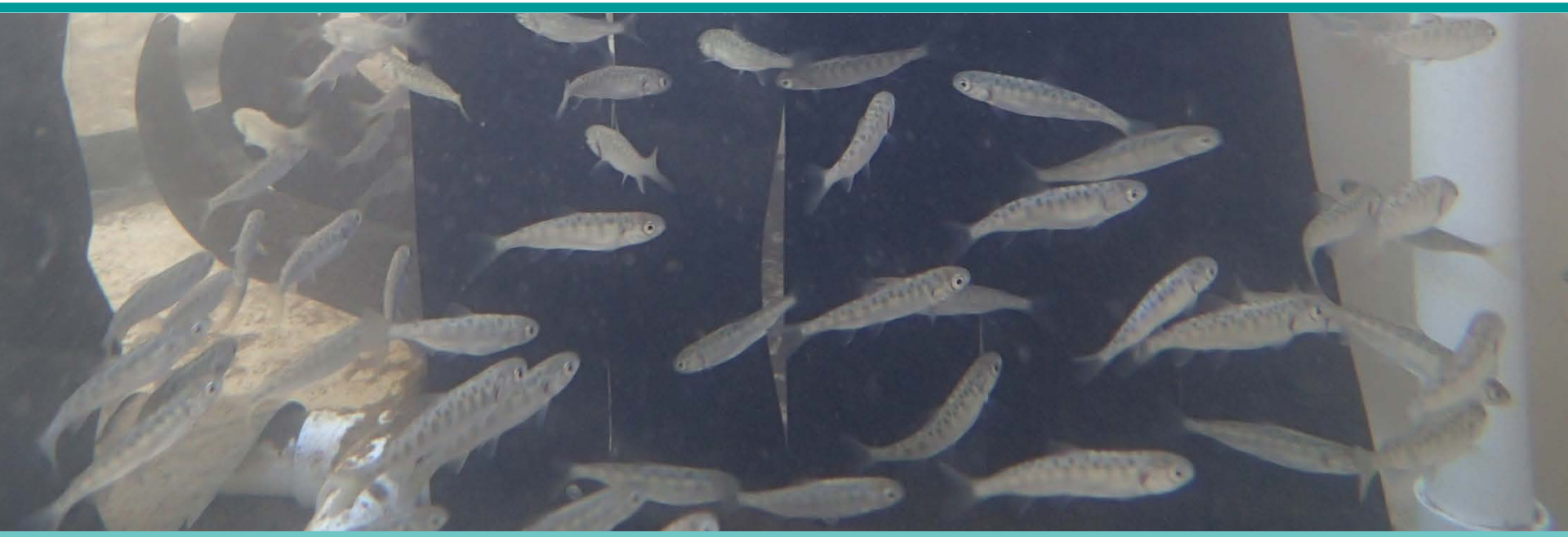
Developing and delivering wild fish surrogate Chinook salmon and steelhead trout



Karen Cogliati, David Noakes, Carl Schreck, Cameron Sharpe

science for a changing world

US Army Corps of Engineers.

OREGON Fish & Wildlife

OREGON HATCHERY RESEARCH CENTER

OREGON COOPERATIVE FISHERY RESEARCH UNIT Semper Catostomus

ACKNOWLEDGEMENTS

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Funding:

Army Corps of Engineers

The Surrogate Project

Goal:

Rear and deliver surrogate fish to researchers

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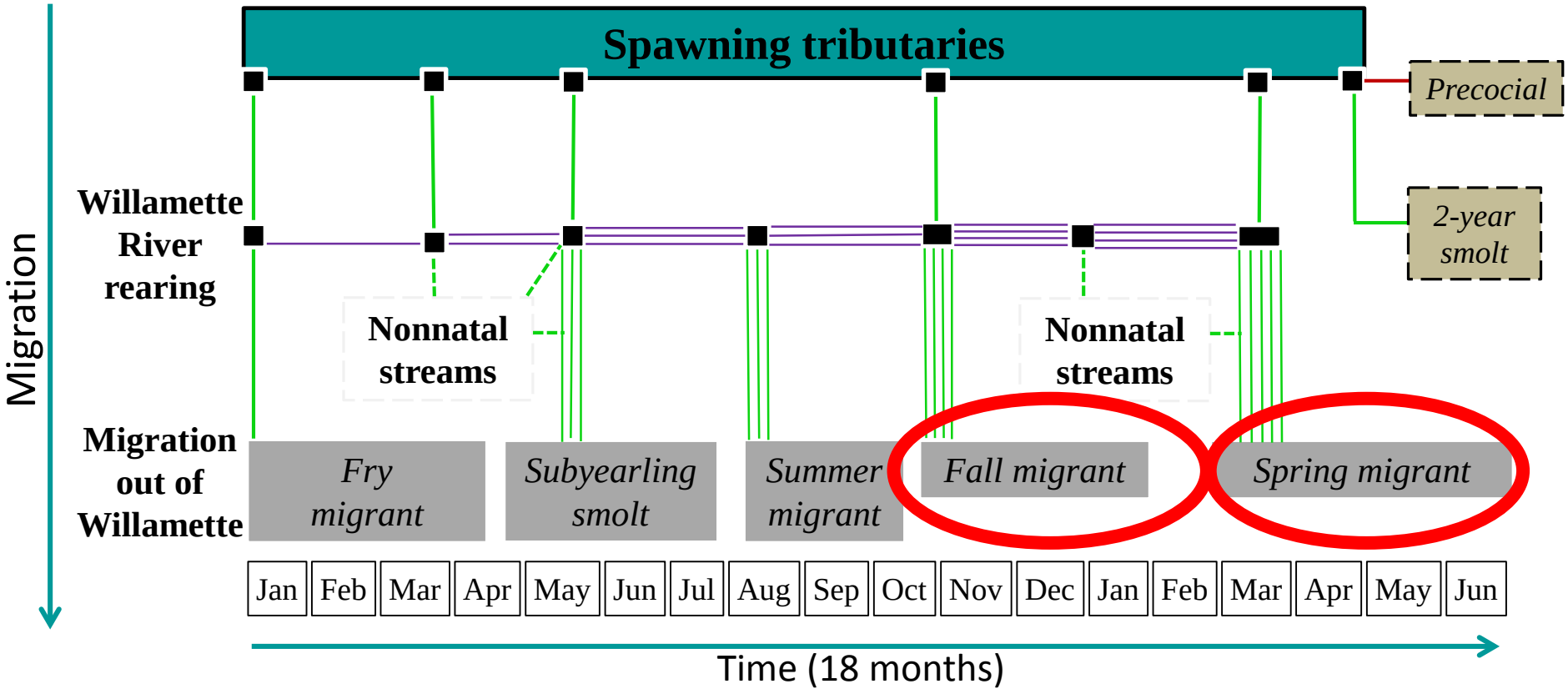
WILD FISH SURROGATES

- Juveniles reared in artificial environments that emulate specific wild phenotypes
  - Spring Chinook salmon
  - Winter steelhead trout

JUVENILE CHINOOK SALMON LIFE HISTORIES



Schroeder et al. 2015

Willamette Valley Project Dams

- Barrier to fish movement
- Studies evaluating juvenile movement to and through WVP dams
- ESA listed salmon and steelhead


Detroit Dam


Cougar Dam

Step 1: Order Fish

Step 1: Order Fish

Step 1: Coordinate Fish Needs

- Key players
  - USACOE project leaders
  - RME researchers
  - ODFW field researchers
  - ODFW hatcheries

