

# Summer Thermal Thresholds of Fish Community Transitions in Connecticut Streams

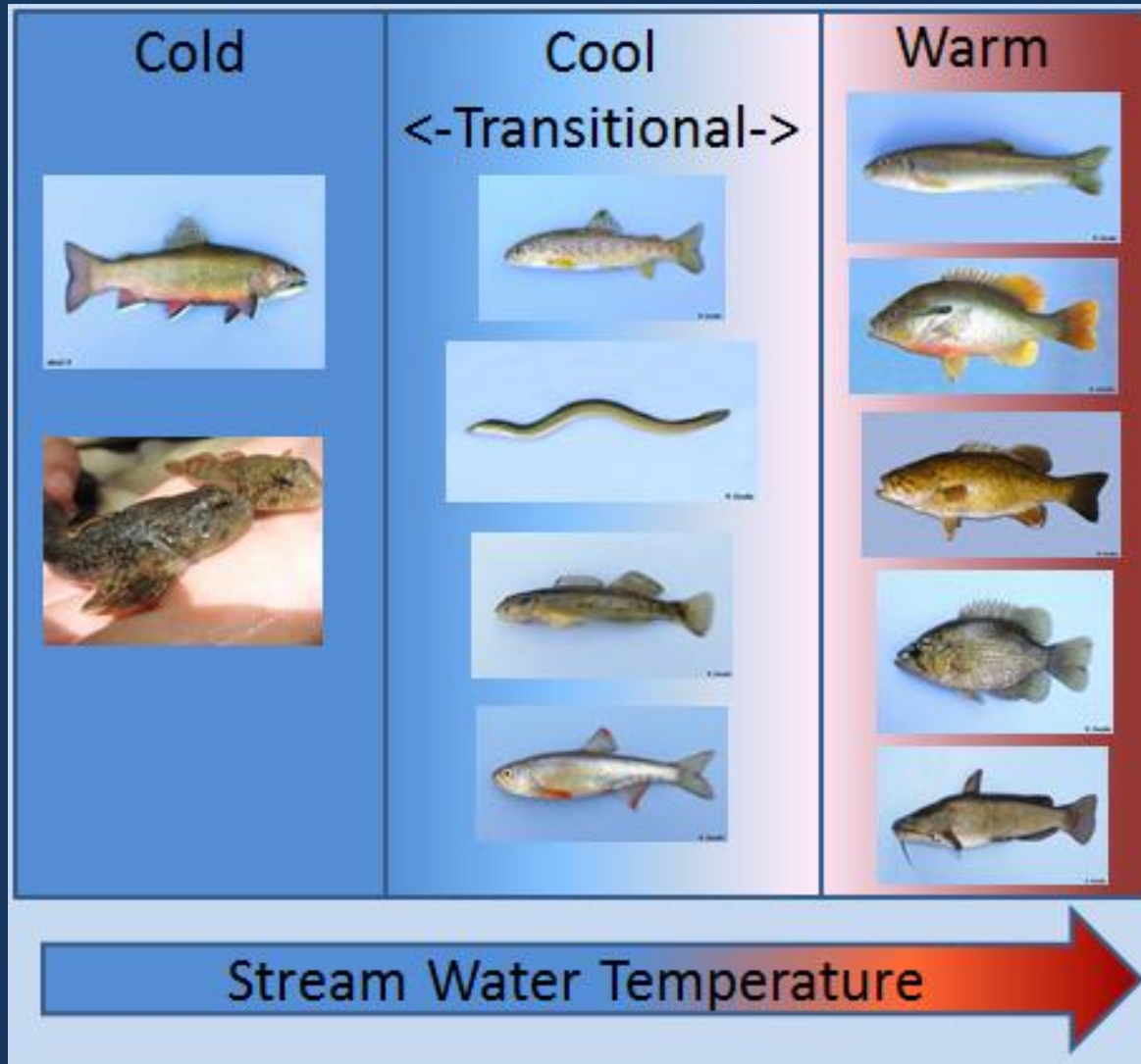
Stream Temperature and Data Modeling II,  
Hadley, MA-May 1, 2014

*Mike Beauchene, Mary Becker, Chris Bellucci, Neal Hagstrom, and Yoichiro Kanno*



Connecticut Department of Energy and Environmental Protection

# Bottom Line Up Front



# April 2009 – Triennial Review

“Water temperature criteria were established in 1973, 36 years ago and have remained relatively unchanged since then”

“DEP’s Temperature Criteria For Class AA, A, and B Surface Waters Fail To Protect Cold Water Fisheries, Including Trout, And Should Be Revised Accordingly Under Connecticut law”



# 85 and 4

| <b>Class AA</b>   | <b>Class A</b>   | <b>Class B</b>   |
|---|--|--|
| There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and in no case exceed 85° F, or in any case raise the temperature of surface water more than 4° F. | There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 85° F, or in any case raise the temperature of surface water more than 4° F. | There shall be no changes from natural conditions that would impair any existing or designated uses assigned to this Class and, in no case exceed 85° F, or in any case raise the temperature of surface water more than 4° F. |





