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

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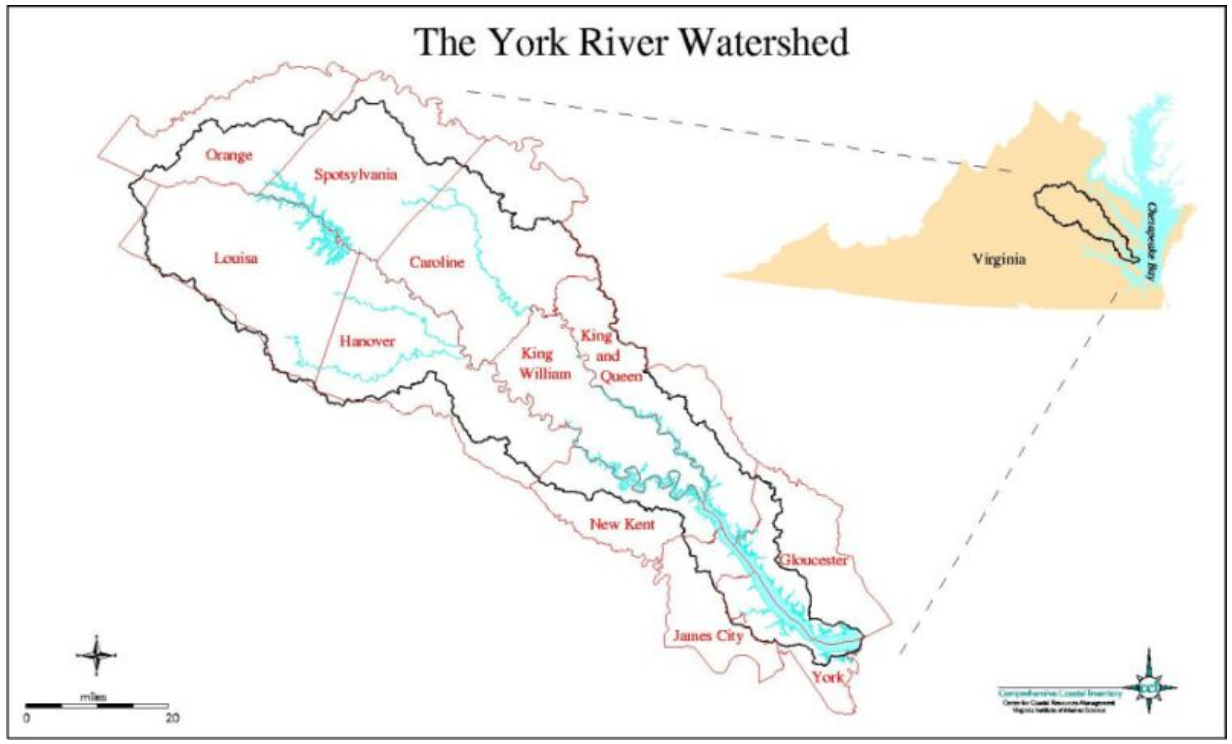

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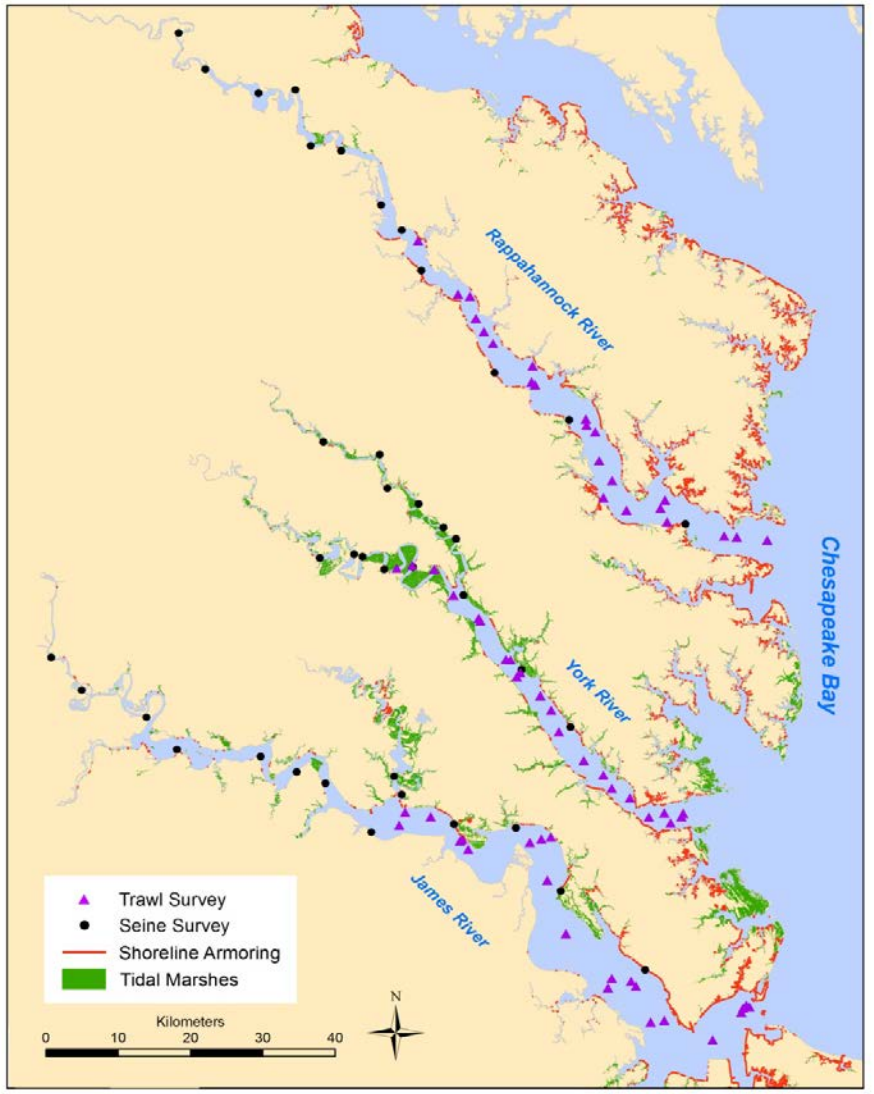
Need