Step 1: Coordinate with researchers

- Planning 1-2 years in advance of fish needs
  - Rear from eyed-egg or green egg stages

- Information required from researchers:
  - Brood stock
  - Brood year
  - Time of release
  - Target size at release

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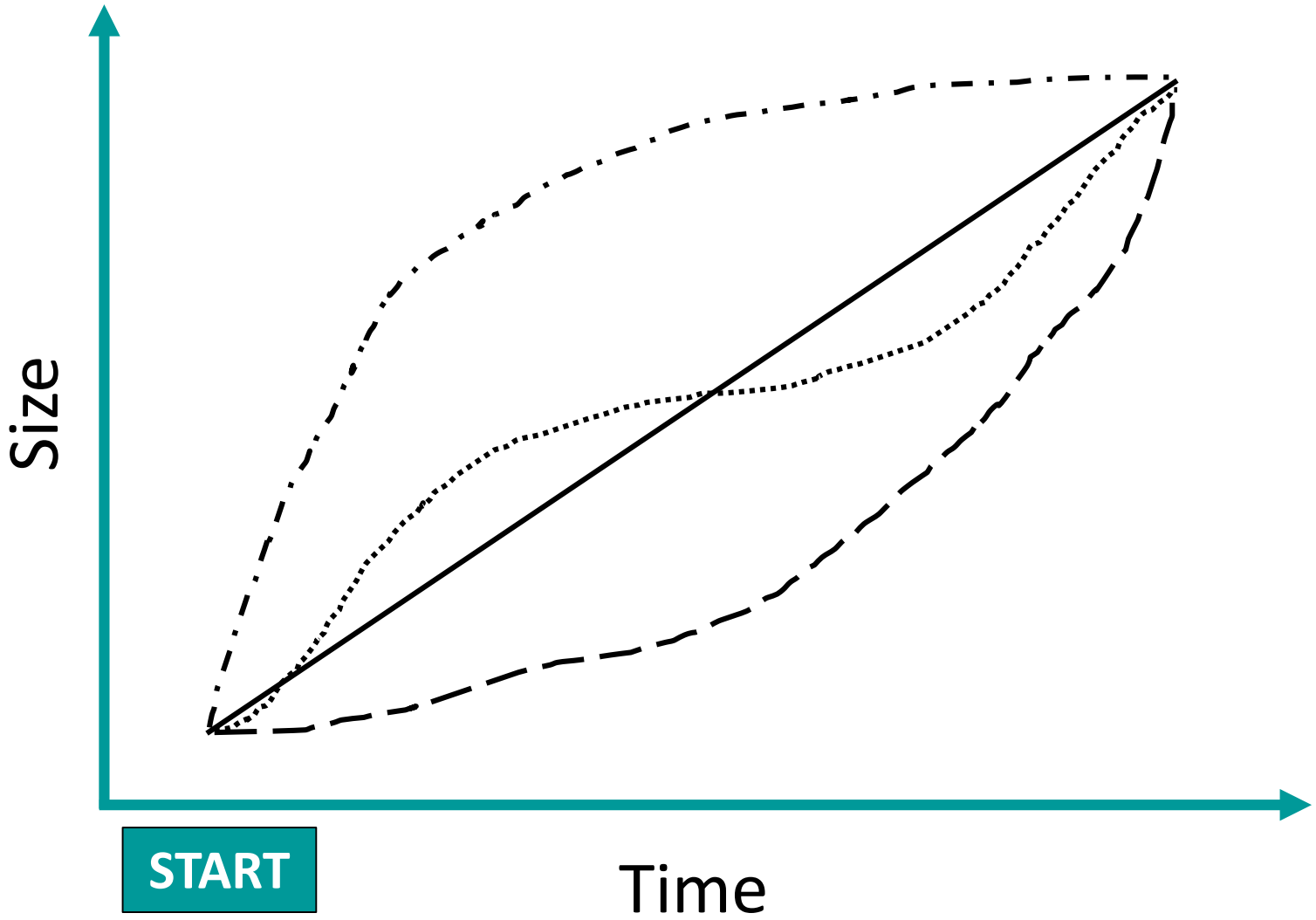
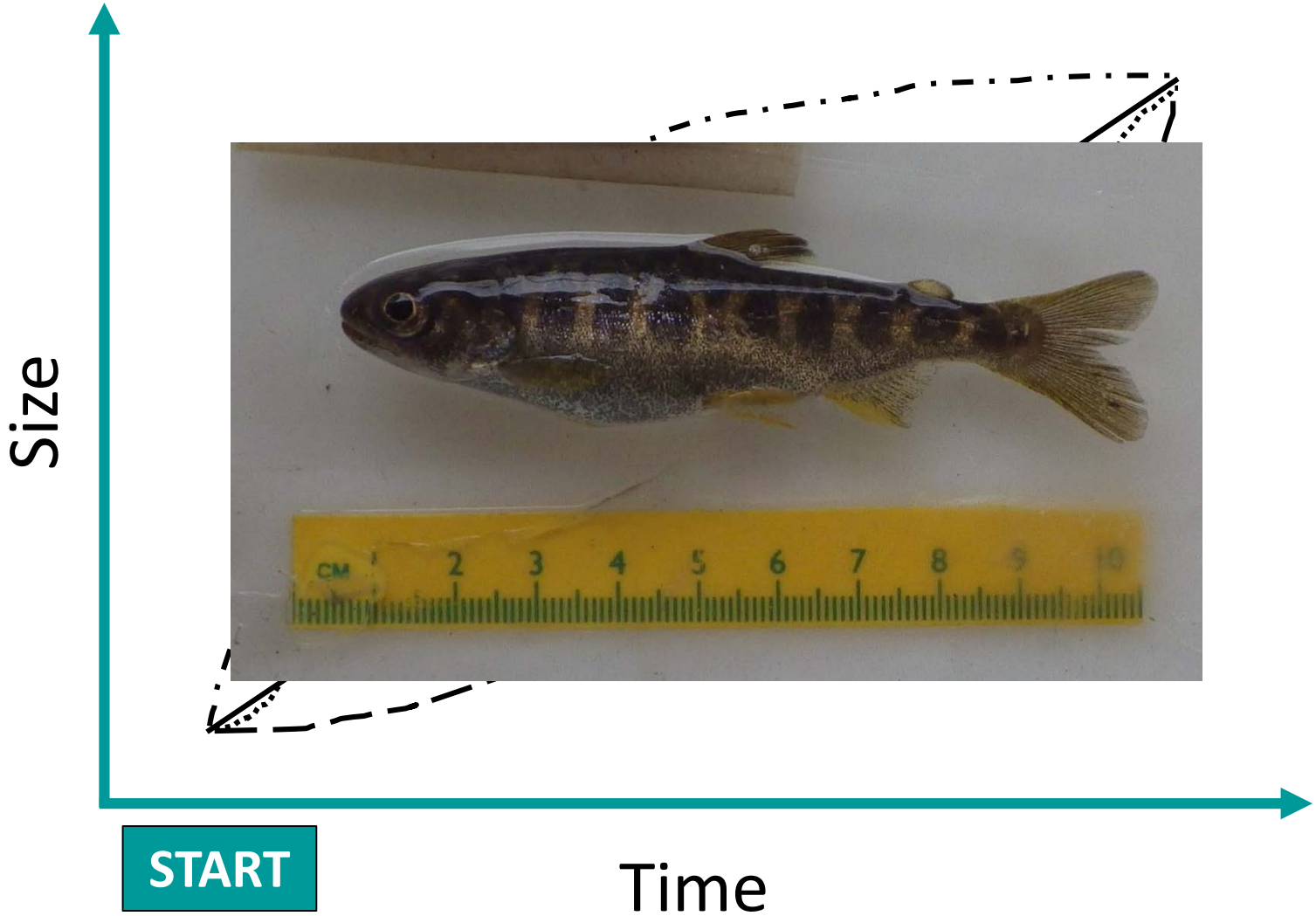
  - **Time of release**
  - **Target size at release**

