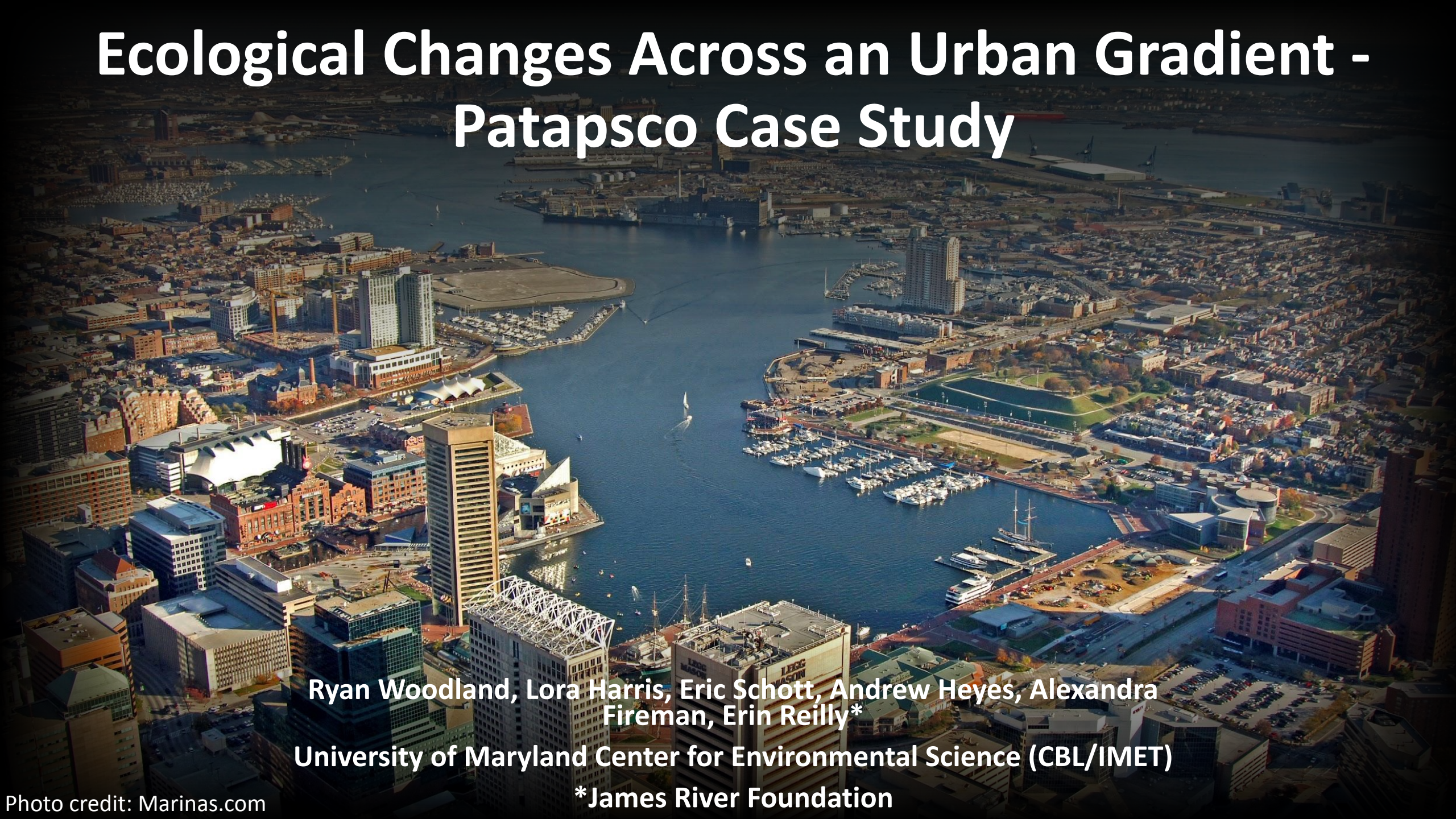
Ecological Changes Across an Urban Gradient - Patapsco Case Study



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University of Maryland Center for Environmental Science (CBL/IMET)

*James River Foundation

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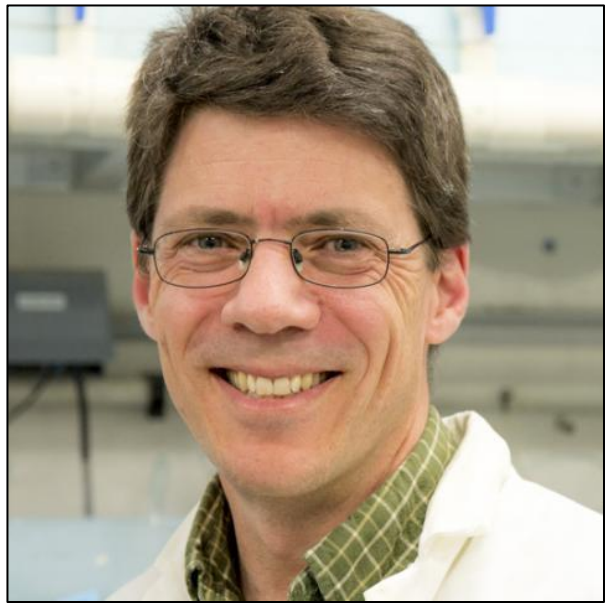
Harbor Science and Stakeholder Workshop

