Impacts of the Deepwater Horizon Oil Spill on Red Snapper (*Lutjanus campechanus*) Larvae in the Northern Gulf of Mexico

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About Me

- Hometown: Seattle, WA
- University of Portland (2015), OR
  - B.S. Biology
    - Minor: Psychology

Dr. Frank J. Hernandez, Jr.

- Fisheries oceanography
- Current Projects
  - Natural Resource Damage Assessment
  - Marine Debris
  - Gulf of Mexico Research Initiative (GoMRI)*
- Year 4

Dr. Jesse E. Filbrun

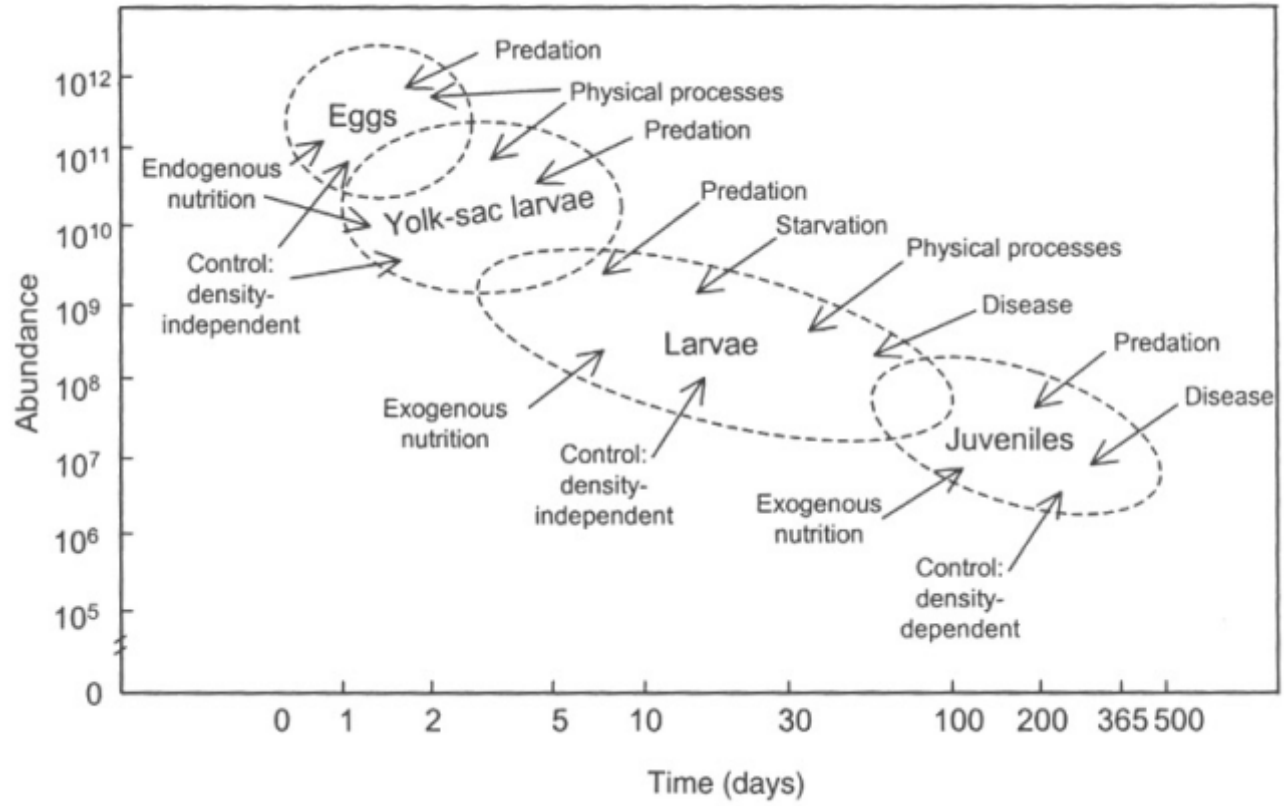
- Ph.D. in Evolution, Ecology, and Organismal Biology
- Lower food web dynamics
  - Natural and human impacts on aquatic and marine ecosystems
- Southern Arkansas University

Introduction

Deepwater Horizon Oil Spill	Red Snapper
April 20, 2010 – September 19, 2014 (Hoffman et al. 2011)	Spawn from May/June to September/October (Moran and Morais 1998; Kulaw 2012) Hatch ~24 – 27 hours after fertilization (Rabalais et al. 1980)
Macondo Well 100 mi south, 1500 m deep (Atlas et al. 2011)	Larvae occupy shallow waters 15 – 30 m deep (Szedlmayer et al. 2014)