# Assemble the Temperature Team



Jester  
Beauchene

Sir  
Bellucci

Gallant  
Hagstrom

Lady Becker  
Knight  
Kanno



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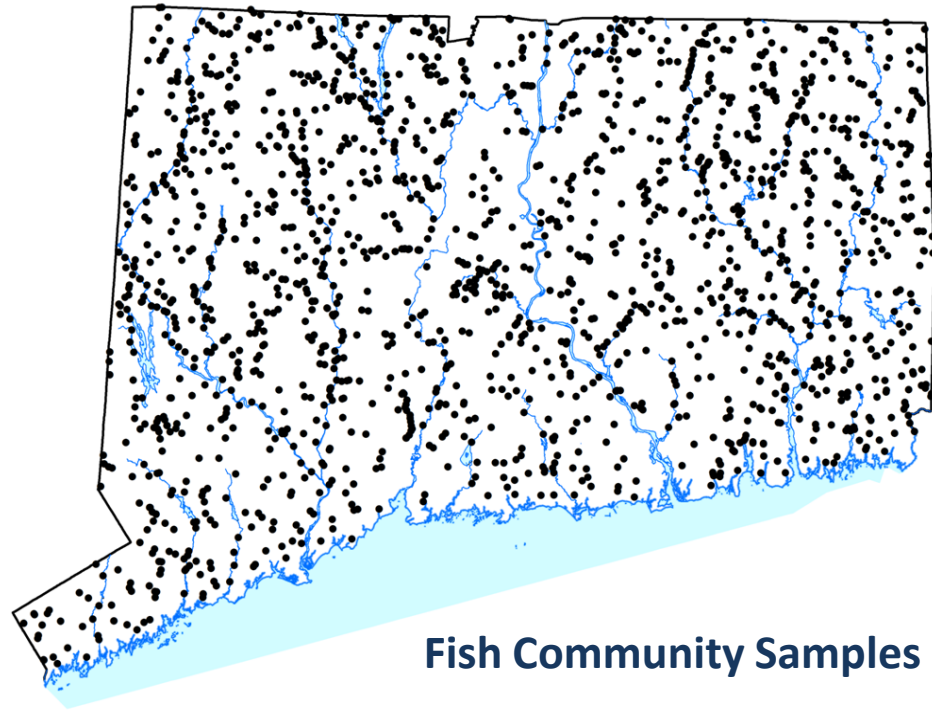
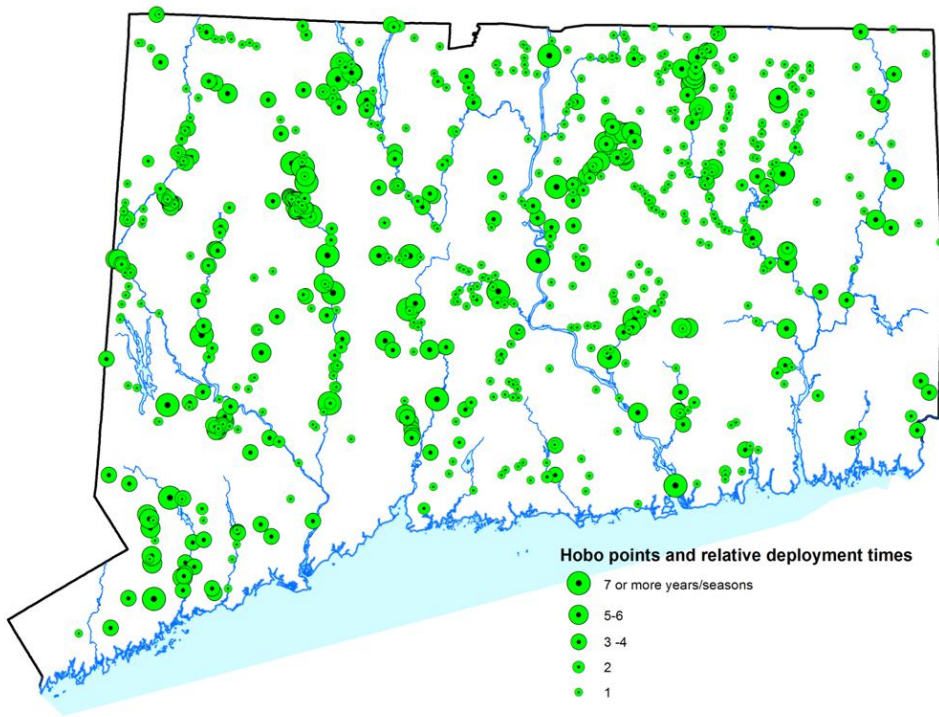