- Studies show a negative impact on habitats and species due to shoreline armoring

A comprehensive understanding of how shorescapes – the interface between land and water – effects forage quality.

Bulkhead armoring



Objectives

- Develop metrics of upland/shorescape condition to evaluate the effects of armored shorescapes and land use on forage quality (i.e., relative abundance, size, biomass)

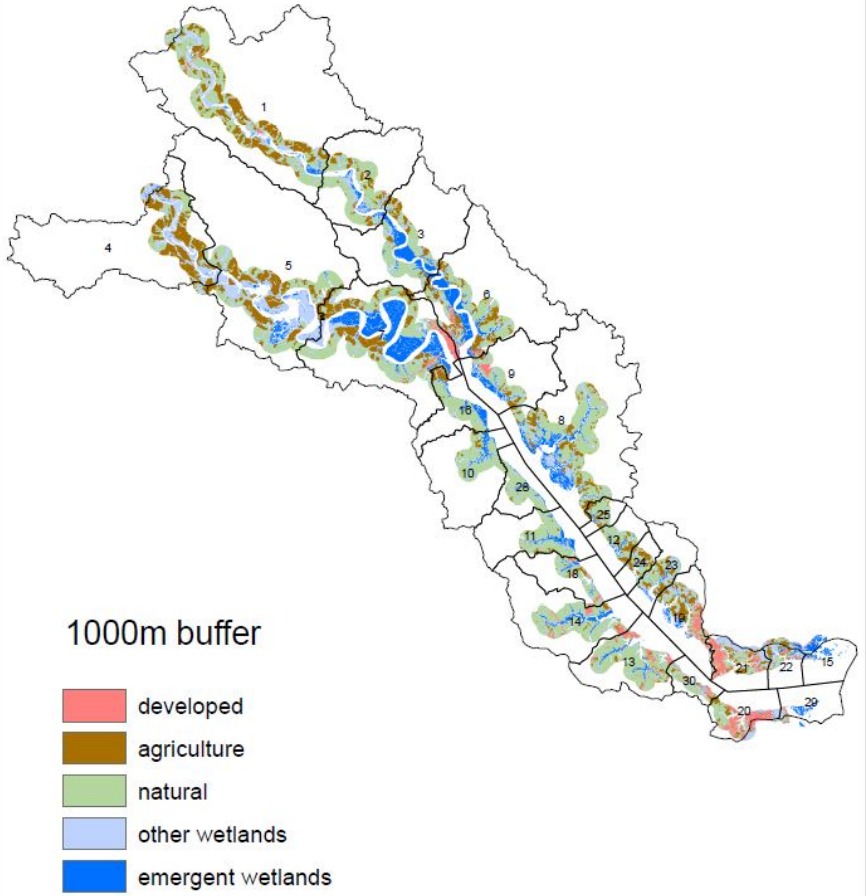
- Identify threshold values of the shorescape metrics above which forage quality is compromised

