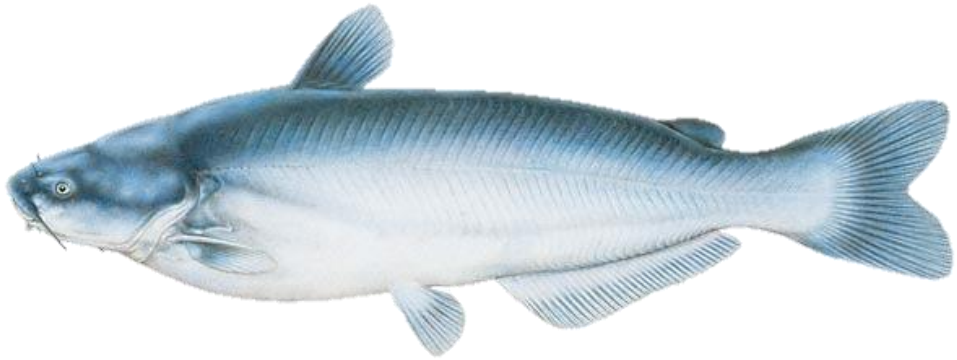
Salinity Tolerance of Blue Catfish



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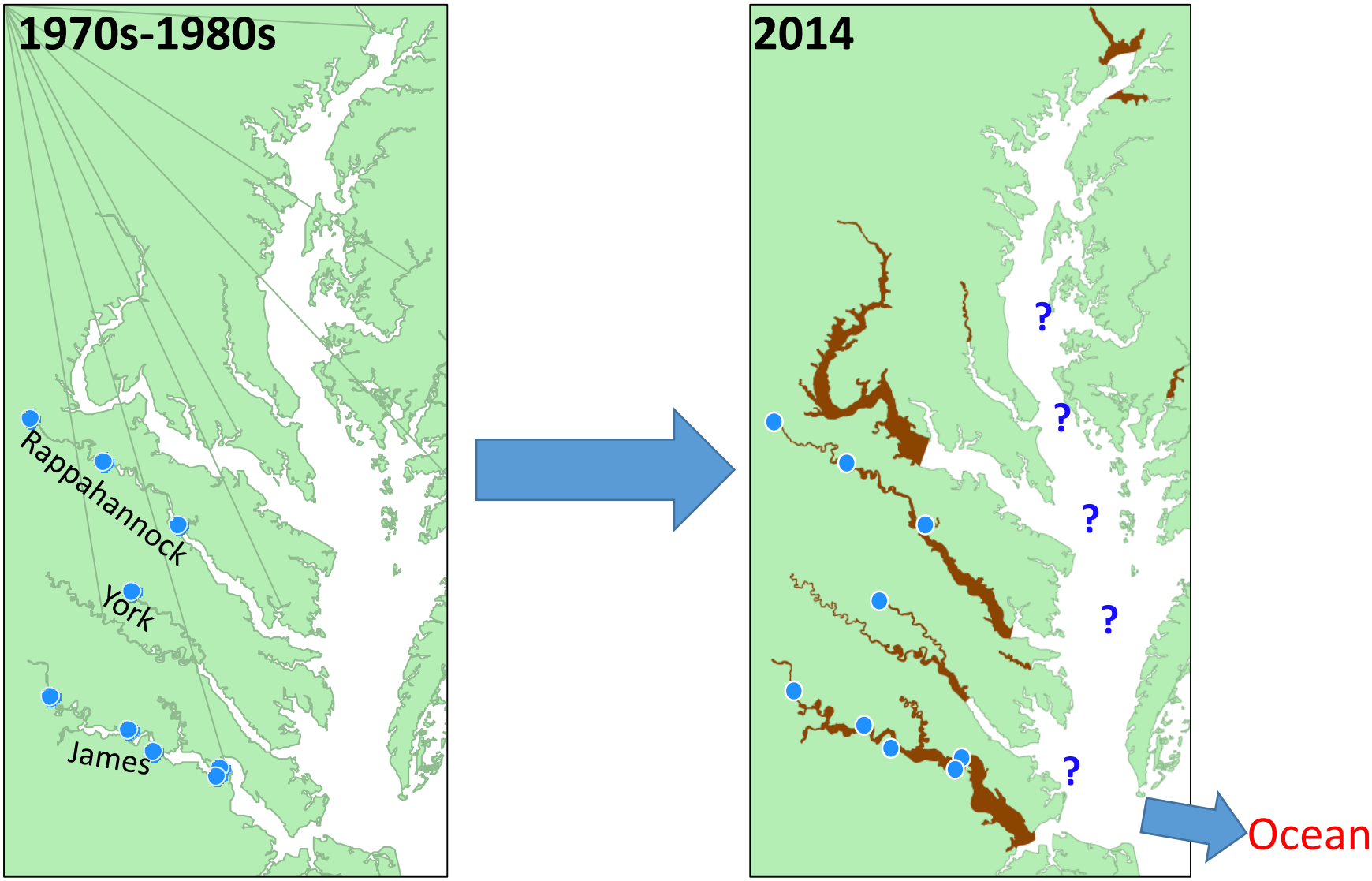
Range Expansion