Introduction

- Survival affected by mortality events
- Investigate diets (gut content), growth (size at age), and condition (size)



Null Hypothesis

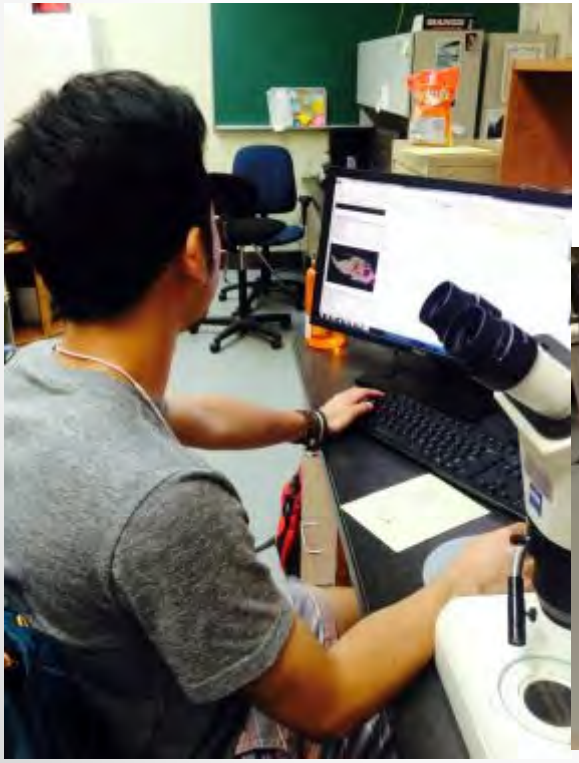
- H_{01}: Larval red snapper diets, growth, and condition will not differ across periods (before, during, and after the oil spill).

Methods: Overview

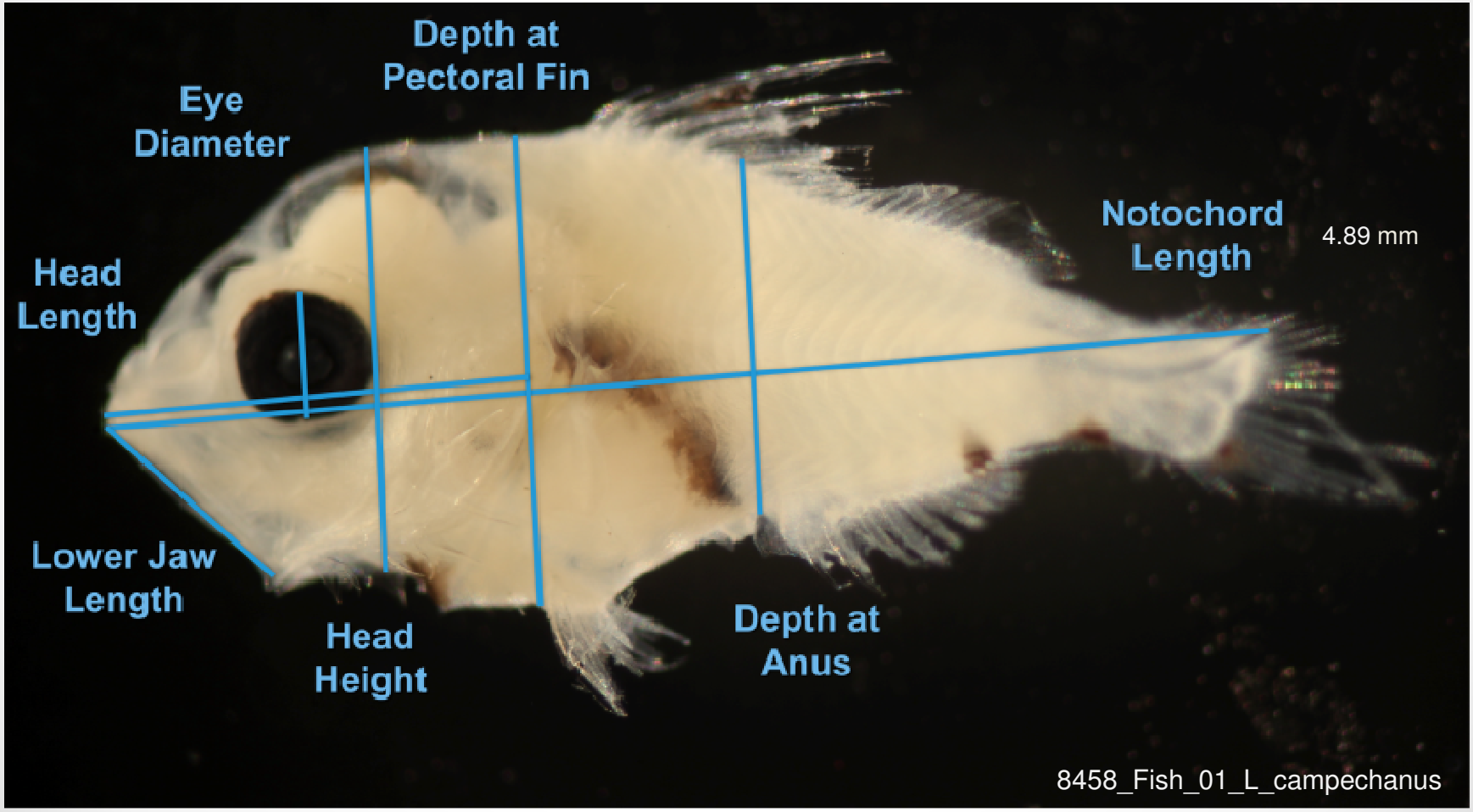
- Fisheries Oceanography of Coastal Alabama (FOCAL)
  - Long-term ichthyoplankton and zooplankton survey
  - 2004 – 2011
- Sample Sites:
  - T20: 20 m deep
  - T35: 35 m deep
- 357 Red snapper larvae

