Razorback Sucker hybrids: hatch rates, larval survival and morphometrics

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David Rogowski: Arizona Game and Fish Department

David Ward: US Geological Survey

Reproductive Isolation Mechanisms

- Mating behaviors: courtship
- Geographical Isolation
- Ecological isolation: breeding requirements
- Temporal isolation: breeding seasons

http://www.toonts.com/birds-of-paradise/

Historical Reproductive Isolation Mechanisms

- Ecological Isolation: Razorback spawning runs
- Temporal Isolation: different spawning seasons?

Glen Canyon 1873 http://www.wikiwand.com/en/Glen_Canyon#/Historic_period

Today’s Management Concerns

- Species fusion? Hybrid swarm
- Hybrid speciation? Hybrid is reproductively superior to parents
- Hybrid zones
- Hybrid viability

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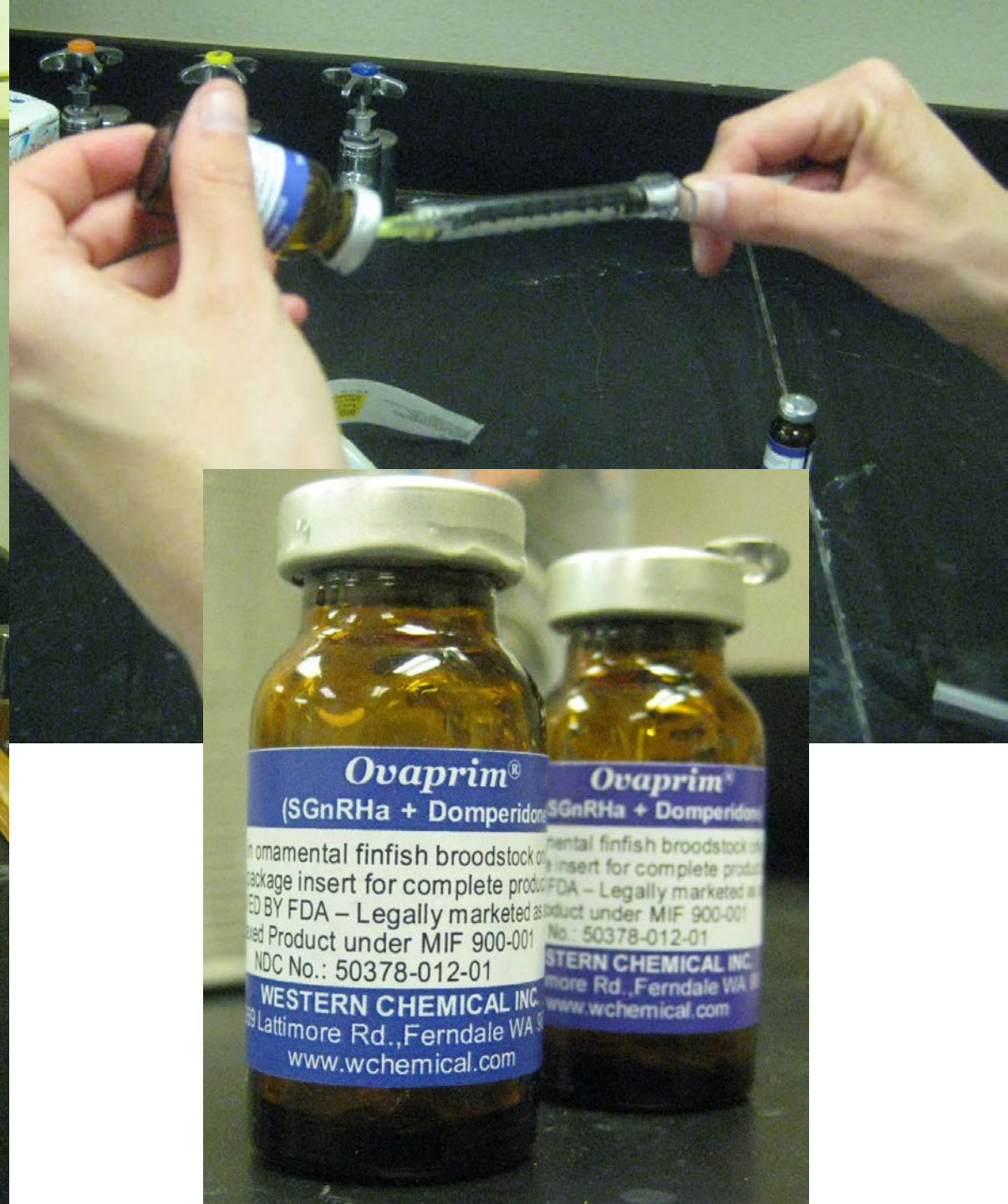
Questions

- Do hybrids hatch as frequently as pure Razorback Suckers?
- Do hybrids differ from Razorback Sucker in larval survival?
- What do Razorback Flannelmouth sucker hybrids look like?