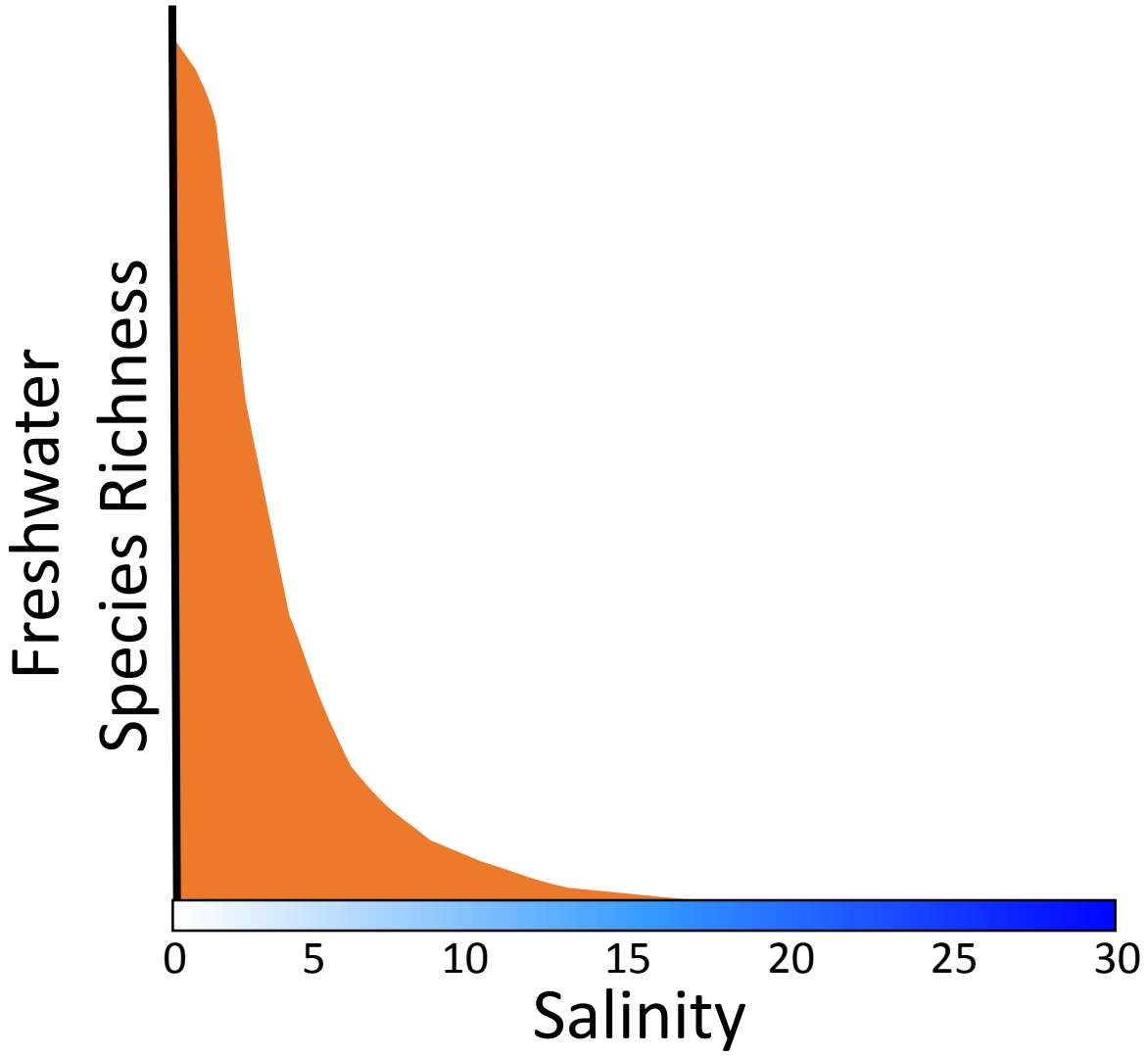
VIMS | William & Mary
Virginia Institute of Marine Science

VCU Virginia Commonwealth University

Virginia Department of Game & Inland Fisheries

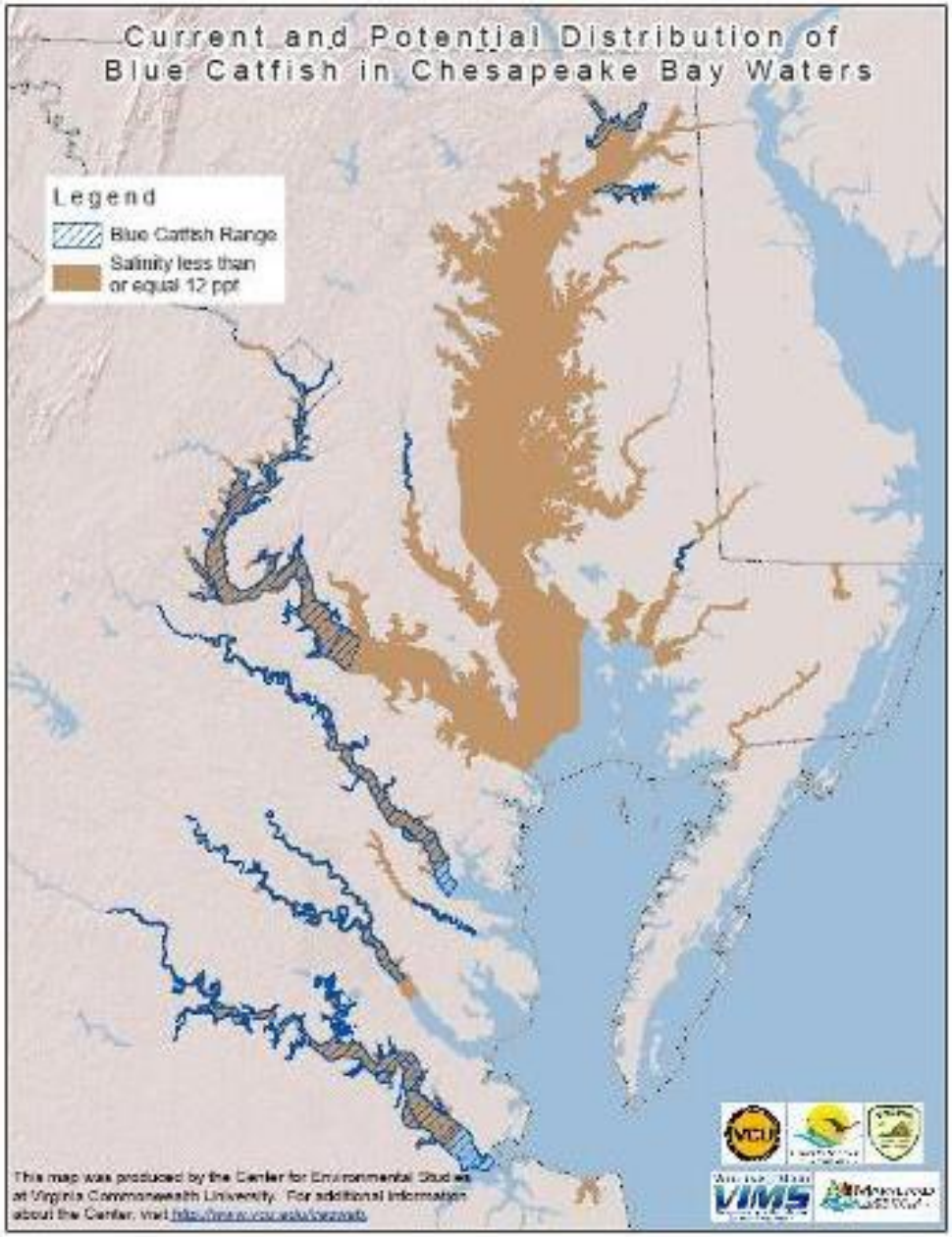
Maryland Department of Natural Resources

