FISHING & ALEWIFE

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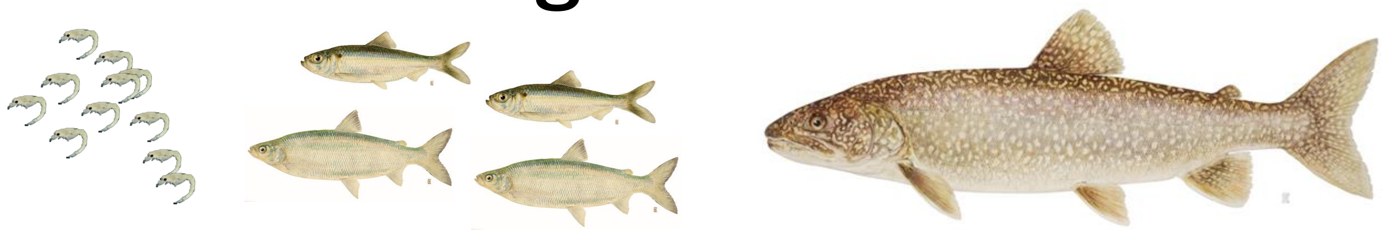
Dept of Natural Resources and the Environment

Cornell University

2025 ANNUAL MEMBERSHIP MEETING

It's all about Alewife: The value of long-term datasets to navigate fisheries restoration



Keuka Lake Association – Saturday 19 July 2025

Alex Koeberle, Brad Hammers, Dan Mulhall, Web Pearsall, Tom Stewart, Evan Cooch, Jim Watkins, Suresh Sethi, and Lars Rudstam

Keuka Lake project collaborators:

Research funding:

Today's Outline:

1. What **causes** alewife collapse?
2. What are the **consequences** of alewife collapse?
3. **Why is this important** for native fish restoration?

Local application:
Cisco restoration in Keuka Lake

Why are prey fish important?

- Important **food web link** between lower trophic **plankton** and upper trophic **predator fish**
- Prey fish populations **sustain** important commercial + recreational **fisheries**
- Water quality indicators: '**canary in the coal mine**'

Cisco (*Coregonus artedi*)

Alewife (*Alosa pseudoharengus*)

Why reintroduce Cisco to Keuka Lake?

Historical food web

<u>Top predator</u>:
Wild Lake Trout (*Salvelinus namaycush*)

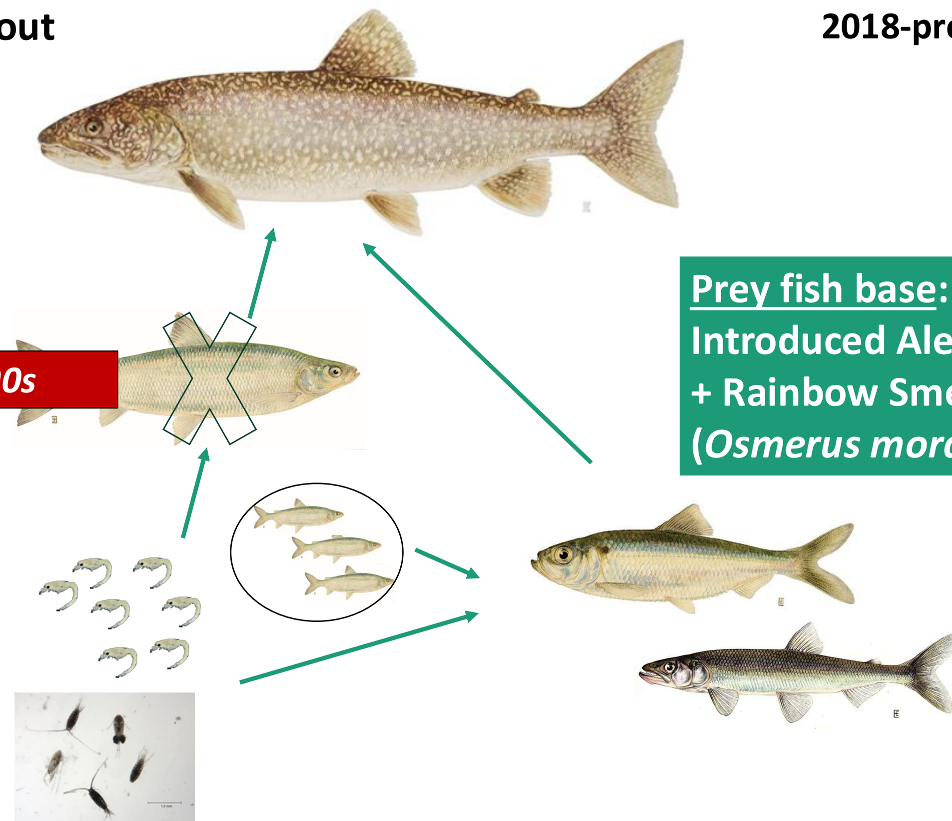
<u>Prey fish base</u>:
Cisco

<u>Lower trophic</u>:
Mysids (*Mysis diluviana*) + zooplankton

Why reintroduce Cisco to Keuka Lake?