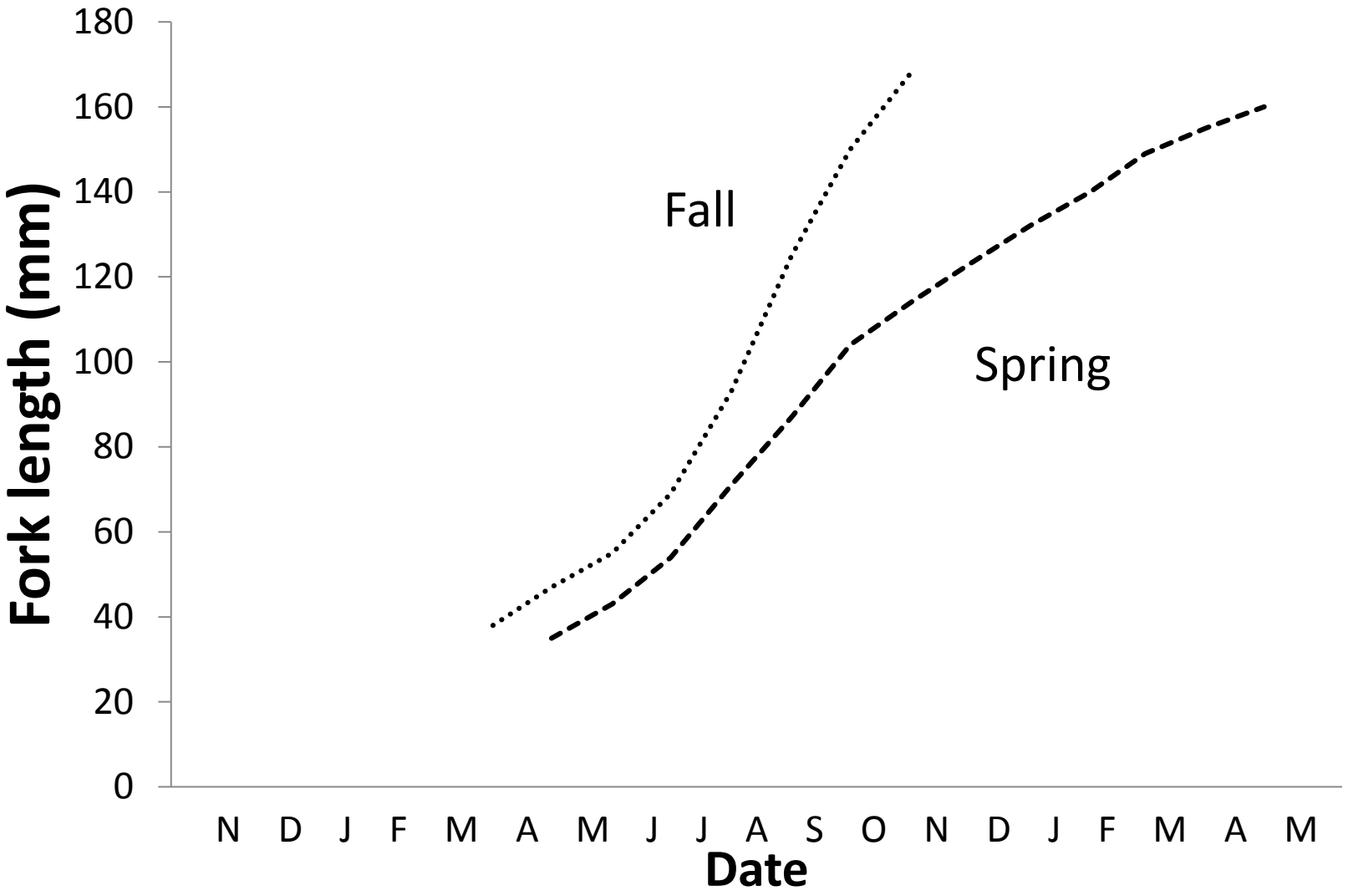
Target Size and Time



Target Size and Time



CHINOOK SALMON GROWTH TRAJECTORIES



Data from Monzyk and Romer

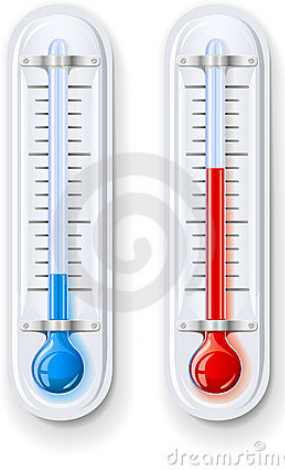
Altered rearing environment

Diet

Density

Tank environment

Temperature



CHINOOK SALMON 2015 DELIVERIES

Location	Brood Year	Target type	# fish	Status
Cougar	13	Yearling	500	Pit tagged and picked up March 2015
Foster	13	Yearling	800	4 deliveries from Feb to Apr
Cougar	14	Sub-yearling	500	Pit tagged and picked up June 2015
Cougar	14	Sub-yearling	500	Delivered Sept 2015
Cougar	14	Sub-yearling	500	Pit tagged and picked up Sept 2015
Foster	14	Sub-yearling	1350	RT and PIT tagged at FPGL Oct 2015

CHINOOK SALMON 2015 DELIVERIES

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Foster	14	Sub-yearling	1350	**RT and PIT tagged at FPGL Oct 2015**

CHINOOK SALMON UPCOMING DELIVERIES

Location	Brood Year	Deliverable type	#	Target date	Target size (mm)
Cougar	14	Yearling	500	Feb 2016	140
Foster	14	Yearling	750	Feb-Apr 2016	210
Green Peter	14	Yearling	500	May 2016	210
Cougar	15	Sub-yearling	1,500	June 2016	75
Cougar	15	Yearling	1,500	Spring 2017	140
Foster	15	Sub-yearling	1,350	Oct 2016	200
Foster	15	Yearling	1,000	Spring 2017	210
Lookout Point	15	Sub-yearling	300	Fall 2016	200
Lookout Point	15	Yearling	1,000	Spring 2017	210

WINTER STEELHEAD 2015 DELIVERIES

Location	Brood Year	Target type	# fish	Status
Foster	13	2-yr smolt	900	4 deliveries from Feb to Apr
Foster	14	Yearling	100	Moved from OHRC to FPGL for RT and PIT tagging Oct 2015
Detroit	14	Yearling	21,620	Moved to Marion Forks Dec 2014 for Fall 2015 release
Detroit	15	Yearling	28,800	Delivered to Marion Forks Dec 2015 for Fall 2016 release