Salt Stress



Remane 1934, modified

Prediction: State-of-the-Science



As of 2013

Goal

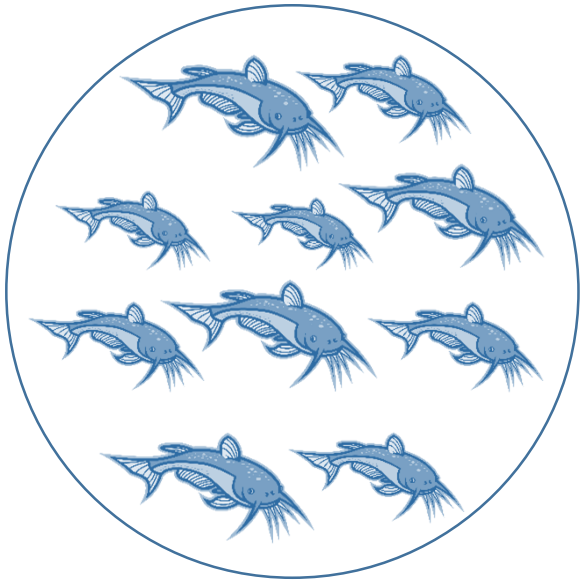
- Test the acute toxicity of seawater to blue catfish
- Evaluate the potential for blue catfish to expand into estuarine habitats of Chesapeake Bay