Current food web

Top predator: Wild Lake Trout (*Salvelinus namaycush*)



Cisco

Extirpated mid-1990s

Prey fish base: Introduced Alewife + Rainbow Smelt (*Osmerus mordax*)

Lower trophic: Mysids (*Mysis diluviana*) + zooplankton

NYSDEC Cisco reintroduction 2018-present

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USGS science for a changing world

THE LIFE HISTORY AND ECOLOGICAL RELATIONSHIPS OF THE ALEWIFE (*POMOLOBUS PSEUDOHARENGUS* [WILSON]) IN SENECA LAKE, NEW YORK[1]

T. T. Odell
Hobart College, Geneva, N. Y.

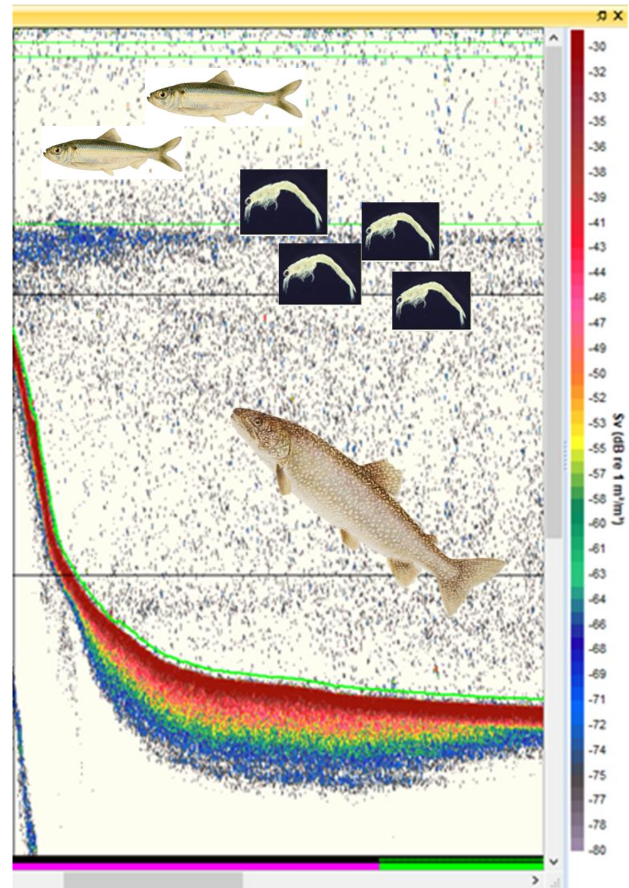
"The author believes that the alewife is a much more desirable fish to introduce into lakes."
- Odell (1934) *Transactions of American Fisheries Society*.