NOVEMBER 2, 2018
8:30AM TO 1:00PM

University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

IMET
Institute of Marine and Environmental Technology



Harbor Science and Stakeholder Workshop

- Propose a research question for Baltimore Harbor and the Patapsco River
- Mixed-group teams
  - Individual ideas
  - Round-robin brainstorming
- Teams pitch a research question
  - Why is it important to you, to the region?
  - Discuss Feasibility & Urgency
- Individual “Dot” voting

Research category	Research project title	Feasibility	Urgency	Research value	Final Score
Social emphasis	How can we institutionalize environmentally responsible behavior throughout the BH watershed?	2	10	0	**12**
	What Watershed & Harbor monitoring can we do to most effectively engage public to influence bahviors and attitudes to lead to policy change	9	14	13	**36**
	How do we understand the health/well-being of people/animals in the urban baltimore ecosystem?	0	0	2	**2**
Cross-cutting: social & scientific	Can we use a social and environmental meta-analysis of Baltimore Harbor's past to predict and suggest future management and remediation?	8	2	11	**21**
	What should be the indicators of success for green infrastructure projects beyond the $ per pound nitrogen? E.g. flood reduction, habitat, air quality, social/economic impact	2	9	7	**18**
	Microbial source tracking for the Patapsco using multiple techniques	5	4	8	**17**
Primarily scientific	What is the mass balance of water and TMDL's of Baltimore Harbor?	1	0	3	**4**
	Why do surface hypoxia events persist, what are the implications for the ecosystem and how can we mitigate?	6	4	2	**12**
	Are bottom sediments a concern for water quality and human health?	3	0	5	**8**
	Monitoring of biodiversity from microbes to fish	8	2	7	**17**
	Urban fishing and contaminant risks to human health	9	9	8	**26**

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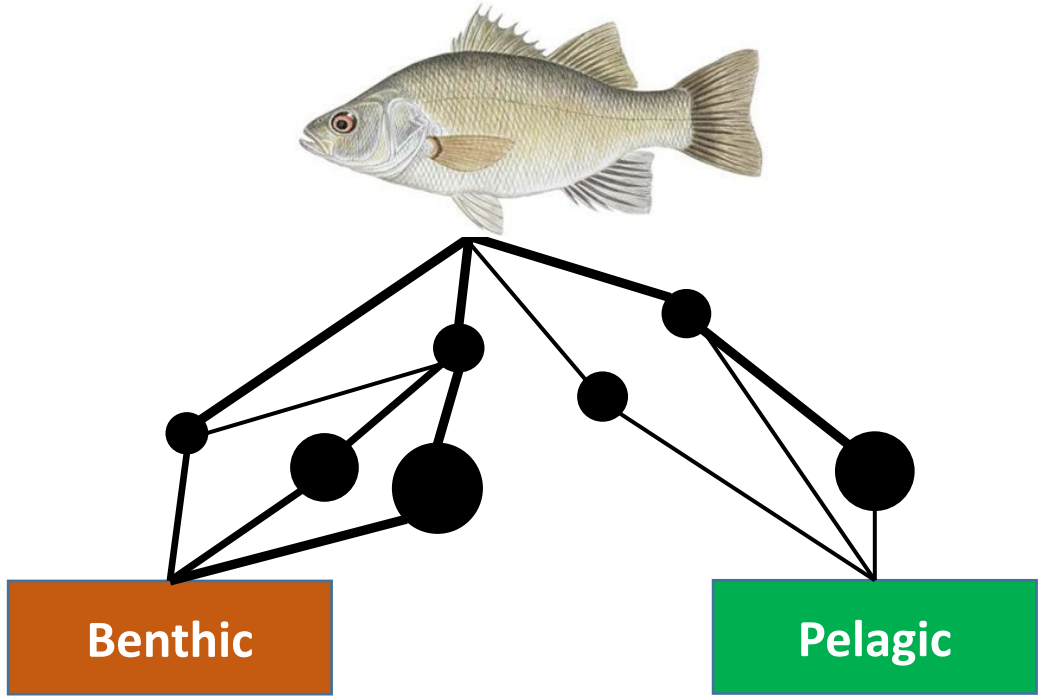
Ecological conditions across an urban gradient: Food web structure and trophic niche