https://amex-ideamaninc.netdna-ssl.com

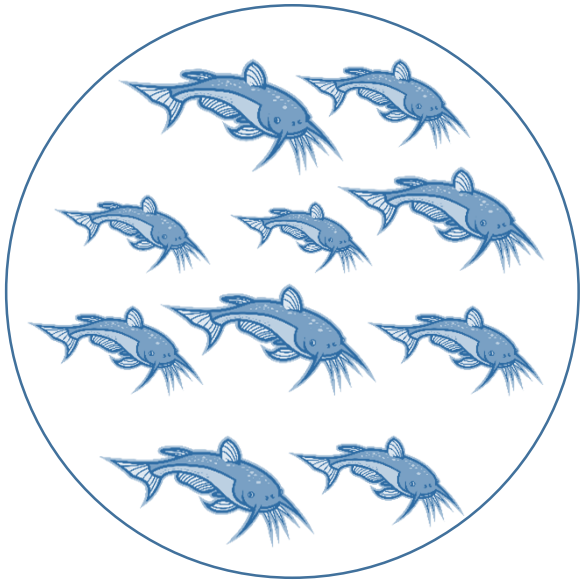
72-Hr LC50 test

Experiment 1

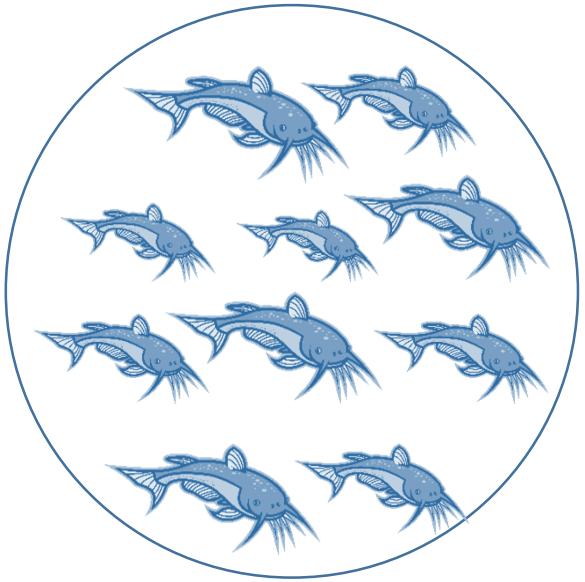
7 ppt



17 ppt

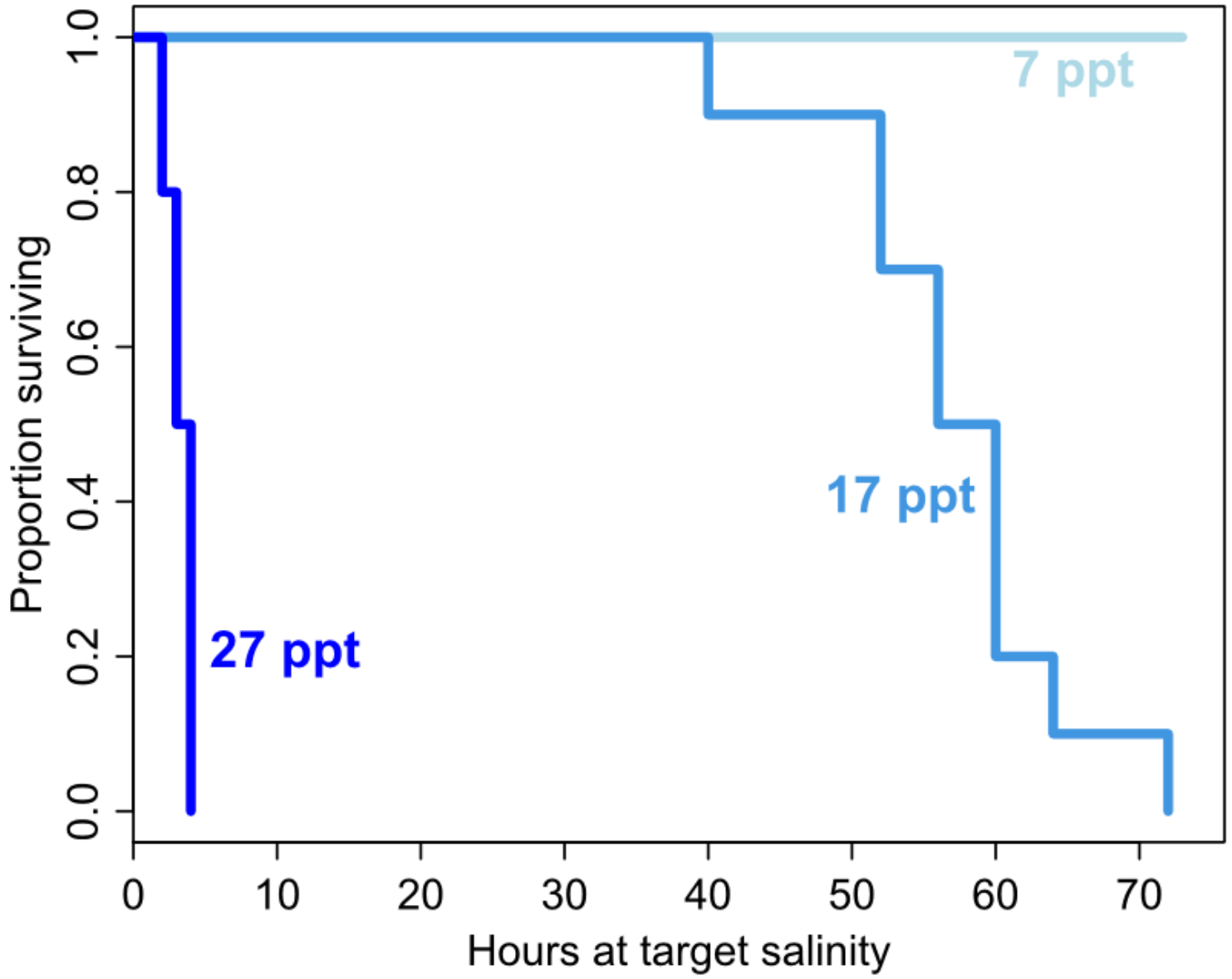


27 ppt



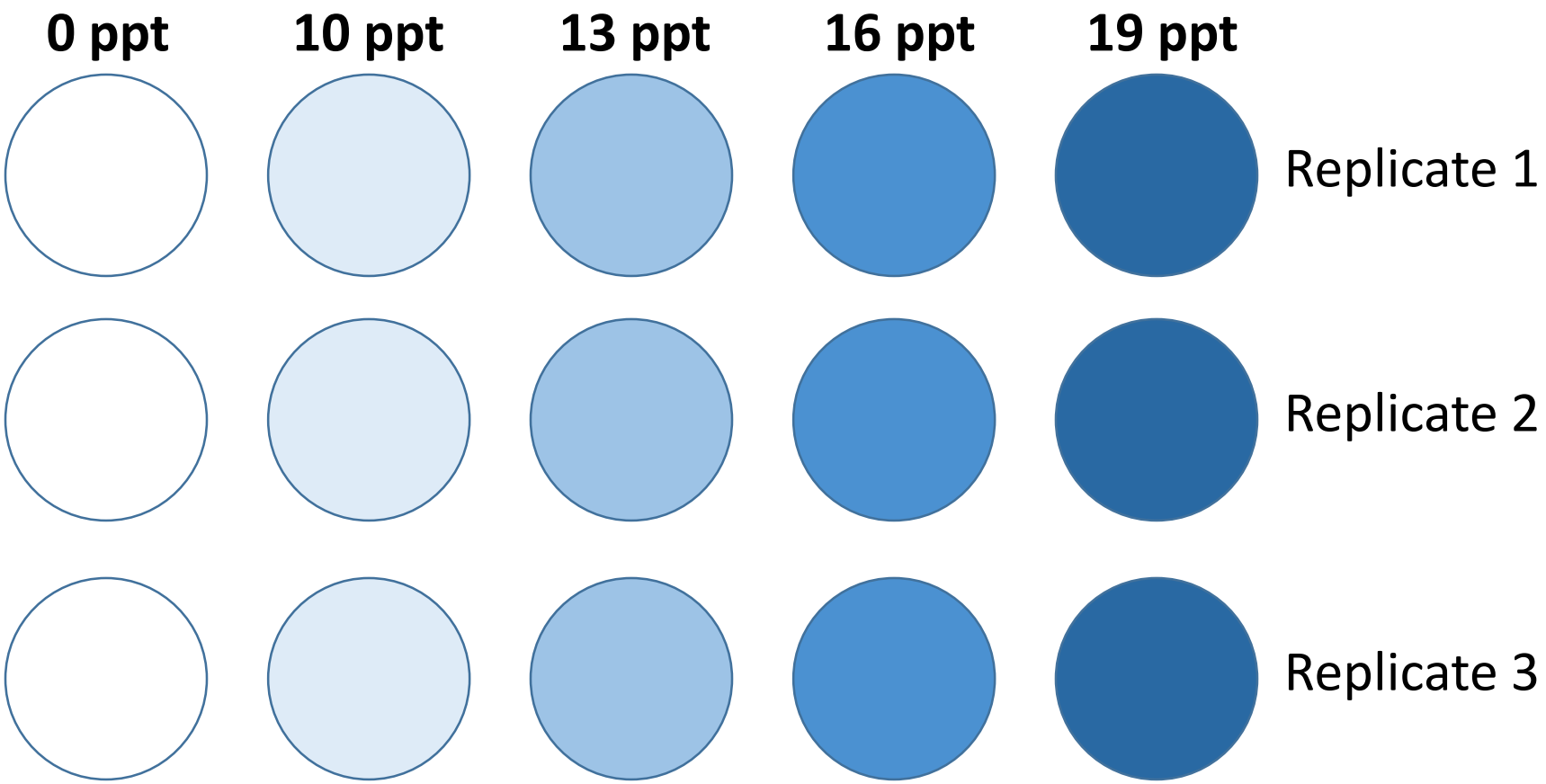
10 fish per tank
Subadults (165-265 mm FL)

