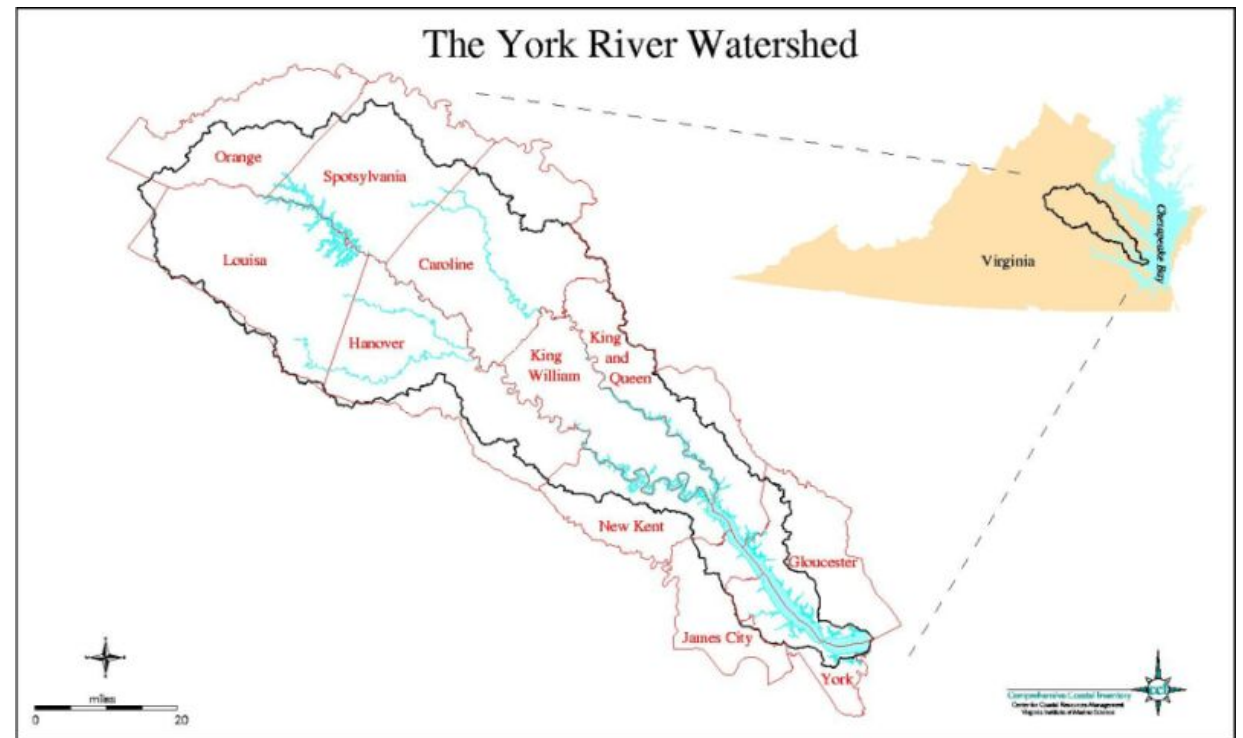


Quantifying the relative effects of shorescape development on forage fish production in the York River subestuary, 2000 - 2016

Troy D. Tuckey
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Julie Herman



Funding through:



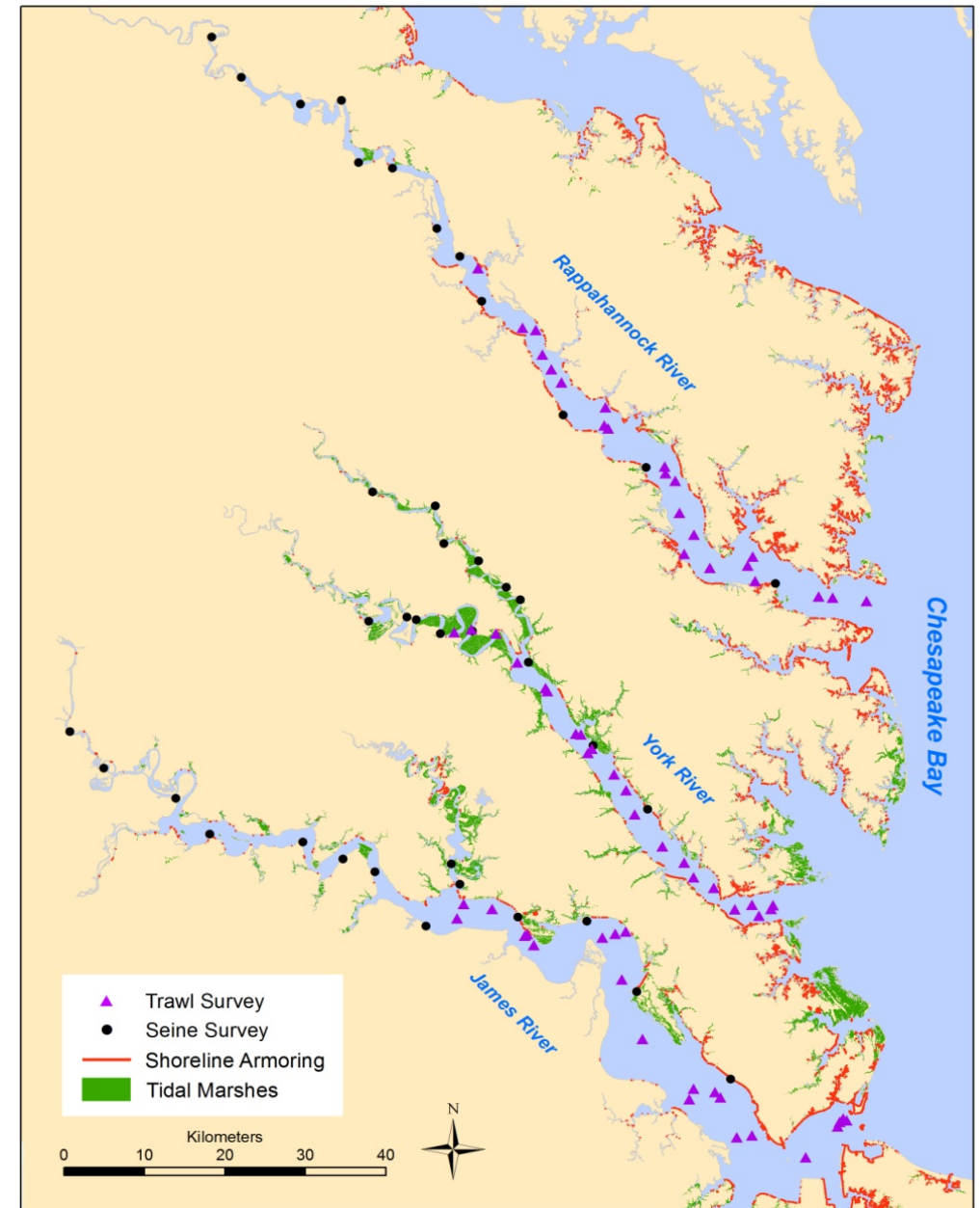
Goal Implementation Team Initiative

Need

- Spatially targeted studies show a negative impact of shoreline armoring on nearshore habitats and species
- A comprehensive understanding of how shorescapes – the interface between land and water – affect forage quality.



Bulkhead armoring





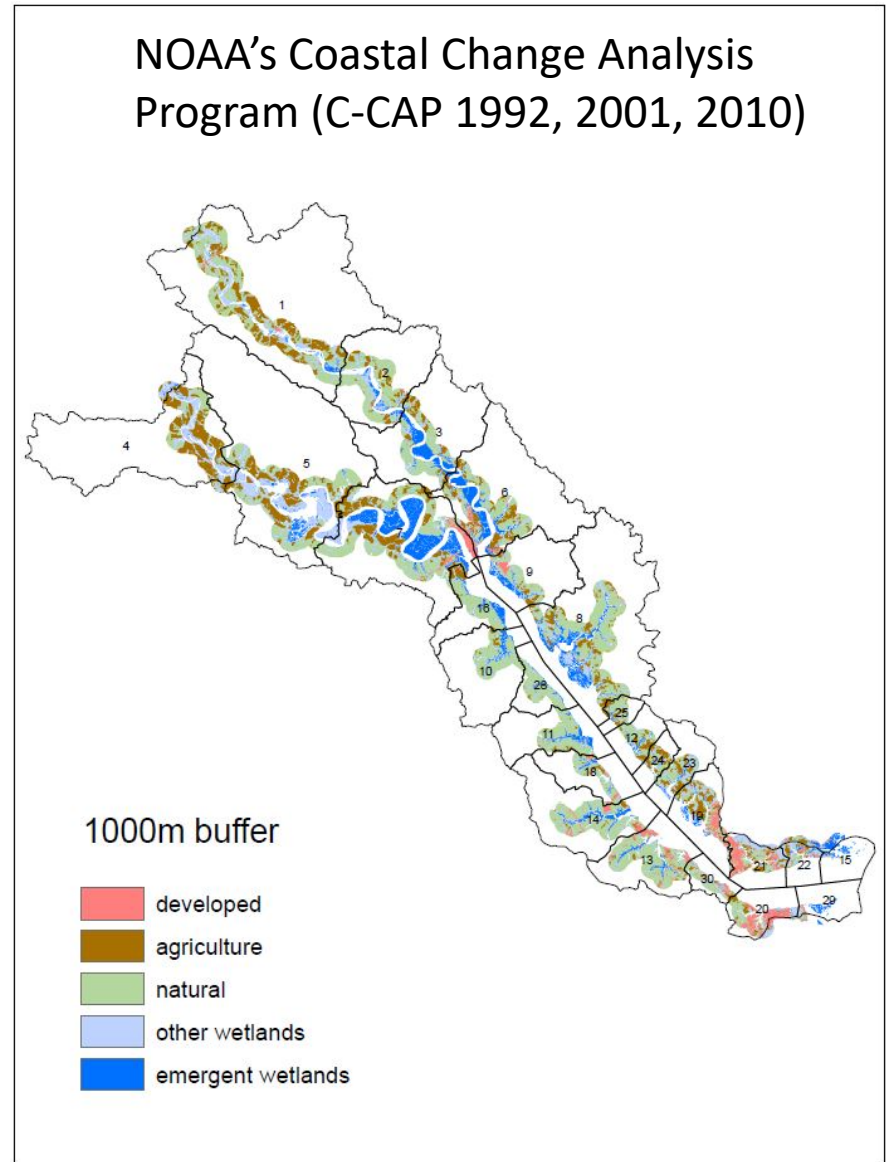
Objectives

- Develop metrics of upland/shorescape condition to evaluate the effects of armored shorelines and land use on forage quality (i.e., relative abundance, size, biomass)
- Identify threshold values of the shoreline metrics above which forage quality is compromised