Cisco catch in 1918, Great Lakes. Image from National Museum of the Great Lakes

Keuka Lake food web analysis outline

1. Survey methods
2. Alewife population
3. Water quality
4. Zooplankton
5. Lake Trout
6. Future consequences

Keuka Lake food web analysis: survey methods

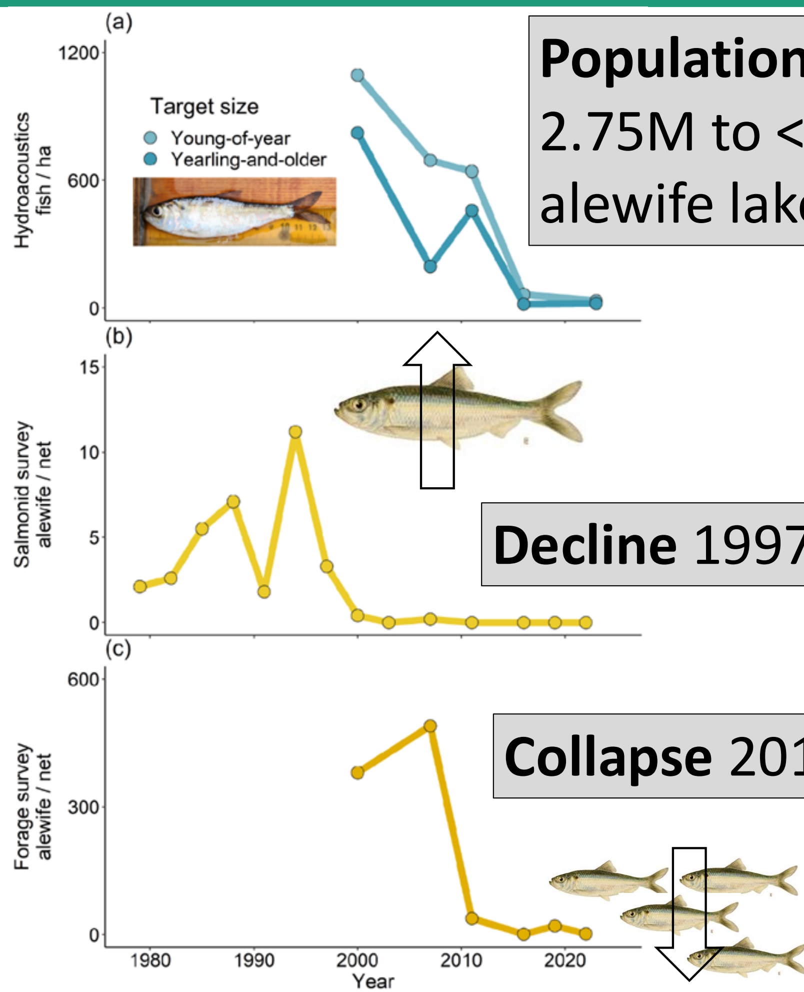


Alewife collapse timing + magnitude

Hydroacoustics

Standard Lake Trout gillnet

Forage gillnet