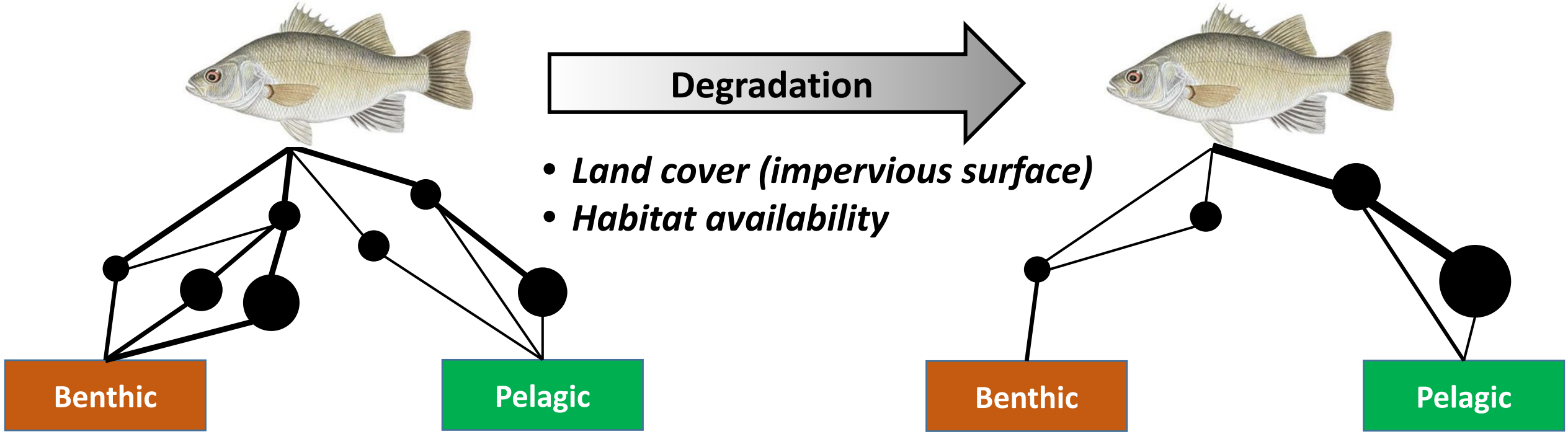
Predator

Prey

Basal resources

Layman 2007, Mayer-Pinto et al. 2015, Todd et al. 2019, https://www.fisheries.noaa.gov/species/atlantic-striped-bass

Ecological conditions across an urban gradient: Food web structure and trophic niche



