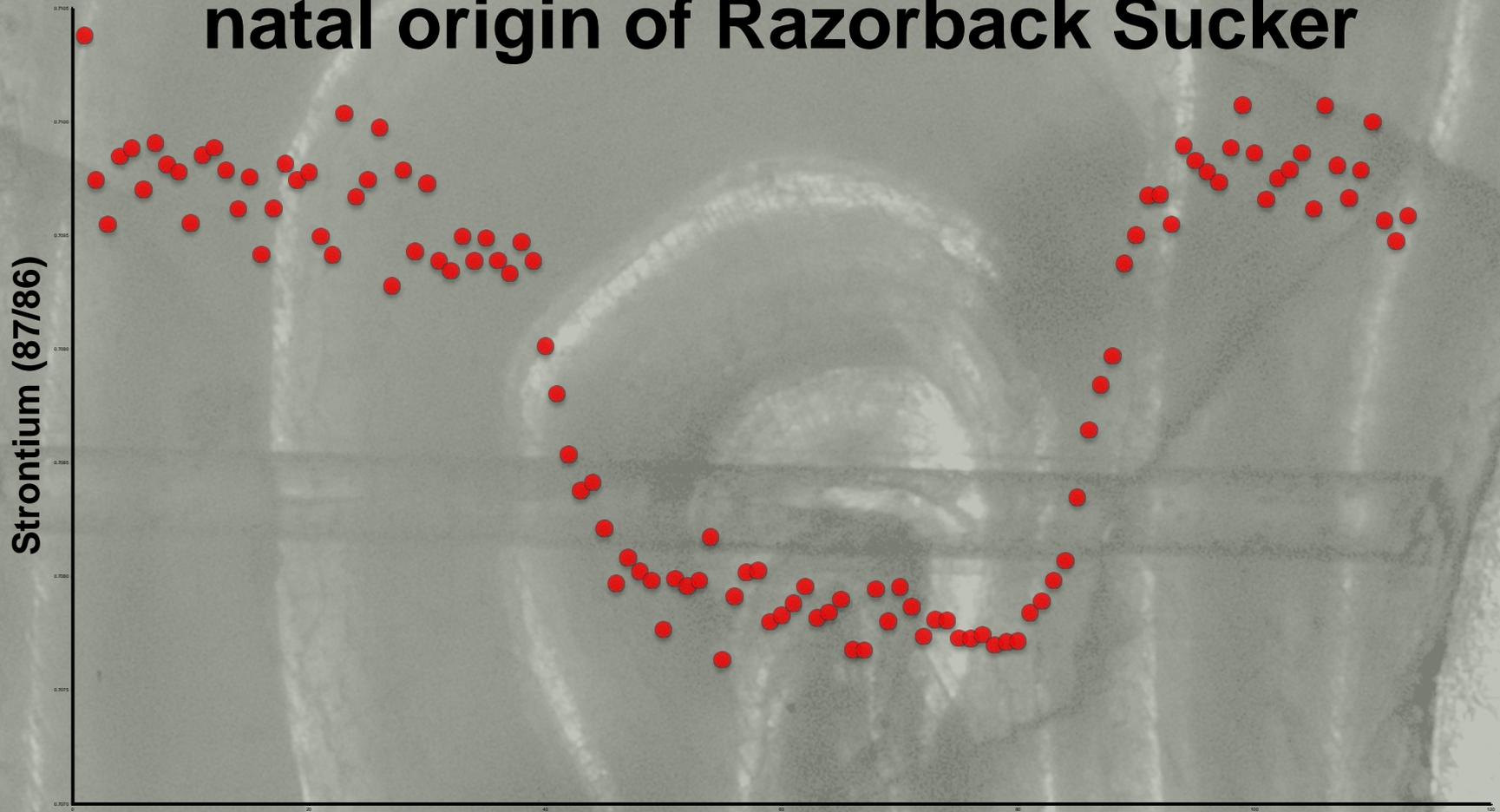


Using microchemistry to determine natal origin of Razorback Sucker



Stephani L. Clark Barkalow, Jennifer L. Kennedy, and
Steven P. Platania

Background

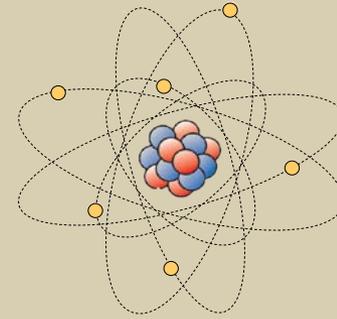
- Need evidence of recruitment of wild Razorback Sucker to sub-adult and adult population (LRP 4.4.1.1, Recovery Plan)
- Untagged Razorback Sucker in San Juan River
 - In 2014, 90 untagged Razorback Sucker
- Need non-lethal method for determining natal origin