Population decrease
2.75M to <90K adult alewife lake-wide

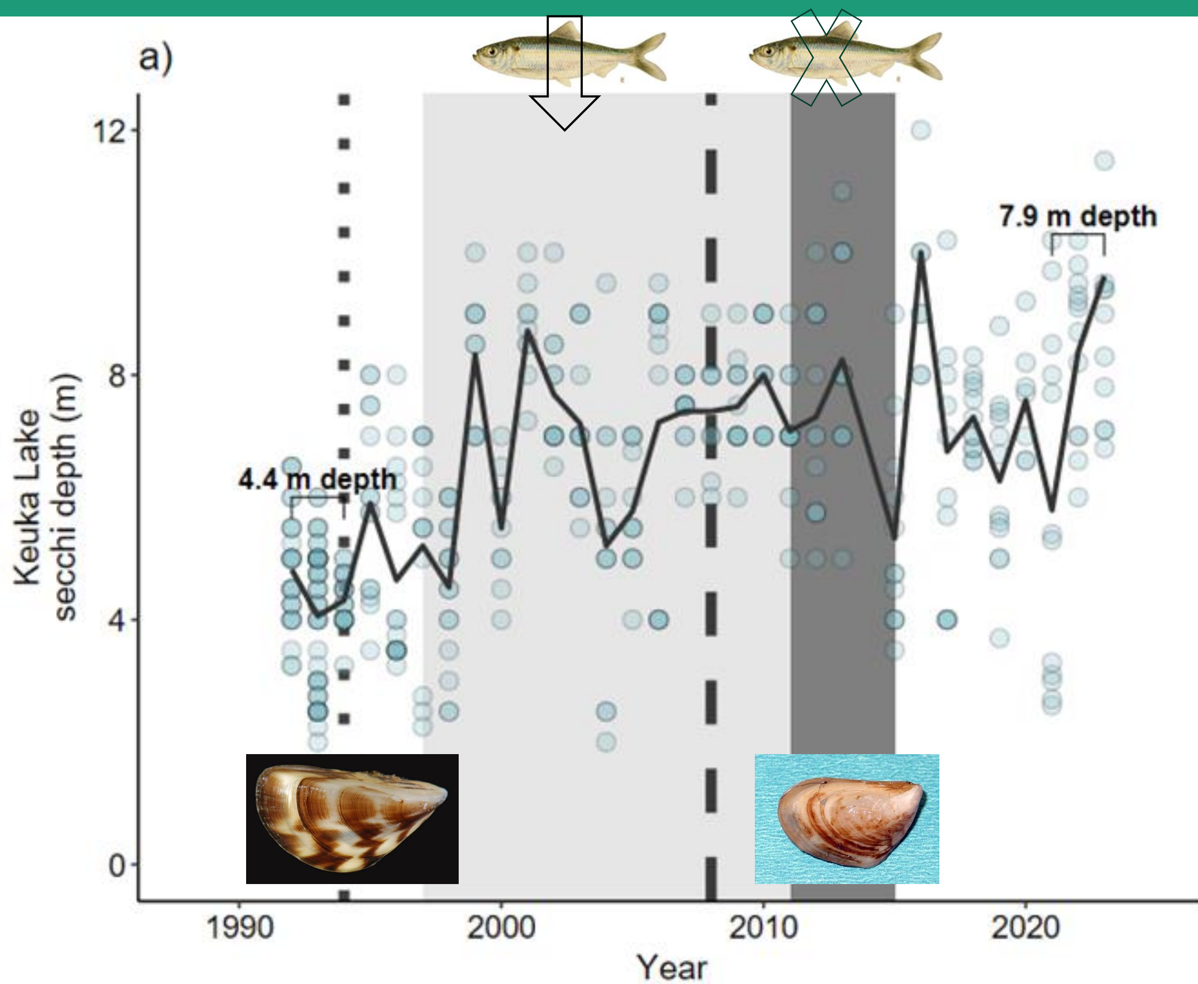
Decline 1997-2011

Collapse 2011-2015

__Hypotheses__:

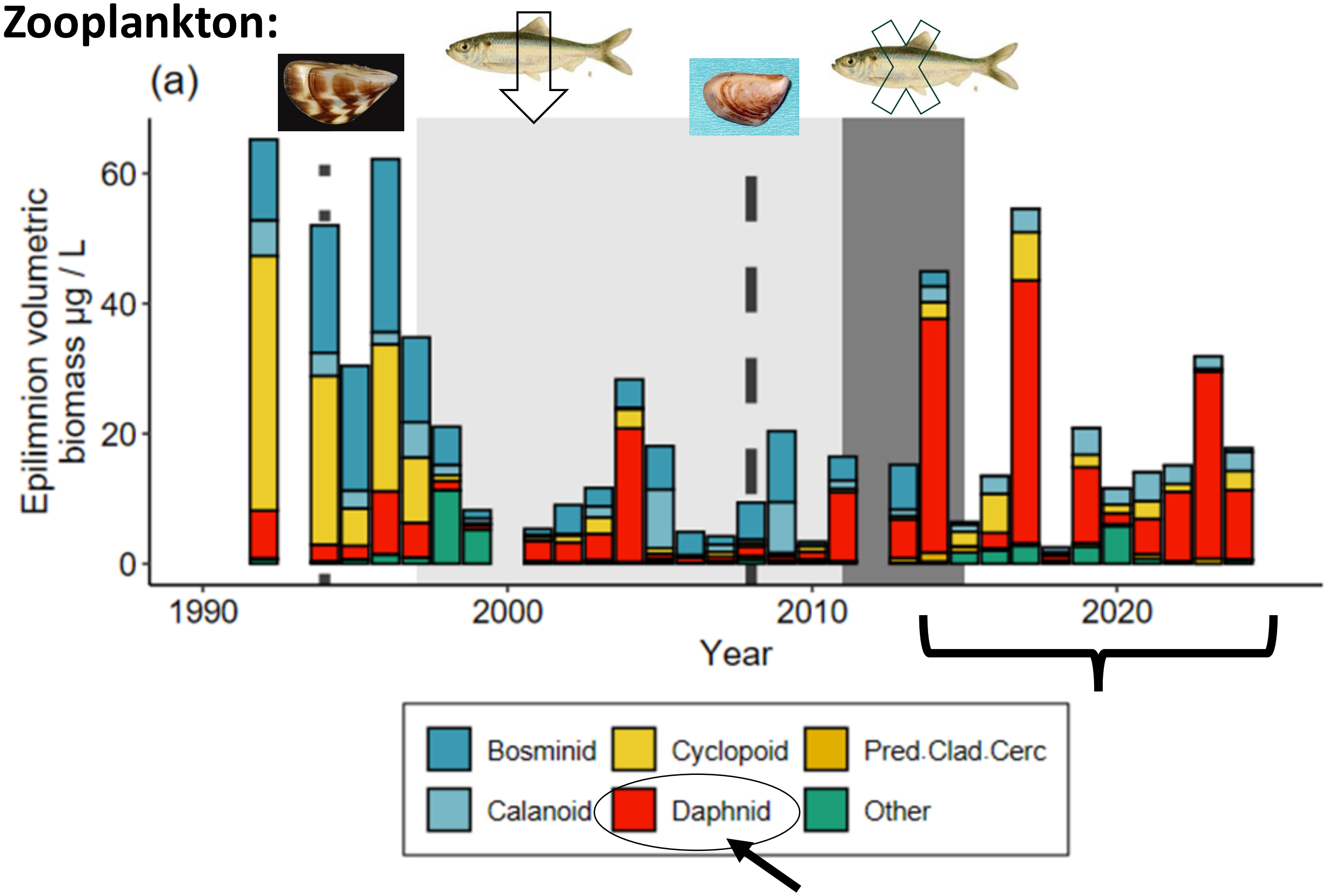
I. Declining productivity + food
II. Lake Trout predation
III. Cold winters

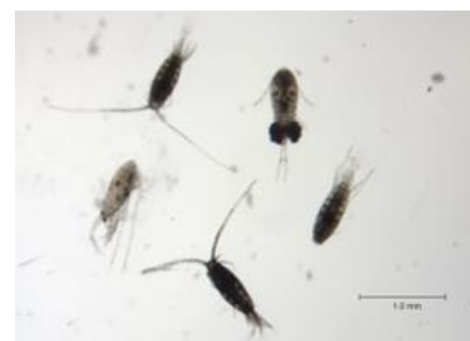
Hypothesis I: Declining productivity



Hypothesis I: Declining food availability

Zooplankton:

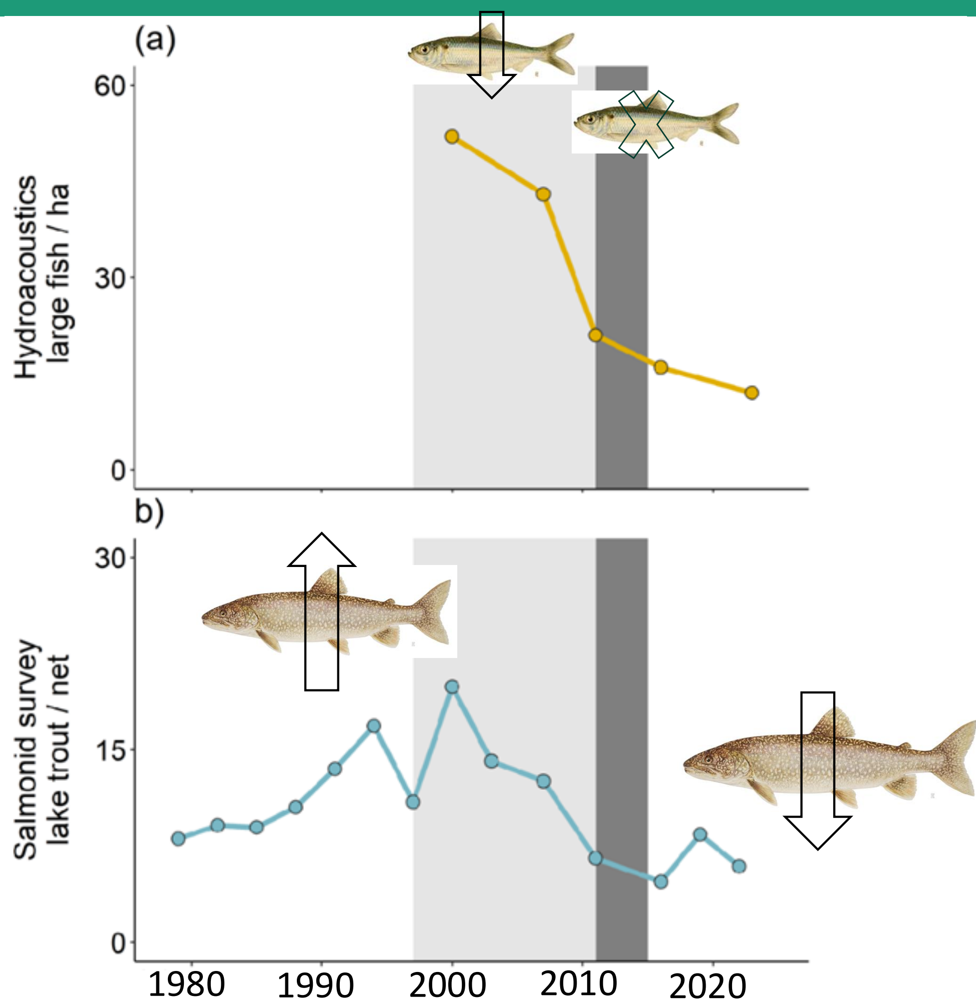




Hypothesis II: Lake Trout predation

Hydroacoustics

Standard Lake Trout gillnet



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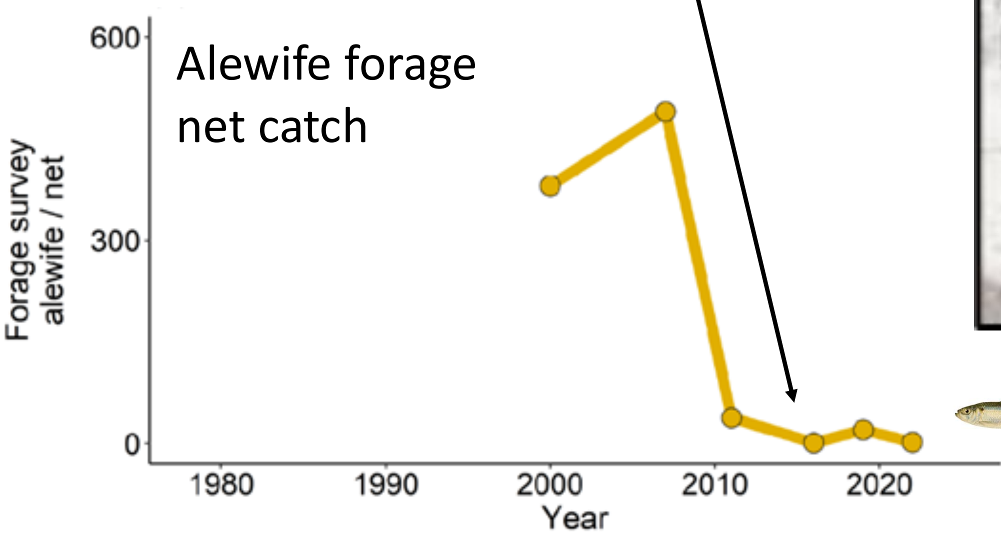
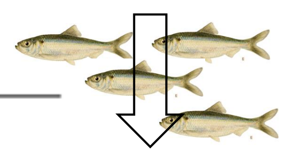
Hypothesis III: Cold winters