Methods: Condition

- Imaging
  - Camera-mounted dissecting microscope
    - 5x magnification

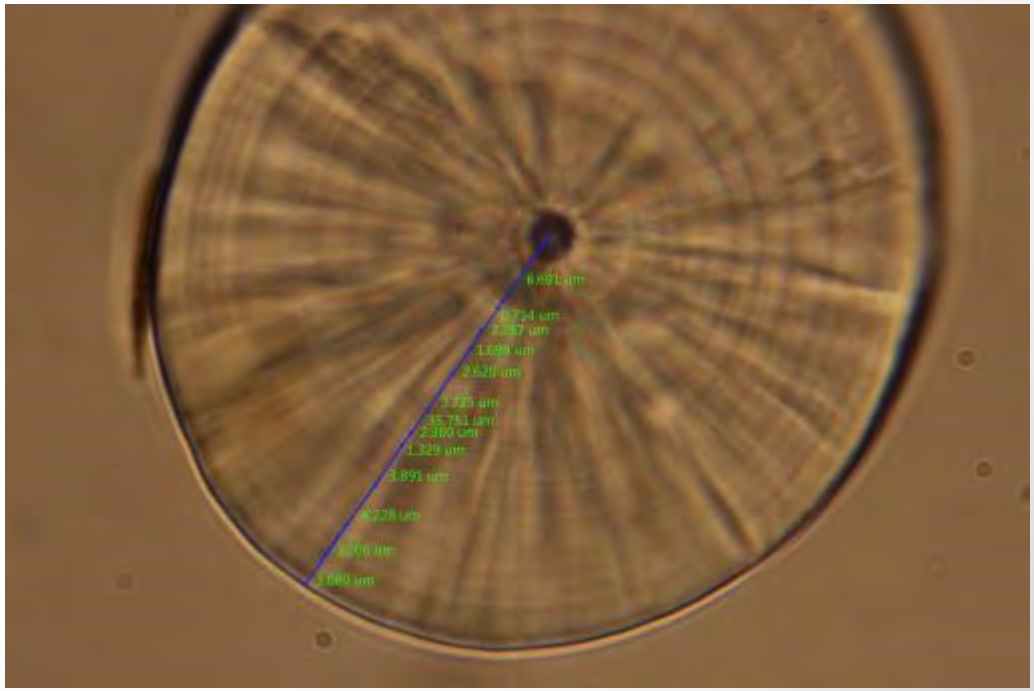


Methods: Condition

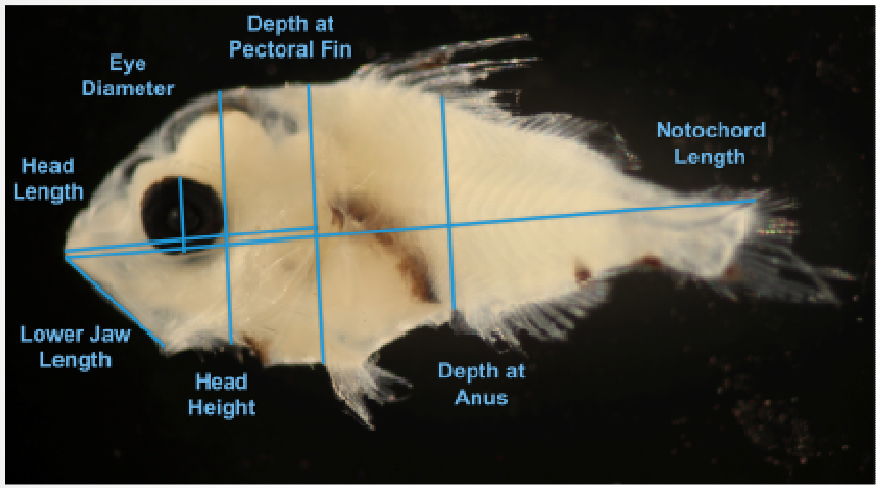