Microchemistry

- **Isotopic**

- Strontium (^{87}Sr : ^{86}Sr)



- **Elemental**

- Sr:Ca, Ba:Ca

- Natural geochemical marker

- Natal origin determination

- Accretion of material

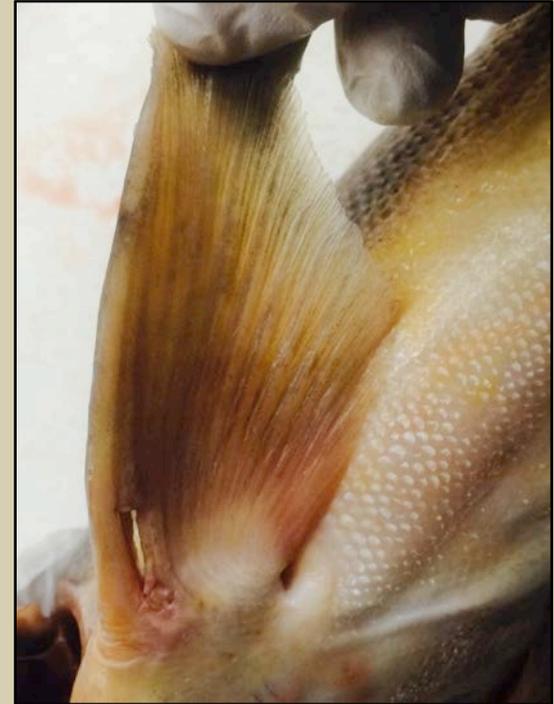
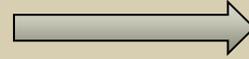
hydrogen 1 H 1.0079	
lithium 3 Li 6.941	beryllium 4 Be 9.0122
sodium 11 Na 22.990	magnesium 12 Mg 24.305
potassium 19 K 39.098	calcium 20 Ca 40.078
rubidium 37 Rb 85.468	strontium 38 Sr 87.62
caesium 55 Cs 132.91	barium 56 Ba 137.33
francium 87 Fr [223]	radium 88 Ra [226]

Objectives

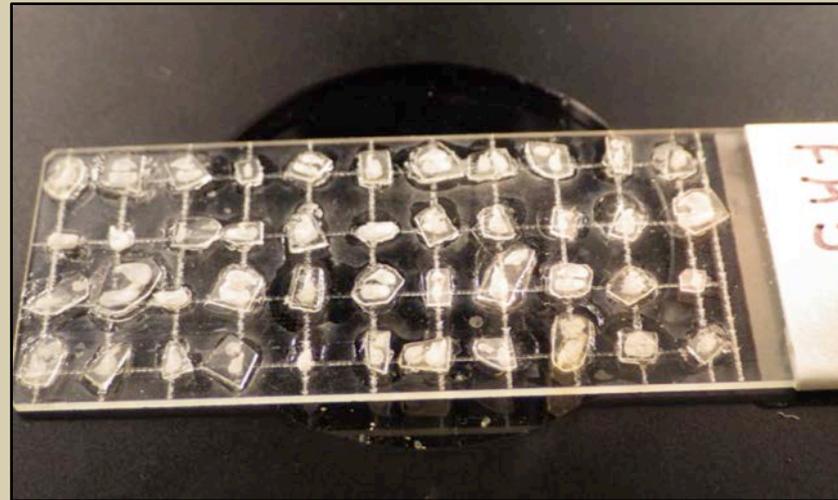
- Use microchemistry to determine natal origin of Razorback Sucker.
- Determine if fin rays can be used instead of scales or otoliths for microchemistry.
- Determine if natural recruitment of Razorback Sucker is occurring in San Juan River.