WINTER STEELHEAD UPCOMING DELIVERIES

Location	Brood Year	Deliverable type	#	Target date	Target size (mm)
Foster	14	2-yr smolt	800	Feb-Apr 2016	180
Green Peter	14	2-yr smolt	500	May 2016	180
Foster	15	Yearling	150	Fall 2016	140
Detroit	15	Yearling	28,000	Fall 2016	140
Foster	15	2-yr smolt	1,000	Spring 2017	180
Detroit	15	2-yr smolt	1,500	Spring 2017	180

Step 1: Coordinate with researchers

Step 1: Coordinate with researchers

Sometimes fish needs change…

- Fish numbers
- Change in request time
- Target sizes

Step 1: Coordinate with researchers

We try to prepare for changes in requests

More advanced notice

=

Better able to adapt to change

The Surrogate Project

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ESTABLISHING TARGET PHENOTYPES

Morphological comparisons

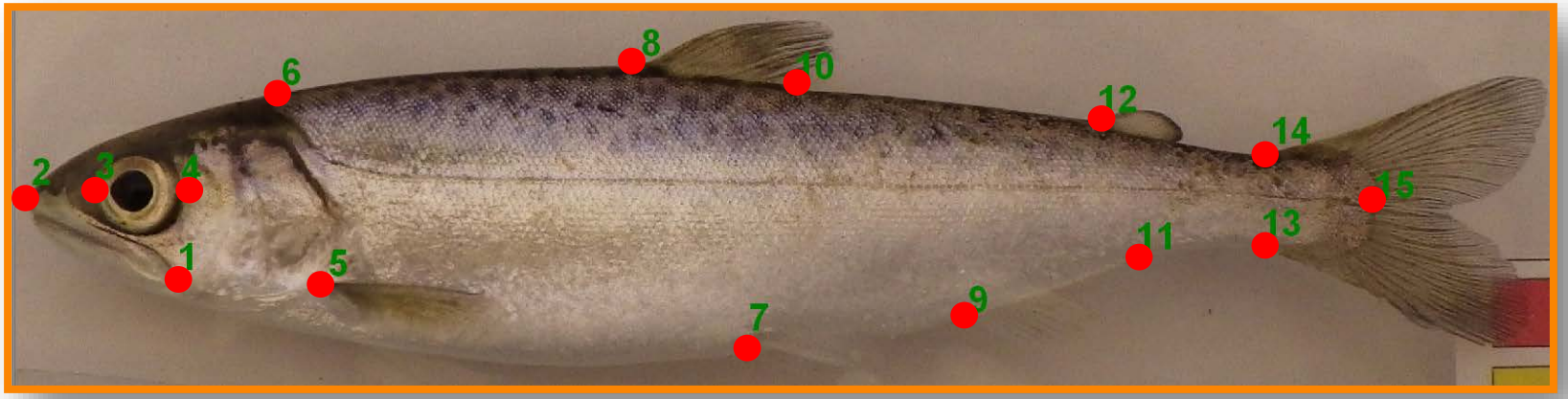
Hatchery

Wild

Photos are to scale

MORPHOLOGICAL COMPARISONS

- Landmark-based geometric morphometrics



Morphological comparisons

Hatchery

>>

Wild

Photos are to scale

Morphological comparisons

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Surrogate

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MORPHOLOGICAL COMPARISONS

Hatchery

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Surrogate

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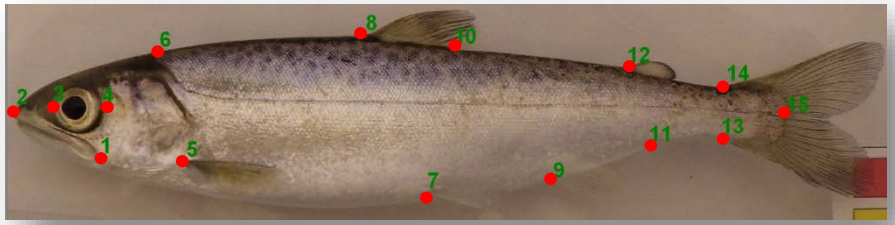
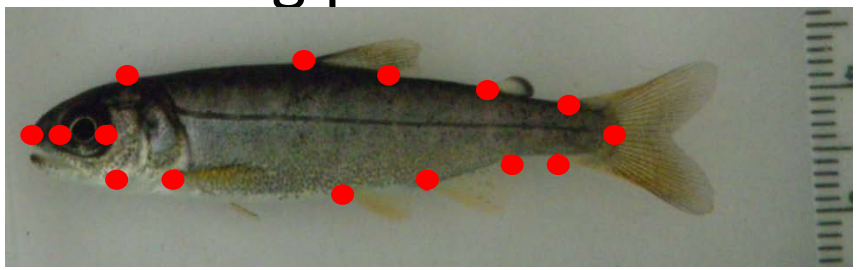
Photos are to scale