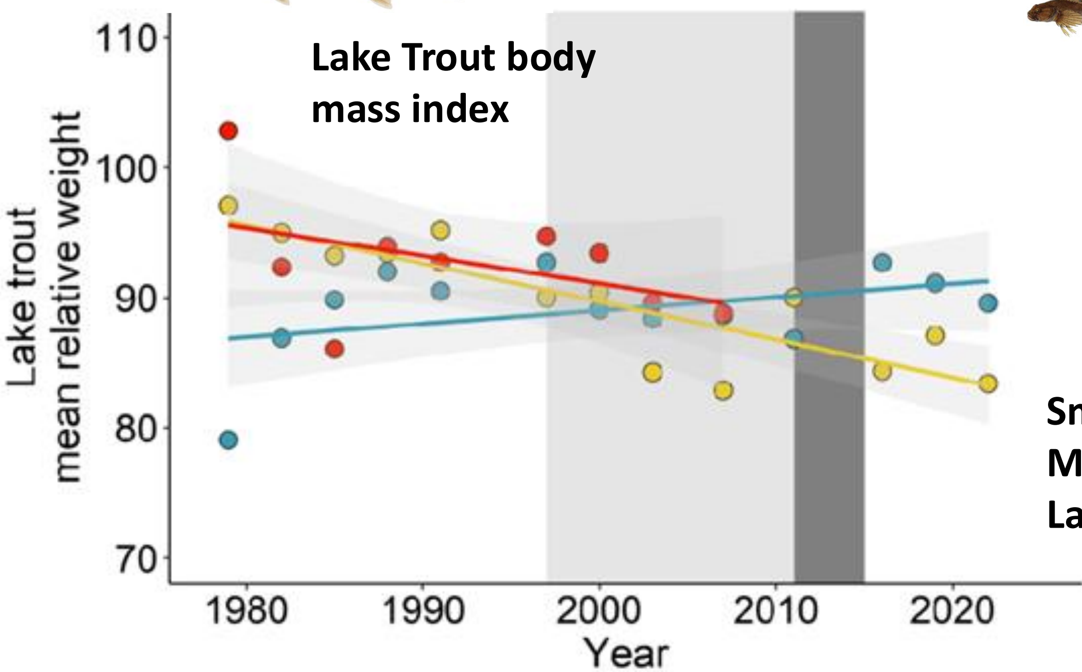
Polar vortex years 2014/2015



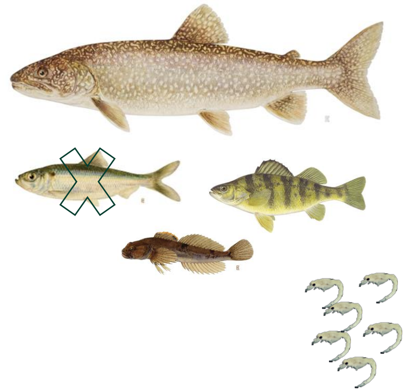


What are the consequences for Keuka Lake?

Upper trophic

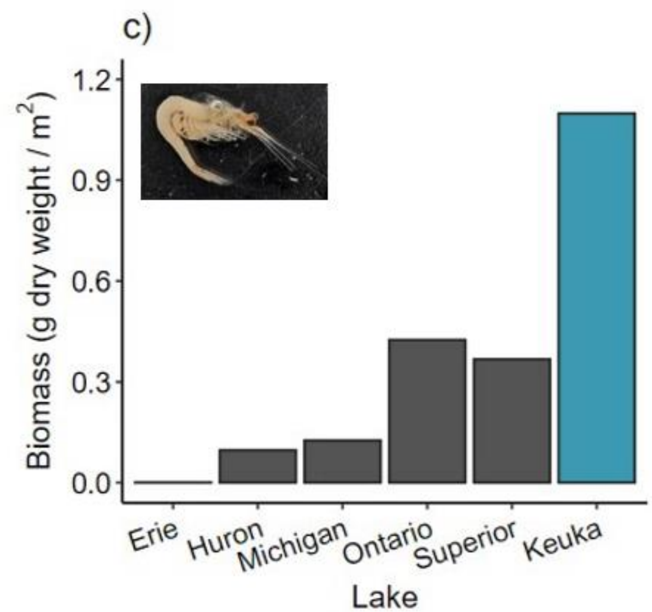


Small < 20”
Medium < 25”
Large > 25”

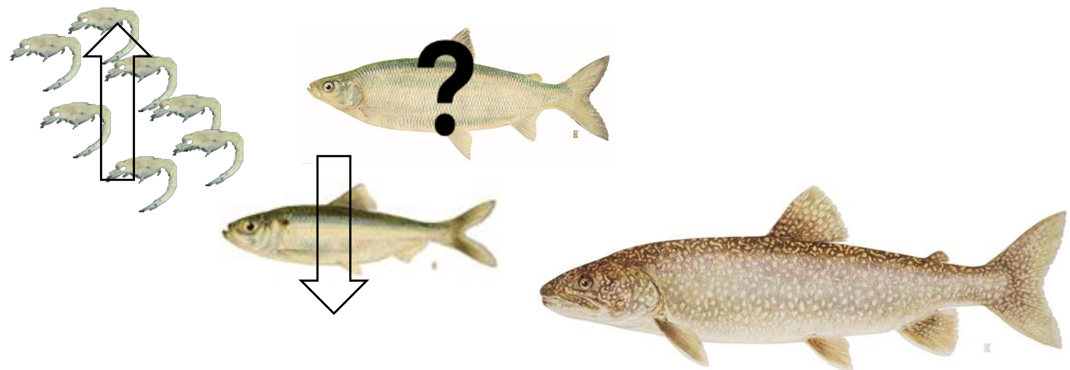


Lower trophic

2024 mysid survey:



Study conclusions:



1. What **caused** the Alewife collapse in Keuka Lake? **A combination of (I) declining plankton, (II) high Lake Trout predation, and (III) a few cold winters 2014/2015.**
2. What are the **consequences** of Alewife collapse? **Increased zooplankton biomass, decreased Lake Trout condition.**
3. **Why is this important** for Cisco restoration? **Changing lake conditions and high food availability (mysis + zooplankton) provide an opportunity to restore native prey fish.**

Thank you KLA, and any questions?