# Data Review



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# Data Review





74°0'W

73°30'W

73°0'W

72°30'W

72°0'W

# 160 Sites

## Fish community/water temperature

42°0'N

41°30'N

41°0'N

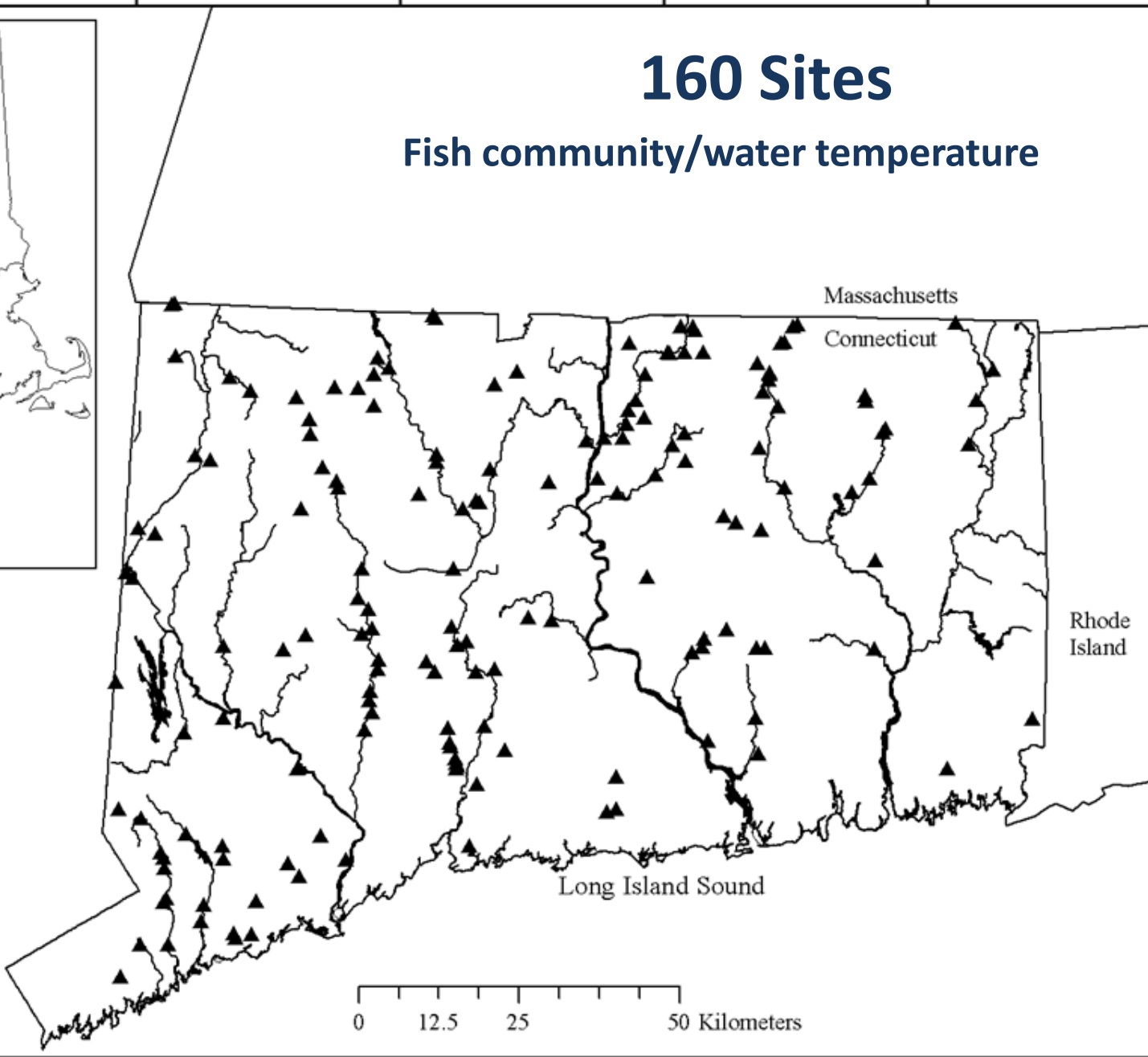
Massachusetts

Connecticut

Rhode Island

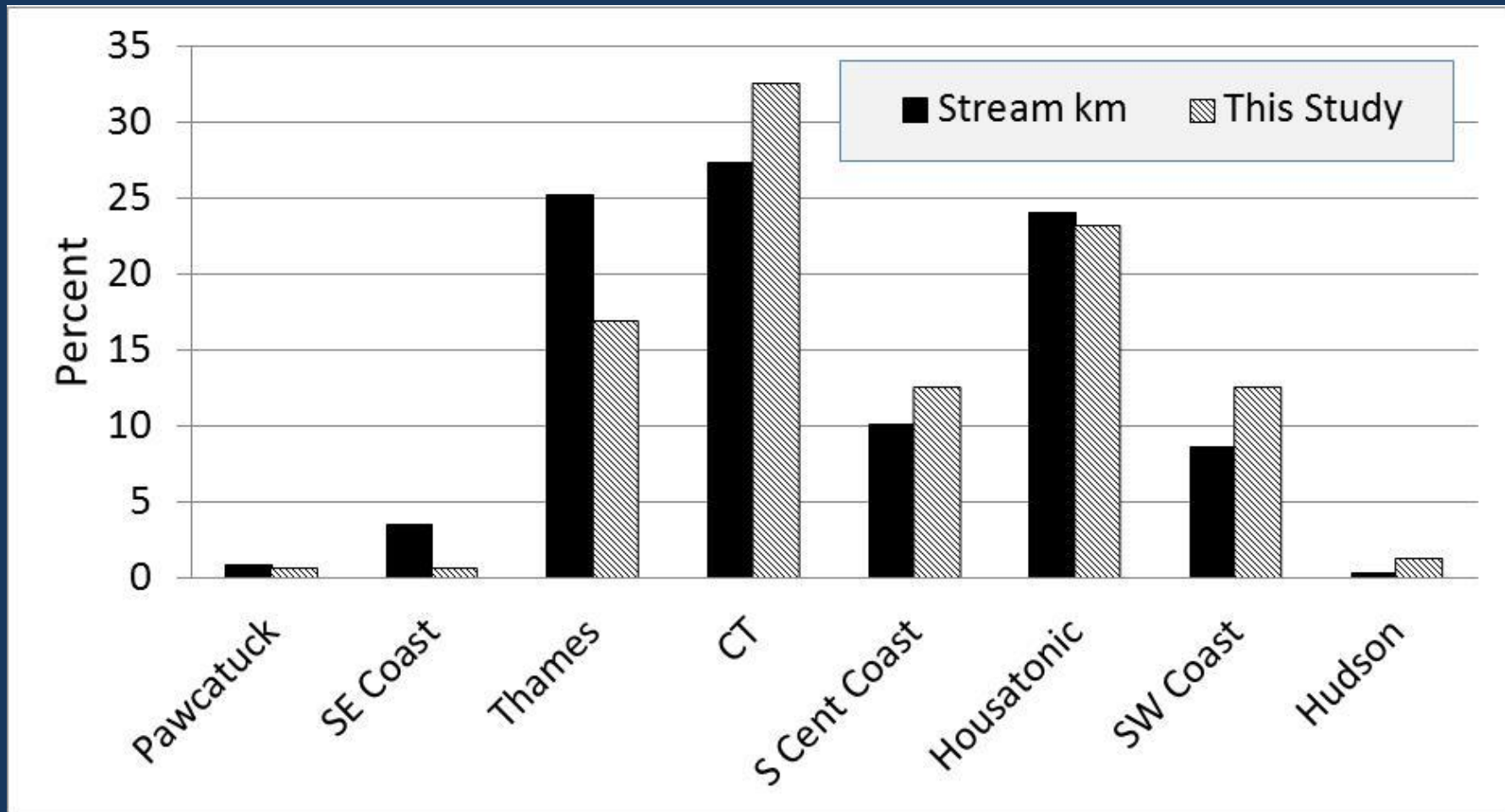
Long Island Sound

0 12.5 25 50 Kilometers



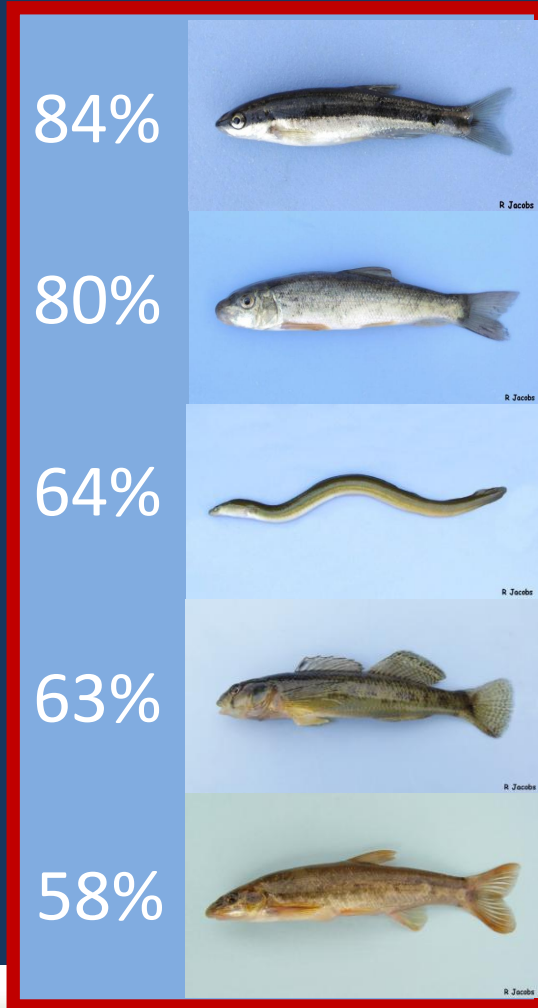


# Sites across the state



# 26 Fish Species

- 5 Most Common Species



- 4 species decrease in response to temperature increases



# Data Analysis

-Calculated summer temperature metrics<sup>1</sup> for all sites-  
June-Aug Mean, July Mean, Max Daily Mean

-Change points of fish community to temperature  
metrics using TITAN<sup>2</sup>

-Scatterplots of fish density and temperature metrics

-Identification of Indicator Species<sup>3</sup>

<sup>1</sup> Lyons, J., et al. 2009. NAJFM 29:1130-1151.