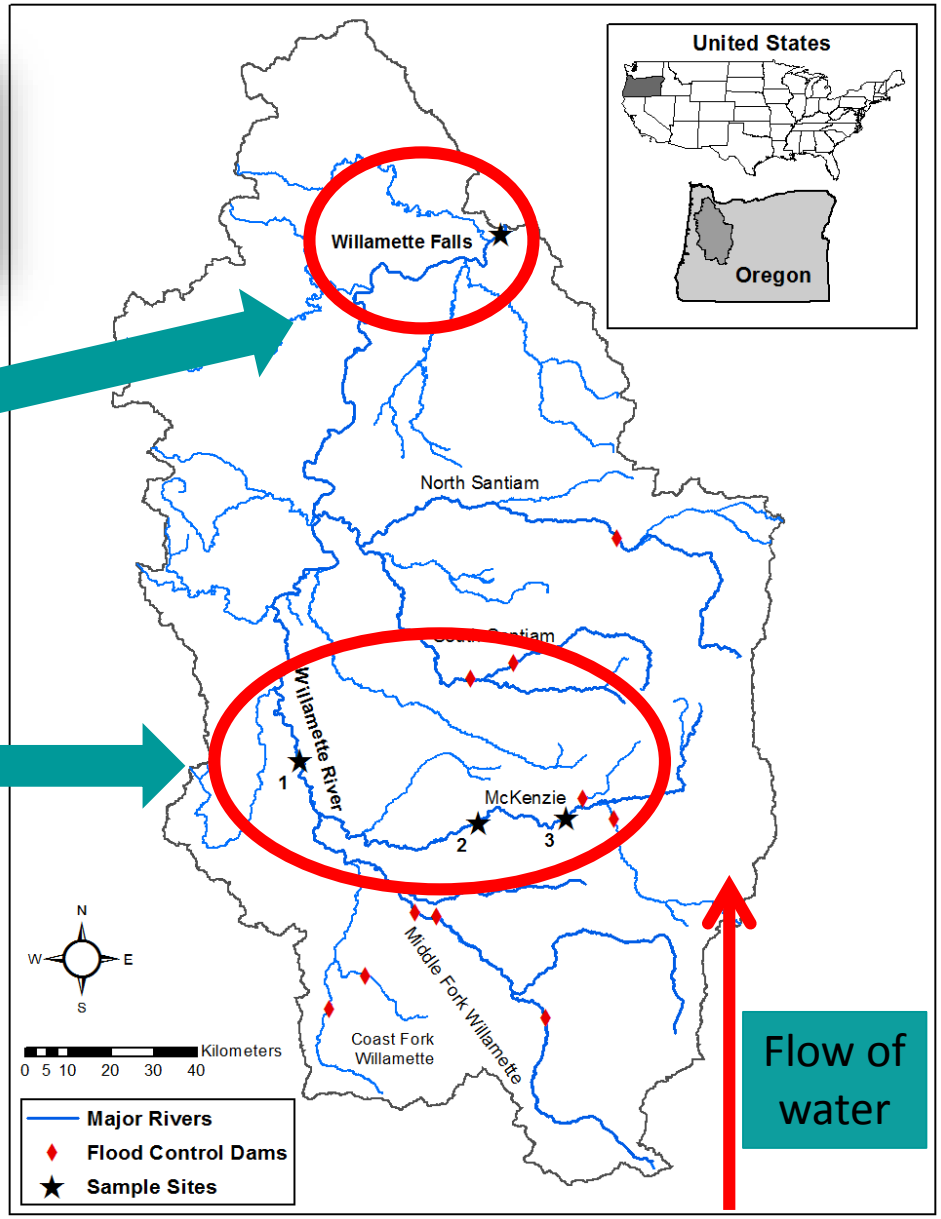
WILD MIGRANT MORPHOLOGY



Fall or spring migrants

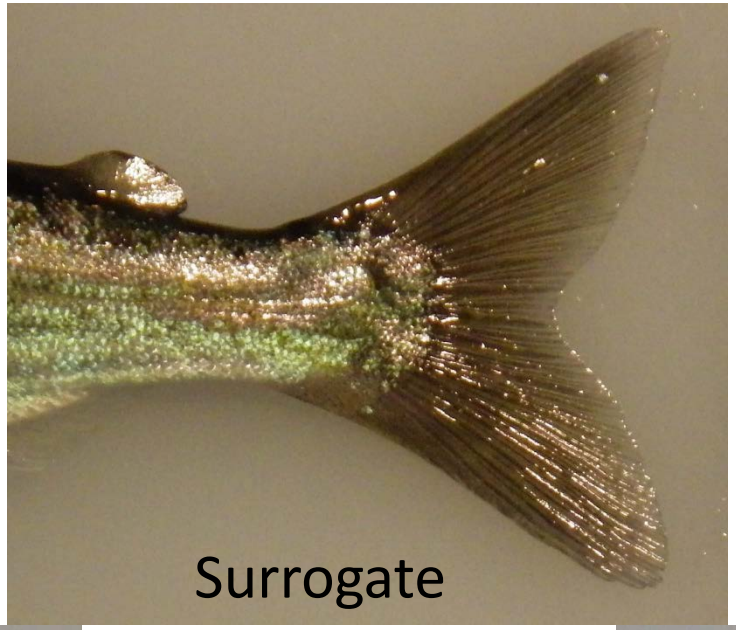
Tributary and mainstem rearing parr





Billman et al. 2014

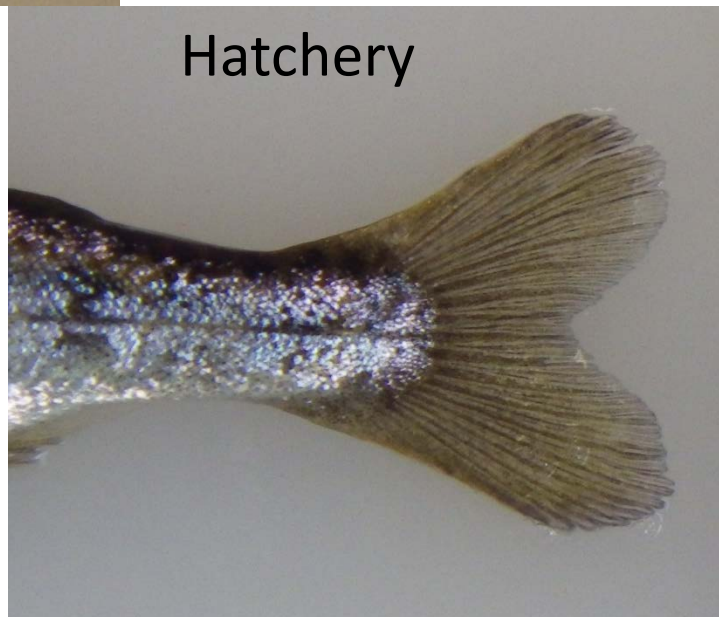
Fin Quality



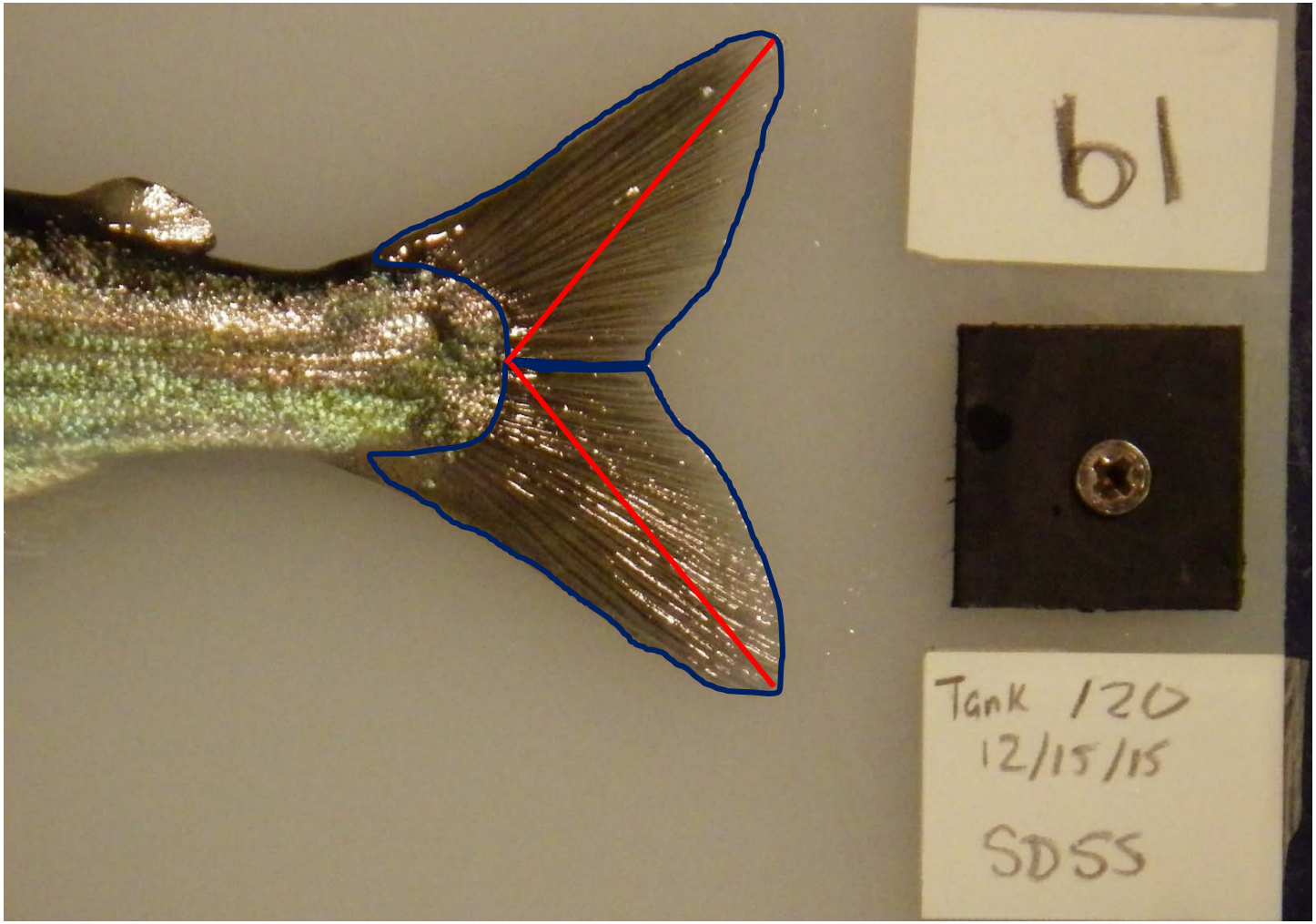
Surrogate

OHRC Stream

