beginning to understand how AIS disrupt sport fisheries

Bethany Bethke • MN DNR
2017 MAISRC Showcase
A Collaborative Project
Infestations Over Time

WATER BODIES

WATER BODIES

[Graph showing the increase in infestations over time from 2000 to 2015.]
Known Impacts
Unknown Impacts
What’s the problem?
What’s the problem?
Or...?
Study Goals

• Across varying stages of invasion:
  1. Assess small fish growth
  2. Compare fish food habits
Our Large Lakes

- Cass
- Kabetogama
- Lake of the Woods
- Mille Lacs
- Rainy
- Red
- Vermilion
- Winnibigoshish
Our Large Lakes

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Our Large Lakes
Leveraging Large Lake Sampling
What we’re after
How we’ll get it

Field sampling
- Summer
  - Seine for small fish
  - Collect invertebrates by any means possible
- Fall
  - DNR netting for adult fish
Bigger is Better

Larger fish:
• Eat a wider variety of prey
• Can escape predators better
• Have more energy reserves for winter
Small fish growth

• Compare sizes:
  • Walleye (age-0)
  • Yellow Perch

• Historical data
  • 1980’s onward
  • Before/after invasion

• Does the presence of zebra mussels or spiny waterflea lead to reduced growth?
Tissues tell a story
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Nitrogen

Offshore Carbon

Nearshore Carbon
You are what you eat

Diagram showing carbon and nitrogen isotope ratios for different species:
- Cisco
- Walleye
- Yellow Perch
- Northern Pike
- Bluegill
- Zooplankton
- Nearshore invertebrates
You are what you eat
Informing Management

• What can we expect to happen to walleye when an invasive is found?
  • Other fish?
• Do the effects vary by lake?
• Is there a key component of a lake that helps to buffer against AIS effects?
Thanks!

• Funding
  • Environmental and Natural Resources Trust Fund
  • Federal Aid - Sport Fish Restoration

• Field work
  • Large Lake Staff
    • DNR and Red Lake Nation

• Photo credits:
  • Zebra mussel: Nature and Outdoor Tourism Ontario
  • Sport Fish: fws.gov, fishingplanet.wiki
  • Spiny waterflea: kids.invadingspecies.com

• Plankton: planktonmania.org
• YOY walleye: fishingparadise3d.com
• Midge: thecatchandthehatch.com
QUESTIONS AND DISCUSSION
More about isotopes
Heavy and Light Atoms

Carbon – 12

Carbon – 13
Isotopes are Naturally Occurring

Stable Isotope Ecology Brian Fry
“Heavy” and “Light” Atoms

$^{13}\text{C}$

- A regular Carbon atom has:
  - 6 Electrons
  - 6 Protons
  - 6 Neutrons
  - An atomic mass of 12 ($^{12}\text{C}$)

- A carbon isotope has:
  - 6 Electrons
  - 6 Protons
  - 6 Neutrons
  - An atomic mass of 13 ($^{13}\text{C}$)

$^{15}\text{N}$

- A regular Nitrogen atom has:
  - 7 Electrons
  - 7 Protons
  - 7 Neutrons
  - An atomic mass of 14 ($^{14}\text{N}$)

- A carbon isotope has:
  - 7 Electrons
  - 7 Protons
  - 8 Neutrons
  - An atomic mass of 14 ($^{14}\text{N}$)
Other invasive species

• Rusty Crayfish
• Banded Mystery Snails
• Starry Stonewort