Methods

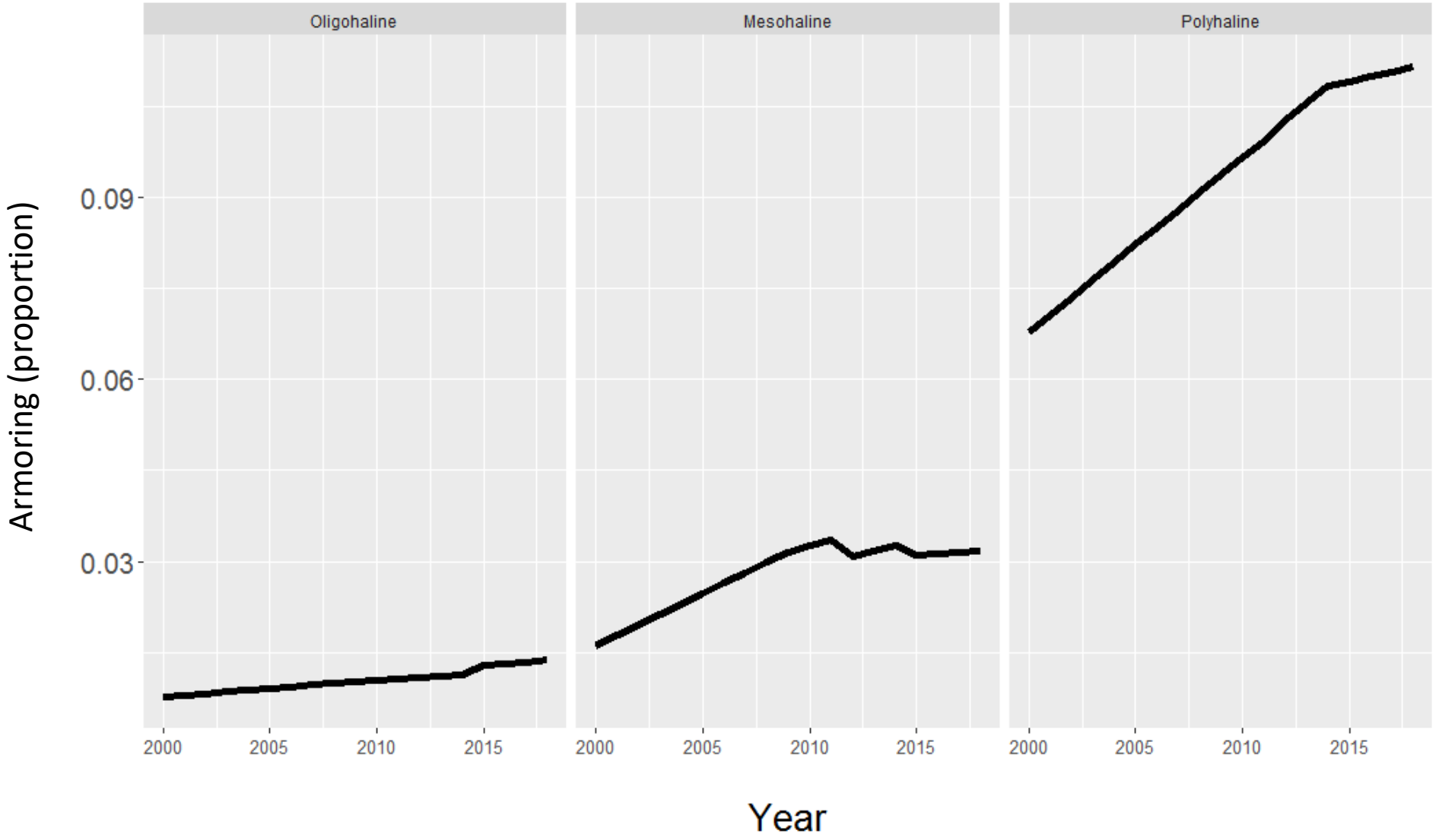
Data sources (2000-2016)

- 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

NOAA's Coastal Change Analysis Program (C-CAP 1992, 2001, 2010)



Methods


Oligohaline
Mesohaline
Polyhaline
Armoring (proportion)
0.09
0.06
0.03
2000
2005
2010
2015
Year

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

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

	Trawl Survey			Seine Survey		
Species	Counts	Length	Biomass	Counts	Length	Biomass
American shad	.	.	.	ns	ns	
Atlantic croaker	ns			ns	ns	
Atlantic silverside	.	.	.	ns	ns	ns
Banded killifish	.	.	.	ns	ns	
Bay anchovy	ns			ns	ns	
Blackcheek tongue	ns		ns	.	.	.
Blueback herring	ns		ns	ns		ns
Blue crab	ns	ns		.	.	.
Kingfish	ns	ns		.	.	.
Mummichog	.	.	.	ns		
Spot	ns			ns		
Spotted hake	ns	ns		.	.	.
Summer flounder	ns	ns		.	.	.
Weakfish	ns			.	.	.
White perch	ns			ns		ns