Methods

ER, A.
END
USGS
MB


Ovaprim®
(SGnRHa + Domperido
ornamental finfish broodstock
package insert for complete produ
ED BY FDA – Legally marketed as
ed Product under MIF 900-001
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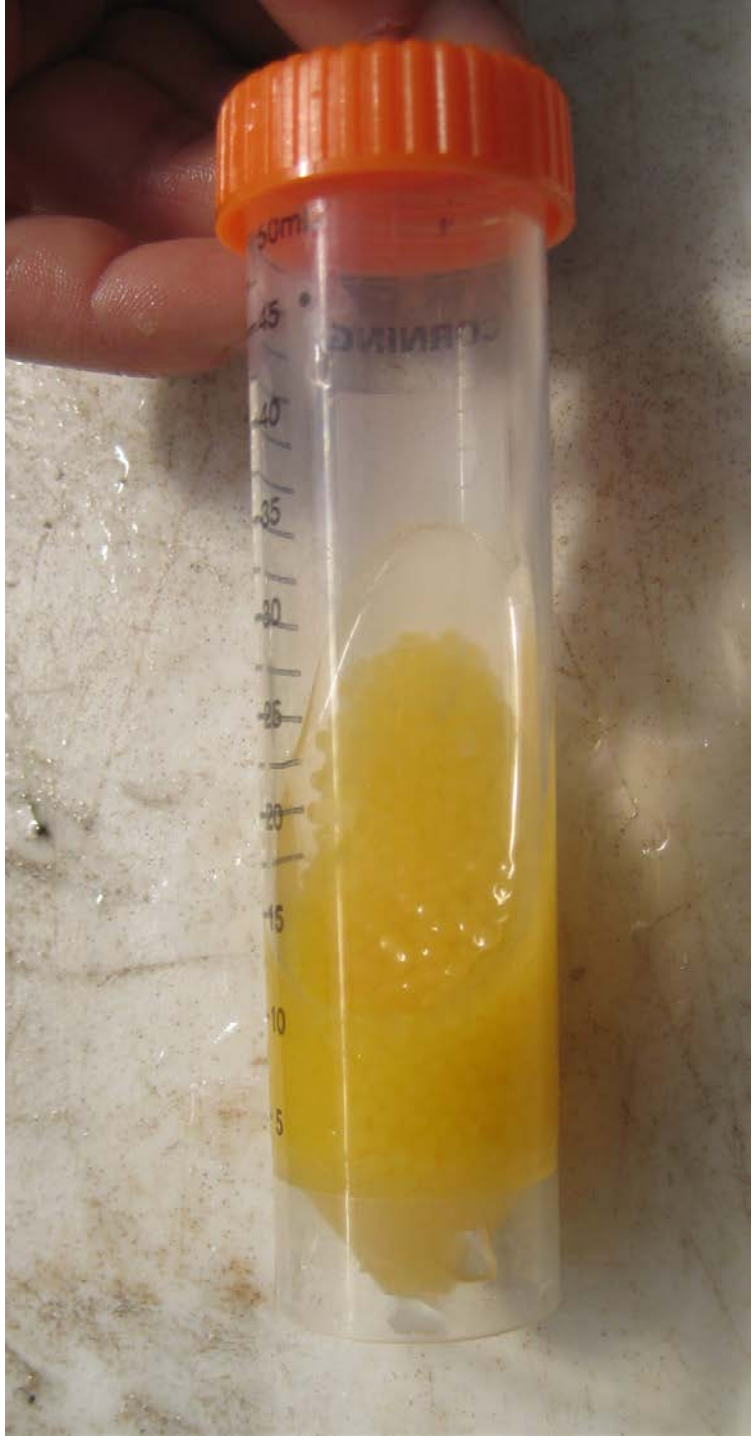
Parental Participation

- Females
  - 4 Razorback
  - 2 Flannelmouth
- Males
  - 7 Razorback
  - 2 Flannelmouth



Hunt
Like
a Girl

Combinations

- Razorback: 9 unique parental pairs
- *Razormouth: 6 unique parental pairs
- Flannelmouth: 4 unique parental pairs
- **Flannelback: 6 unique parental pairs

*Razormouth Sucker:

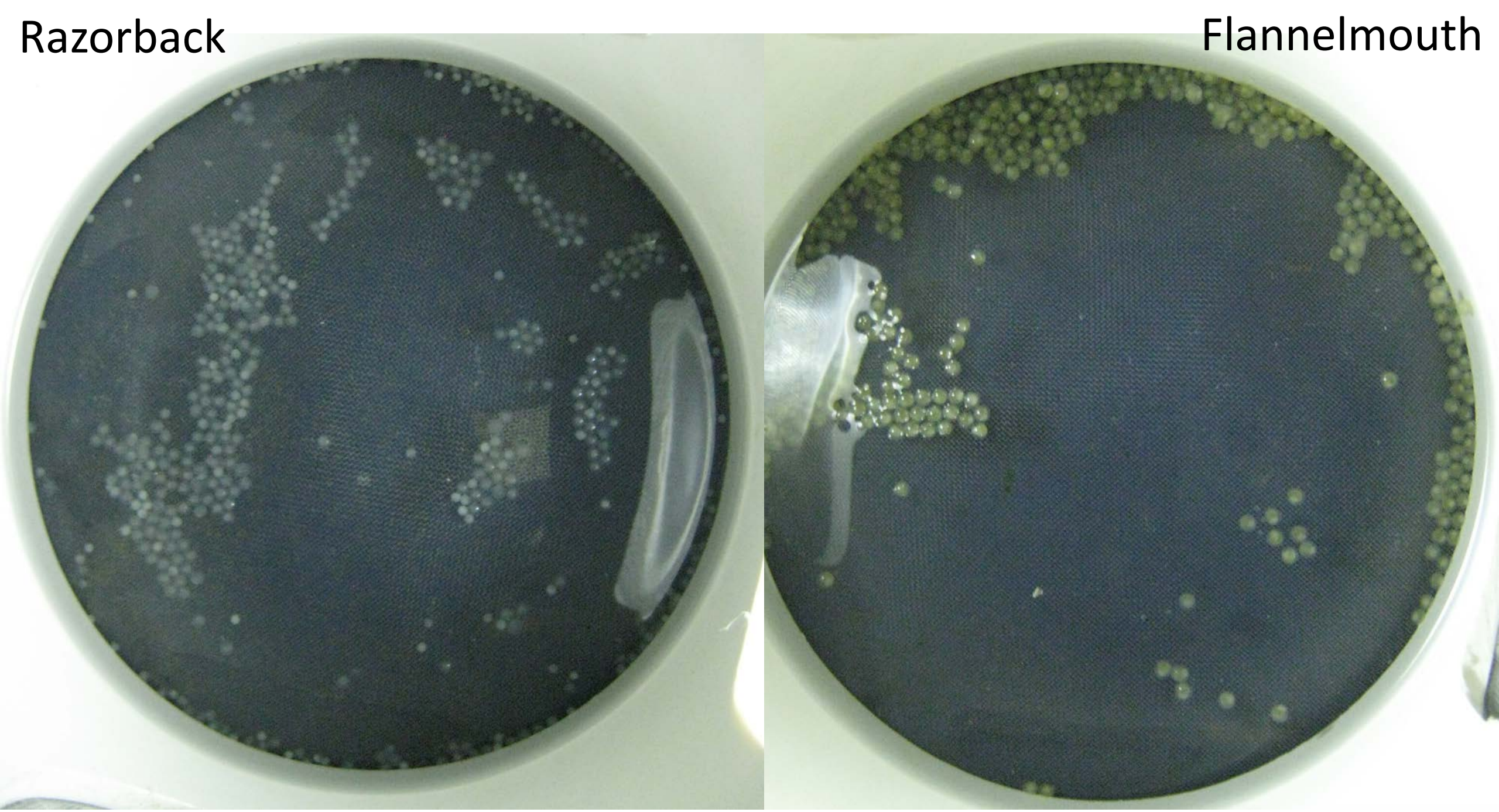
Razorback female X Flannelmouth male

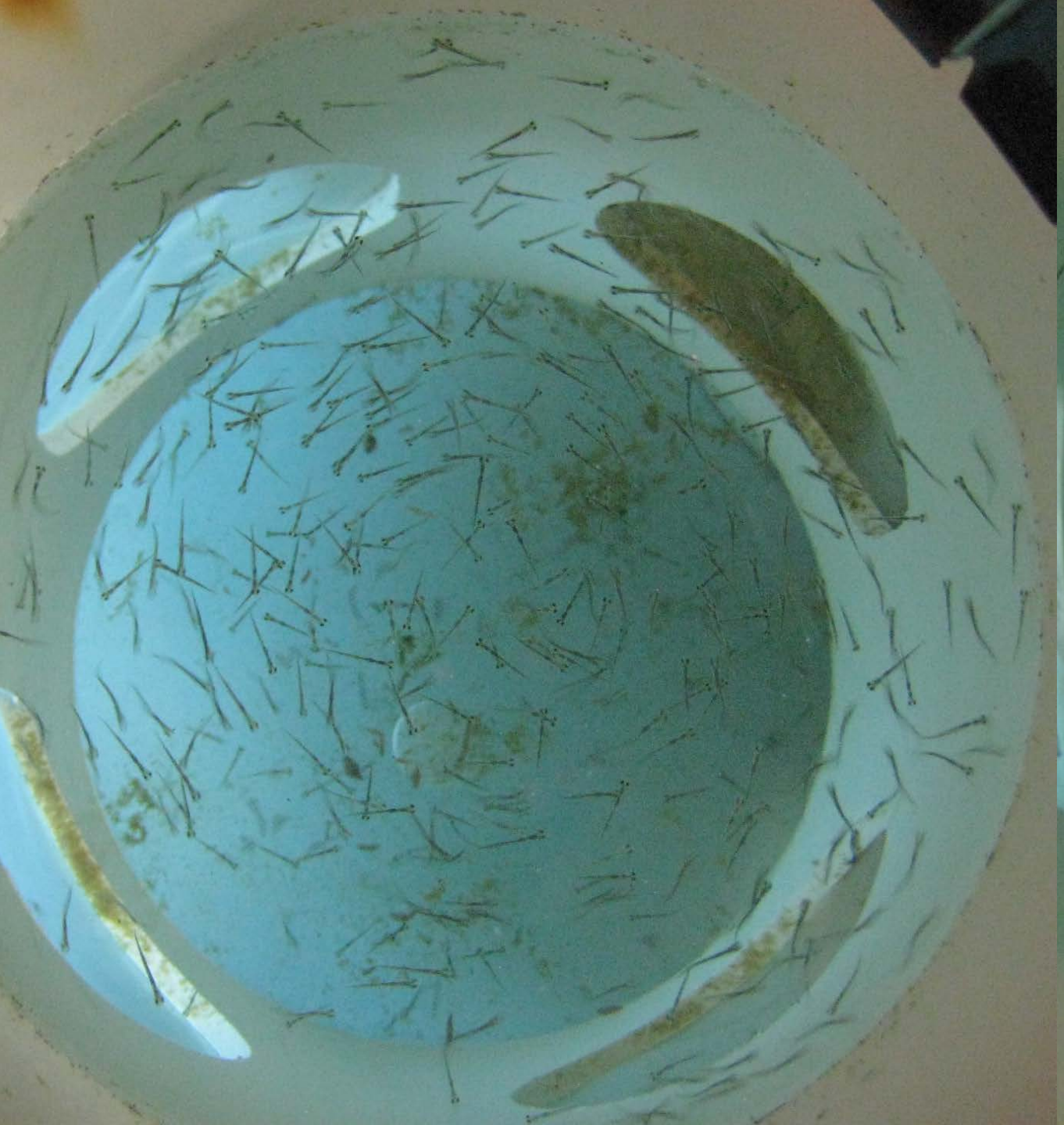
**Flannelback Sucker:

Flannelmouth female X Razorback male

Northern Arizona University
CLASS OF 2010

Hoops
Hoops
30-3


Razorback
Flannelmouth



Treatment success

Combinations	Fish Hatched per combination
• Razorback: 9 unique parental pairings	• 564
• Razormouth: 6 unique parental pairings	• 735
• Flannelmouth: 4 unique parental pairings	• 8
• Flannelback: 6 unique parental pairings	• 9