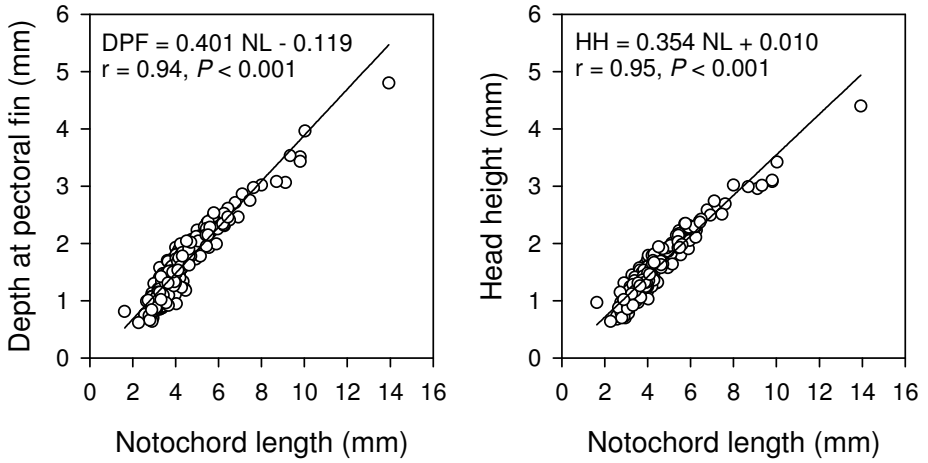
Methods: Growth

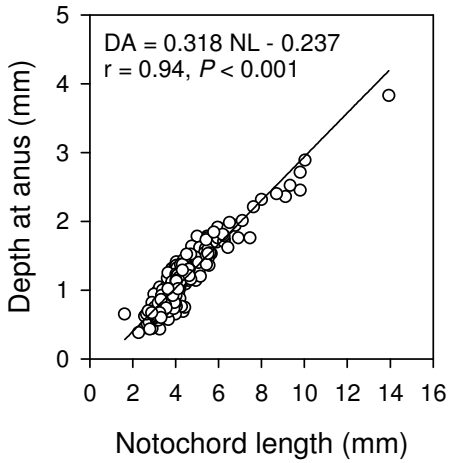
- Otolith extraction
- Imaging
- Measuring
  - Longest radius
  - Daily rings
- Size vs. Age