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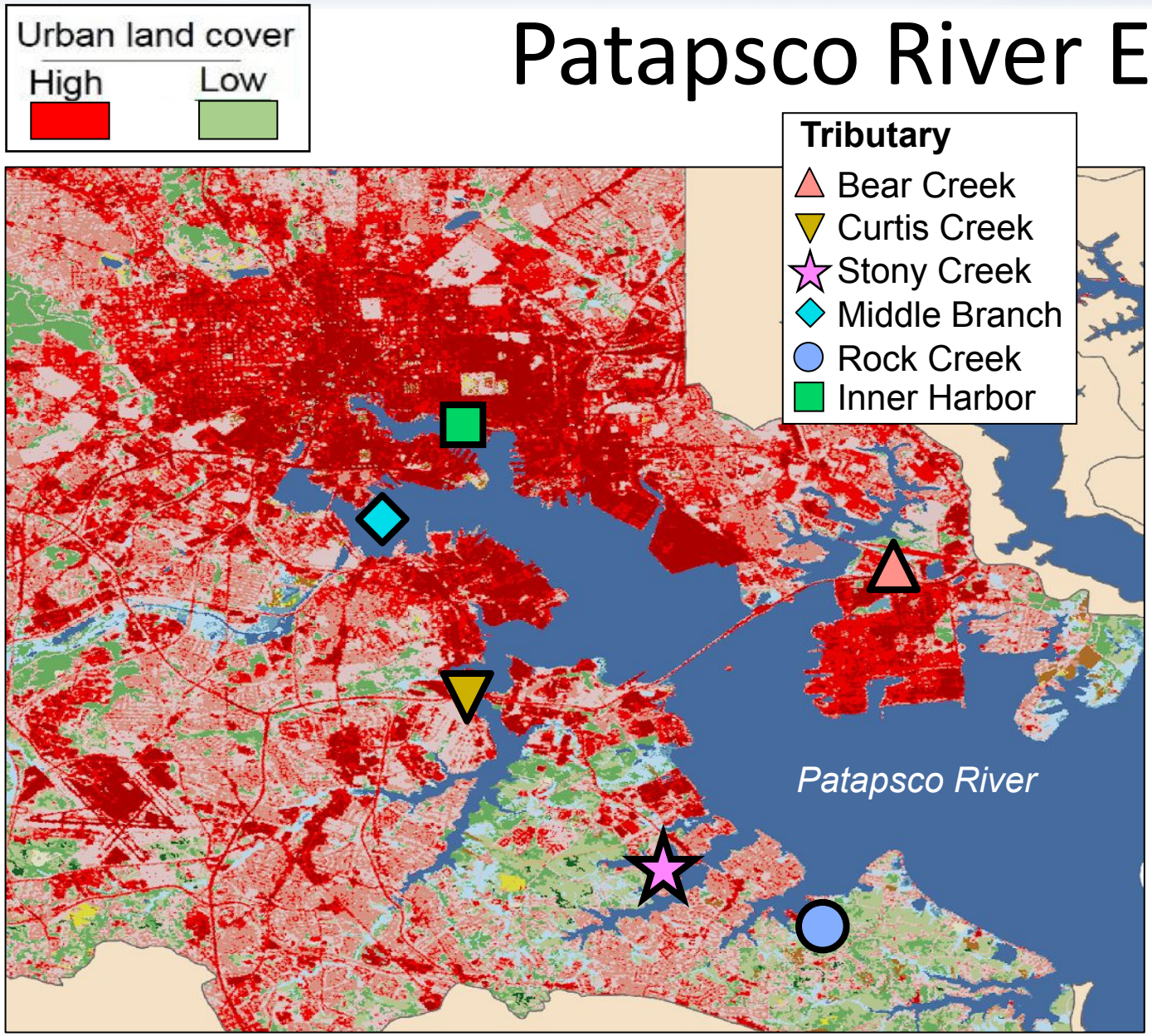
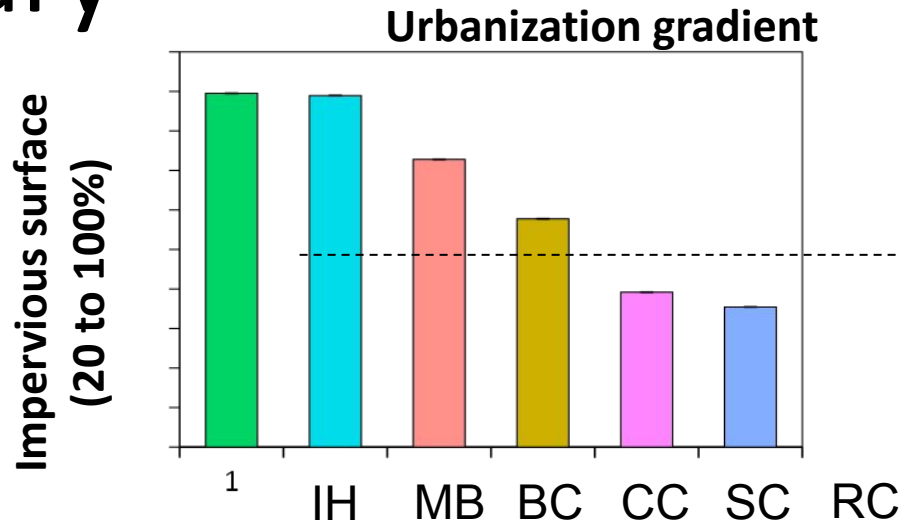