Acknowledgements

- New York State Dept. of Environmental Conservation
- New York Sea Grant (NOAA)
- Centre for Ecosystem Management (University of Guelph)
- USGS Tunison Laboratory of Aquatic Science
- US Fish and Wildlife Service Northeast Fishery Center
- Keuka Lake Association
- Cornell Biological Field Station at Shackelton Point
- Department of Natural Resources and the Environment (Cornell University)
- Mysis + acoustics: Sarah Lawhun, Kayden Nasworthy, Ondine Morgan-Knapp, Rory Paltridge
- Title slide photo: Sarah Rubenstein (USGS-Tunison)
- **LIM collaborators**: Doran Mason, Marten Koops, Dick van Oevelen, Kevin McCann, KC Cazelles, Kayla Hale, Henrique Giacomini
- **PhD Committee**: Suresh Sethi, Lars Rudstam, Evan Cooch, and Brad Hammers (NYSDEC)

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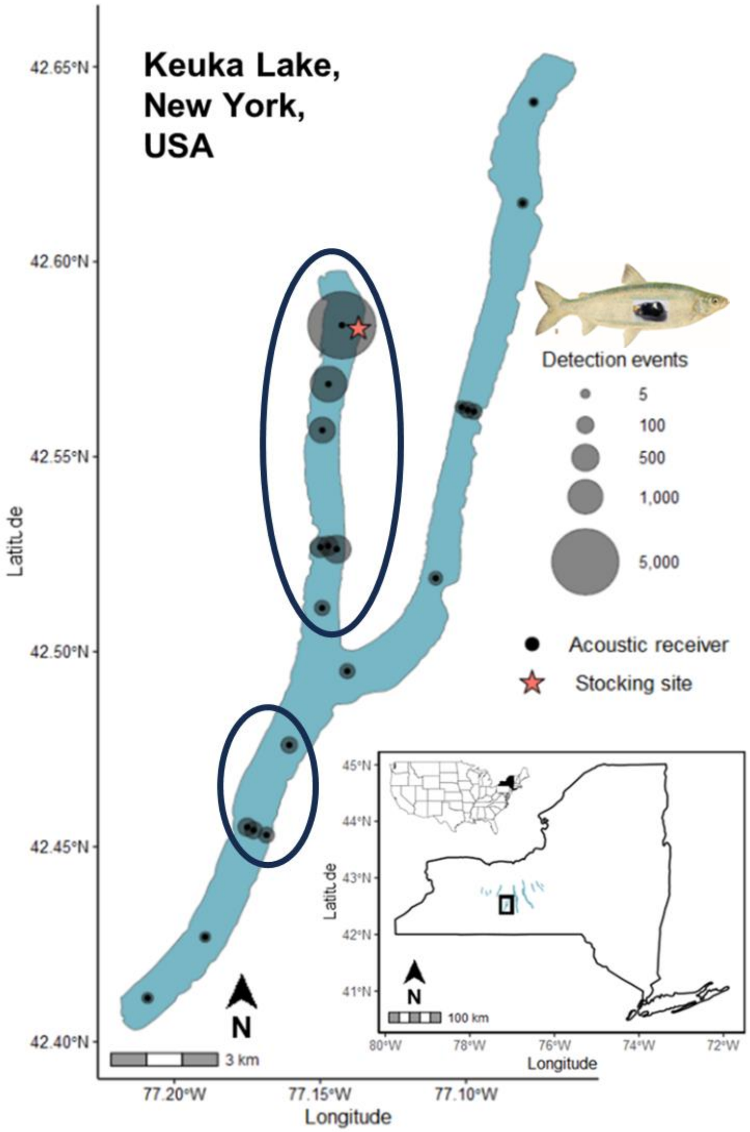


Cisco monitoring: Acoustic telemetry + small tags (<1g)

Telemetry study:
- *n* = 272 tagged juvenile fish
- Monitoring from 2018 to 2021

<u>'Size-Efficiency Hypothesis'</u>:
No alewife = larger zooplankton

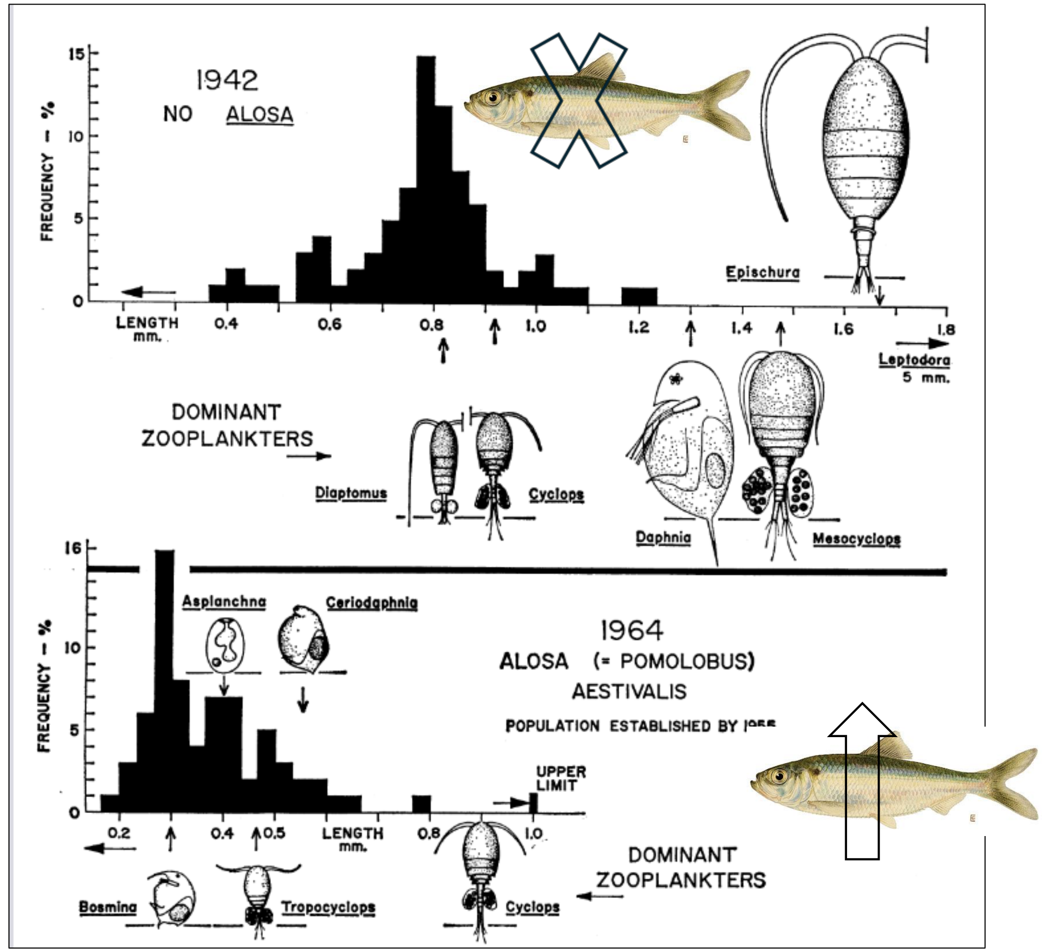
Predation, Body Size, and Composition of Plankton