Armoring

Positive

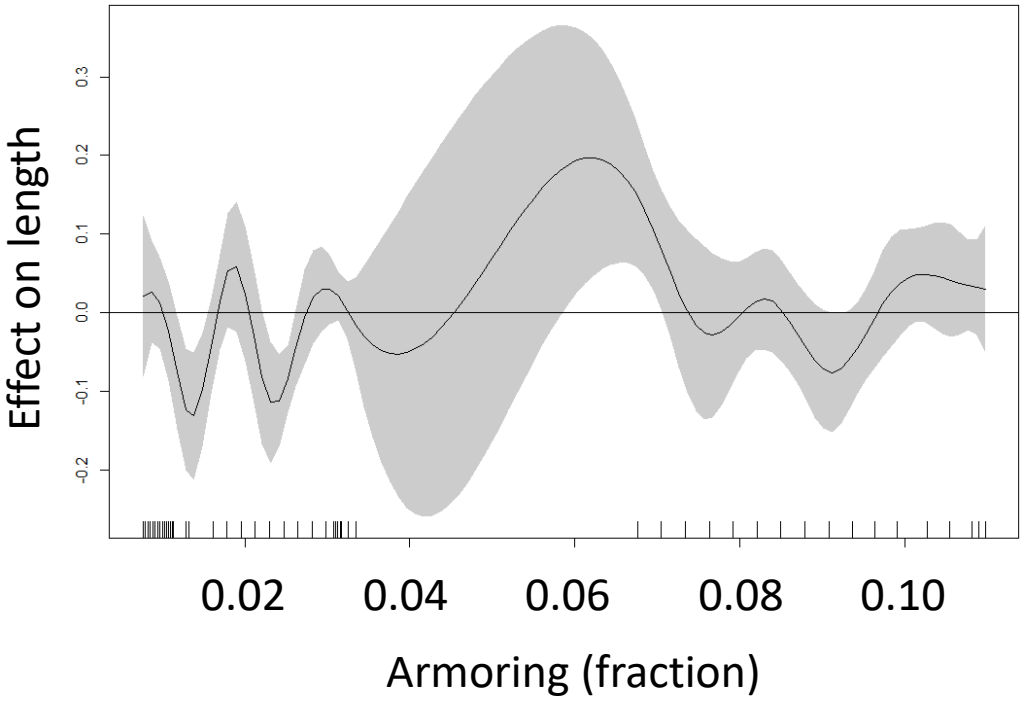
Mixed

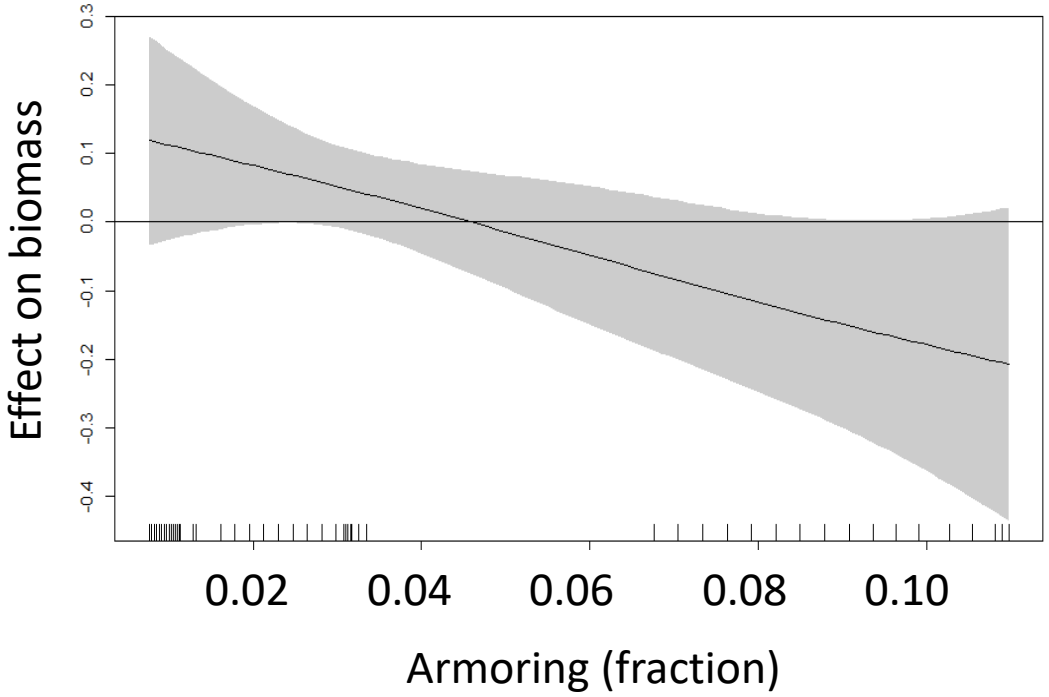
Negative

ns – not significant

Results - Weakfish

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

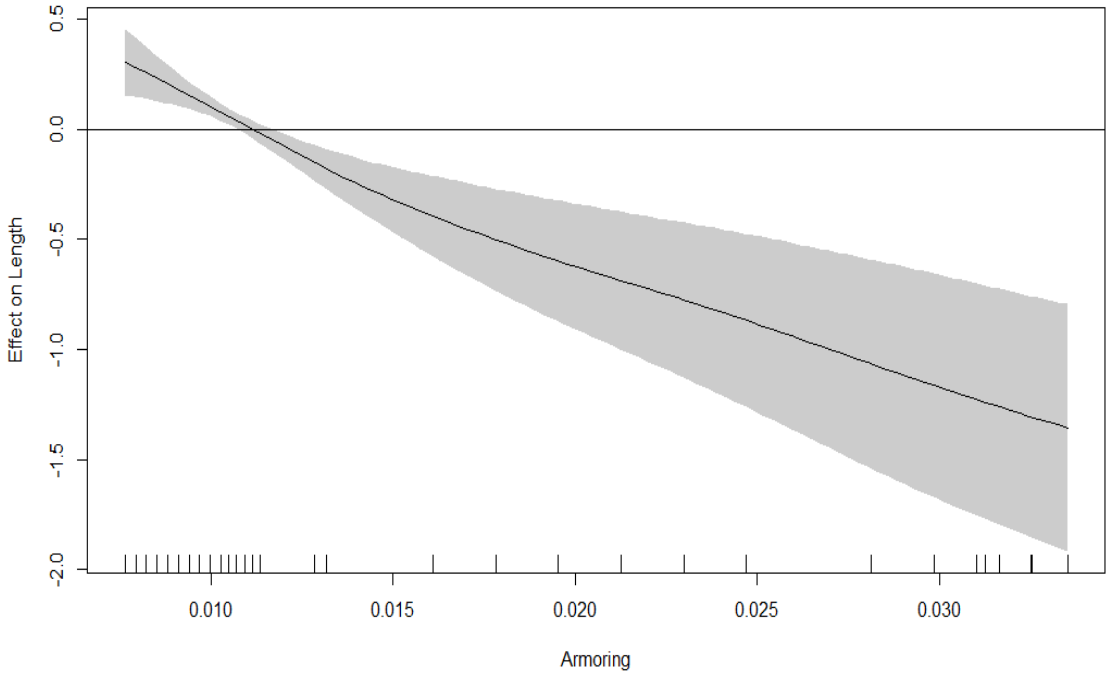




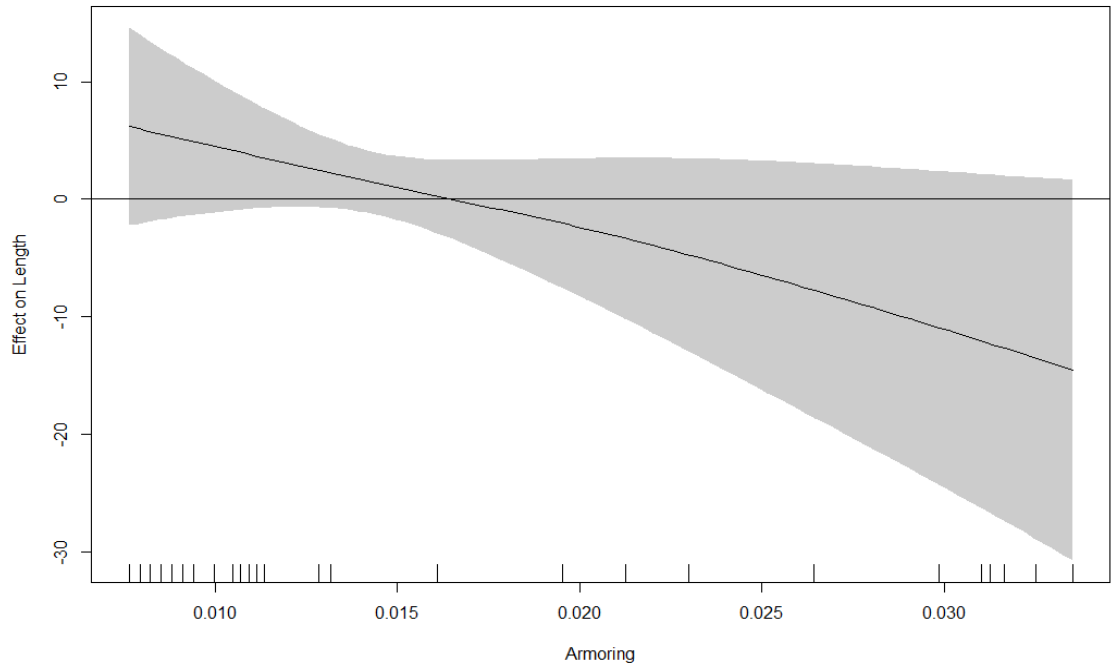
Results