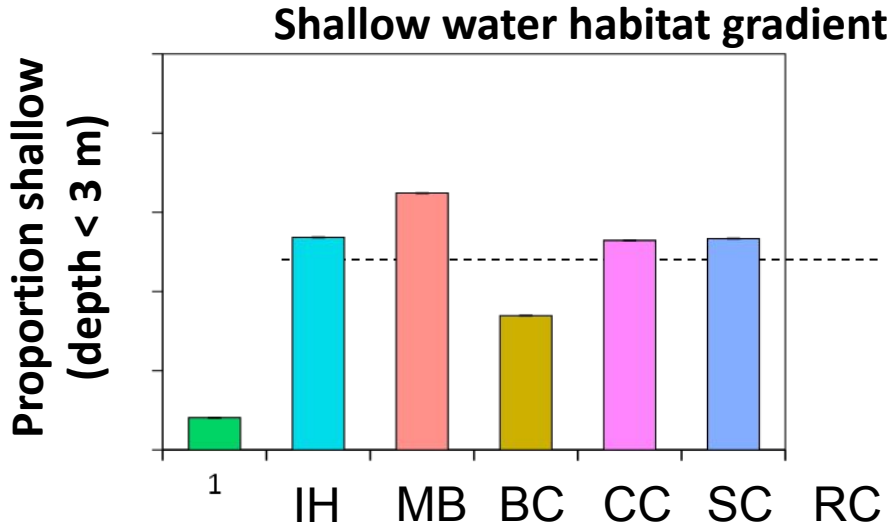
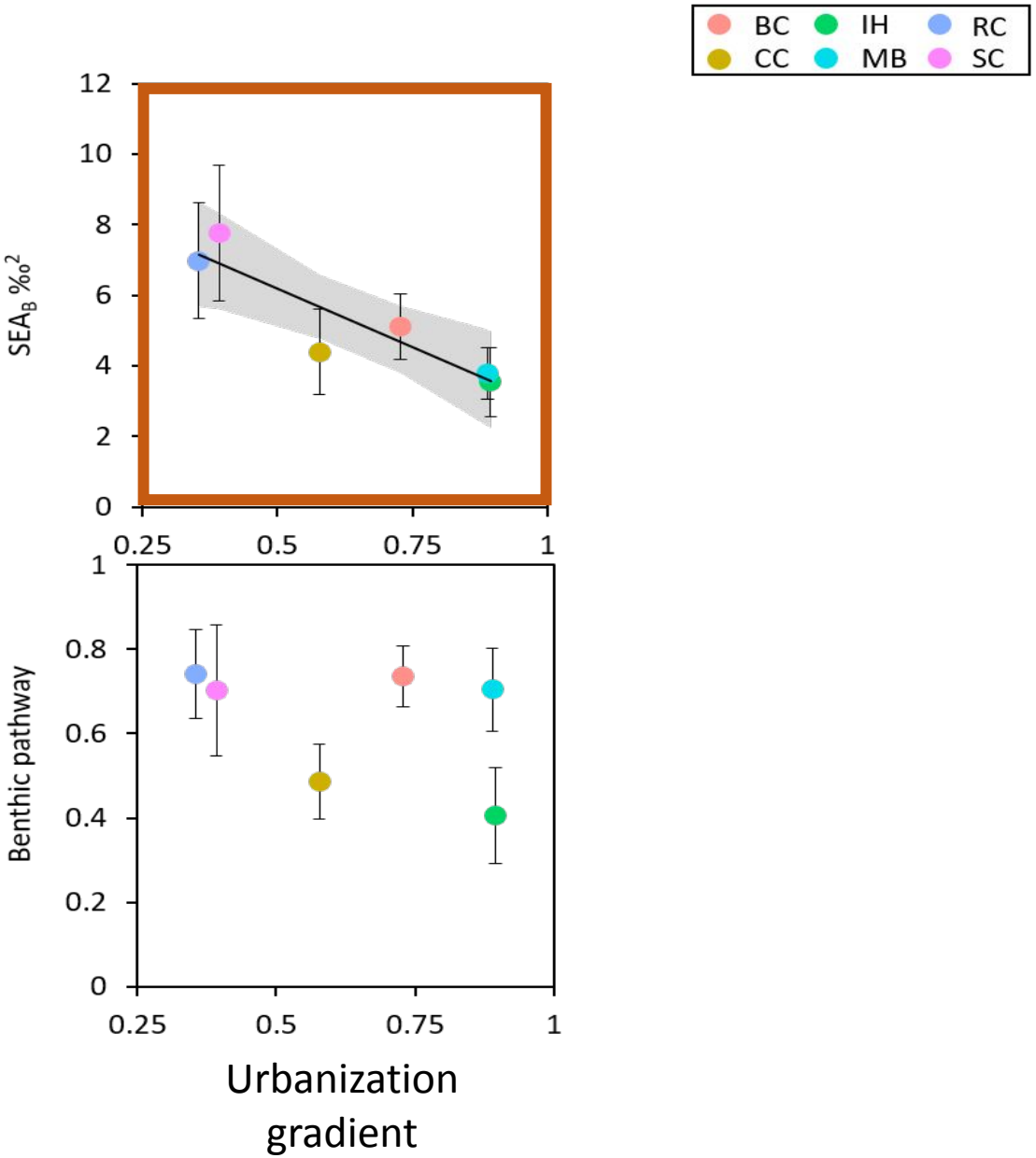
Patapsco River Estuary