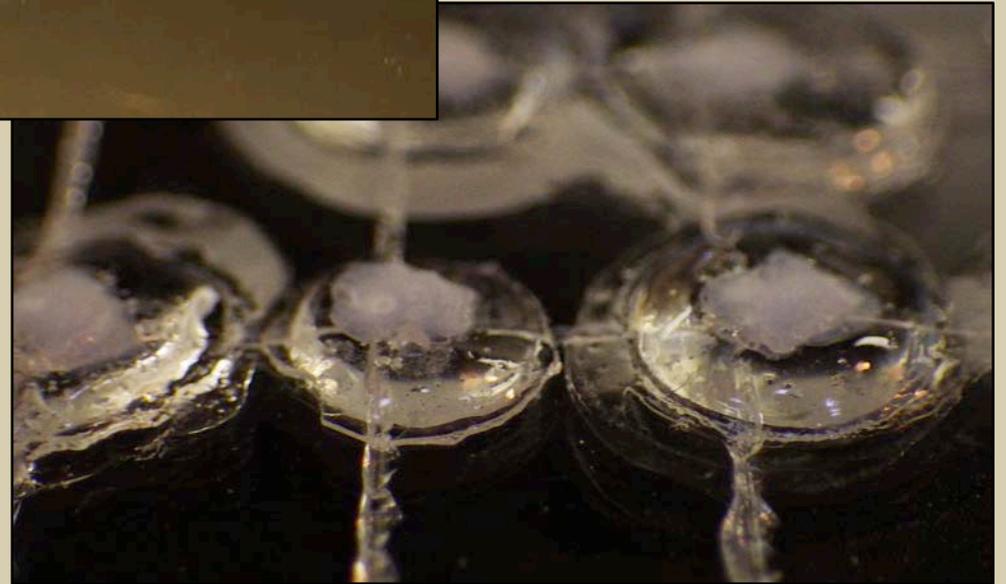
Fin Ray Excision



Fin Ray Processing

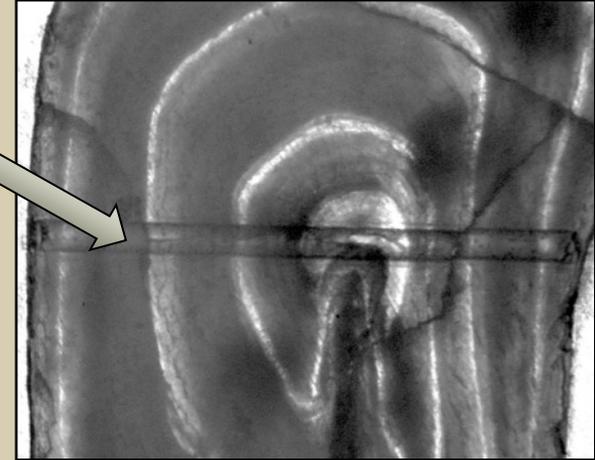


Otolith processing



LA-ICP-MS

- Laser ablation
- **Neptune**
 - $^{87}\text{Sr}:^{86}\text{Sr}$ (*only one ratio*)
- **Element 2**
 - Sr, Ba, Ca (*many*)