Mortality End-point

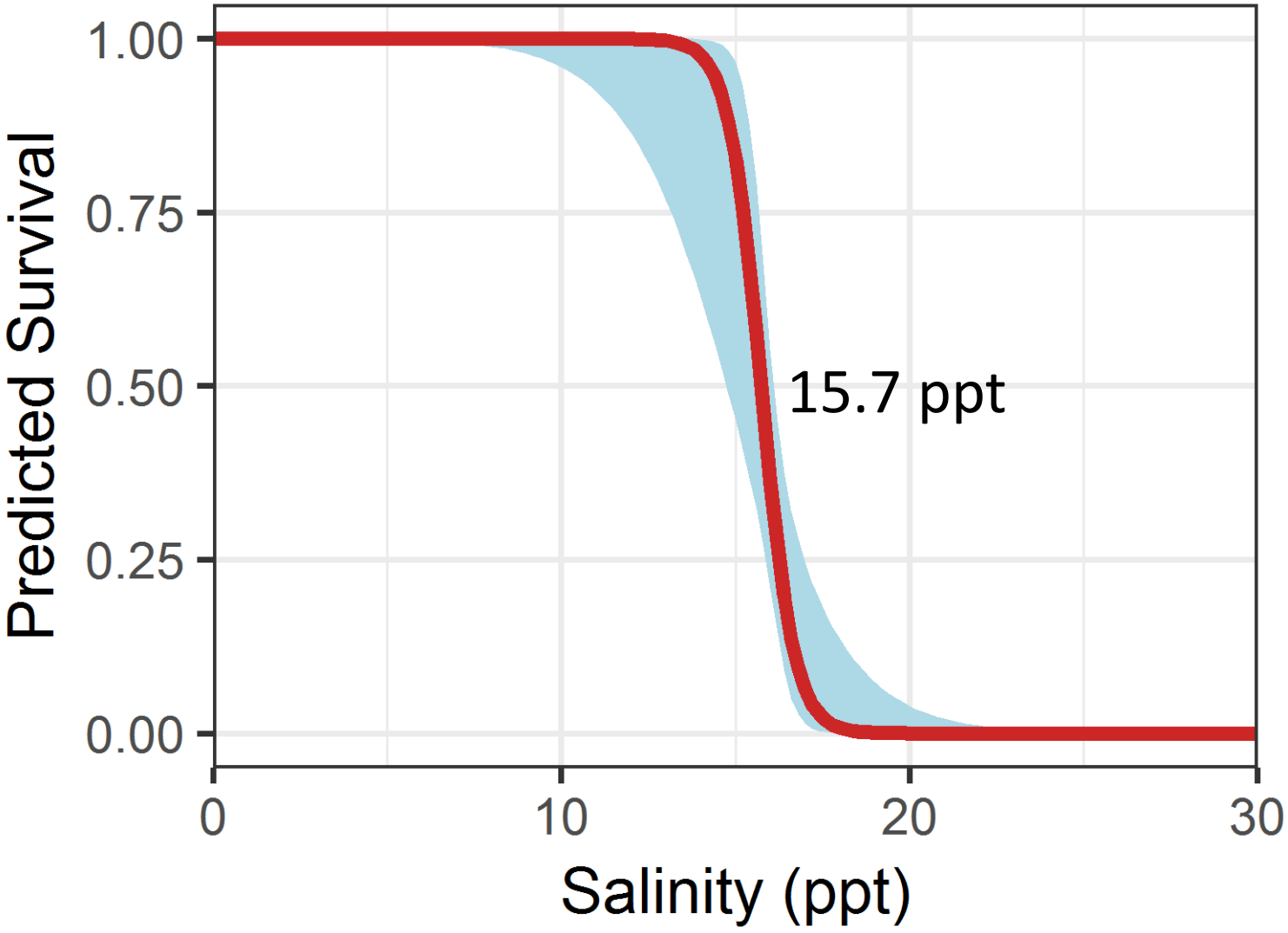


72-Hr LC50 test

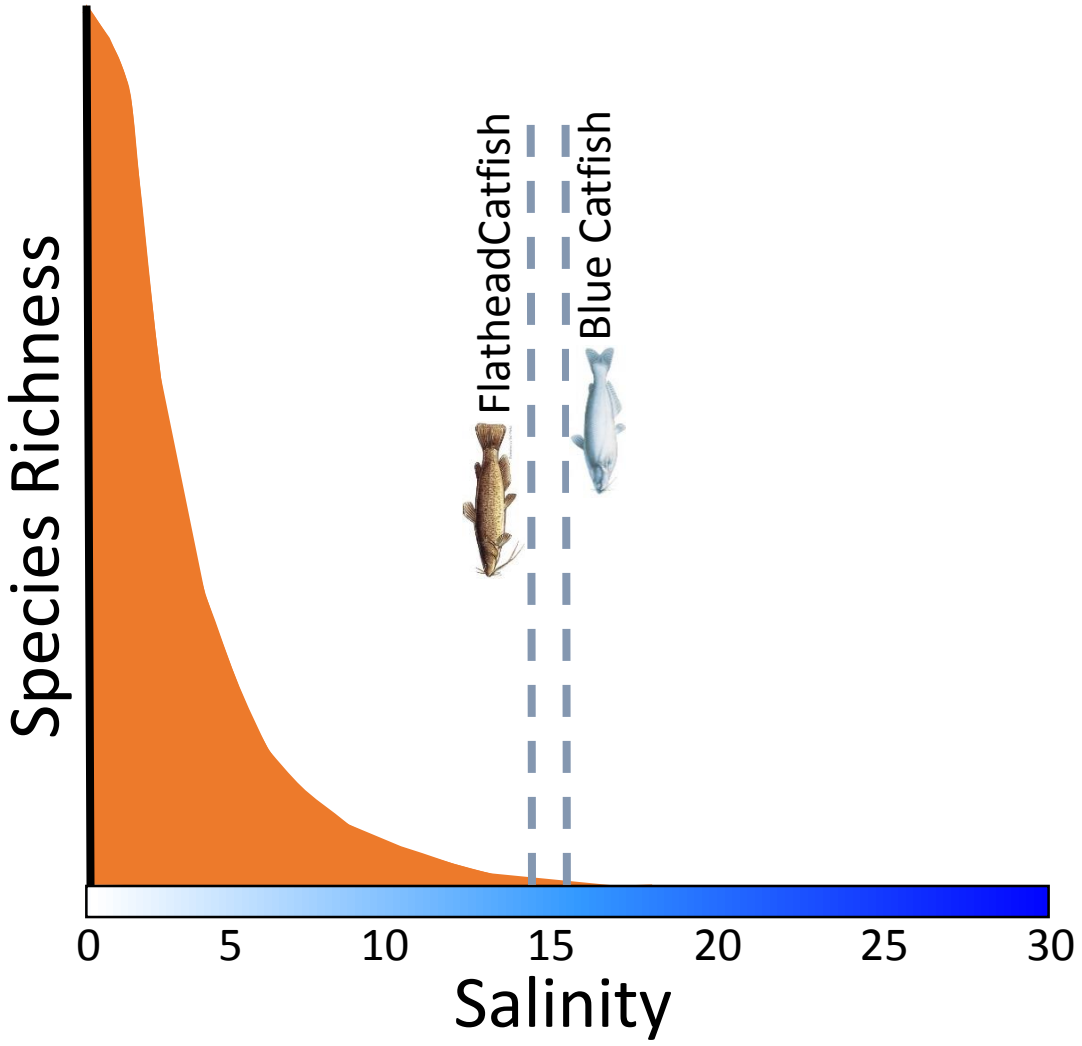
Experiment 2



72-Hr LC50


Predicted Survival