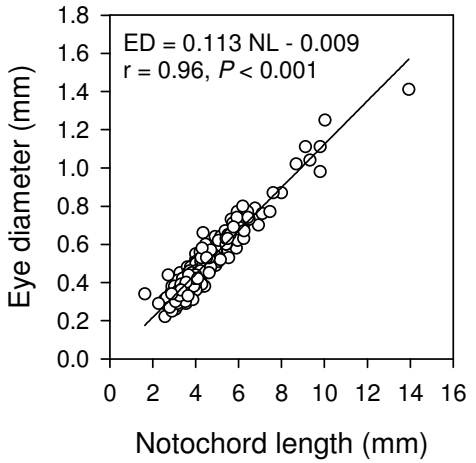


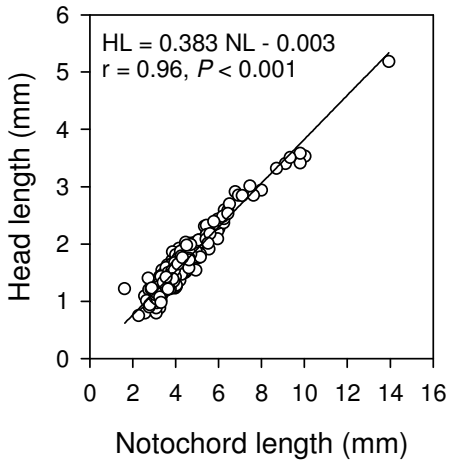
Results: Condition

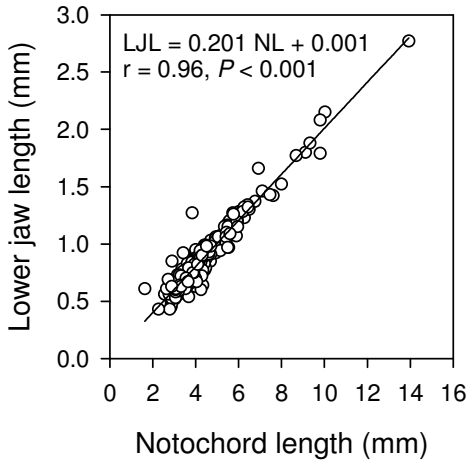






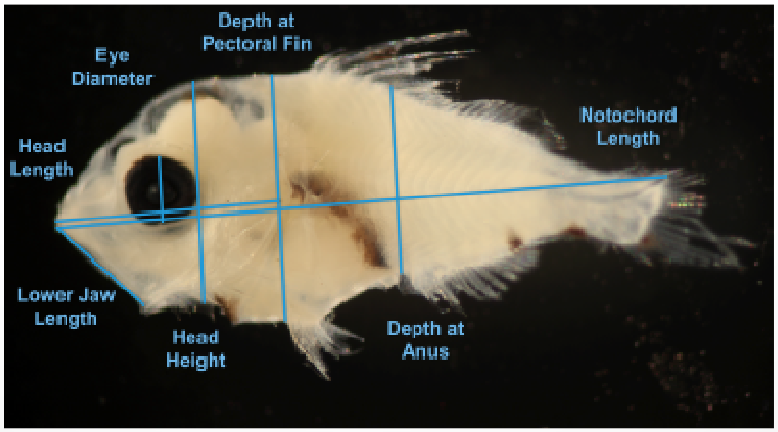




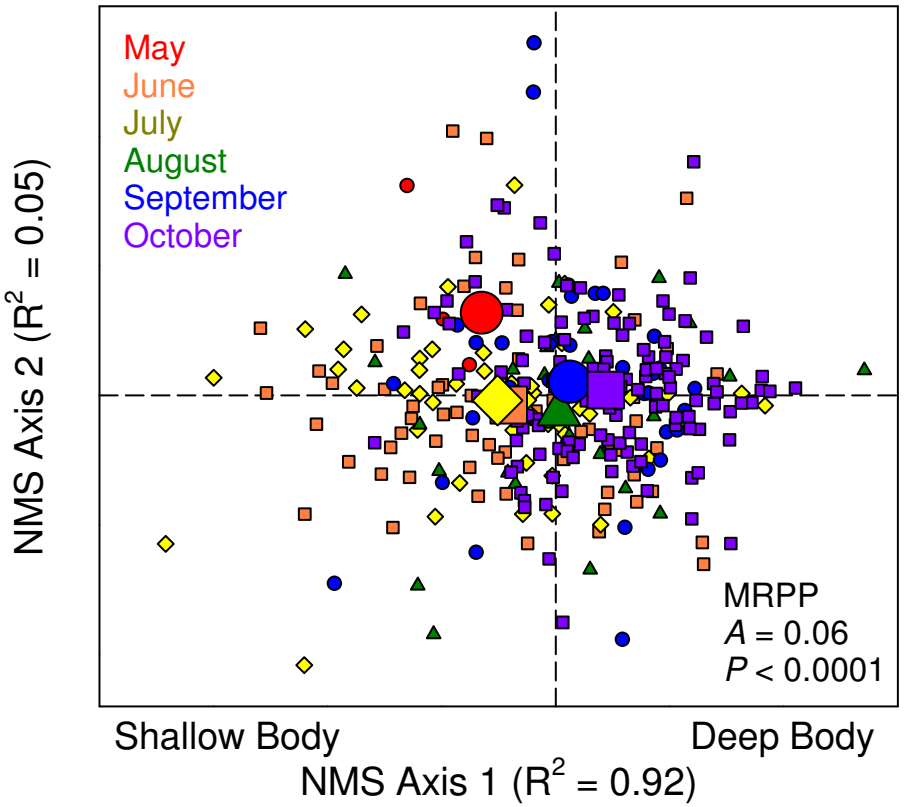


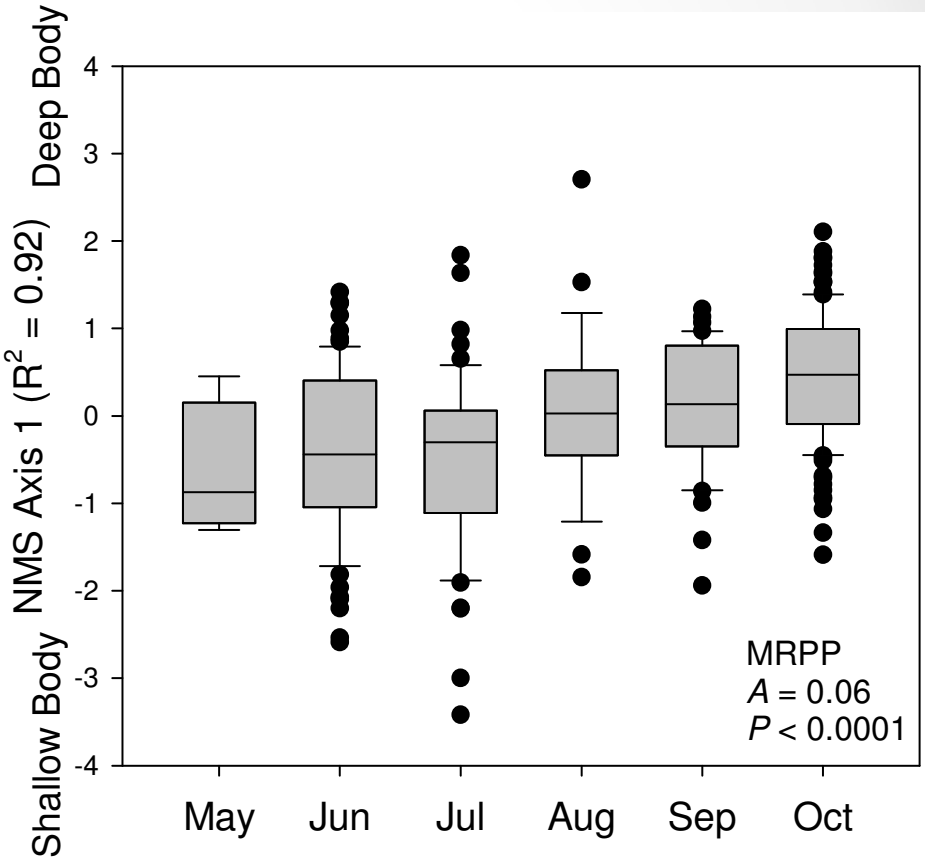
Results: Condition

Body dimension	NMS Axis 1 (R^2 = 0.92)		NMS Axis 2 (R^2 = 0.05)	
	r	*P*	r	*P*
Depth at pectoral fin (DPF)	0.93	< 0.001	-0.18	0.00
Depth at anus (DA)	0.89	< 0.001	-0.15	0.01
Head length (HL)	0.71	< 0.001	0.41	< 0.001
Head height (HH)	0.94	< 0.001	-0.02	0.71
Eye diameter (ED)	0.65	< 0.001	0.00	0.94
Lower jaw angle length (LJL)	0.62	< 0.001	0.20	< 0.001



