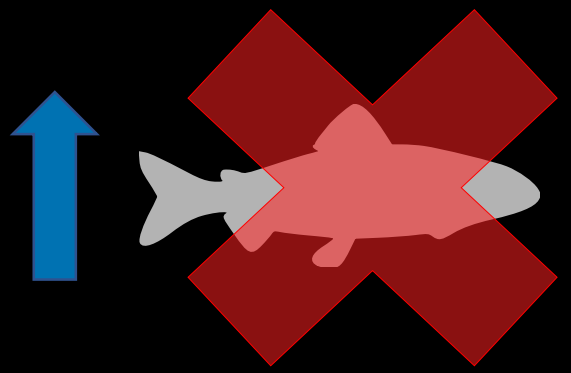
Summary



Summary



Which may lead to…



Questions?