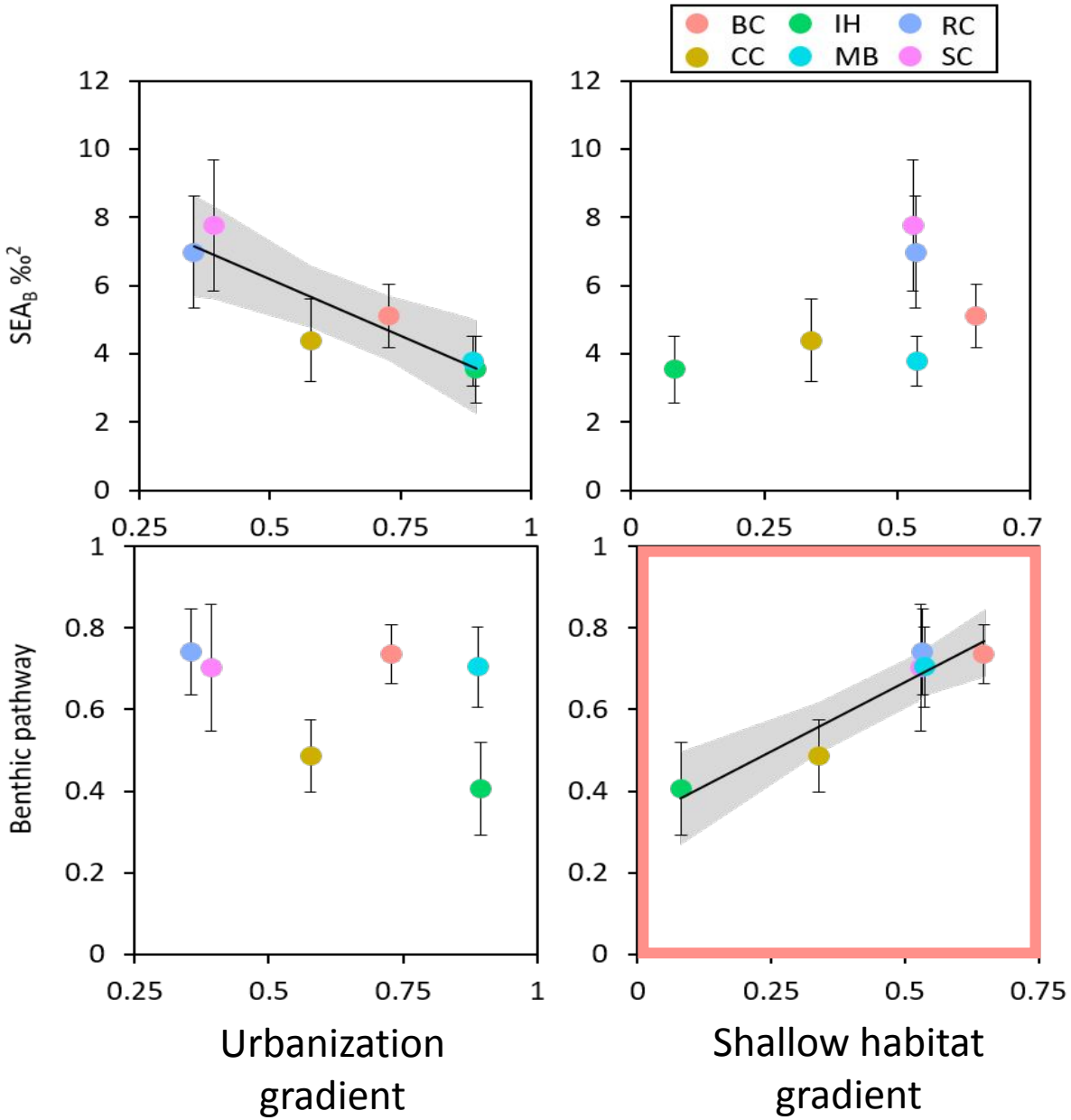








- Niche area declined as land use intensity increased
  - ***46% decline***



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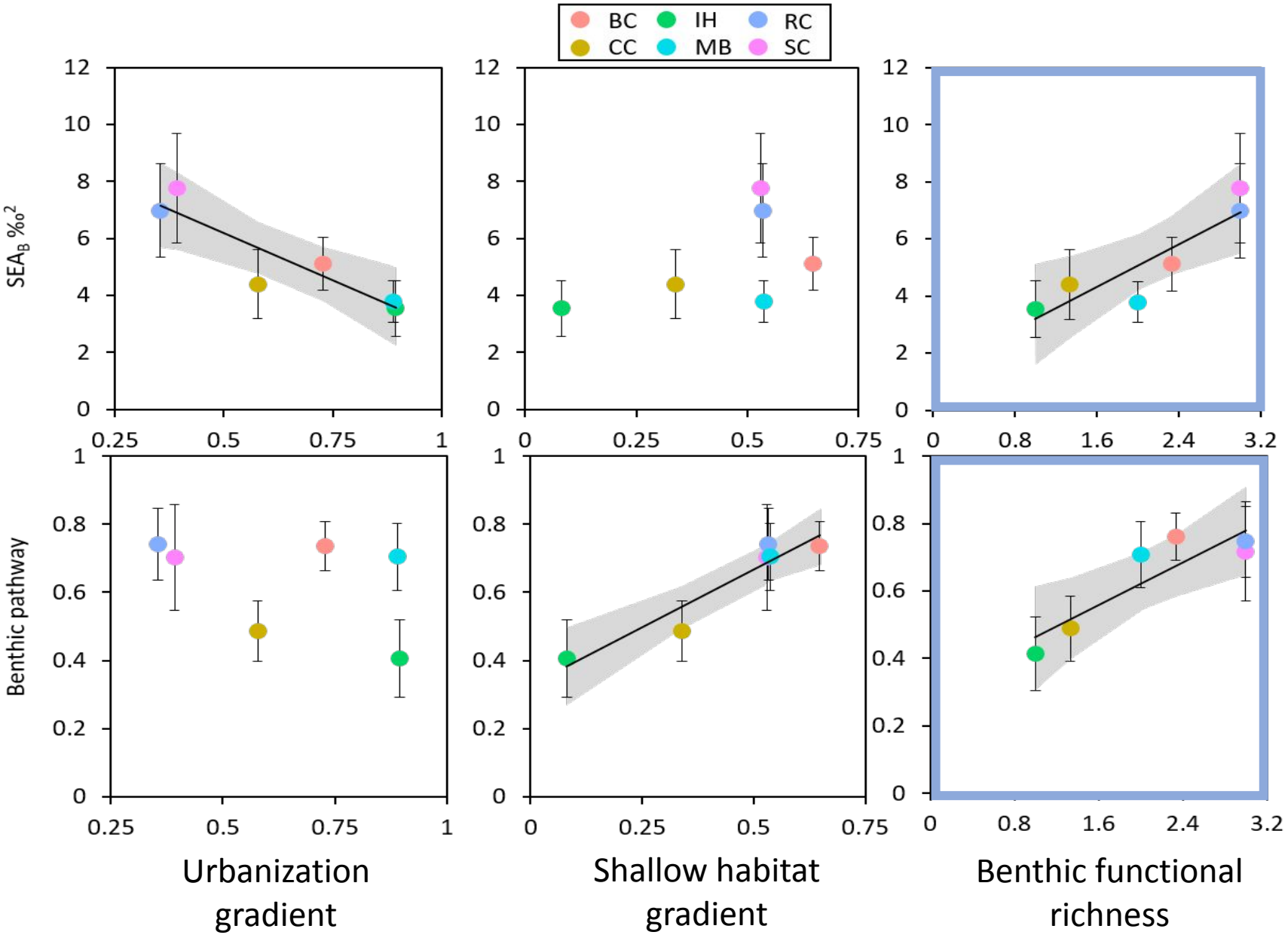
- Benthic pathway contribution increased as shallow habitat increased
  - ***55% increase***