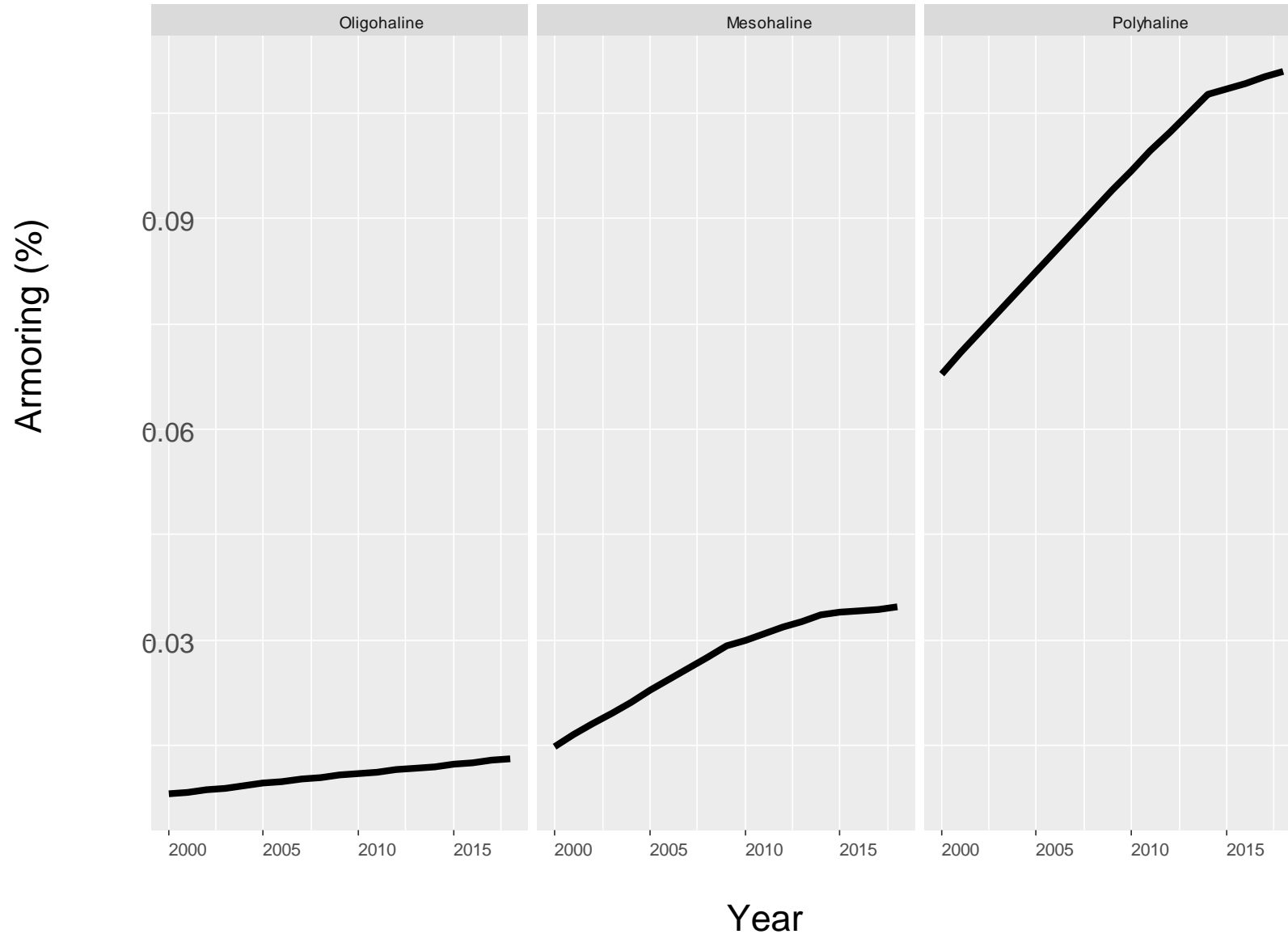
Methods

Data sources (2000-2016)

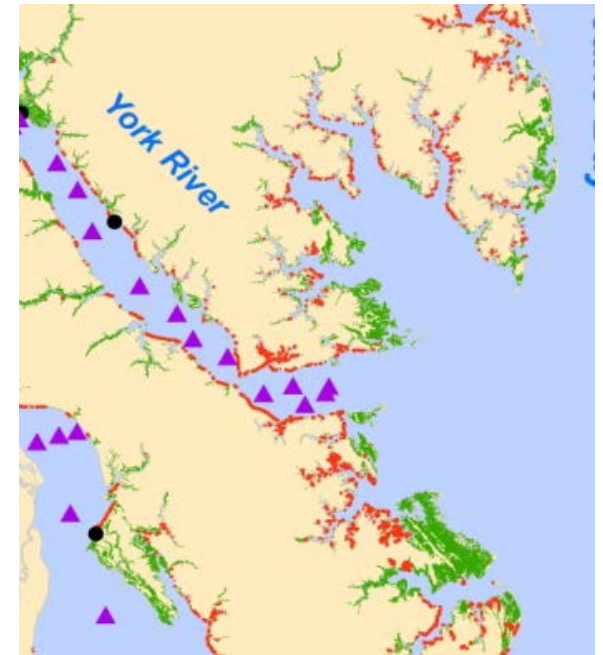
- Land use NOAA C-CAP
- Armoring - CCRM shoreline inventories
- Permit database (Four time periods)
- SAV coverage
- River flow (USGS)
- Juvenile Fish Trawl Survey
- Striped Bass Seine Survey
- Water temperature
- Salinity



Methods



Linearized shoreline armoring (%) from CCRM's detailed shoreline inventories (York River 2009 & 2013) and the permit database