Results: Condition





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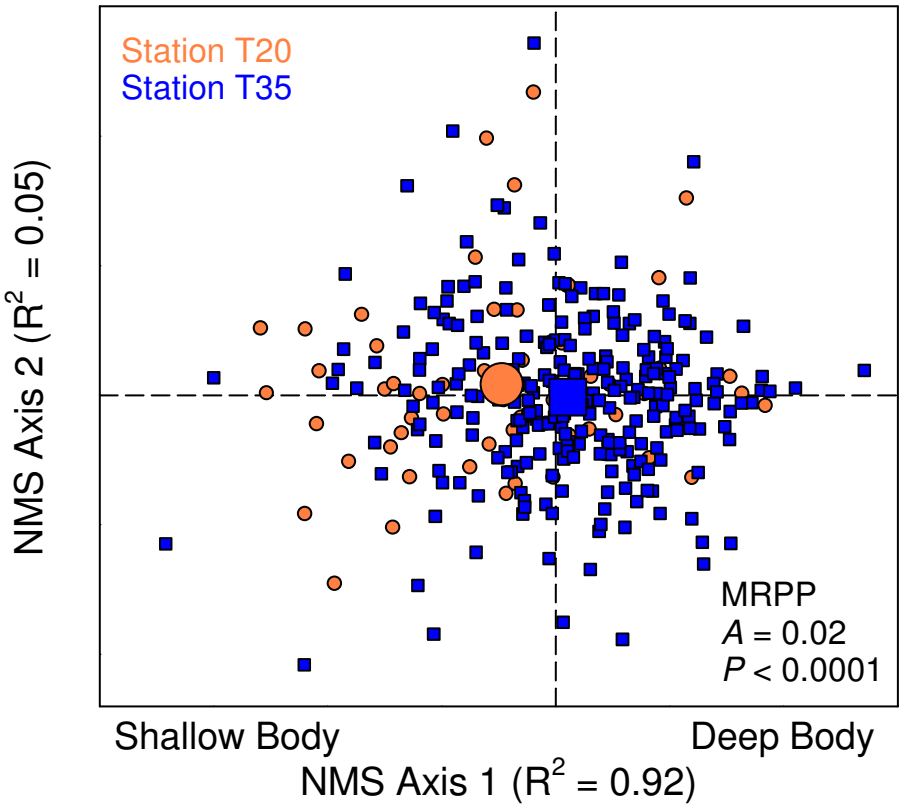
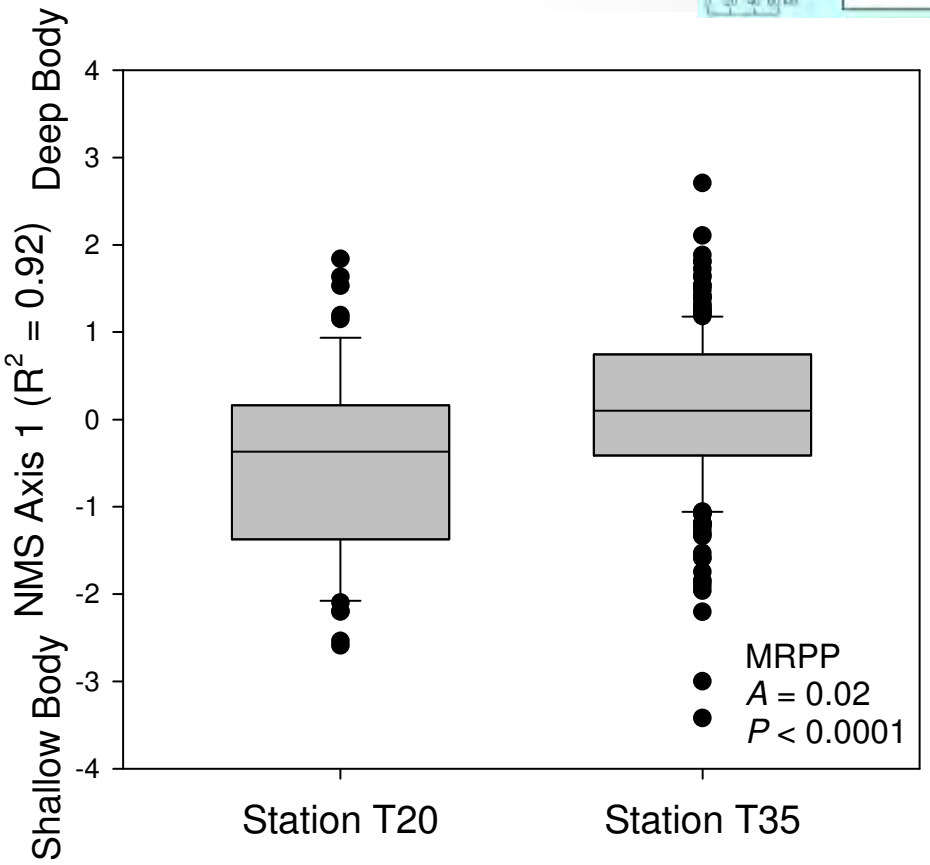