Questions

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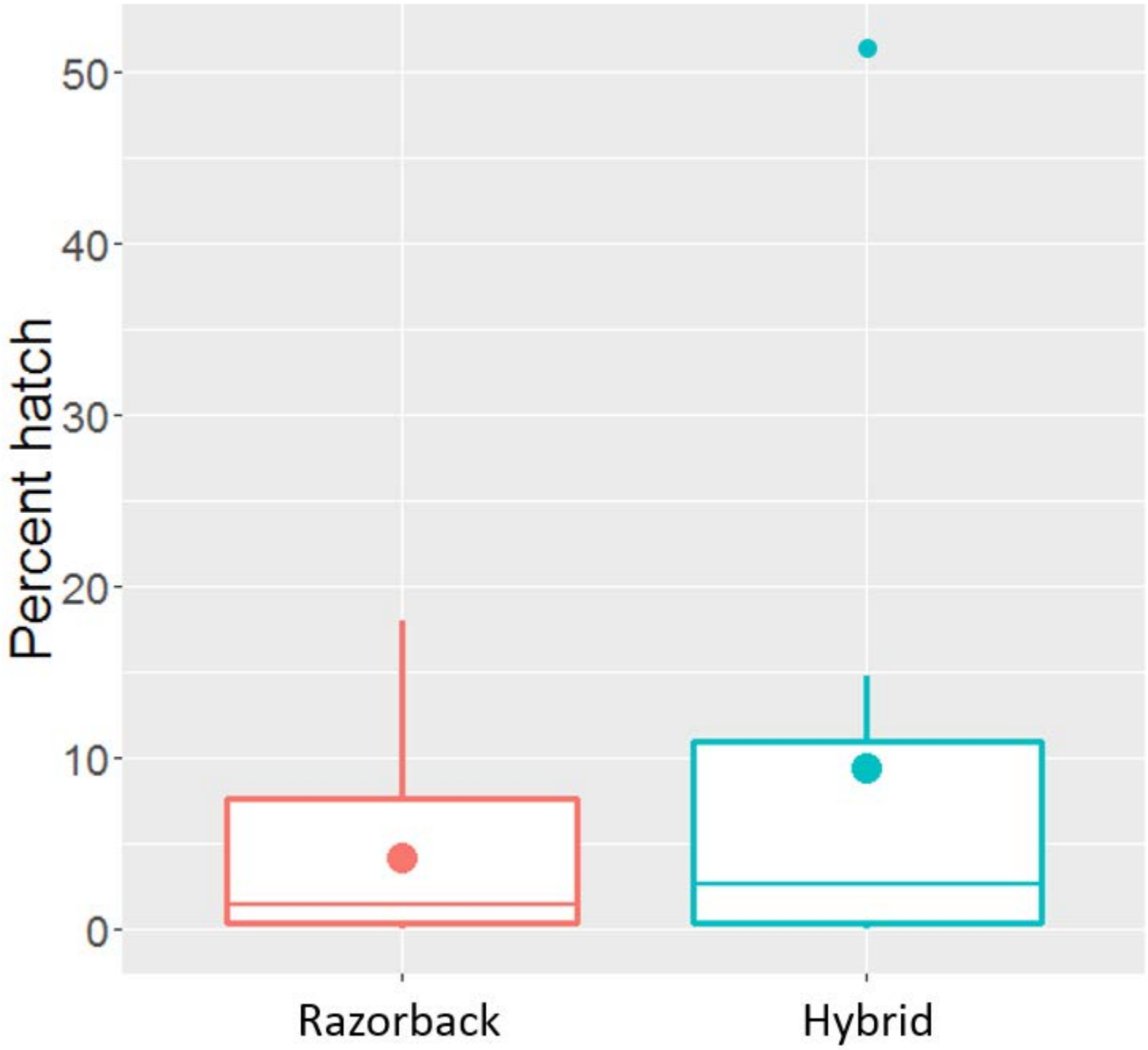

No difference in hatch rates between Razorback or Hybrids

Razorback egg hatch rate: 5.87% [2.84, 9.84]

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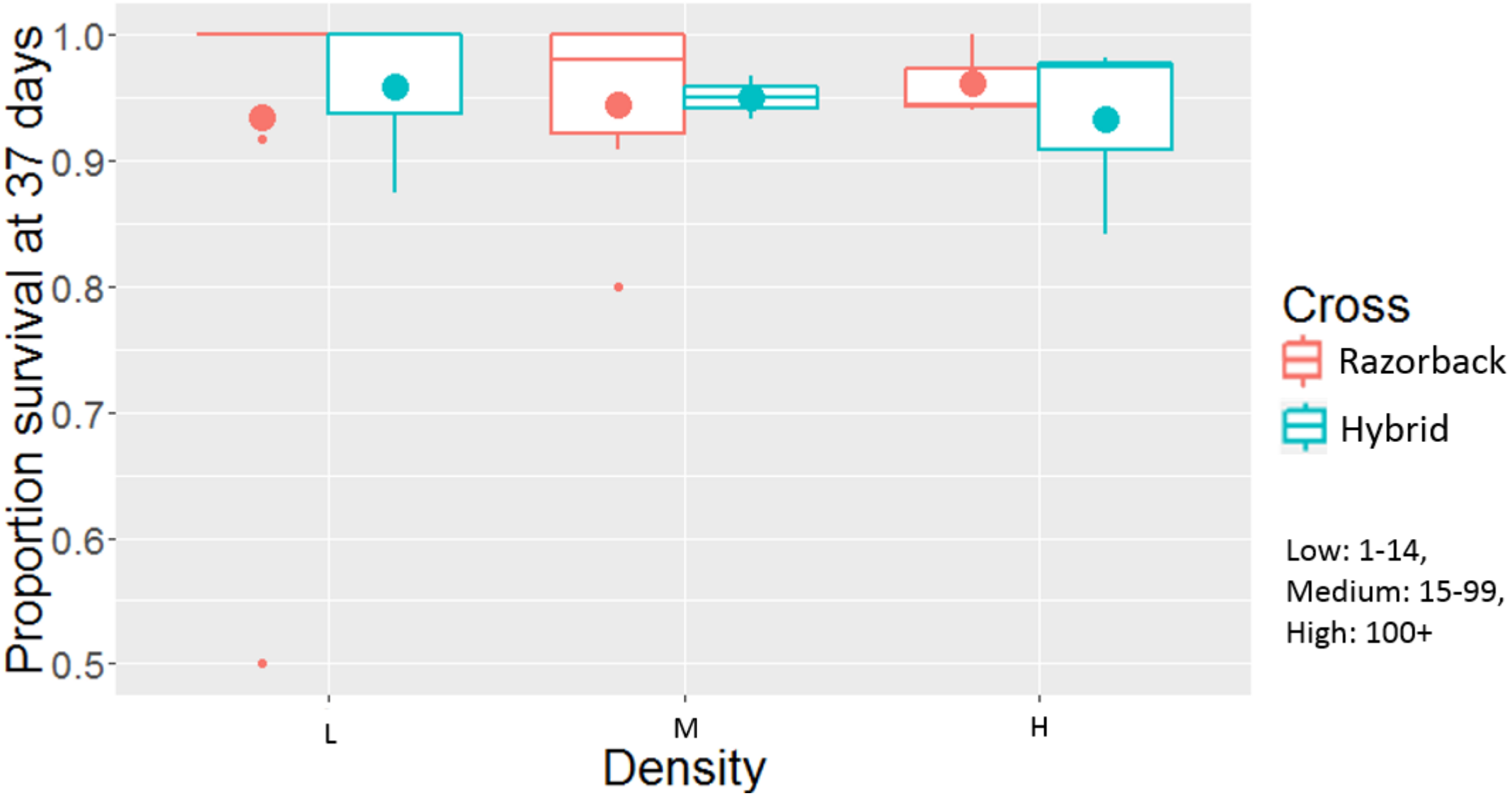
No difference in larval survival to 37 days between cross