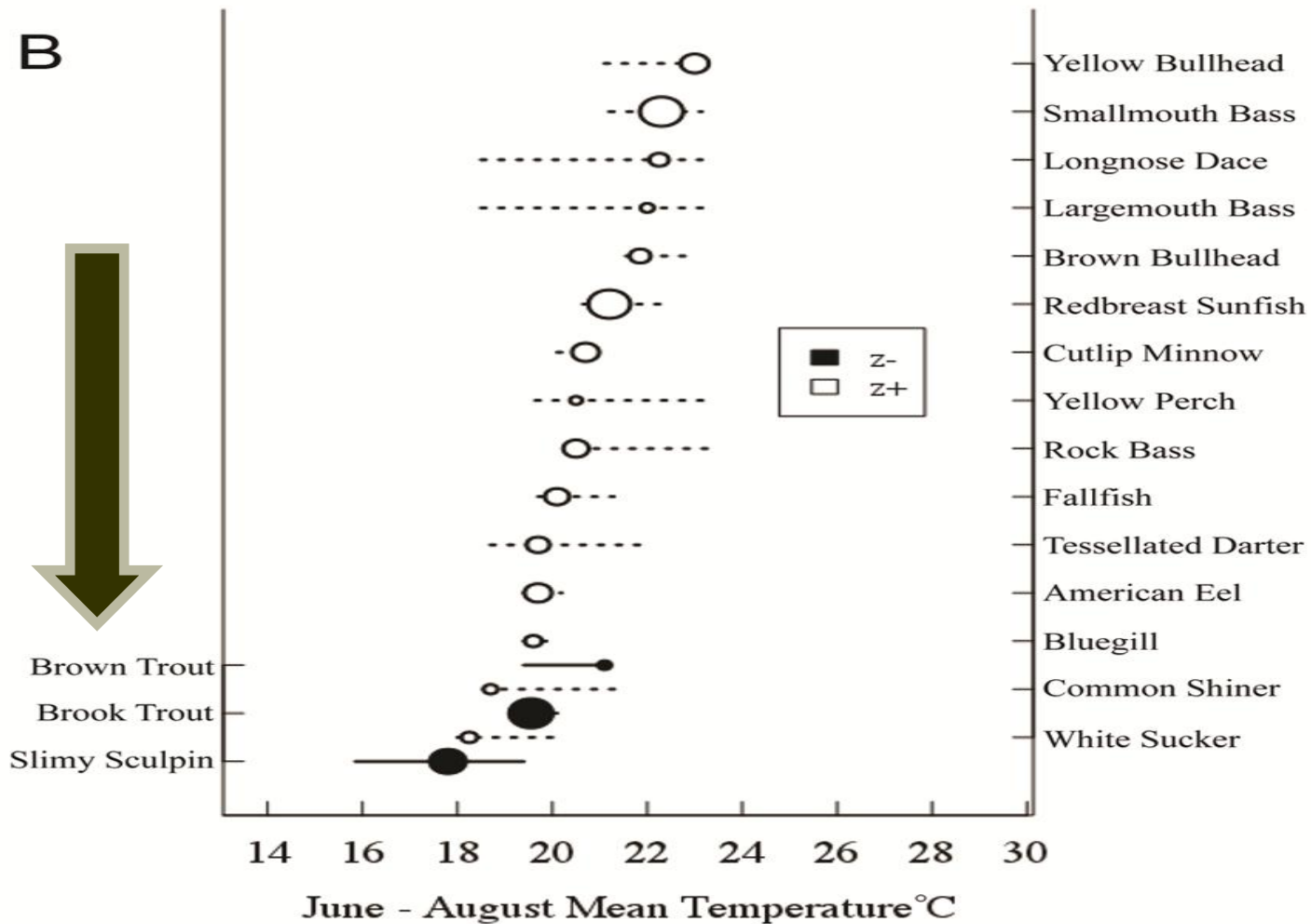
<sup>2</sup> Baker, M. E., and R. S. King. 2010. Methods in Ecology and Evolution 1:25-37.

<sup>3</sup> De C´aceres, M., P. Legendre, and M. Moretti. 2010. Oikos 119:1674–1684.