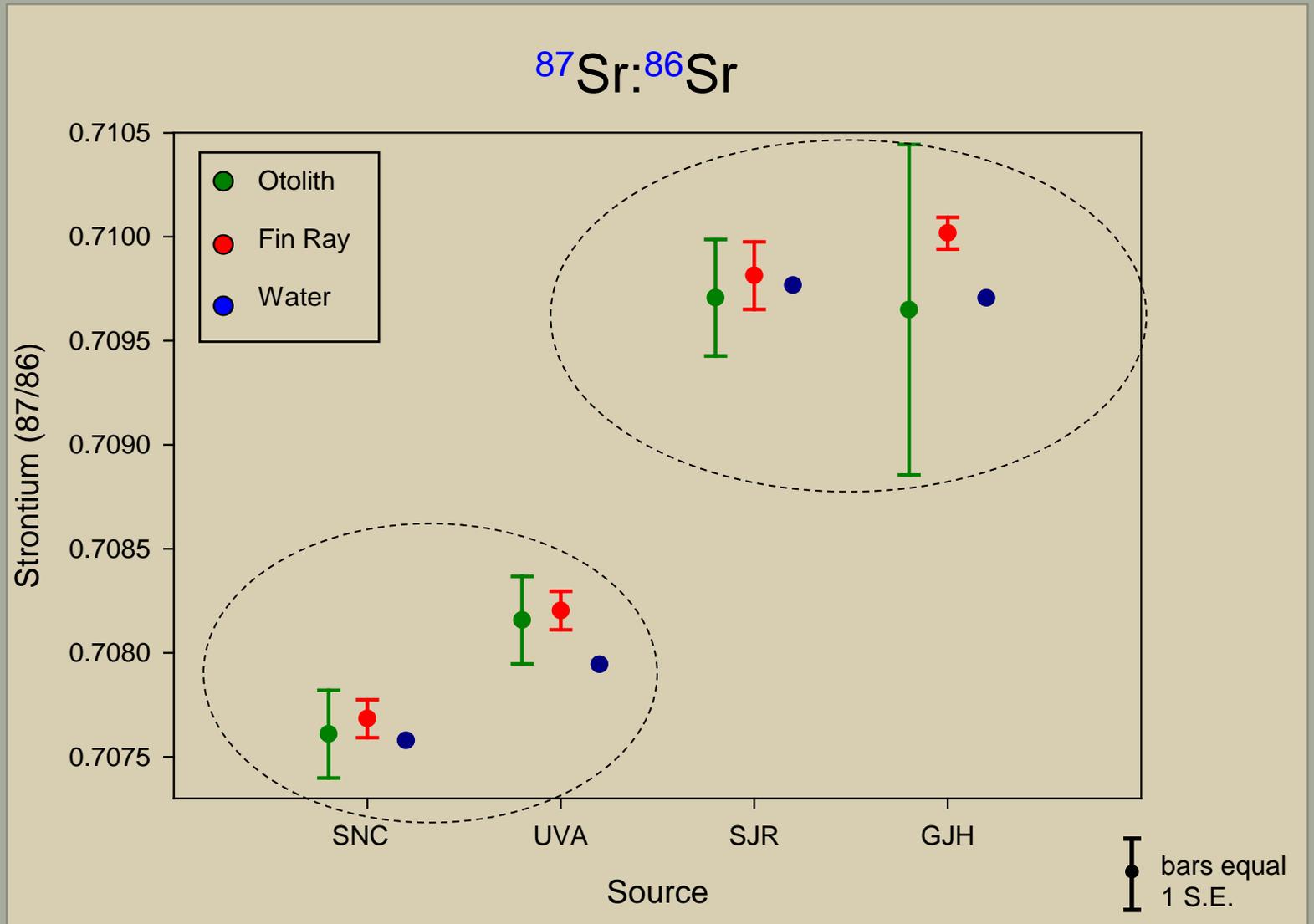


Methods

- Plot **Isotopic Data** while at WHOI
 - Those that don't show signature;
also perform **Elemental** analysis
- ANOVA to analyze difference between sources
 - Dunn's test
- Linear Discriminant Function Analysis



Isotopic Results



Isotopic Results–LDFA Test

Type	Source	N	Predicted Source			
			SJR	GJH	SNARRC	Uvalde
Fin Ray	SJR	76	65	11	--	--
	GJH	38	--	38	--	--
	SNC	38	--	--	38	--
	UVA	31	--	--	--	31
	2014 RBS	96	17	4	20	55