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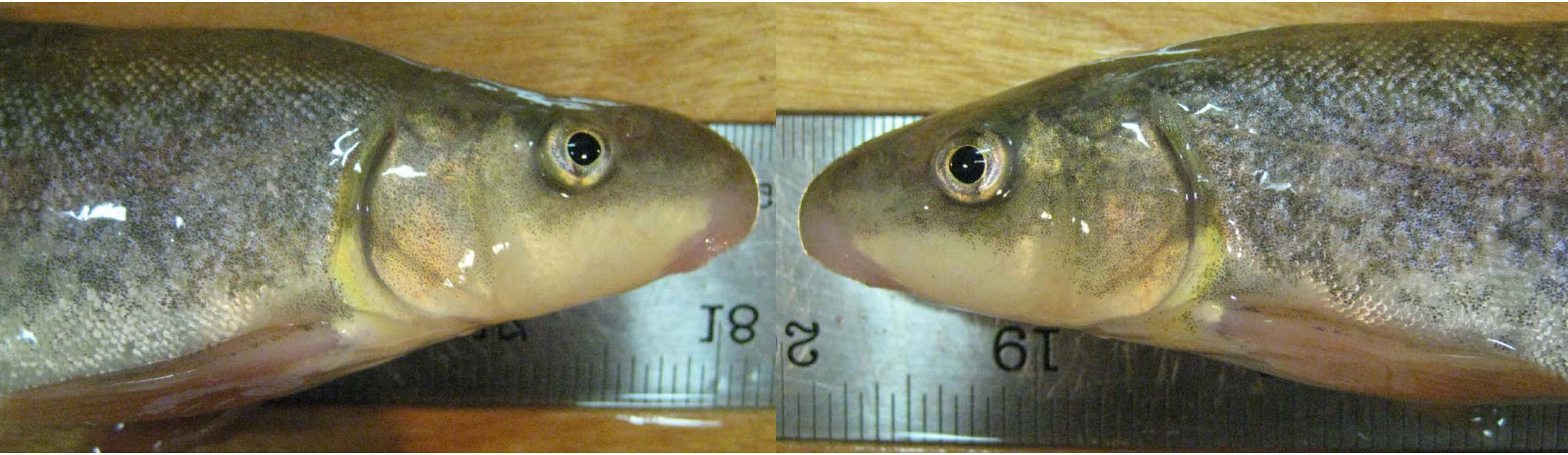