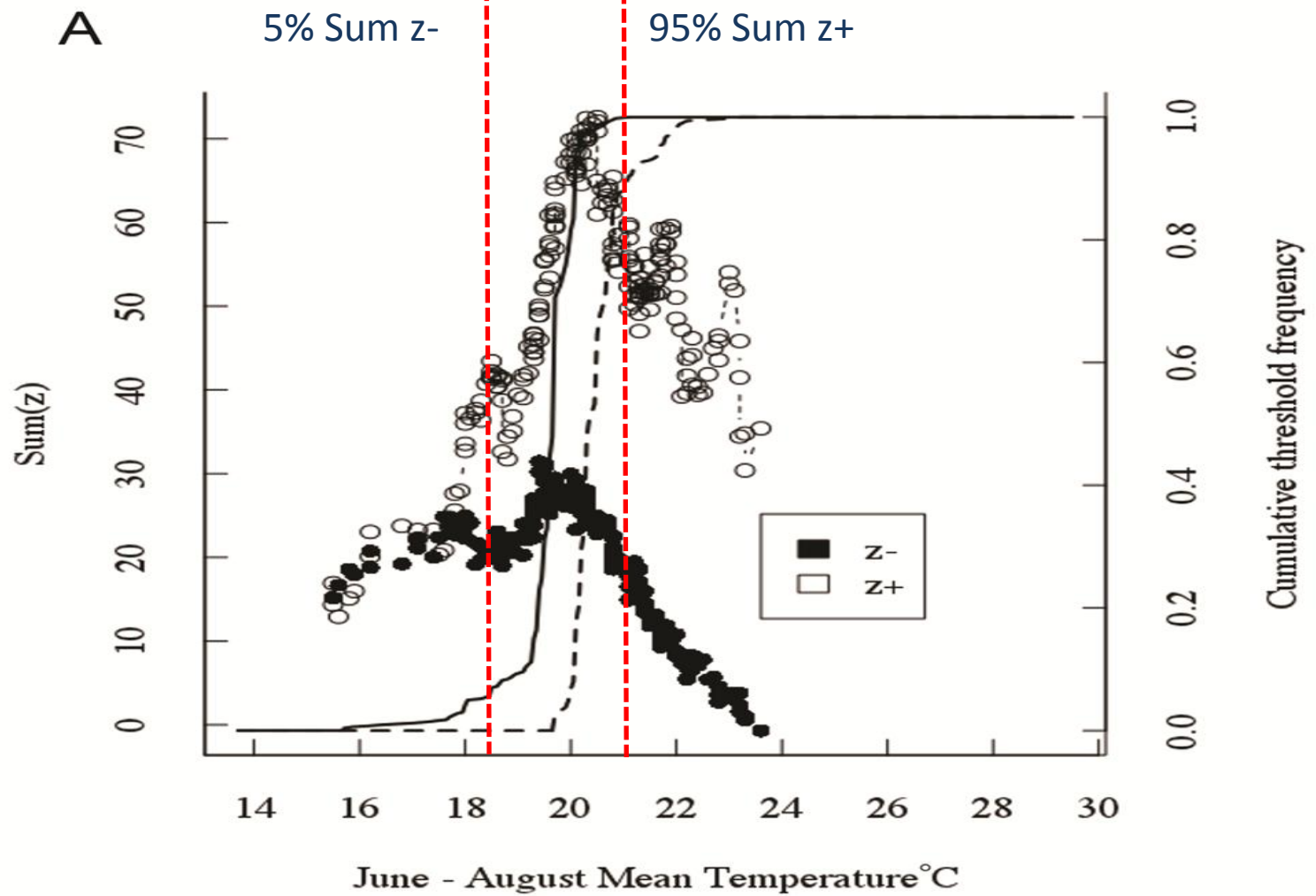




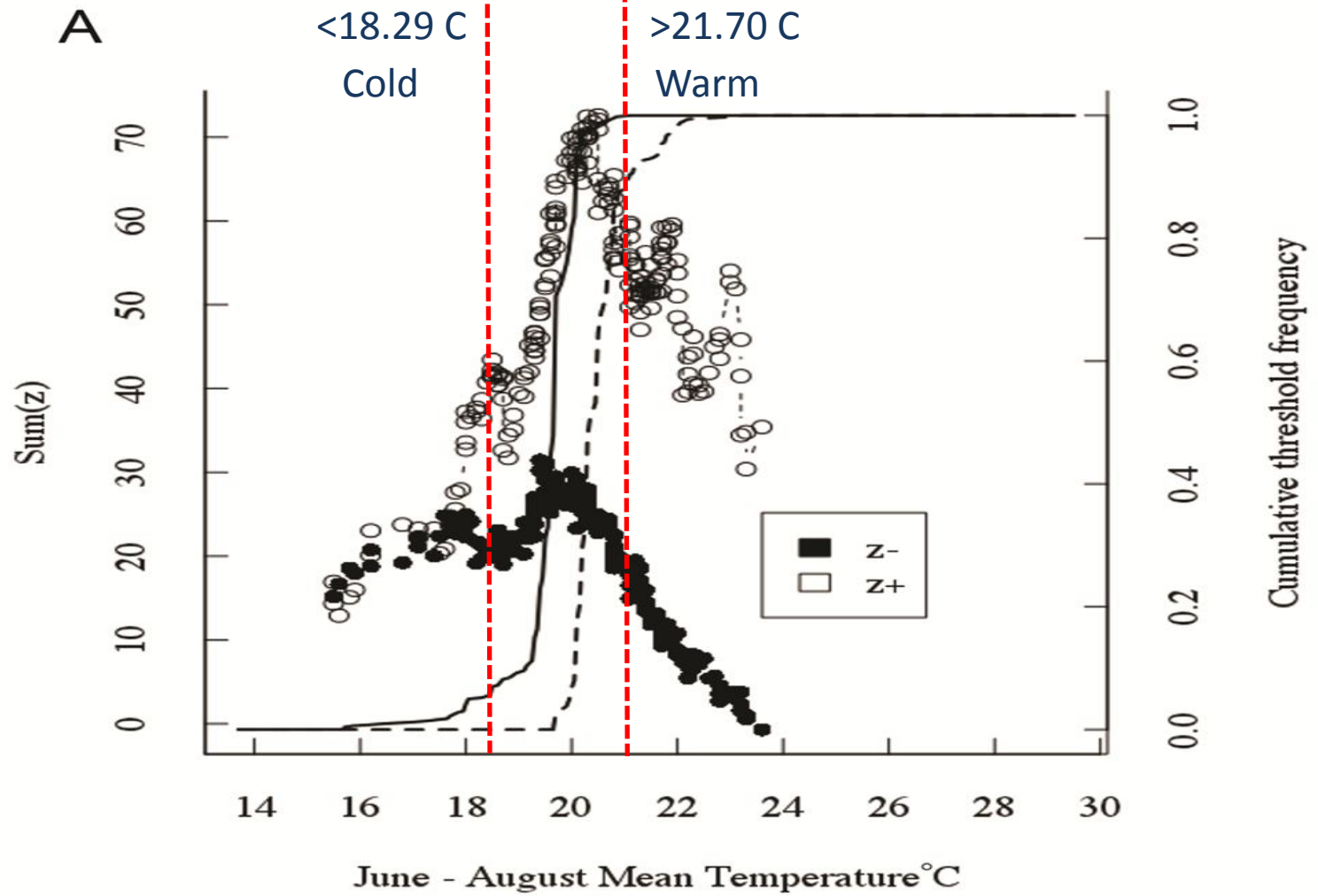
# TITAN Species Plot



# TITAN Community ? Plots



# TITAN Community ? Plots

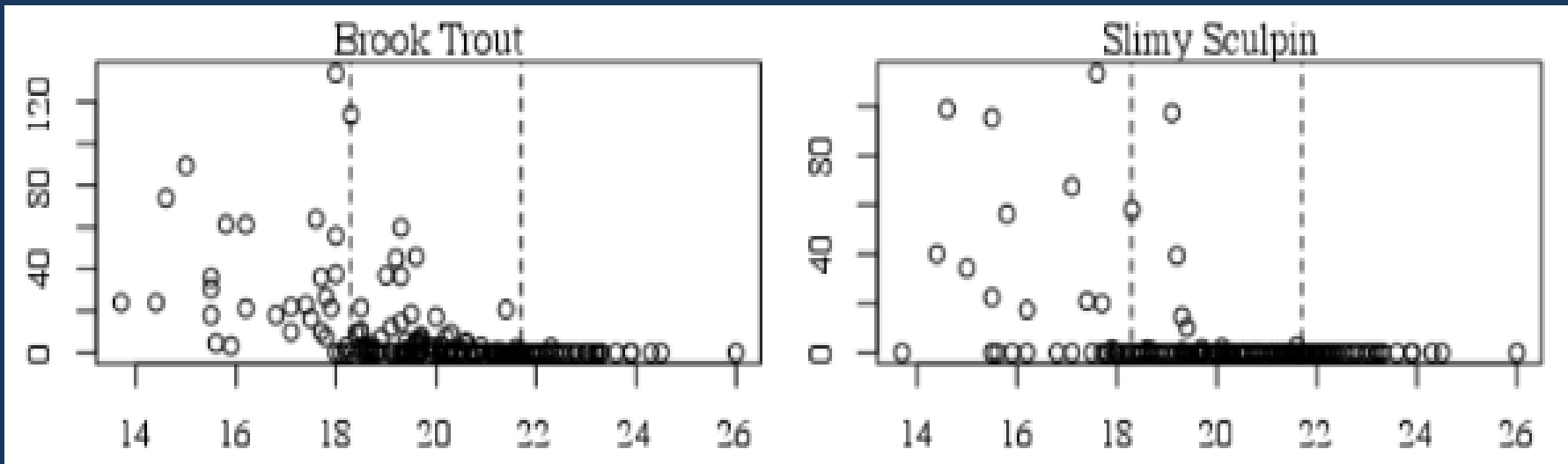




# Cold Water Species



Fish/100 M



June-August Mean Water Temperature -Celsius