1.00
0.75
0.50
0.25
0.00
0
10
20
30
Salinity (ppt)
15.7 ppt

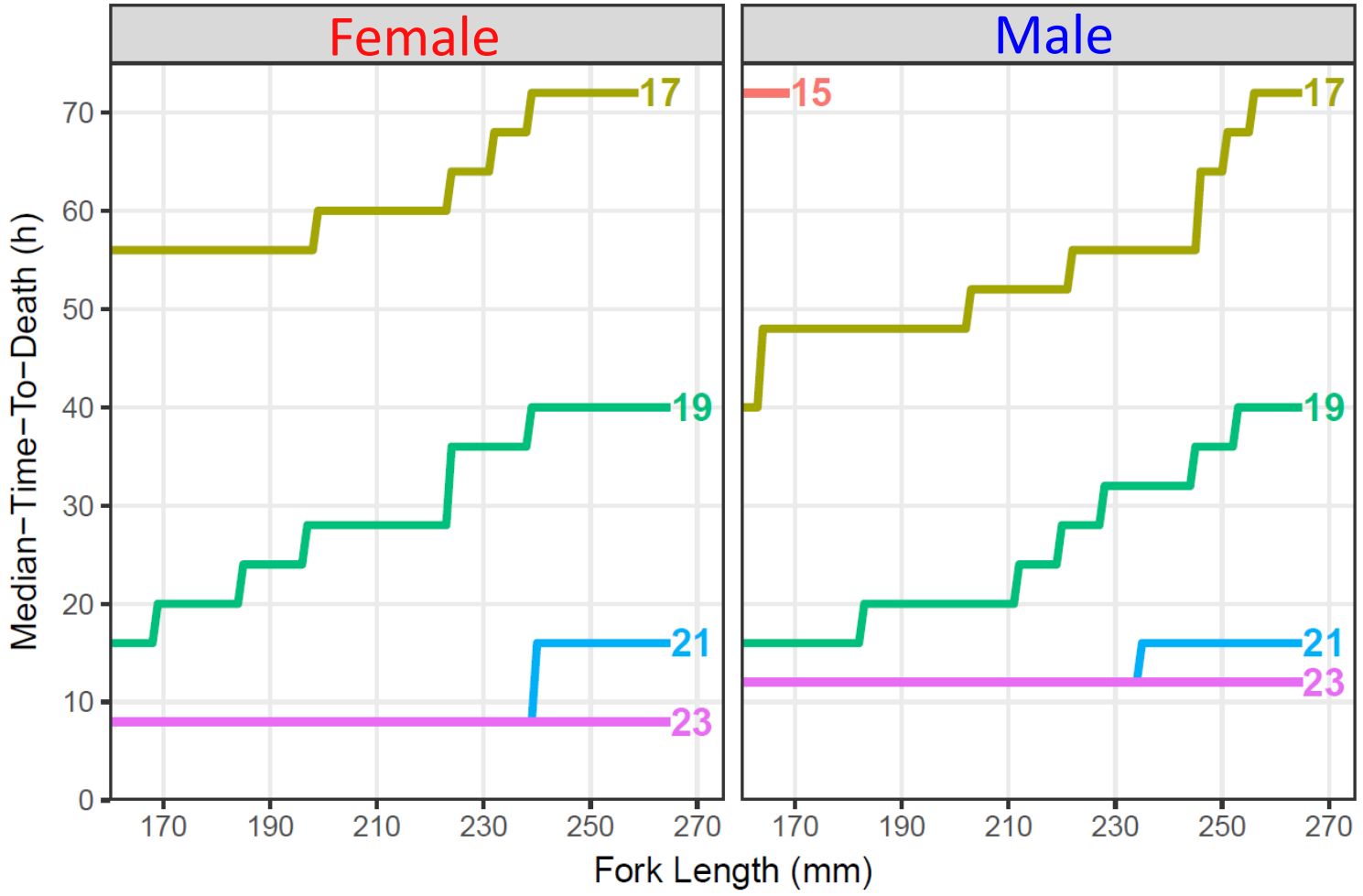
Inter-specific Comparisons



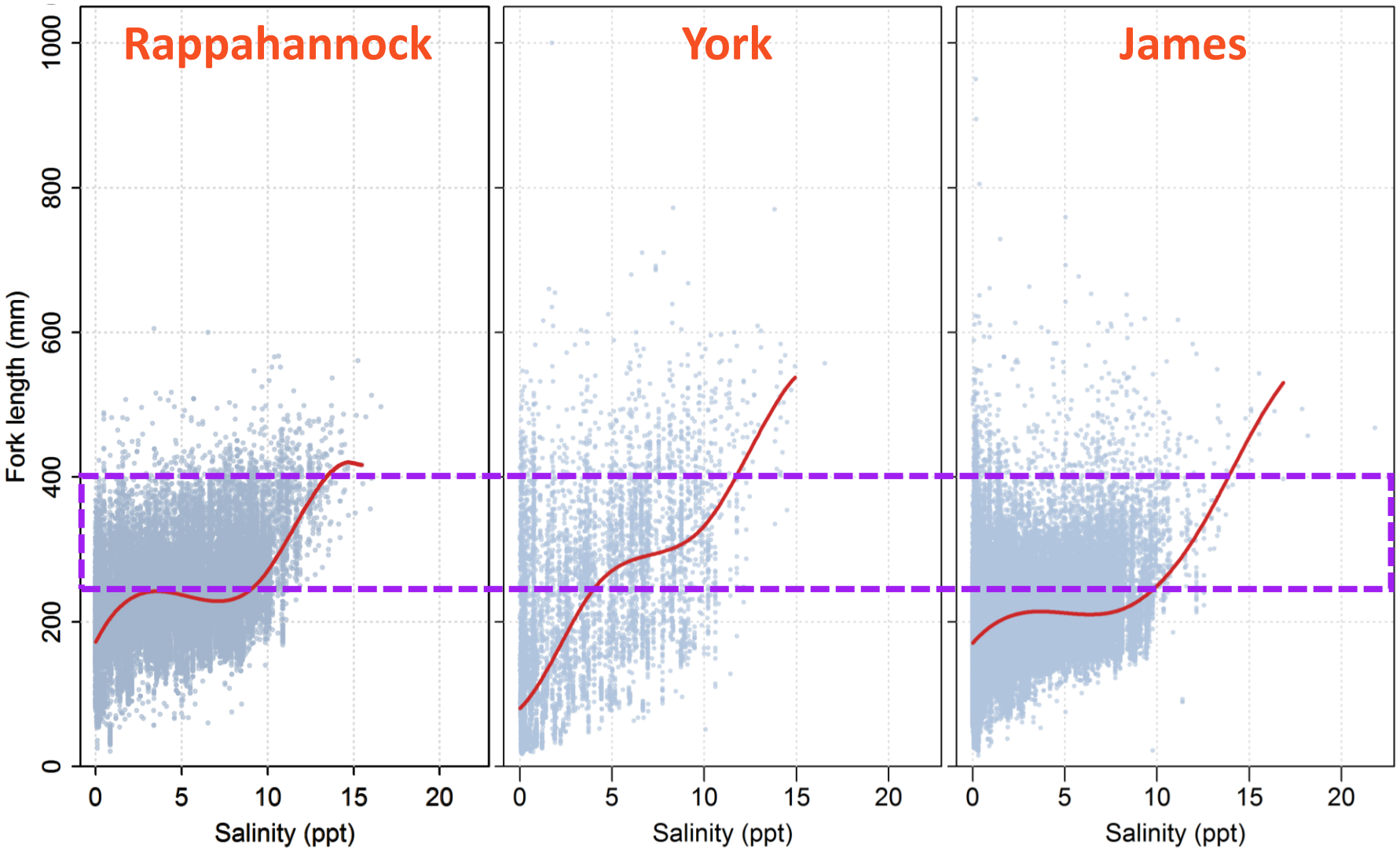