Methods – Data analysis



- Forage quality (abundance, size, biomass)
- 15 species: American shad, Atlantic croaker, Atlantic silverside, banded killifish, bay anchovy, blackcheek tonguefish, blue crab, blueback herring, kingfish, mummichog, spotted hake, spot, summer flounder, weakfish, white perch (Ihde et al. 2015)
- Generalized additive models (GAMs)

Mean length,
abundance,
or biomass

~

armoring + water temp + salinity + SAV +
land use + flow + abundance

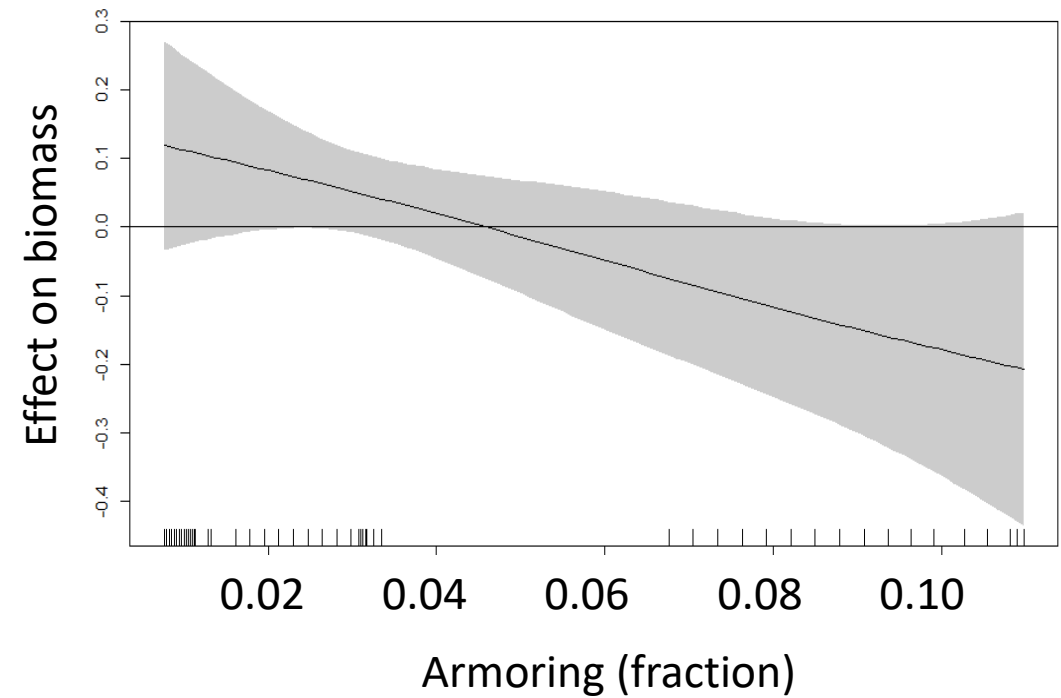
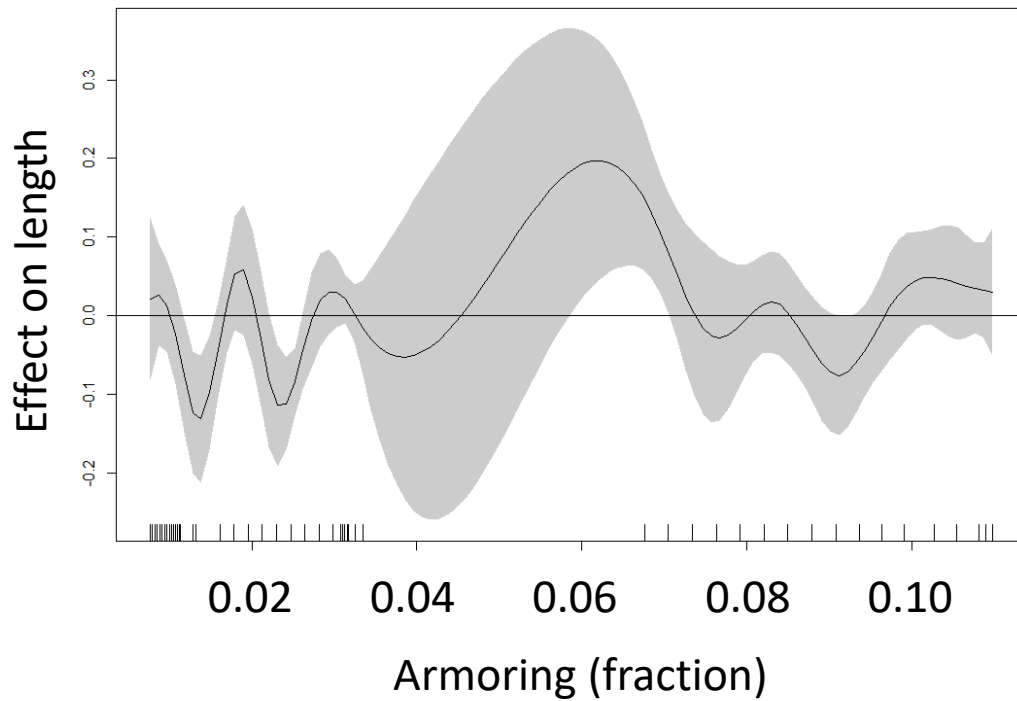
Results

- Armoring was not significant for species counts
- A significant effect of armoring on mean length for some species
- A significant effect of armoring on biomass for some species