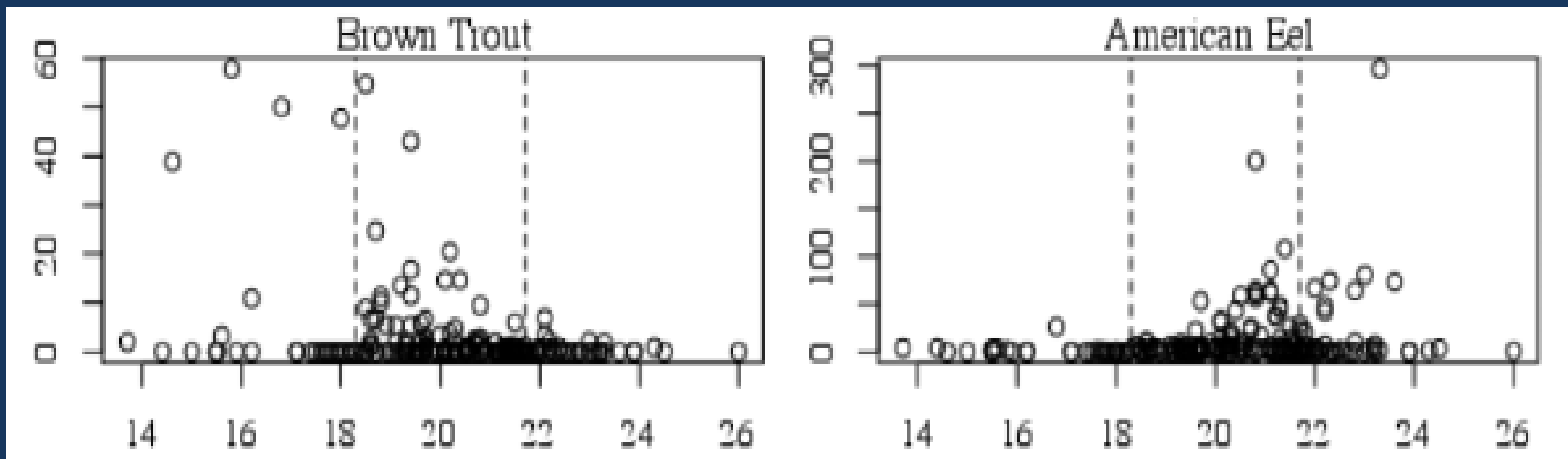


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# Tweeners



Fish/100 M



June-August Mean Water Temperature -Celsius

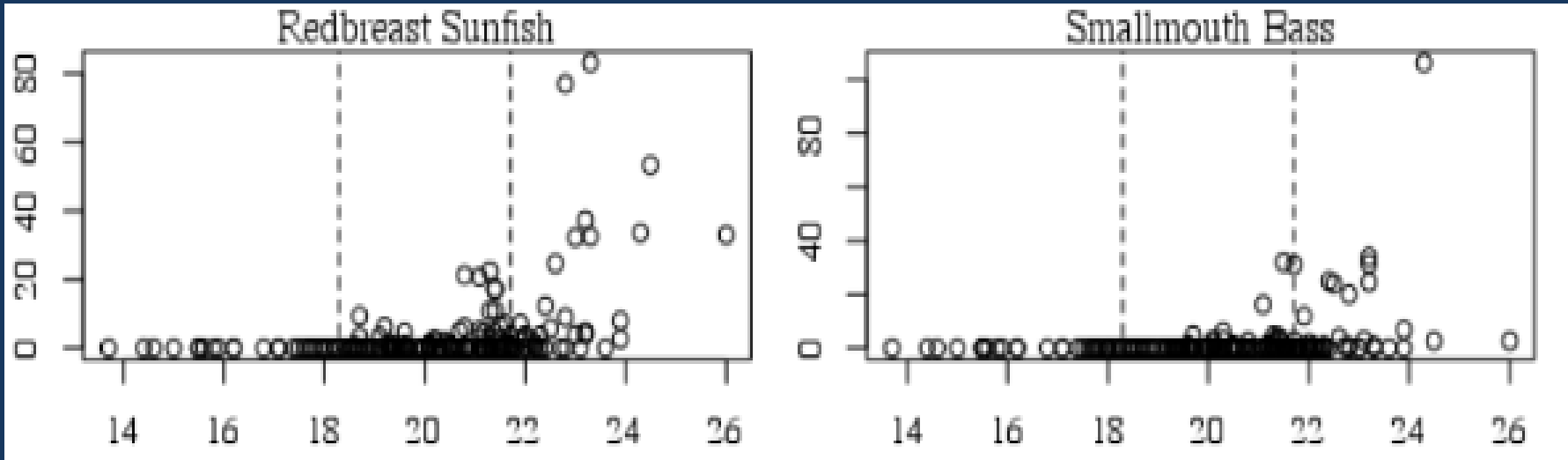


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# Warm Water Species



Fish/100 M