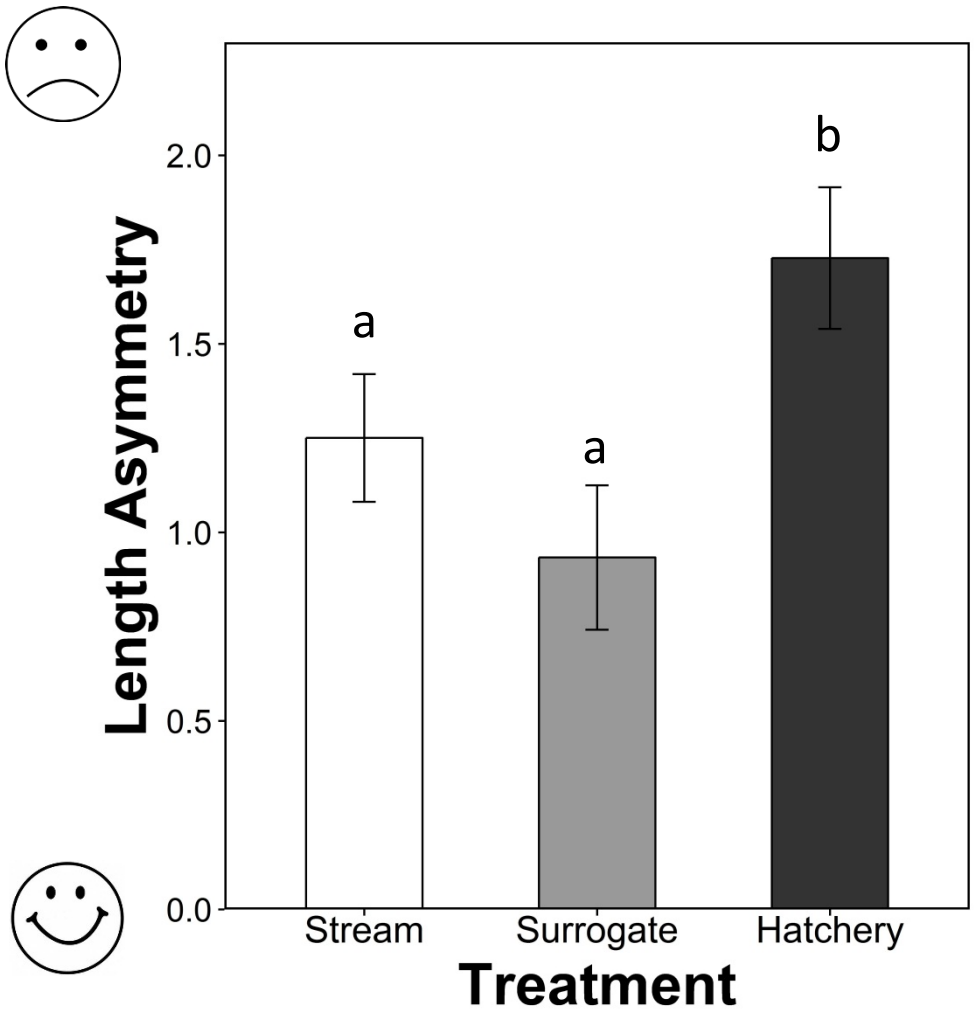
Hatchery

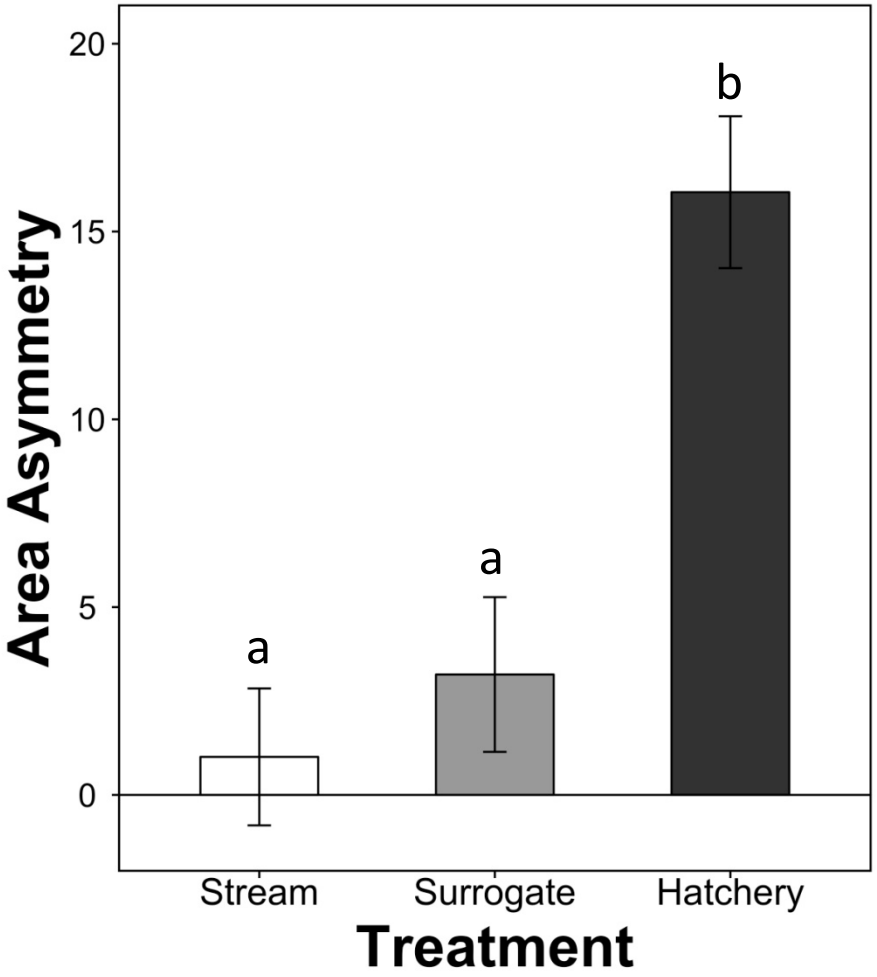


Fin Quality - methods

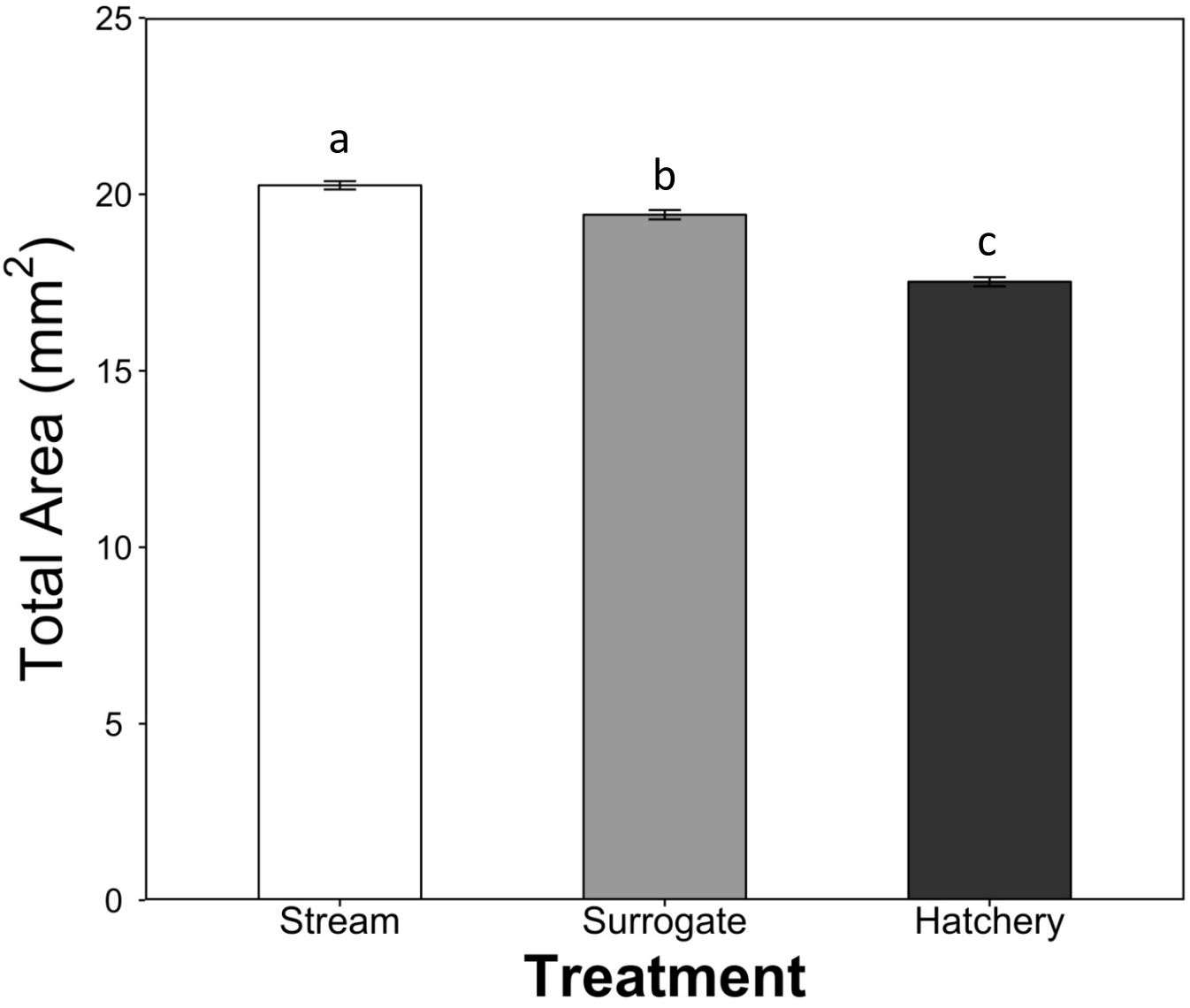


FIN QUALITY


Length Asymmetry
2.0
1.5
1.0
0.5
0.0
a
a
b
Stream
Surrogate
Hatchery
Treatment


Area Asymmetry
20
15
10
5
0
a
a
b
Stream
Surrogate
Hatchery
Treatment