Bringolf et al. 2005; Remane 1934, modified

Time-to-Death Analysis

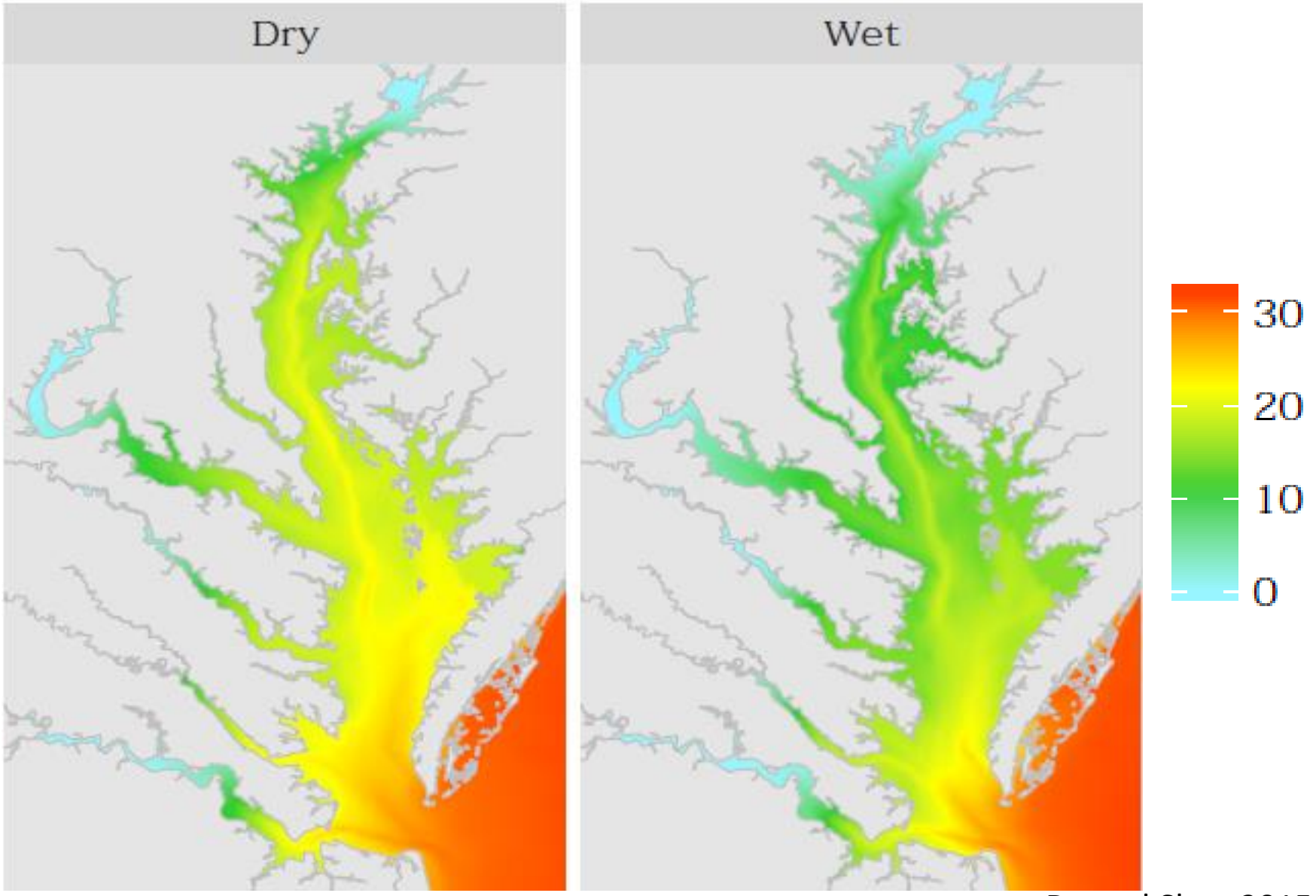
- Stratified Cox models for males and females