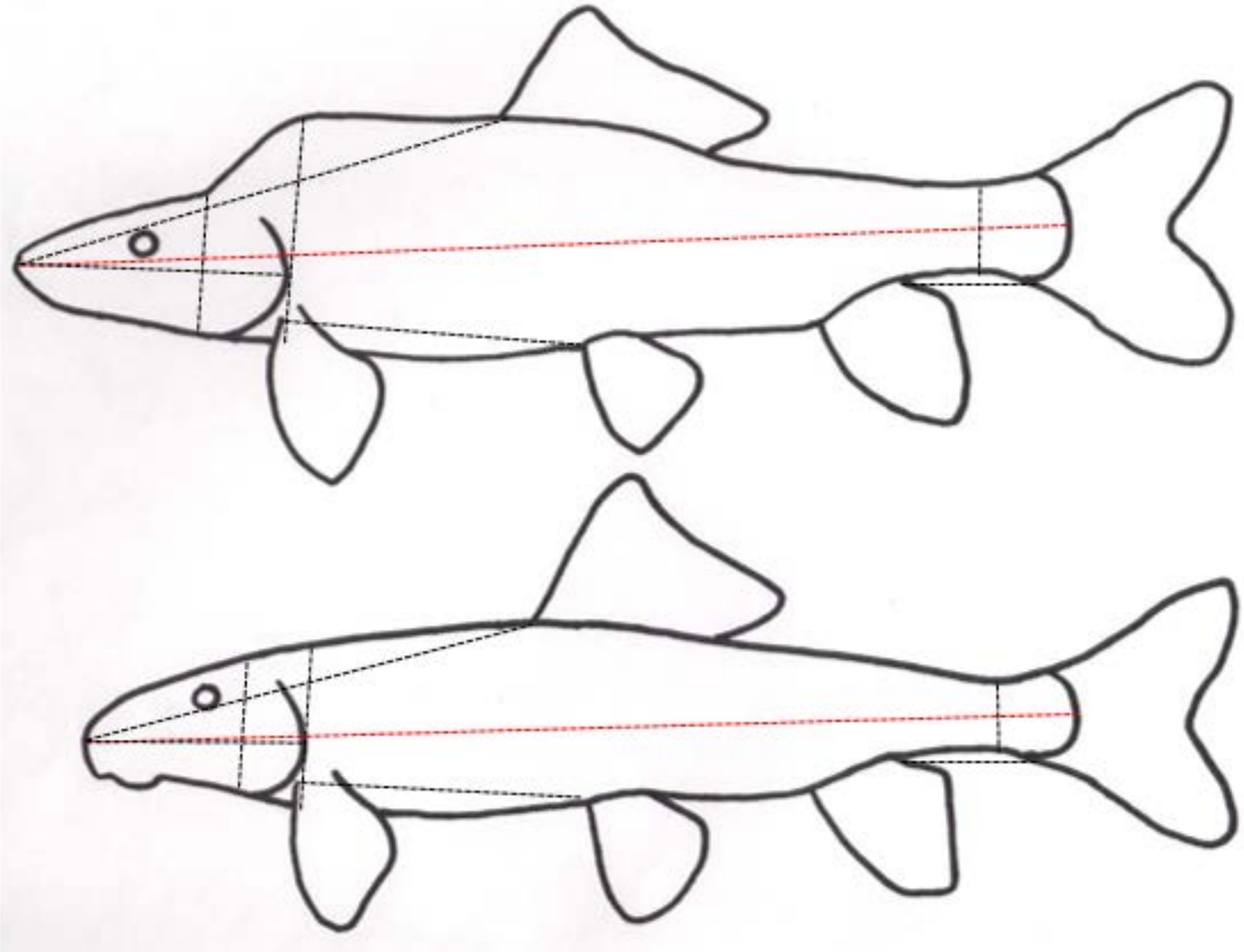
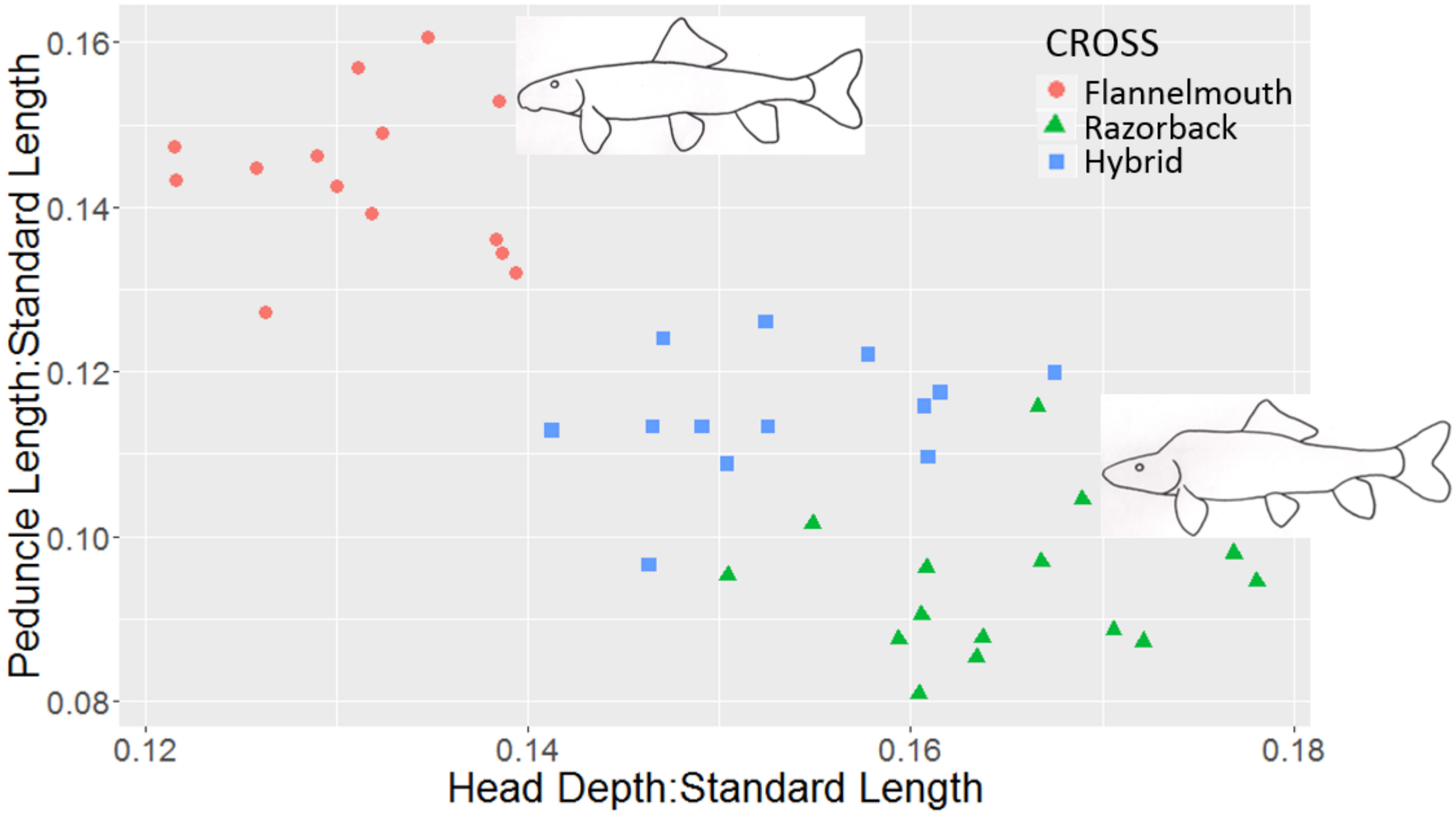