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

White perch from seine survey

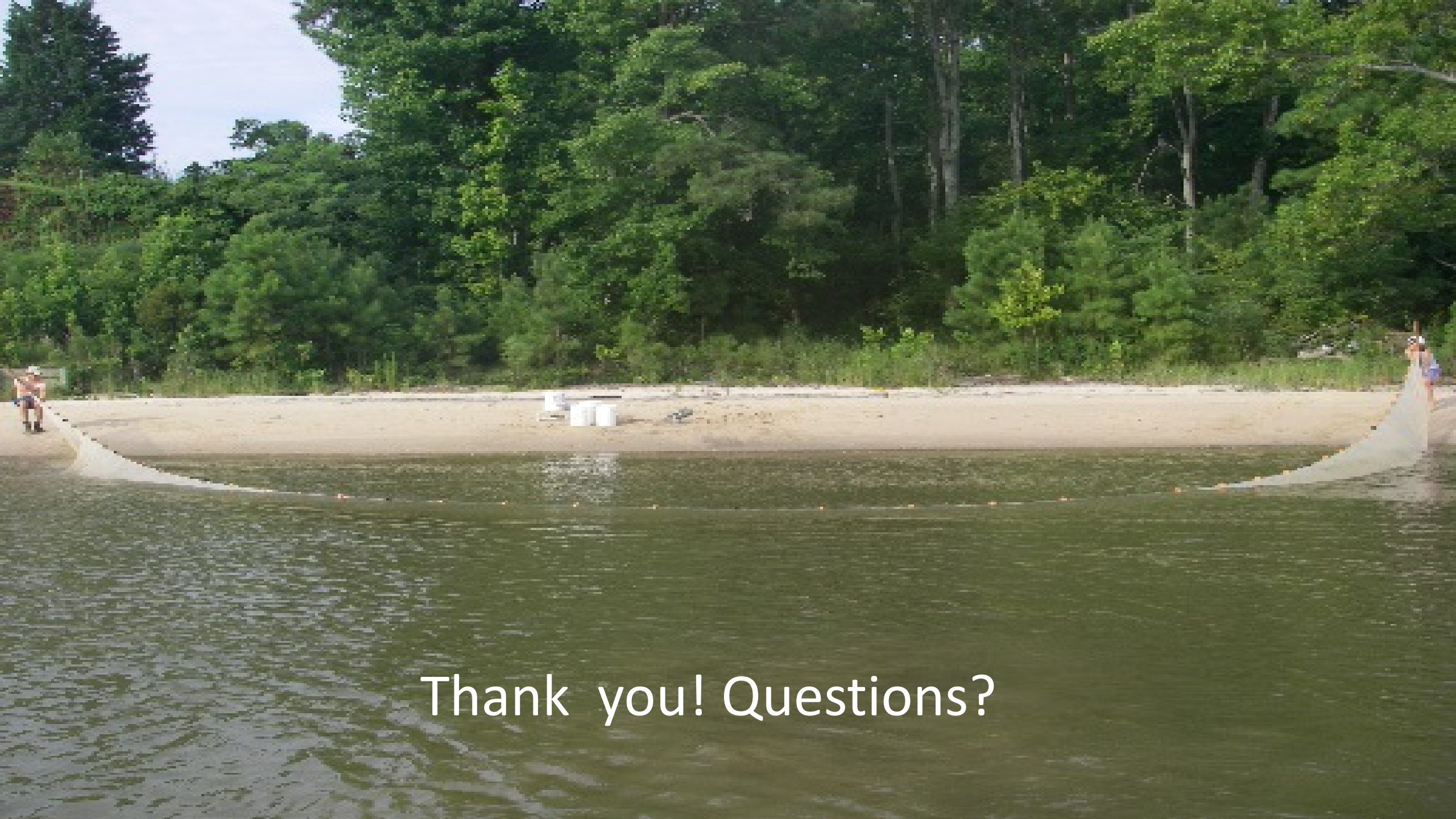


White perch from trawl survey

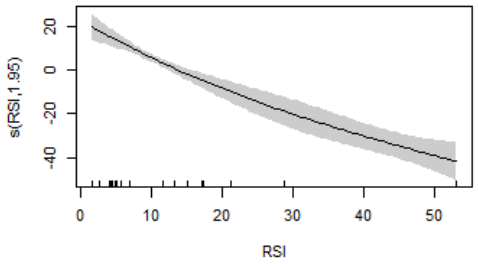


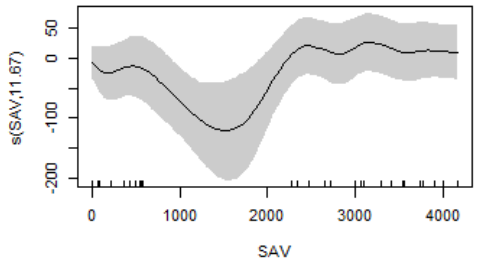
Conclusions

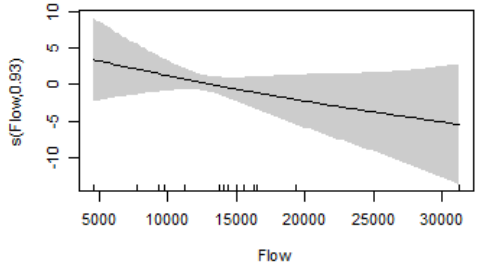
- Results vary by species and forage quality metric
- Armoring was not significant for relative abundance of any species
- Results vary depending on source of fish
- A single river system – including other systems may help detect thresholds
- Detailed shoreline characterizations are critical

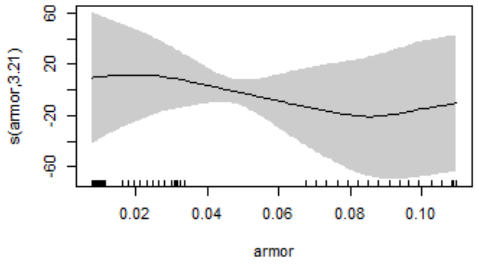

Thank you! Questions?