Survey Data

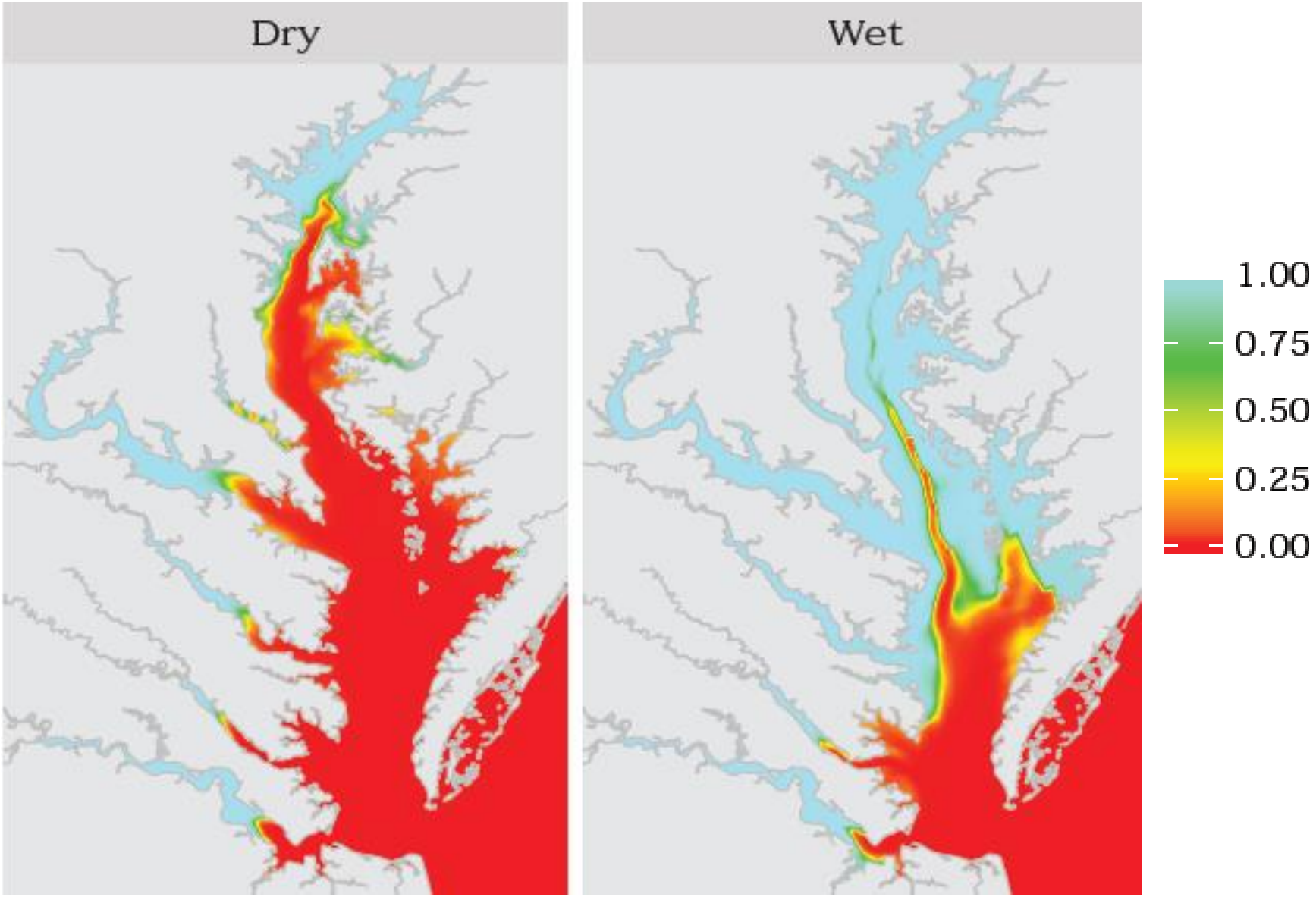

Rappahannock
York
James
Fork length (mm)
0
200
400
600
800
1000
0
5
10
15
20
Salinity (ppt)

Salinity in Chesapeake Bay



Du and Shen 2015

Predicted 72-Hr Survival



Summary

- Salinity tolerance higher than most freshwater fishes
- Potential to expand into other rivers
  - Salt-bridge
- Larger fish more tolerant of salinity
  - Support *in*- and *ex-situ*
- Potential of large individuals to inhabit high-salinity waters

Implications

Ability to expand to (and survive in) much of Chesapeake Bay

+

LARGE population size and density

+

Opportunistic, generalist feeding

↓

Ability to alter estuarine ecosystem structure and function

Potential loss of ecosystem services

Schloesser et al. 2011; Schmitt et al. 2016; Fabrizio et al. 2017

Discussion Questions

- What is the value of this research to fishery managers?
  - Higher resolution prediction
- Where are there still data gaps?
  - Sublethal effects of salinity (feeding, growth, reproduction, …)
- What should be the next steps?
  - Add telemetry/range expansion rate data

Acknowledgments

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- VIMS Juvenile Fish Trawl Survey Crew
- Jiabi Du and Jian Shen (VIMS)
- VIMS Office of Academic Studies

VIMS | William & Mary
Virginia Institute of Marine Science

Sea Grant
Virginia

Questions