The effect of a marine planktivore on lake plankton illustrates theory of size, competition, and predation.

John Langdon Brooks and Stanley I. Dodson

During an examination of the distribution of the cladoceran *Daphnia* in the lakes of southern New England, it was noted that large *Daphnia*, although present in most of the lakes, could not be found among the plankton of several lakes near the eastern half of

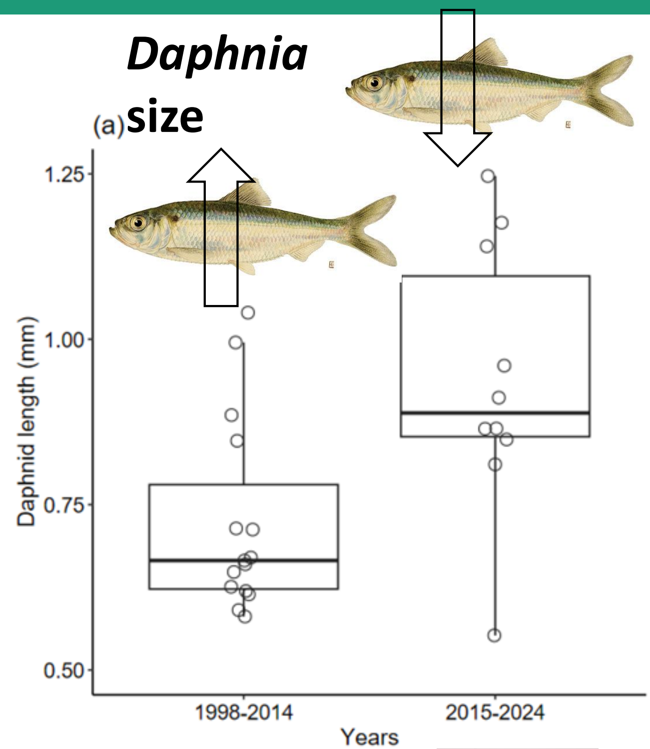
The marine populations live in the coastal waters of the western Atlantic, from the Gulf of St. Lawrence to North Carolina, and ascend rivers and streams to spawn in springtime. The young return to the sea in summer and autumn (*4*). The seven Connecticut lakes (Fig.



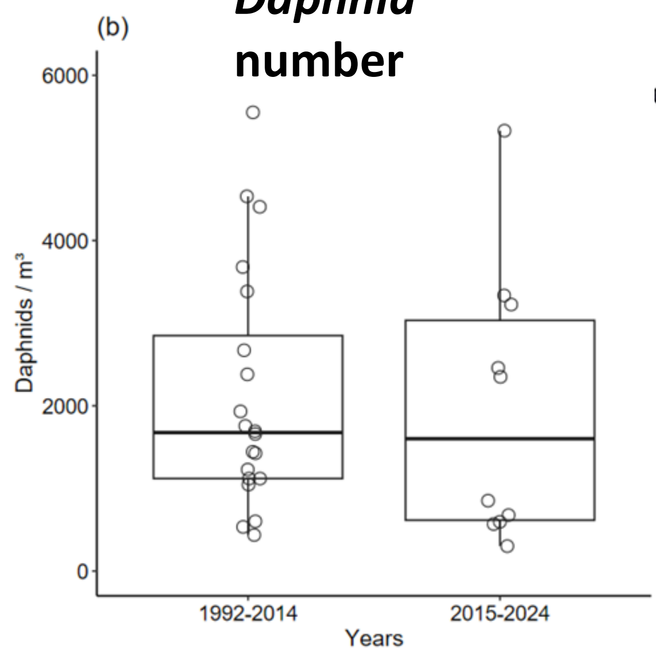
Taken from Brooks and Dodson (1965) *Science*

Keuka Lake changes: zooplankton results

***Daphnia* size**



***Daphnia* number**



Daphnia retrocurva

Daphnia pulicaria

After alewife collapse:
Increase in larger zooplankton