Species	Trawl Survey			Seine Survey			Armoring
	Counts	Length	Biomass	Counts	Length	Biomass	
American shad	.	.	.	ns	ns		Positive
Atlantic croaker	ns			ns	ns		
Atlantic silverside	.	.	.	ns	ns	ns	
Banded killifish	.	.	.	ns	ns		Mixed
Bay anchovy	ns			ns	ns		
Blackcheek tongue	ns		ns	.	.	.	Negative
Blueback herring	ns		ns	ns		ns	
Blue crab	ns	ns		.	.	.	ns – not significant
Kingfish	ns	ns		.	.	.	
Mummichog	.	.	.	ns			Positive
Spot	ns			ns			
Spotted hake	ns	ns		.	.	.	Mixed
Summer flounder	ns	ns		.	.	.	
Weakfish	ns			.	.	.	Negative
White perch	ns			ns		ns	

Results - Weakfish

- Armoring has a variable effect on length
- Armoring has a negative effect on biomass

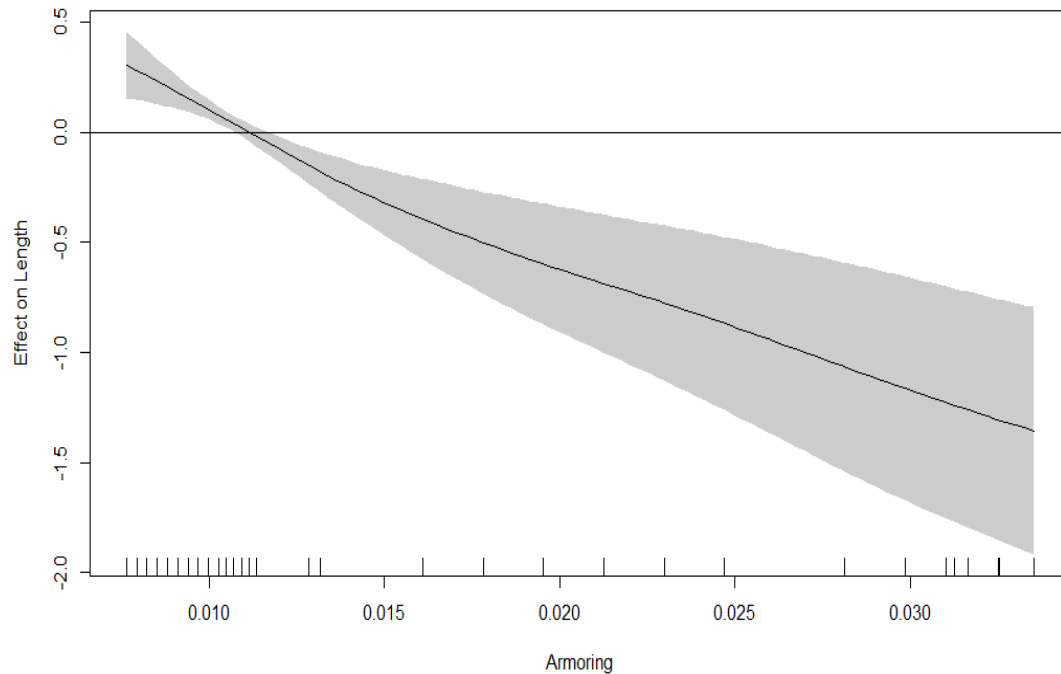


Results

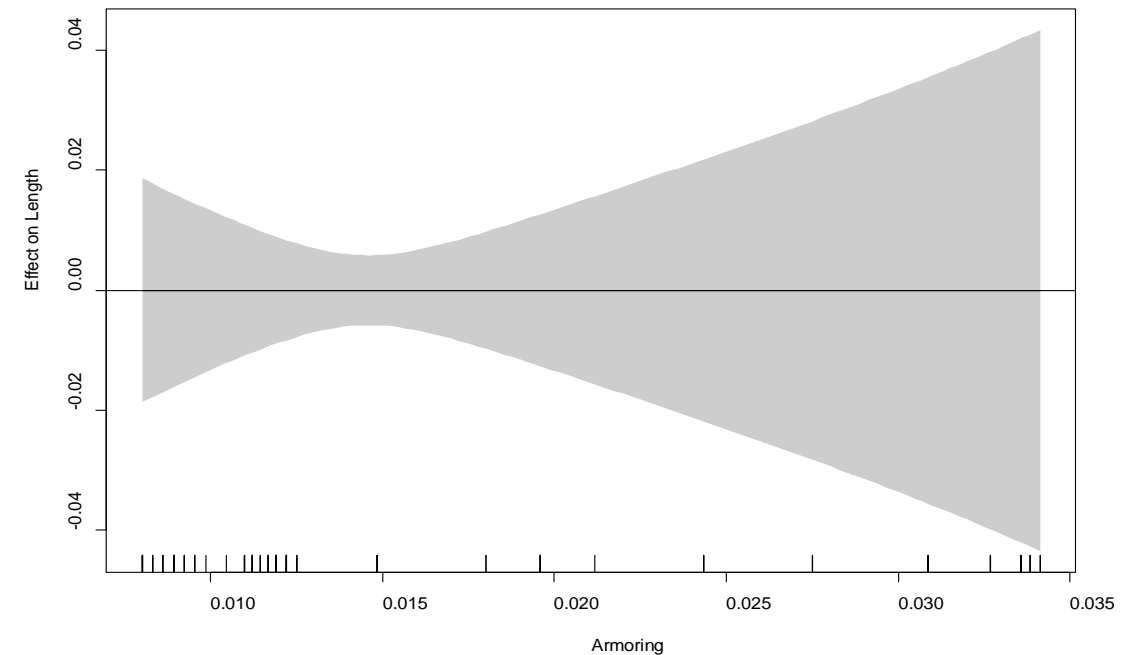
- Negative effect of armoring on length, biomass
- Consistent pattern between surveys