Morphometrics

- 14 Flannelmouth Sucker- Colorado River, Diamond Creek to Lake Mead
- 15 Razorback Sucker- Rocky Mountain Research Station and Bubbling Ponds
- 13 Hybrids- from pilot study

Measurements



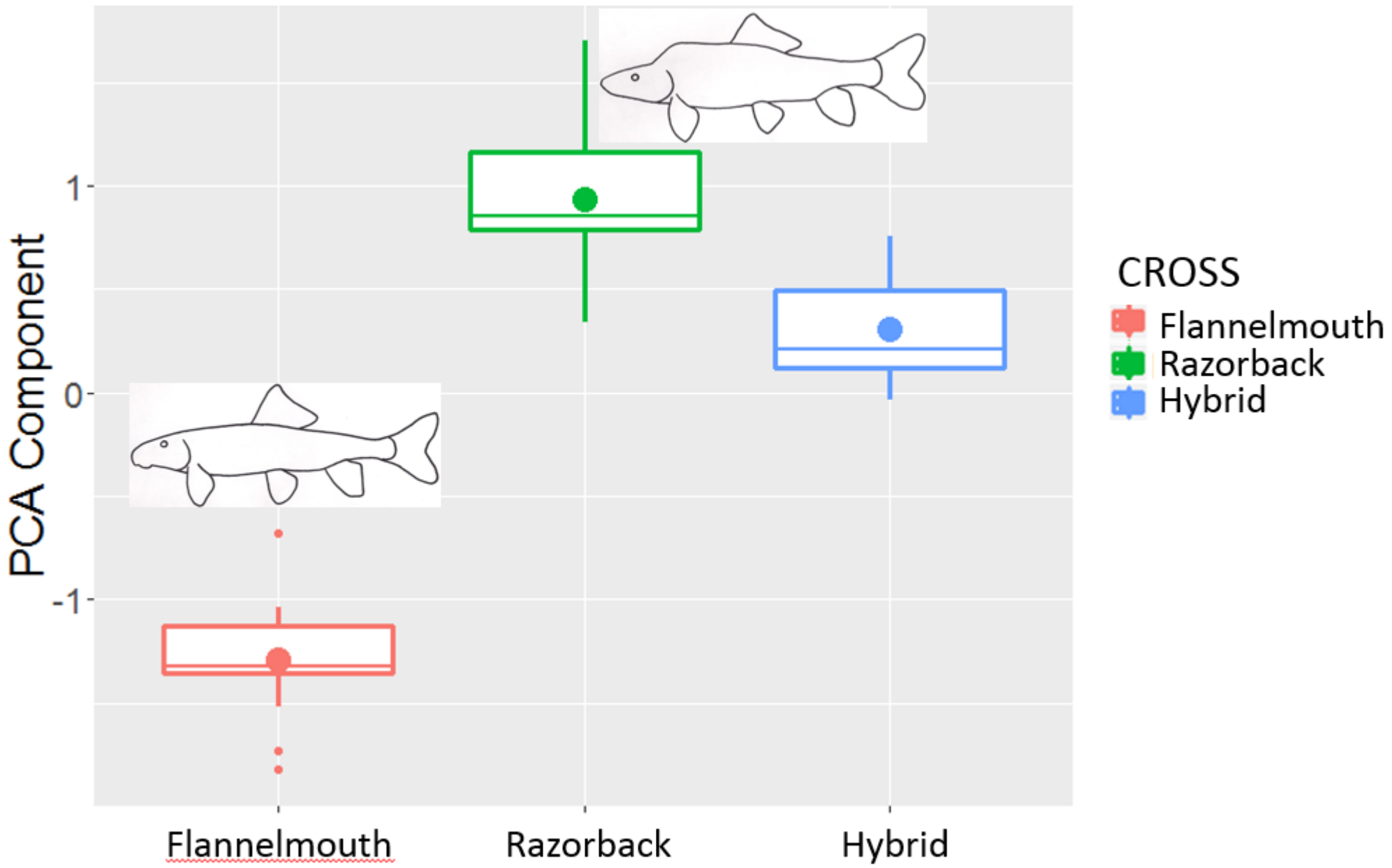

CROSS
Flannelmouth
Razorback
Hybrid
Peduncle Length:Standard Length
0.16
0.14
0.12
0.10
0.08
0.12
0.14
0.16
0.18
Head Depth:Standard Length

Principal Components Analysis

7 Ratios → 1 Component

Component Matrix[a]

	Component 1
HDL.SD	.948
PDD.SD	.942
BDD.SD	.937
PDL.SD	-.911
DR.SD	.851
BELLY.SD	.765
HDD.SD	.946


PCA Component
1
0
-1
Flannelmouth
Razorback
Hybrid
CROSS
Flannelmouth
Razorback
Hybrid

Discriminant Function Analysis

7 Ratios

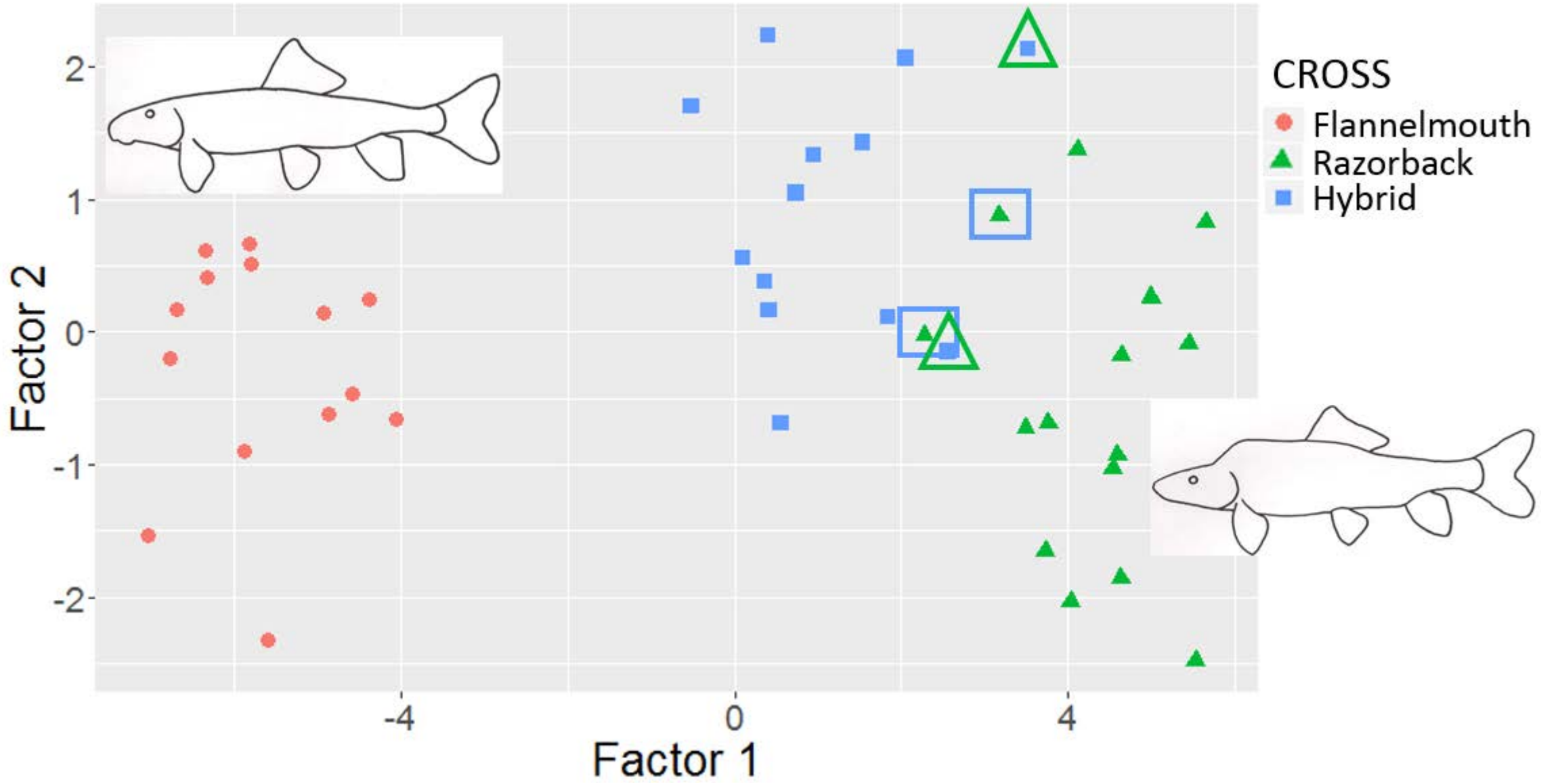
2 Functions

Structure Matrix

	Function 1	Function 2
PDD.SD	.589*	.459
PDL.SD	-.563*	.395
BDD.SD	.563*	.347
HDD.SD	.466*	-.075
HDL.SD	.416*	.089
BELLY.SD	.251*	.006
DR.SD	.254	.344*

Classification Results[a,c]

		CROSS.NO	Predicted Group Membership: FMS	RBS	Hybrid	Total
Cross-validated[b]	Count	FMS	14	0	0	14
		RBS	0	13	2	15
		Hybrid	0	2	11	13
	%	FMS	100.0	.0	.0	100.0
		RBS	.0	86.7	13.3	100.0
		Hybrid	.0	15.4	84.6	100.0