FIN QUALITY


25
20
15
10
5
0
Total Area (mm2)
a
b
c
Stream
Surrogate
Hatchery
Treatment

HIGH QUALITY SURROGATES

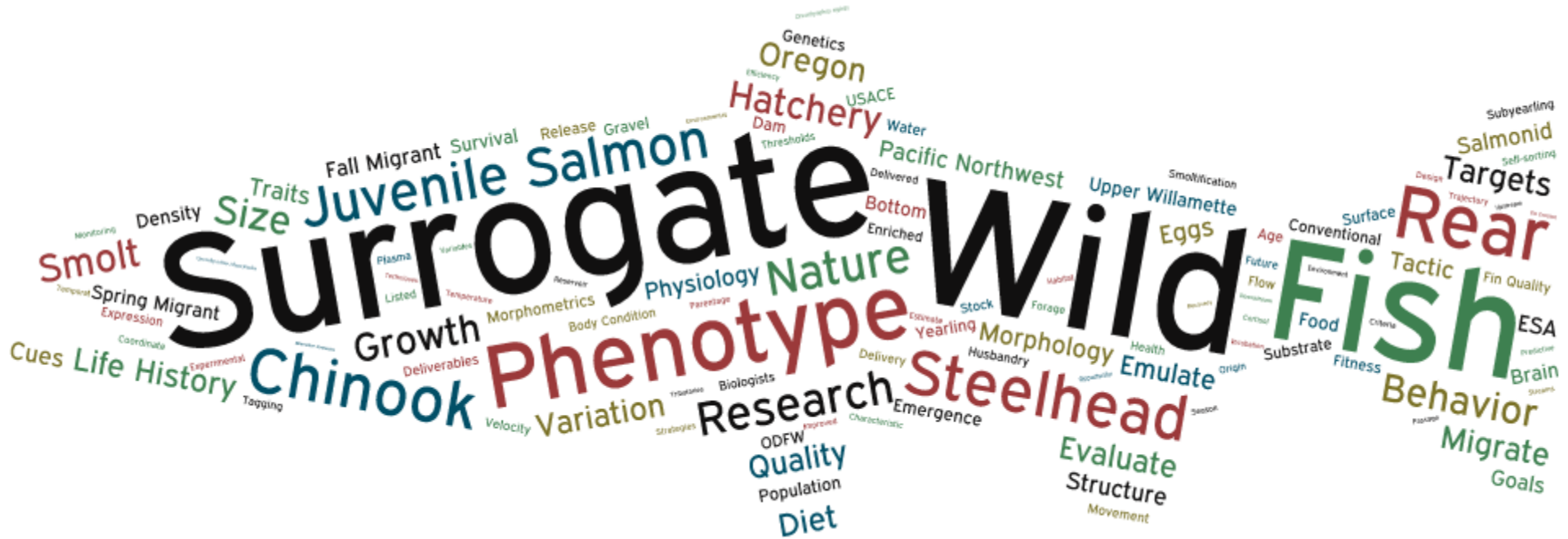
Photo by Todd Pierce

What about the fish?

Phenotypic differences expressed early in life

Different migrant life histories expressed later?

THANK YOU



QUESTIONS?