White perch from seine survey



White perch from trawl survey

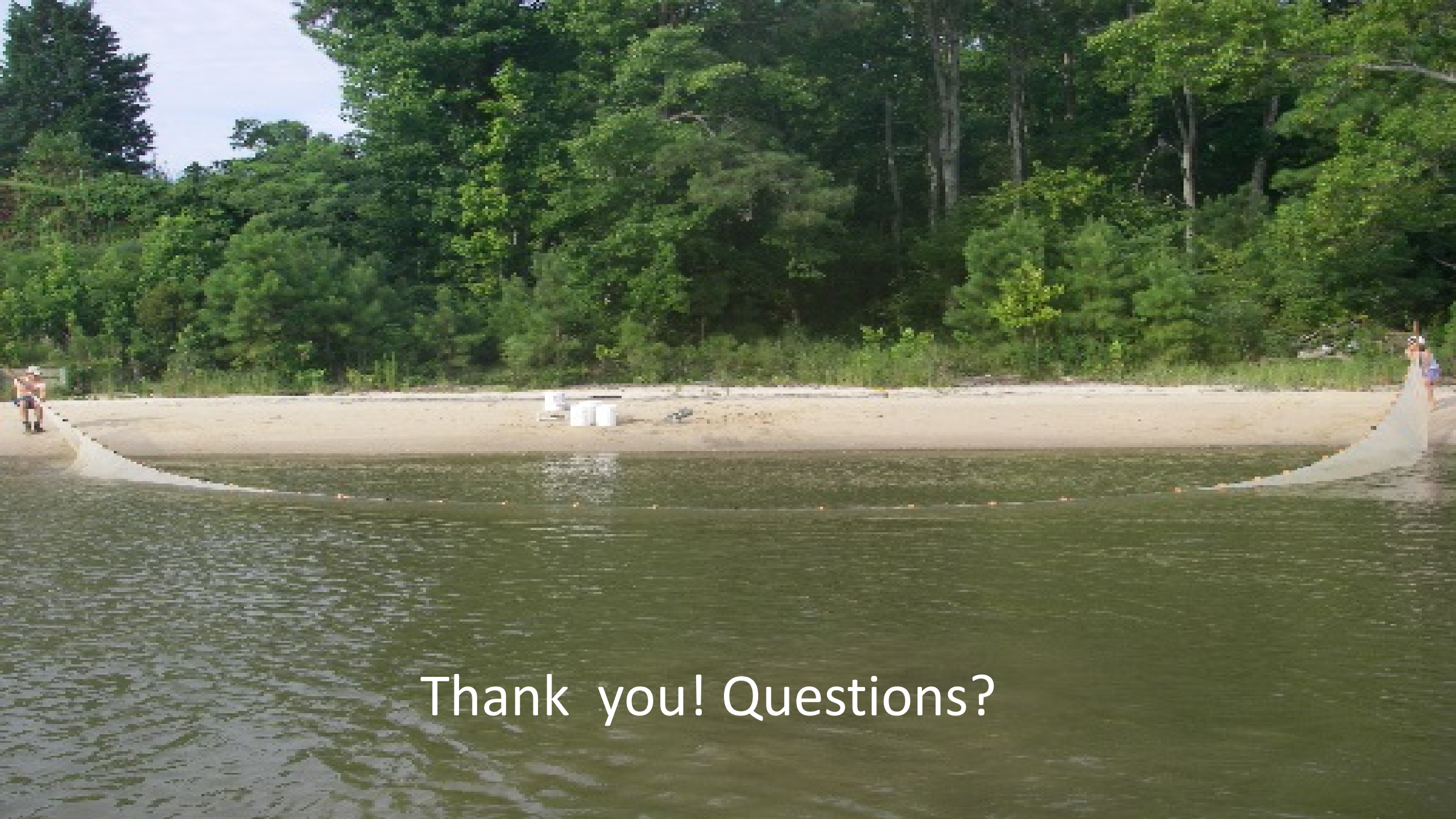




Conclusions



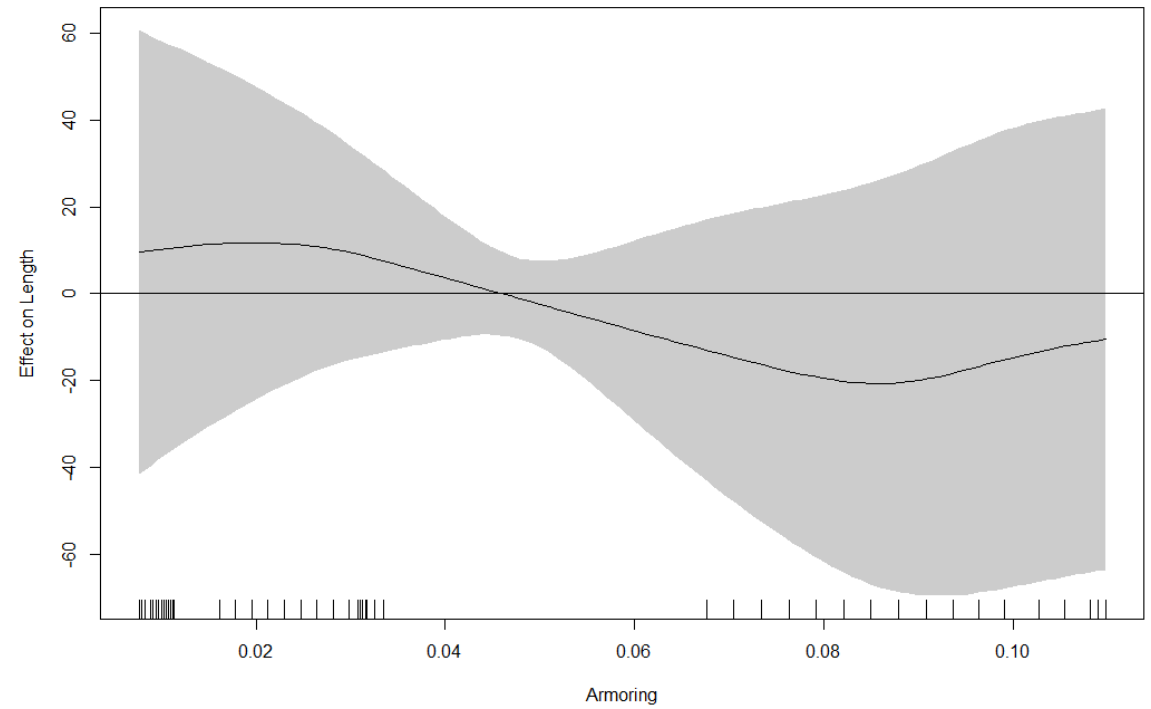
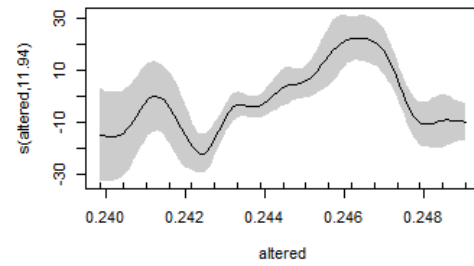
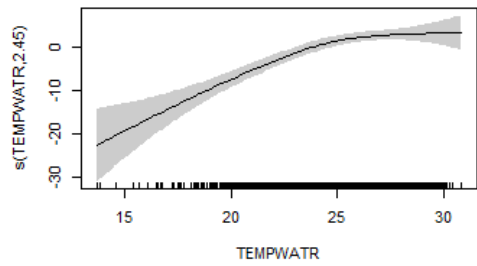
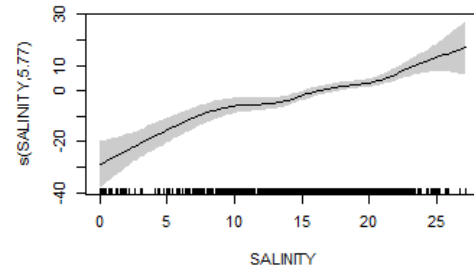
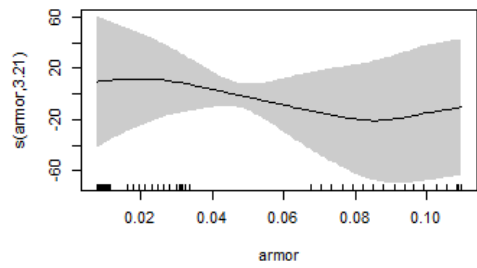
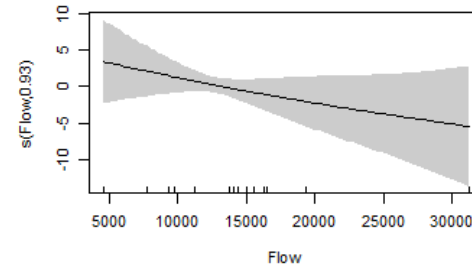
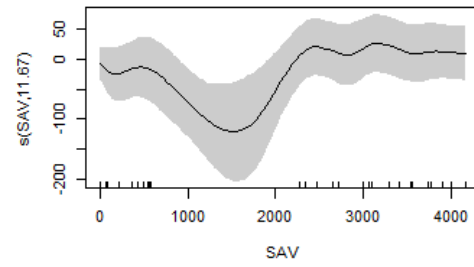
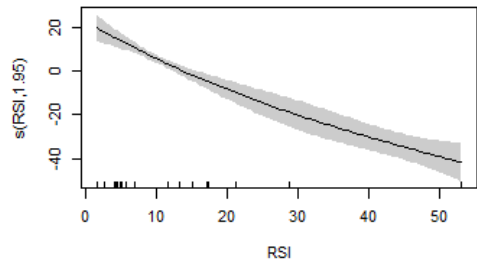
- Results vary by species and forage quality metric
- Armoring was not significant for relative abundance of any species
- Results vary depending on source of fish (trawl/offshore vs. seine/nearshore)
- A single river system – including other systems may help detect thresholds
- Detailed shoreline characterizations are critical



Thank you! Questions?