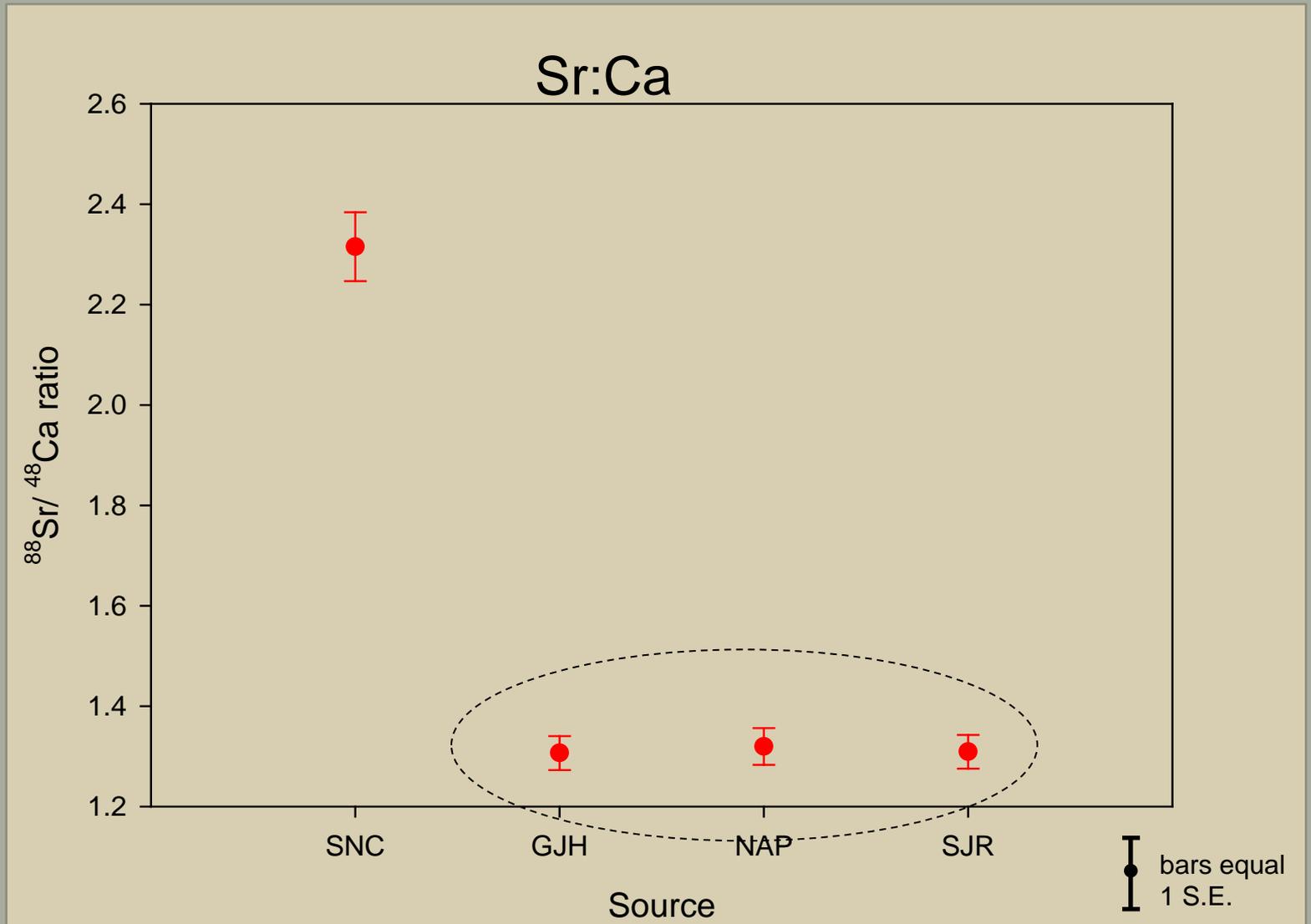
PIT tagged fish % correct

Type	N	Source		
		GJH	SNARRC	Uvalde
Fin Ray	54	80%	33%	100%

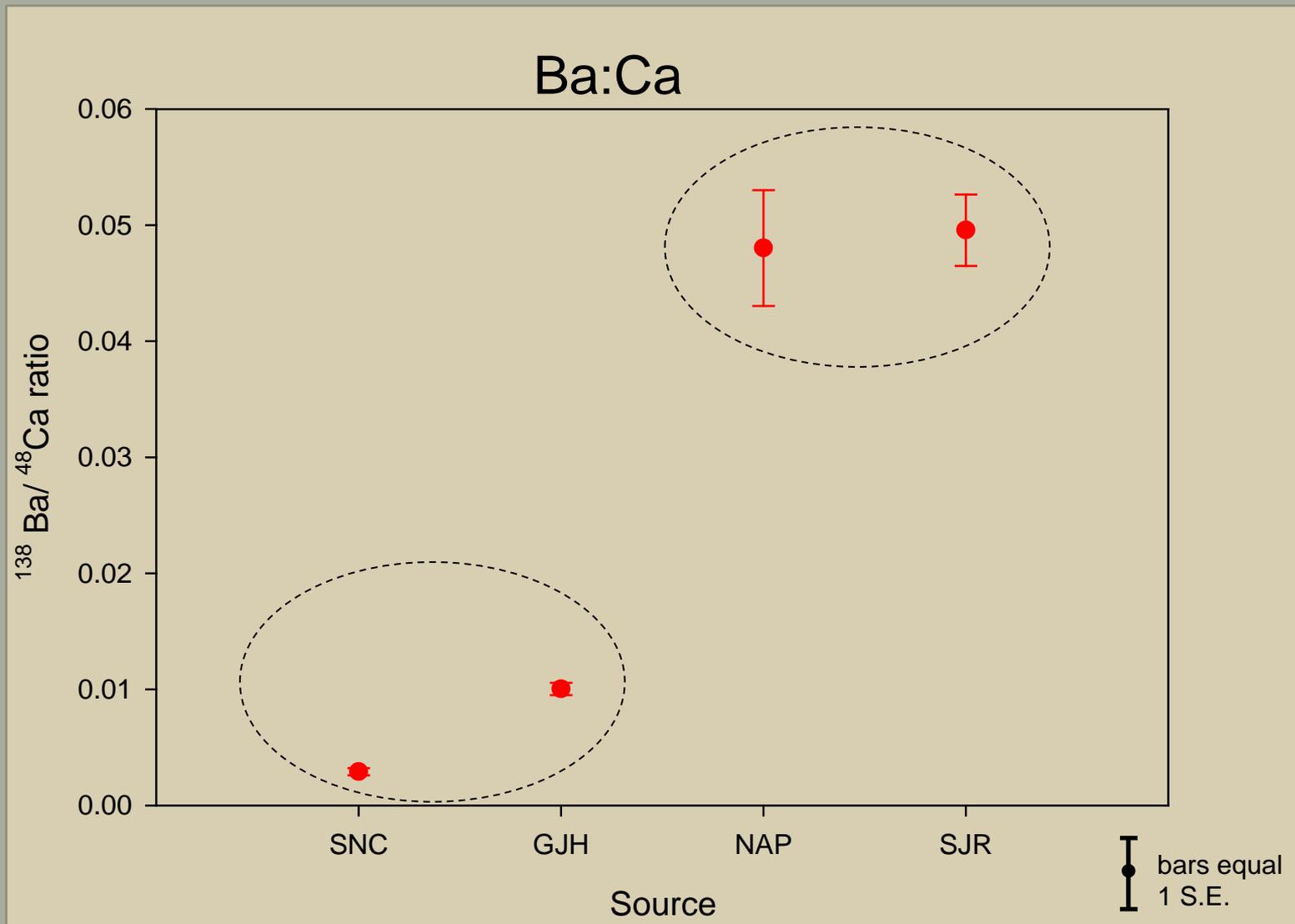
- Fish originating at SNARRC (SNC) are being classified as Uvalde (UVA)



Elemental Results



Elemental Results



Elemental Results–LDFA Test

Type	Source	N	Predicted Source			
			SNC	GJH	NAP	SJR
Fin Ray	SNC	7	7	--	--	--
	GJH	6	--	6	--	--
	NAP	7	--	--	3	4
	SJR	12	--	--	4	8
	2014 RBS	25	6	11	--	7

- 3 PIT tagged originated in NAPI ponds
- 3 un-tagged from year class 2004 and 2006
 - (>10,000 untagged in 2006 and 2007)
- 1 untagged aged 1+ (caught in 2015)



2015 Razorback Sucker

- 224 mm TL caught February 2015 (RM 19)
- Classified to SJR (95% probability)
- **Natural recruitment of Razorback Sucker in the San Juan River**



Summary

- **Project Successful:**
Fin ray microchemistry successfully used to determine natal origin
 - *Discovered Wild Razorback Sucker*
- **Isotopic** data quicker and easier to analyze than **Elemental**
 - Some limitations with **Isotopic**
- 2 step process involving both **Isotopic** and **Elemental** needed for confirmation



Objectives/Conclusions

- Use microchemistry to determine natal origin of Razorback Sucker.
 - Accomplished using Isotopic and Elemental analyses
- Determine if fin rays can be used instead of scales or otoliths for microchemistry.
 - Fin ray microchemistry successfully used to determine natal origin (*quicker/easier*)
- Determine if natural recruitment of Razorback Sucker is occurring.
 - Confirmed for age-1+ Razorback Sucker in Feb 2015



Continue SJR Work

- Process annual samples from program projects (500/year)
- Microchemistry library built
- No new work needed



New Work – Lake Powell

- **Isotopic** and **Elemental** analysis of Razorback Sucker in San Juan Arm of Lake Powell
- Requires water samples from
 - Colorado River
 - Green River
 - Lake Powell



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Fish collection

*Dale Ryden and hatchery crew, Chris Cheek and hatchery crew
Manuel Ulibarri and hatchery crew, Non-native removal crew
Fall monitoring crew*