Morphological comparisons

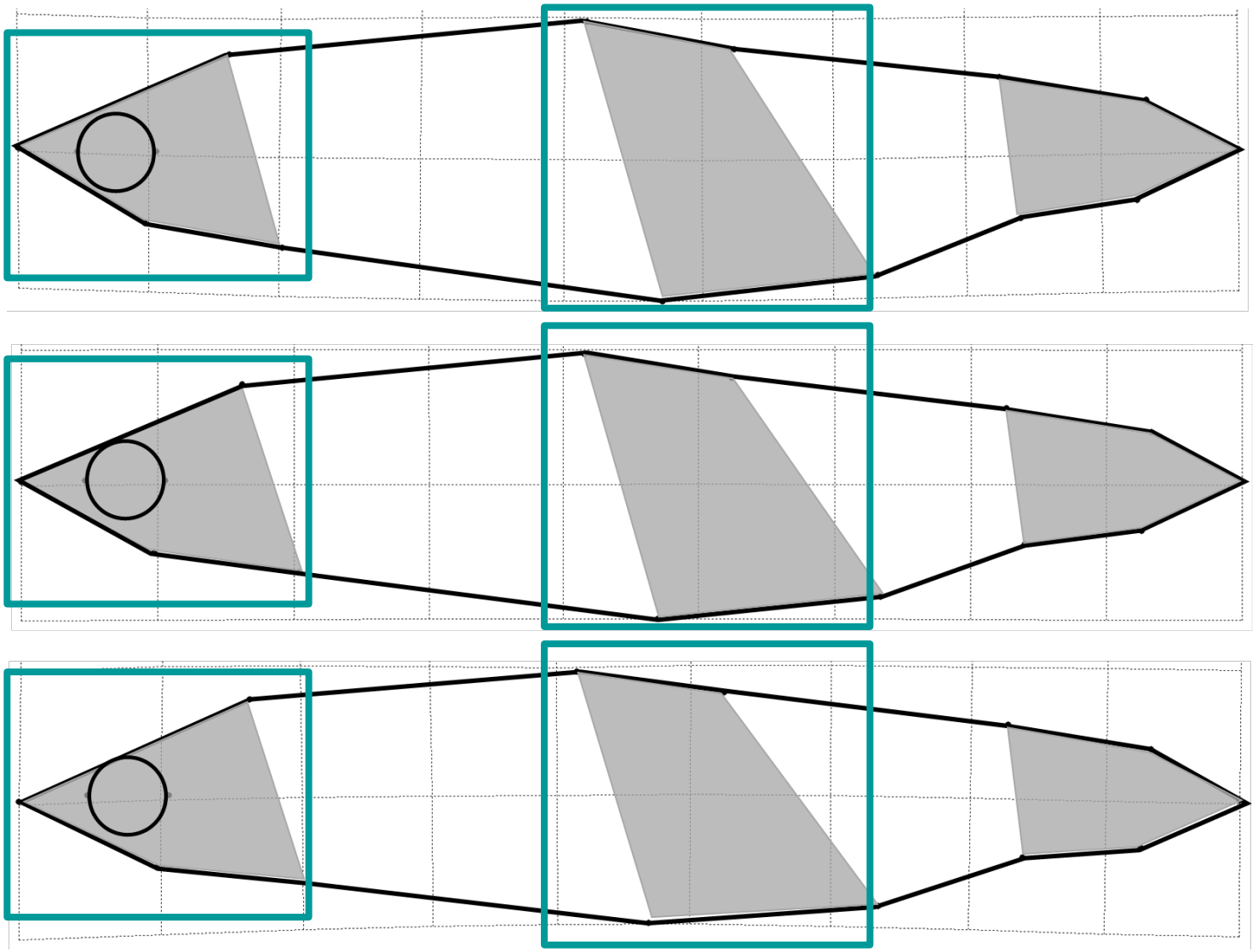
Hatchery

>>

Surrogate

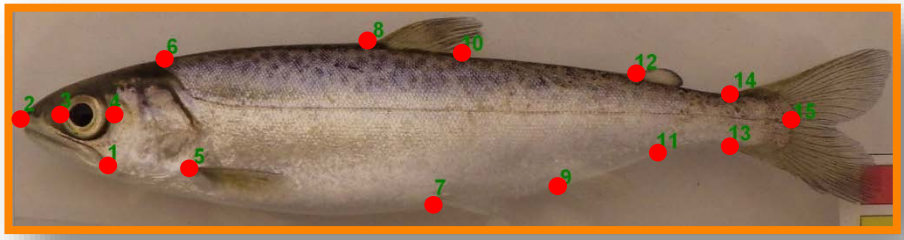
>

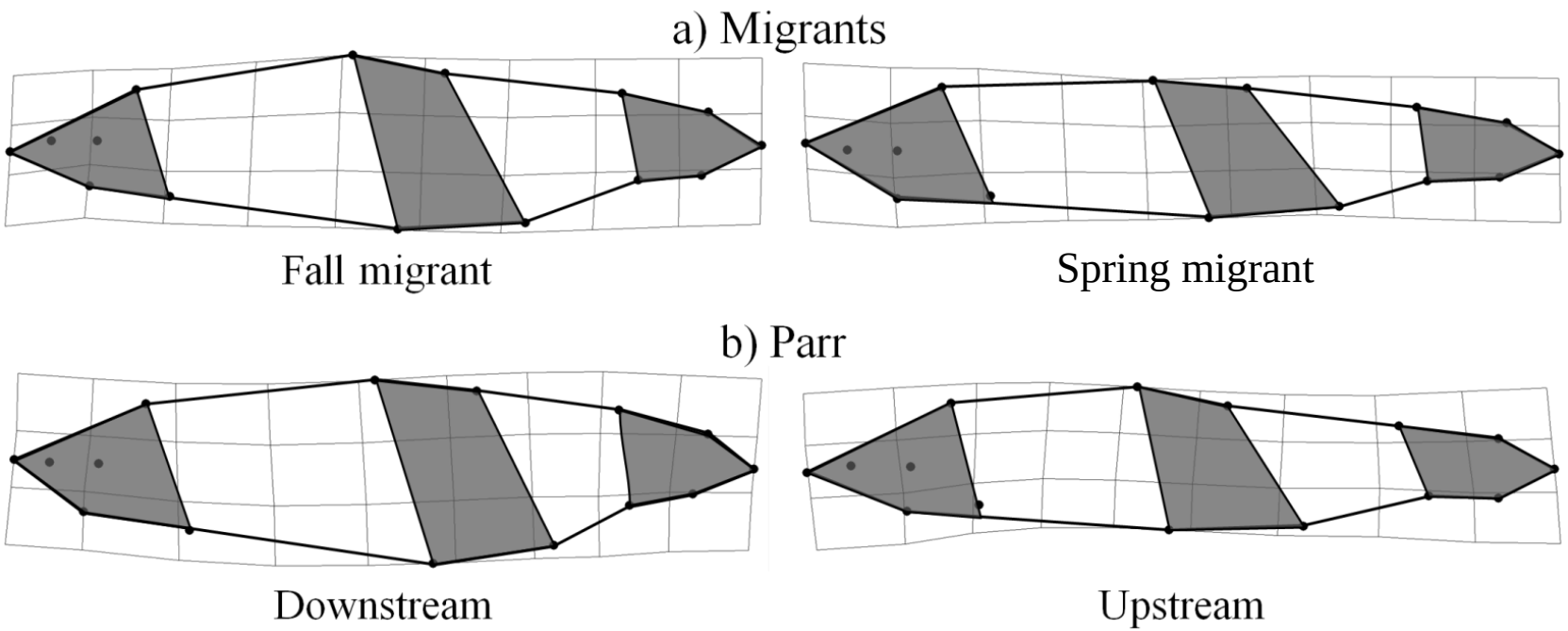
Wild



WILD MIGRANT MORPHOLOGY

Landmark-based geometric morphometrics





Billman et al. 2014

FIN QUALITY - 2013 DATA

- Fin index is a measure of fin erosion
  - = Fin length / fork length