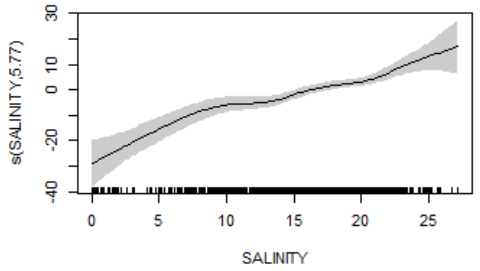
Results -Spot

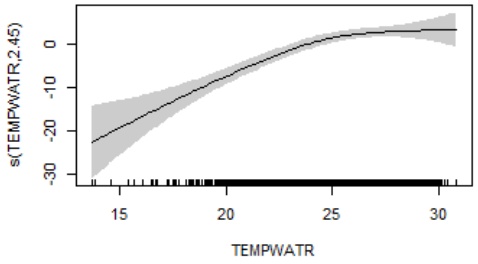


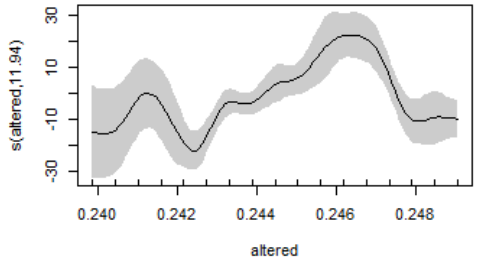


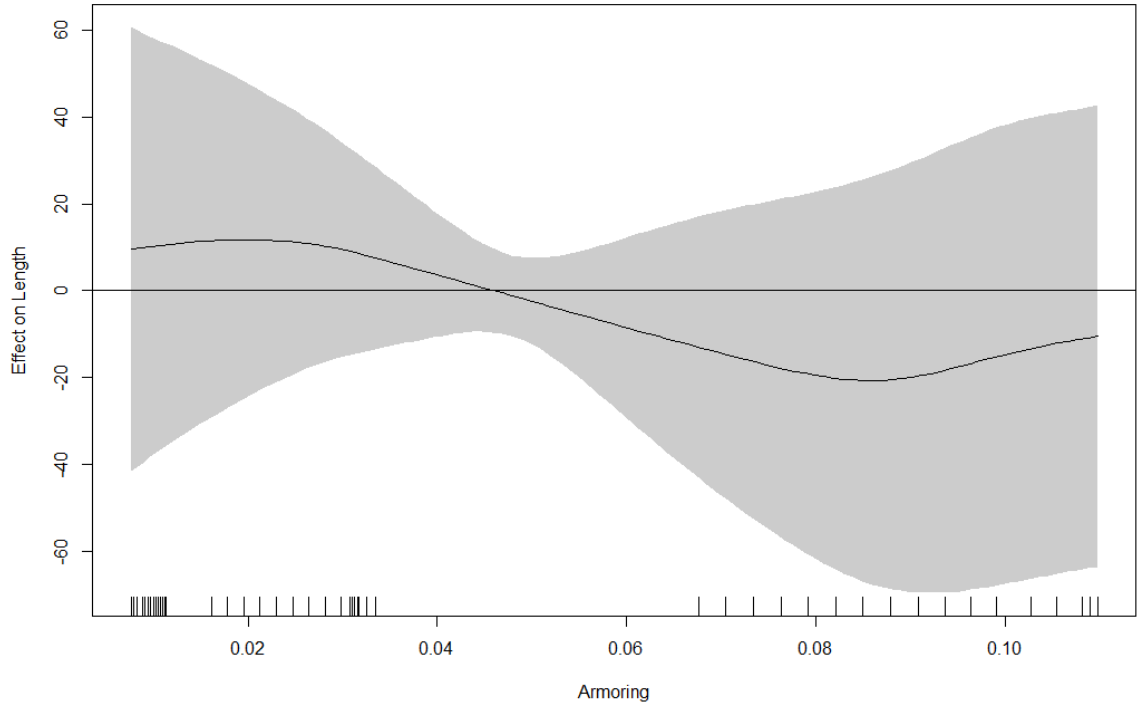






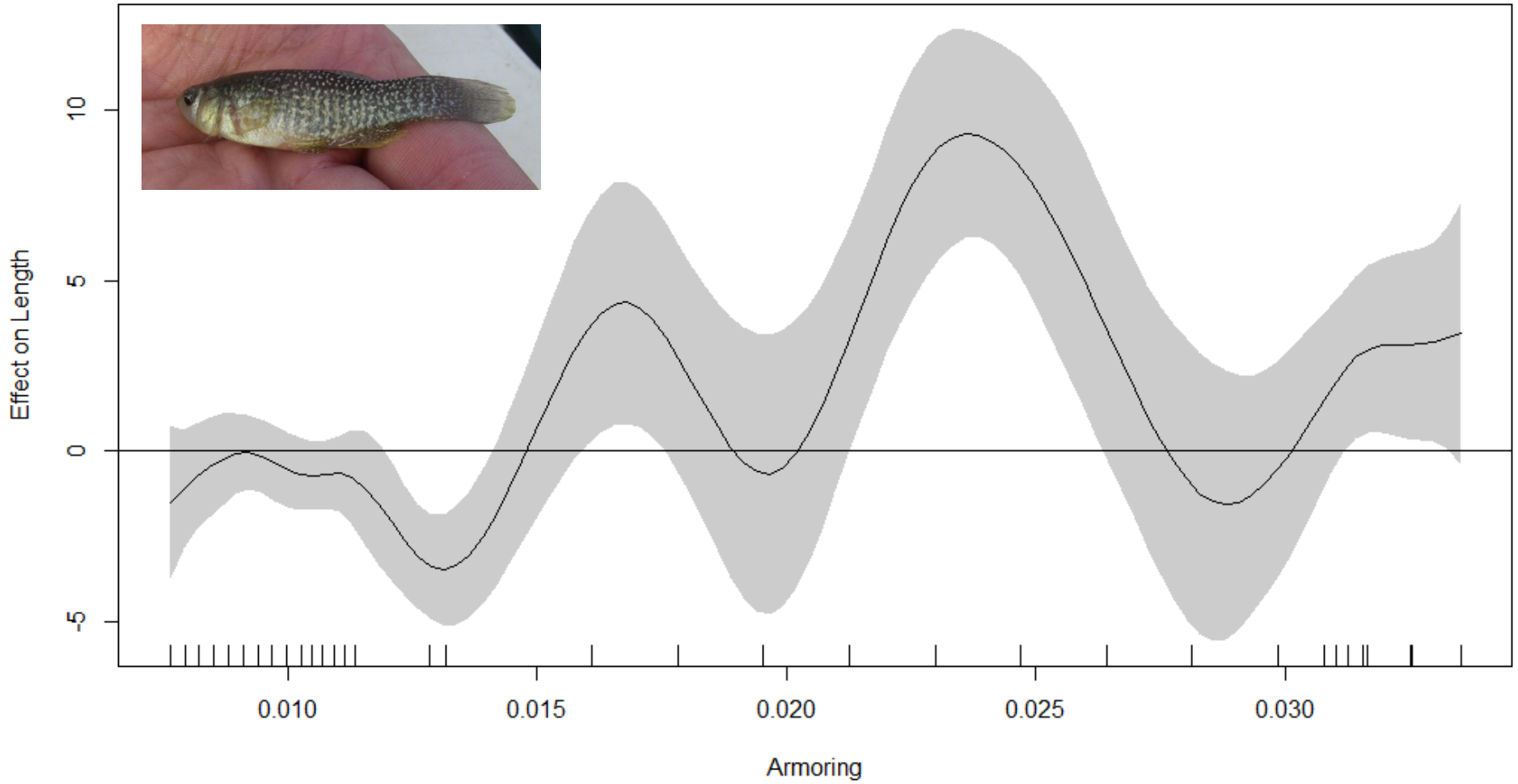