CROSS
Flannelmouth
Razorback
Hybrid
Factor 2
Factor 1
2
1
0
-1
-2
-4
0
4

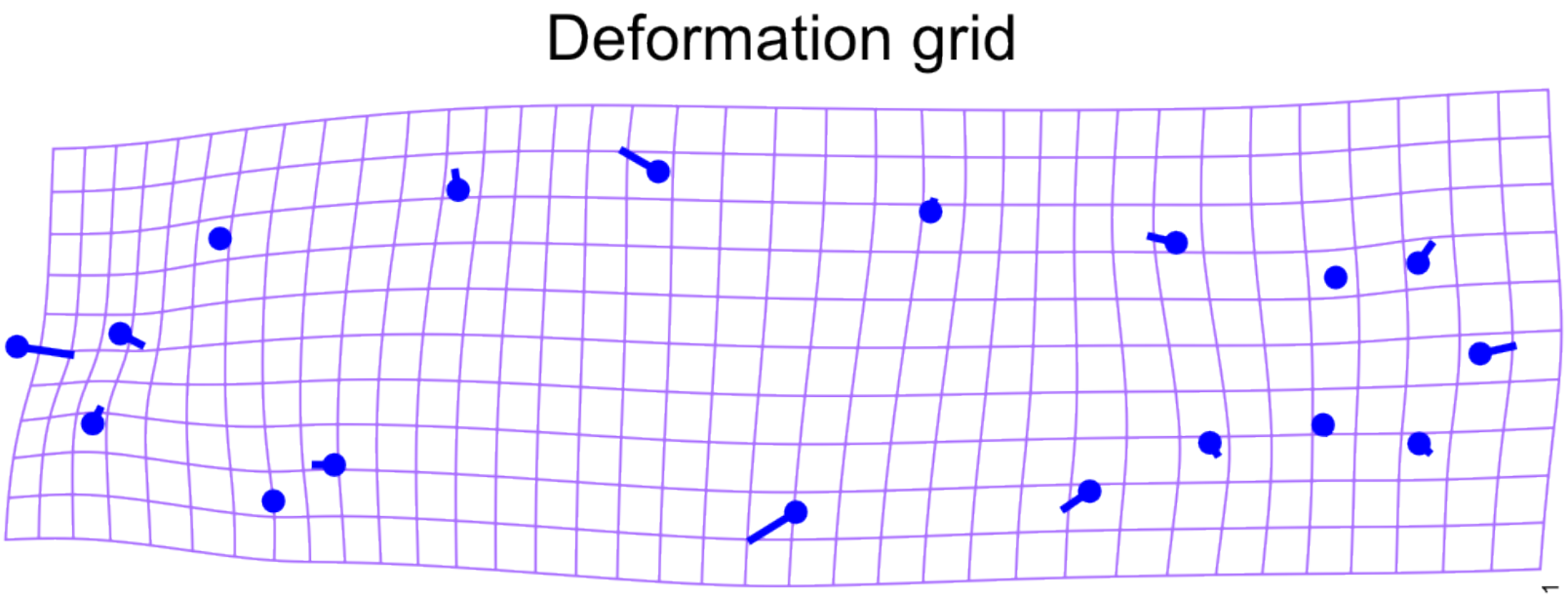
Summary

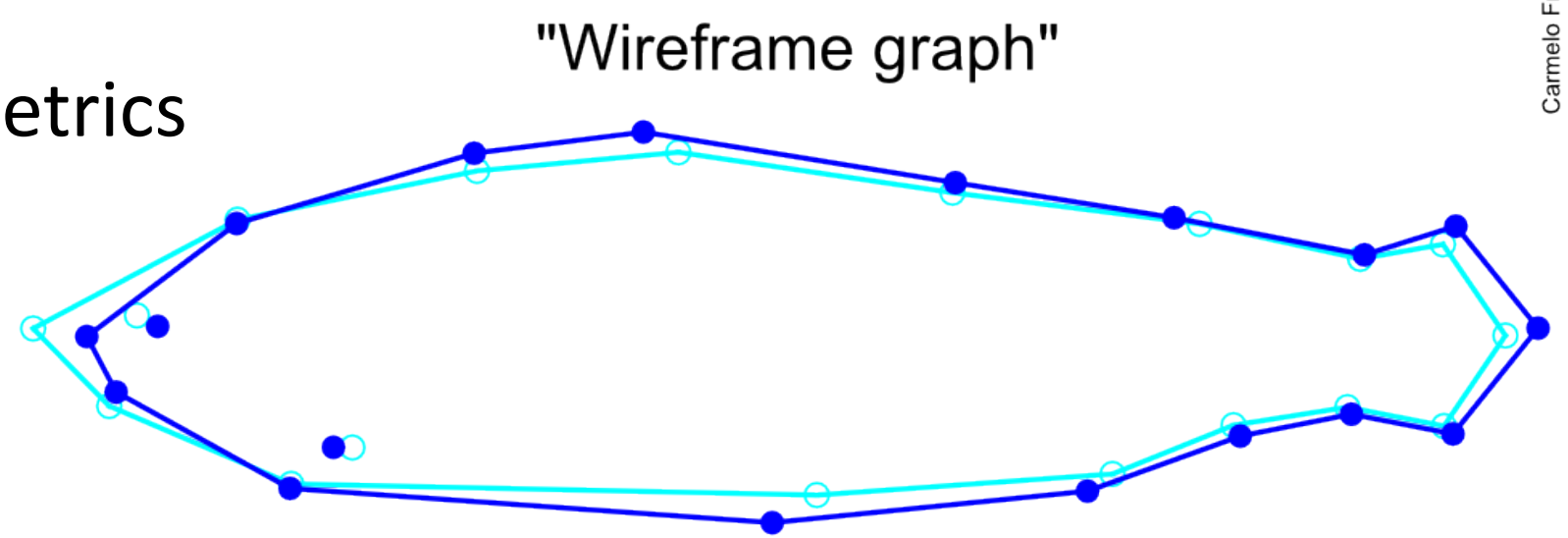
- Hybrids and Razorbacks hatch and survive at similar rates

- Hybrids are an intermediate shape between Flannelmouth Sucker and Razorback Sucker, but look more like Razorback Sucker

Future work

- Re-spawn next spring
- Growth study
- Geometeric morphometrics
- Meristics





Carmelo Fruciano 2011

http://www.fruciano.it/research/geometric_morphometrics.shtml

Acknowledgements

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