RESEARCH IN THE NORTH RIVER/ALBEMARLE SOUND ESTUARY: RULIFSON LAB, EAST CAROLINA UNIVERSITY

North River/Albemarle Sound Estuarine Symposium
Virginia Beach Convention Center, April 19, 2018

ROGER A. RULIFSON
DEPARTMENT OF BIOLOGY, AND INSTITUTE FOR COASTAL SCIENCE AND POLICY
EAST CAROLINA UNIVERSITY
GREENVILLE, NC
Using Water Chemistry and Otolith Chemistry to Determine Strategic Habitat Areas of Striped Bass (*Morone saxatilis*) and River Herring (*A. aestivalis* and *A. pseudoharengus*) in the Albemarle Estuarine System

Coley S. Hughes Cordiero
Coastal Resources Management PhD
NORTH CAROLINA STRATEGIC HABITAT AREAS (SHAs)

Issues

- Nursery habitat
- Juvenile abundance
How Does Otolith (Earbone) Chemistry Work?

WATER CHEMISTRY

• STABLE OVER TIME
• DETERMINED “SIGNALS” OF THE RIVERS

OTOLITH CHEMISTRY

• STRONTIUM (SR), BARIUM (BA), MANGANESE (MN), MAGNESIUM (MG)
Methods – Study Area
DOES WATER CHEMISTRY VARY SPATIALLY?  **YES**

- **STRONTIUM**
  - POSITIVE RELATIONSHIP WITH SALINITY
  - SIGNIFICANT DIFFERENCES AMONG RIVERS AND WITHIN RIVERS

- **BARIUM**
  - ELEVATED IN FRESHWATER RIVERS AND SITES
  - EXHIBITED ELEVATED LEVELS UPSTREAM AND BOTTOM OF ALL RIVERS
    - RIVERINE INPUT
    - GROUNDWATER DISCHARGE

- **MANGANESE**
  - HIGH LEVELS FOLLOWING HURRICANE IRENE (AUGUST 2011)
  - ELEVATED IN THE ROANOKE AND CHOWAN (PERQUIMANS)
    - ANTHROPOGENIC INPUTS
    - CONFINED ANIMAL FEEDING (CAFO) OPERATIONS

- **MAGNESIUM**
  - POSITIVE RELATIONSHIP WITH SALINITY
  - SIGNIFICANT DIFFERENCES AMONG RIVERS AND WITHIN RIVERS
Temporal Variability of Water Chemistry

DOES WATER CHEMISTRY VARY TEMPORALLY? Somewhat

• NO SIGNIFICANT VARIATION OVER SEASONS OR YEARS
  • SR, BA, MN
• SHORT TERM FLUCTUATIONS
  • MG
OTOLITH CHEMISTRY

CAN OTOLITH CHEMISTRY BE USED TO CLASSIFY FISH TO NURSERY HABITAT? **YES**

- **RANDOM FORESTS**
- **PERQUIMANS RIVER**
  - MOHAN 85.53%
  - HUGHES 71.82-77.94%

CAN OTOLITH CHEMISTRY BE USED TO COMPARE NURSERY HABITAT? **YES**

- **QUANTITATIVE METHOD FOR PREDICTING HABITAT**
  - CHOW = BA
  - PERQ = MN
  - PASQ = SR & MG
- **HABITAT RANKINGS BY UTILIZATION**
  - PERQ > CHOW > PASQ
# Predictability of Juvenile River Herring to Nursery Based on Otolith Chemistry

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Adult Classification Based on Juvenile Signatures

- CHOW: 64.4%
  - SCUPP: 11.1%
  - ROAN: 23.8%
  - PERQ: 14.3%
  - PASQ: 28.6%
  - NORTH: 4.8%
  - LITTLE: 20.0%
  - ALLI: 20.0%

- PERQ: 40.0%
  - SCUPP: 20.0%
  - ROAN: 4.8%
  - PASQ: 23.8%
  - NORTH: 14.3%
  - LITTLE: 28.6%
  - ALLI: 11.1%

- SCUPP: 20.0%
  - ROAN: 4.8%
  - PASQ: 23.8%
  - NORTH: 14.3%
  - LITTLE: 28.6%
  - ALLI: 11.1%
  - CHOW: 17.8%
DEMAND FOR WATER IN THE NORTH RIVER/ALBEMARLE ESTUARY
COASTAL DEVELOPMENT IS PUSHING WATER RESOURCES: RO WTP GROWTH
ACKNOWLEDGEMENTS

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