June-August Mean Water Temperature -Celsius

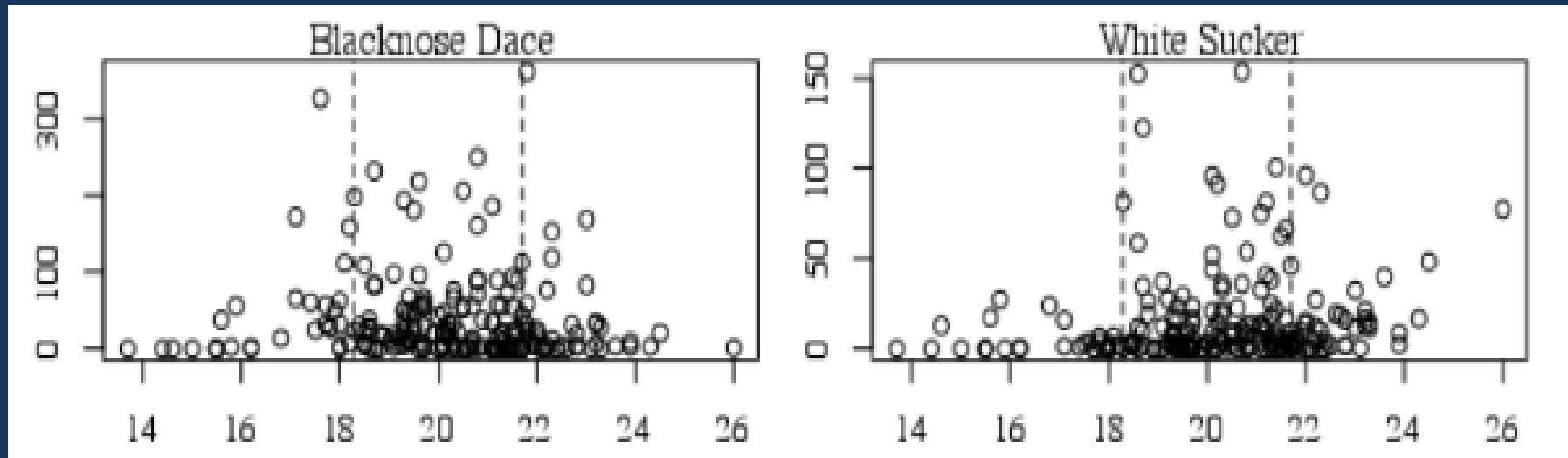




# Ubiquitous Species



Fish/100 M



June-August Mean Water Temperature -Celsius



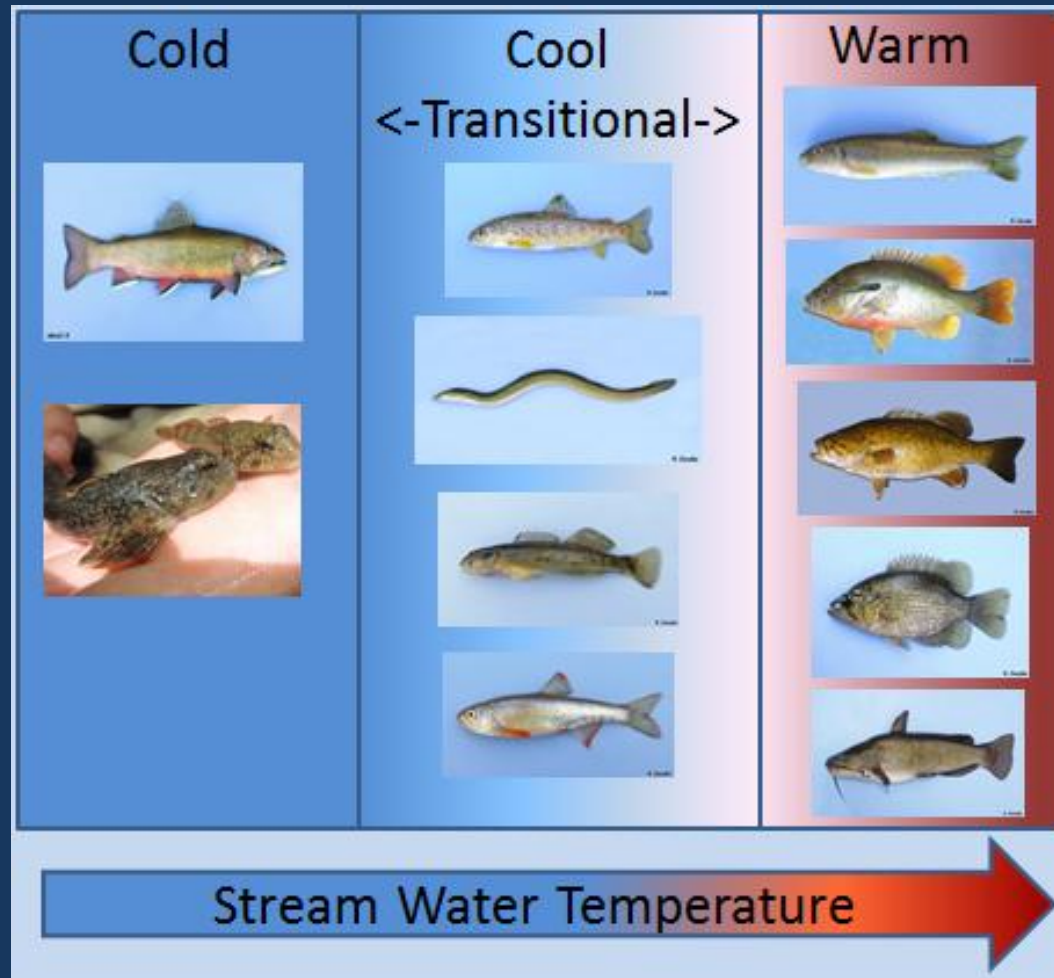
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# Comparison with Lyons et al Metrics