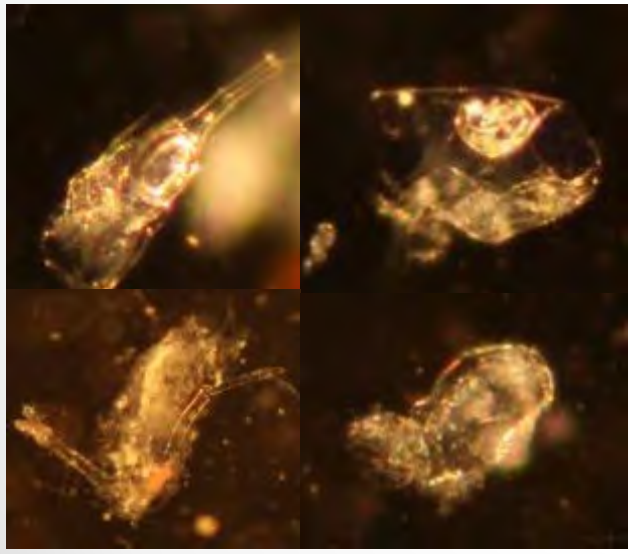


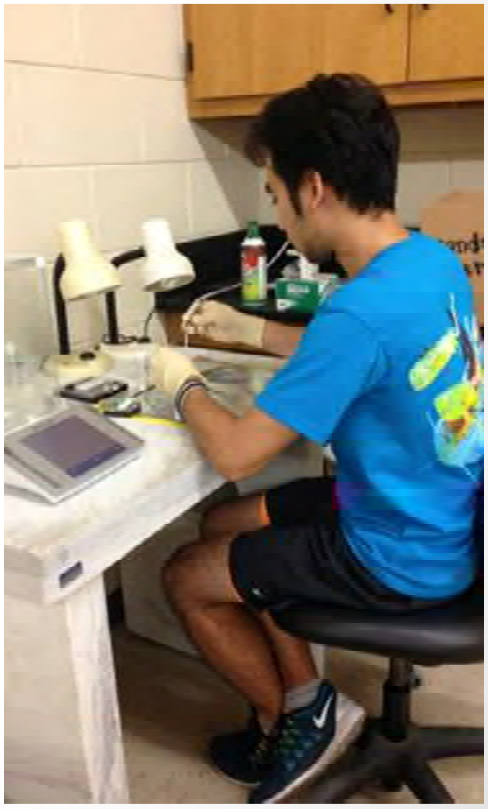
Conclusion

- Morphometrics: Condition
  - Fish caught in earlier months were smaller-bodied than fish in later months
  - Fish caught at T20 were smaller-bodied than those at T35

Conclusion: Future Direction

- Otolith (length at age), gut (diet), isotope (diet), and dry weight (weight at length/condition) analyses still pending

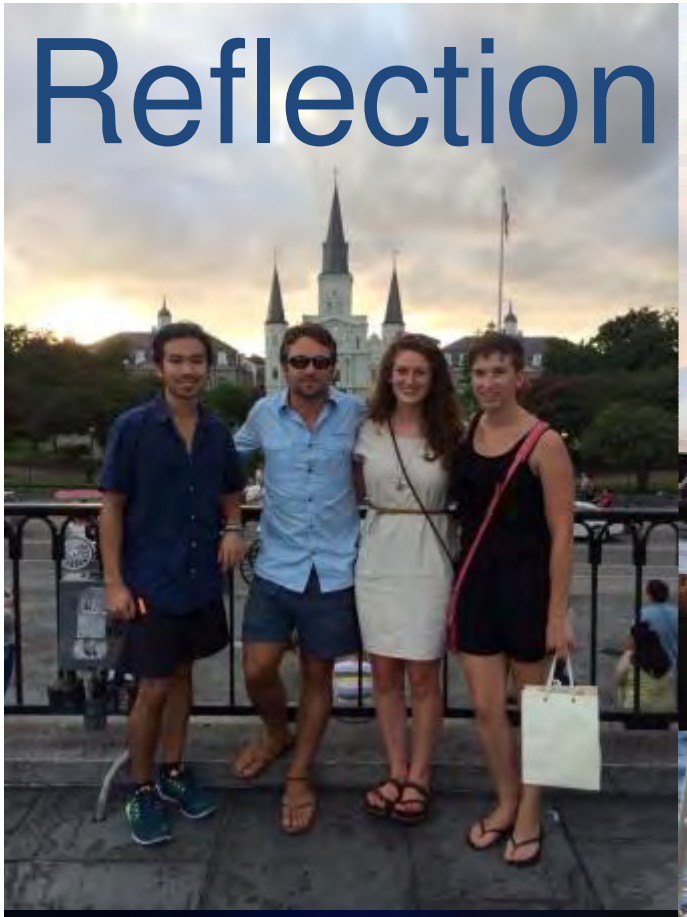




Conclusion

- Other studies:
  - 2010 and 2011 were the worst recruitment years since 1994 (SEDAR 2013)
  - Red snapper abundance was lower after the spill (Patterson and Jagoe)
  - Preliminary results show a decline in growth rate at age after 2010 (Herdter and Murawski 2014)
  - No decline in juvenile red snapper abundance in 2011 (Szedlmayer et al. 2014)

Reflection



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