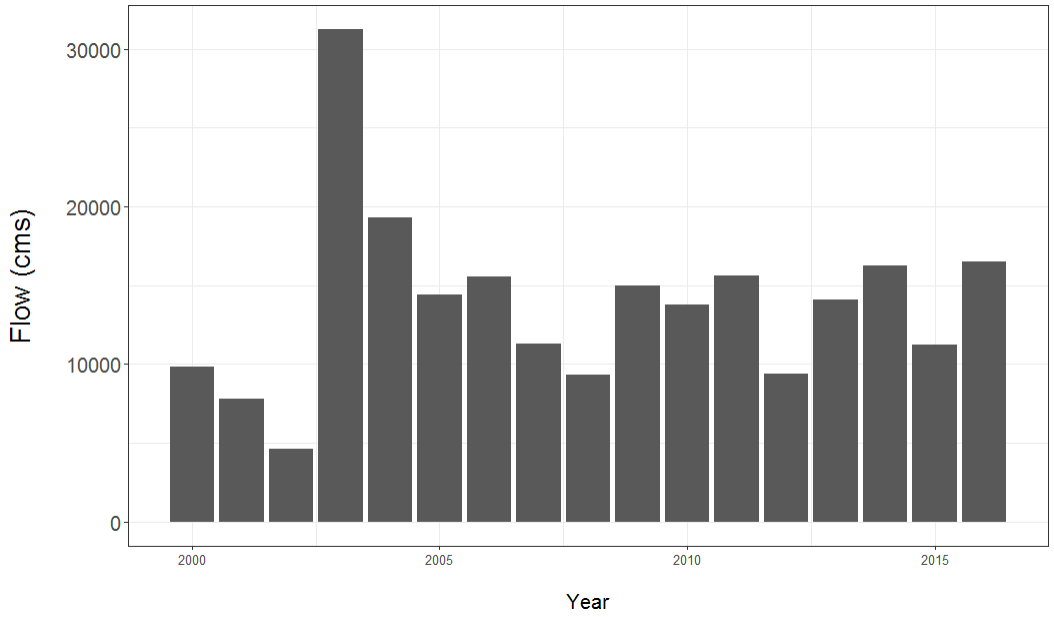


Results

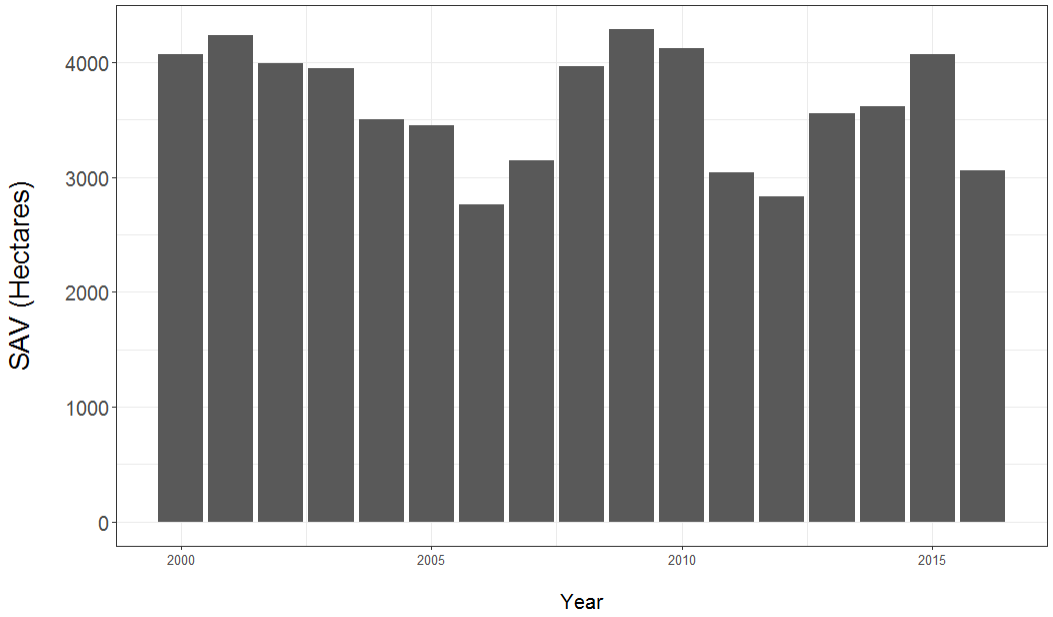
Mummichog from seine survey



Flow


Flow (cms)
30000
20000
10000
0
2000
2005
2010
2015
Year

SAV


SAV (Hectares)
4000
3000
2000
1000
0
2000
2005
2010
2015
Year