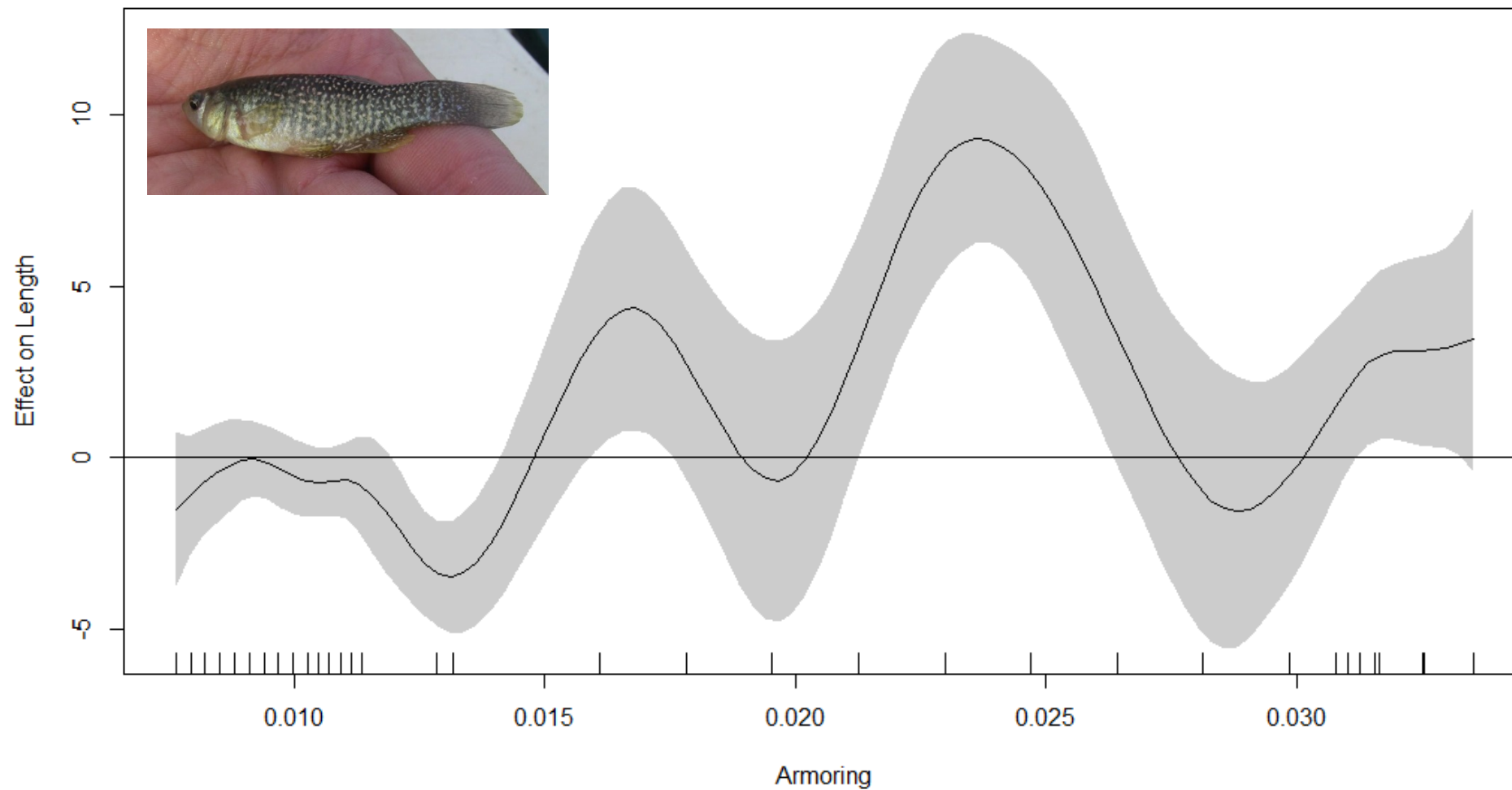


Results -Spot

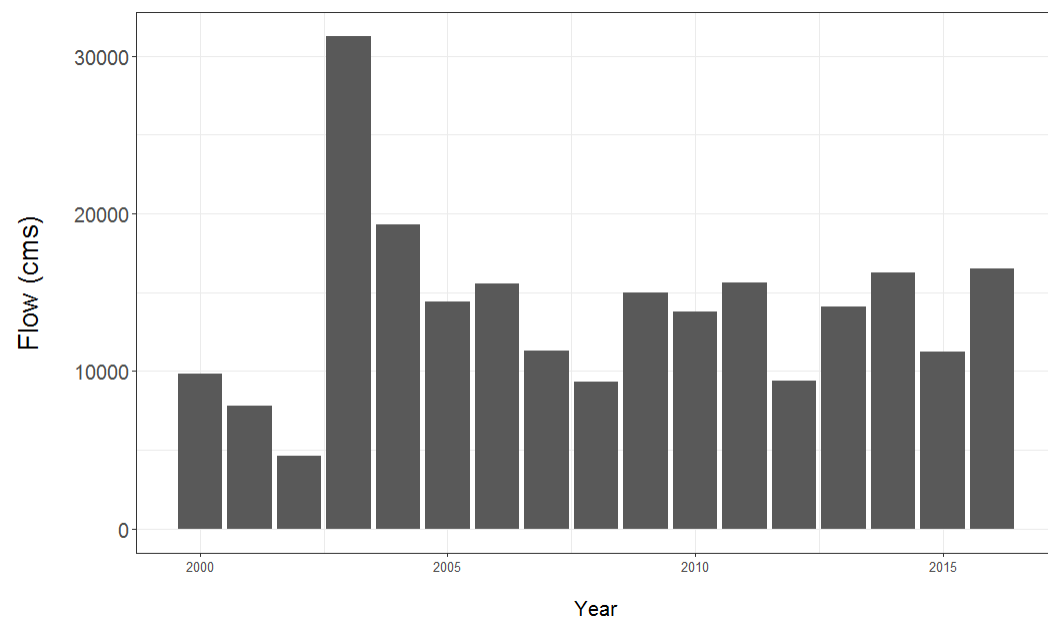


Results

Mummichog from seine survey



Flow



SAV