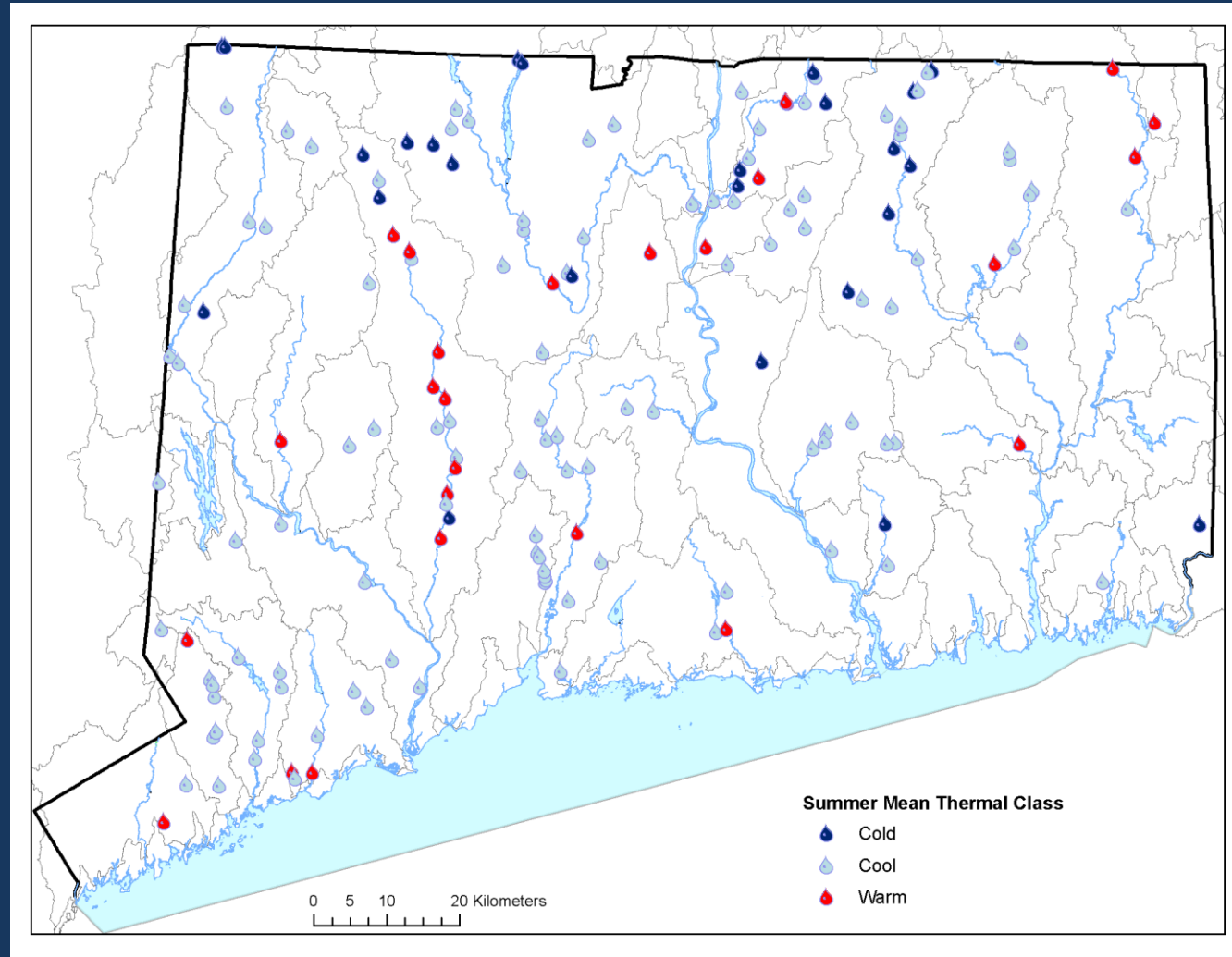
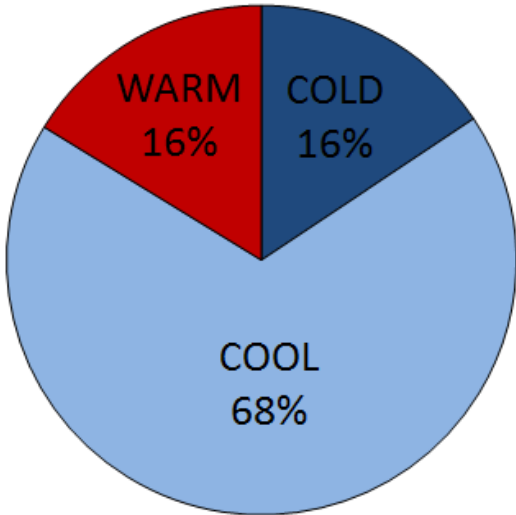
| Where  | Category | Maximum Daily Temp °C | July Mean Temp °C | June-Aug Temp °C |
|--------|----------|-----------------------|-------------------|------------------|
| MI, WI | Cold     | < 20.7                | < 17.5            | < 17.0           |
| CT     | Cold     | < 22.40               | < 18.45           | < 18.29          |
| MI, WI | Cool     | 20.7-24.6             | 17.5-21.0         | 17.0-20.5        |
| CT     | Cool     | 22.40-26.30           | 18.45-22.30       | 18.29-21.70      |
| MI, WI | Warm     | >24 .6                | >21.0             | >20.5            |
| CT     | Warm     | >26.30                | >22.30            | >21.70           |



# CT Stream Fish Assemblages



# Stream Temperature Distribution



# Water Temperature Matters

## Result # 1

Riverine Fish in CT Have Thermal Habitat Preferences

## Result # 2

Small temperatures changes ( $<3\text{C}$ ) are important

## Result #3

Cool water habitat appears to be the dominant habitat in CT

## Result #4

Current 85 and 4 should be re-examined. This analysis can help inform better stream temperature criteria.





# Questions?

Chris Bellucci

Supervising Environmental Analyst

[christopher.bellucci@ct.gov](mailto:christopher.bellucci@ct.gov)

860-424-3735



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