Microchemistry analysis assistance

Robert K. Dudley, Edward M. Jakubowski, Brian A. Wolff

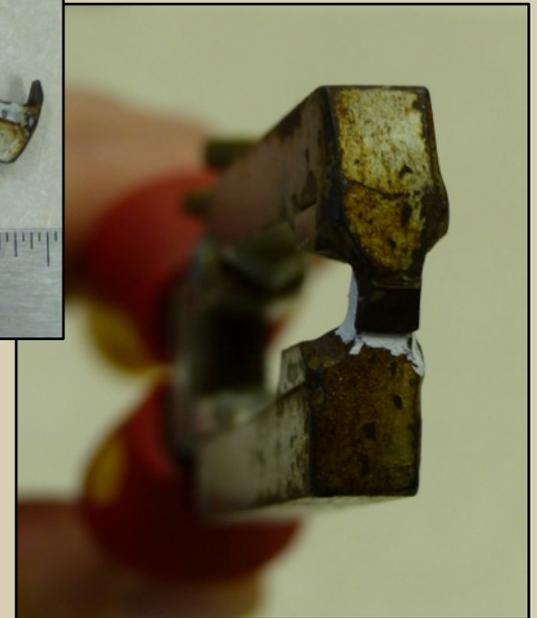
U.S. Bureau of Reclamation

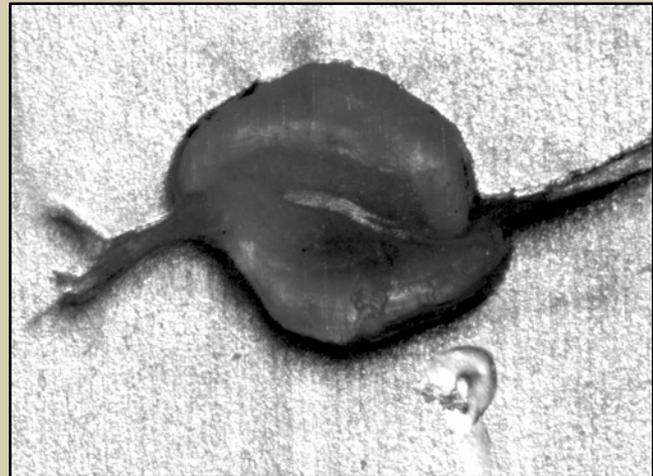
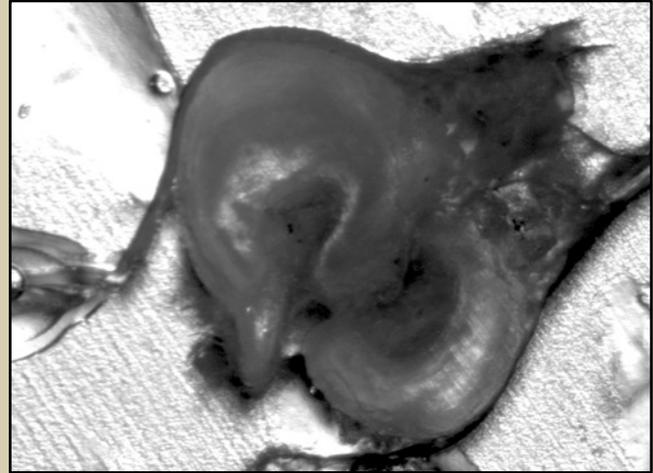
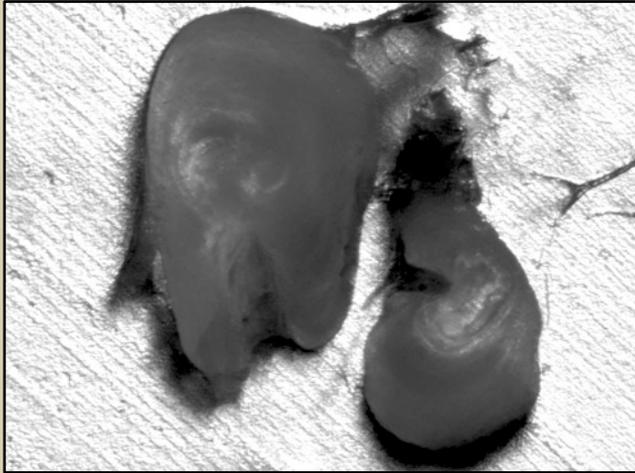
Mark C. McKinstry

SJRBRIP Office

Dave Campbell, Sharon Whitmore, Scott Durst







2014 Young Razorback Sucker

- 213 mm TL caught by UDWR in August 2014
- Fin ray removed too far from fish
- Inconclusive



2014 UDWR fin ray