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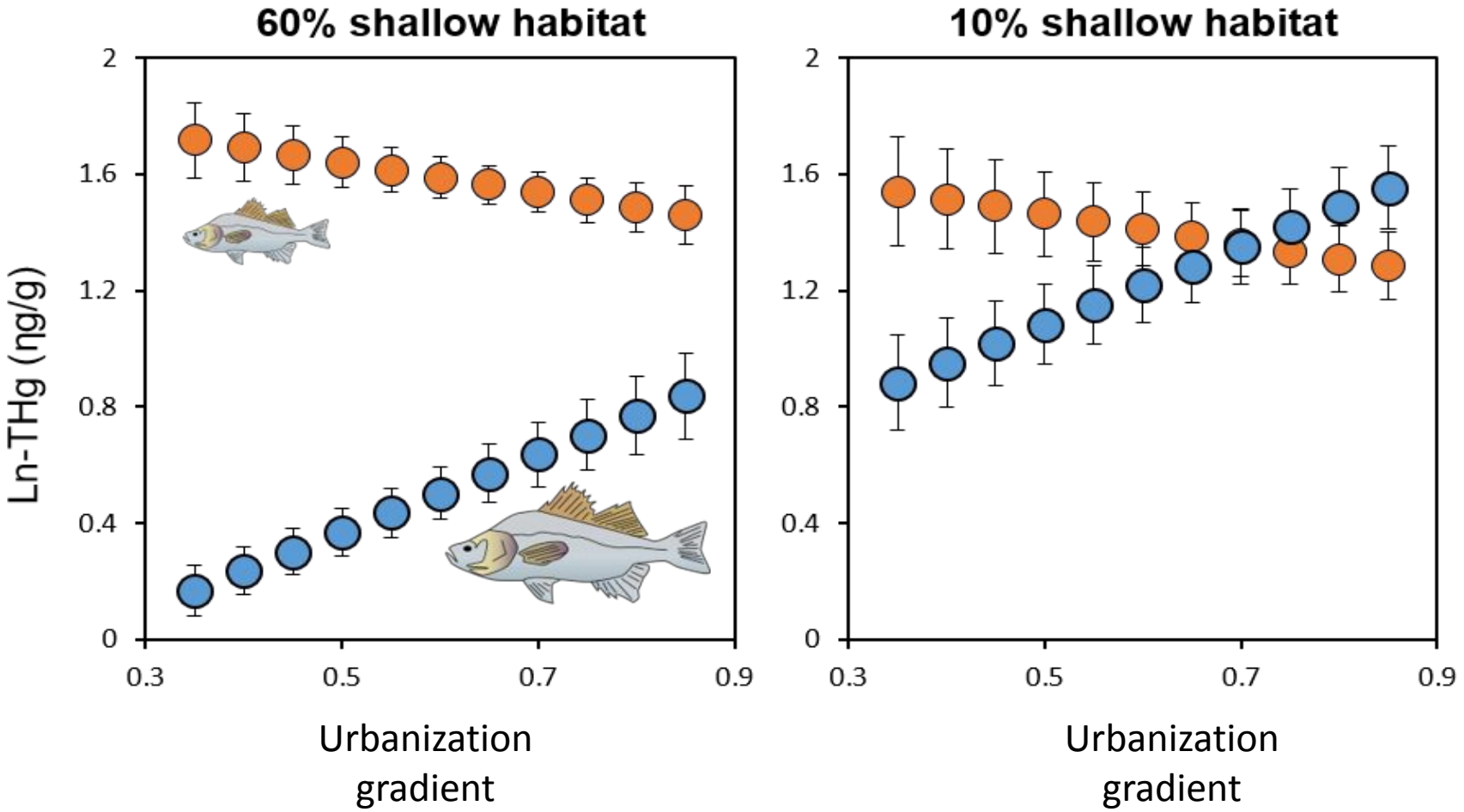
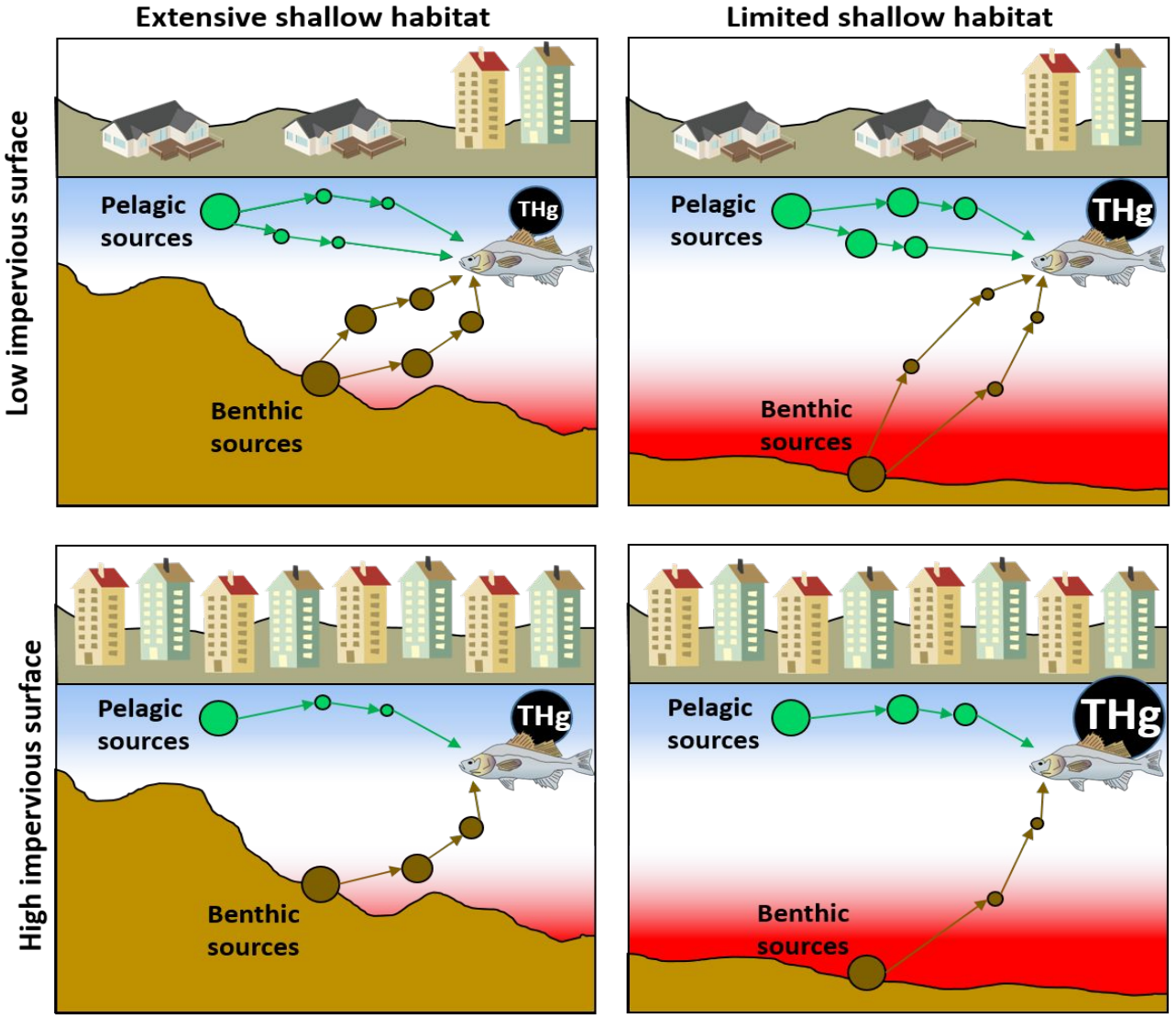
- White perch trophic ecology linked to functional diversity of benthic forage base



- ↑ THg in adult white perch with:
  - ↑ urbanization
  - ↓ shallow habitat
- Preliminary evidence that human health risks may mirror ecosystem health risks



Factor	Response to urbanization	Source	
Proximal land use	↑ Impervious surface ↑ pulsed runoff	A, B B	Abiotic conditions
Shoreline & littoral zone	↑ Armoring ↓ Fringing vegetation ↓ Shallow water area	B B A,B	
Estuary basin	↑ Deep water area ↓ Water oxygenation ↕ Salinity regime ↓ Porewater quality ↓ Sediment grain size ↑ Toxicants	A, B A, B B B B B	
Hydrology	↕ Residence time ↑ Bottom disturbance	B B	
Plants	↓ Seagrasses ↑ Macroalgae ↑ Harmful algal blooms	B B B	Biotic responses
Fauna	↓ Biodiversity ↑ Invasive species ↑ Species turnover ↓ Biomass/abundance (sensitive spp.) ↑ Biomass/abundance variability ↑ Toxicant accumulation ↓ Physiological condition	A B B B C A, B A, B	
Food web	↕ Production : Respiration ↓ Benthic contribution to food web ↓ Food web complexity ↓ Food web stability	B A, B A, B C	

Acknowledgements

Funding

France-Merrick Foundation

Field & Laboratory assistance

Amanda Moore

Melinda Forsyth

Isabel Sanchez

Matt Spitznagel

Curtis Szewczyk

Isabel Sanchez-Viruet

Zachary Gotthardt

Olivia Lopez

Blue Water Baltimore

Workshop assistance

Molly Pickel

Charmaine Dahlenberg

Photo credit: Marinas.com