

Current Status of Preyfish in Lake Michigan

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Introduction

- Lake Michigan ecosystem continues to change and suffer from degradation
- Invasives have exerted major influence
- Chlorophyll a , primary production have decreased
- Key native species gone or nearly gone
 - *Diporeia sp.*, cisco, kiyi, emerald shiner
- Preyfish well below FCO

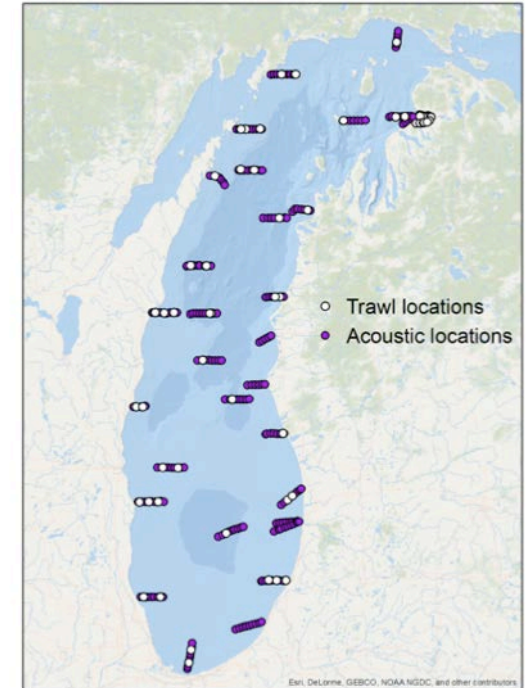
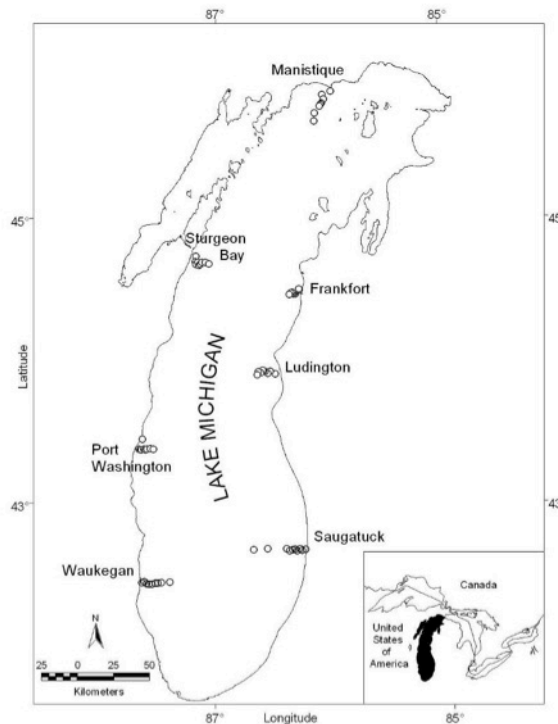
Preyfish – an Overview

- Important to economically/ecologically valuable fish
 - Chinook heavily reliant on alewife
 - Lake trout reliant on alewife, bloater, sculpins
 - Many species utilizing goby
- Important for food web
 - Conduit for energy/nutrients between benthic and pelagic zones
 - Link between zooplankton and piscivores
 - Can influence structure of zooplankton communities

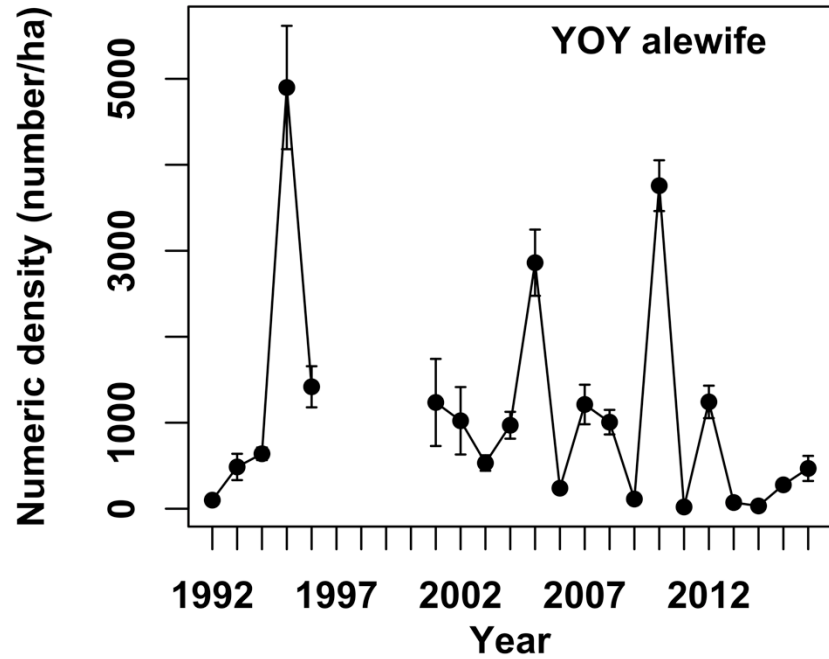
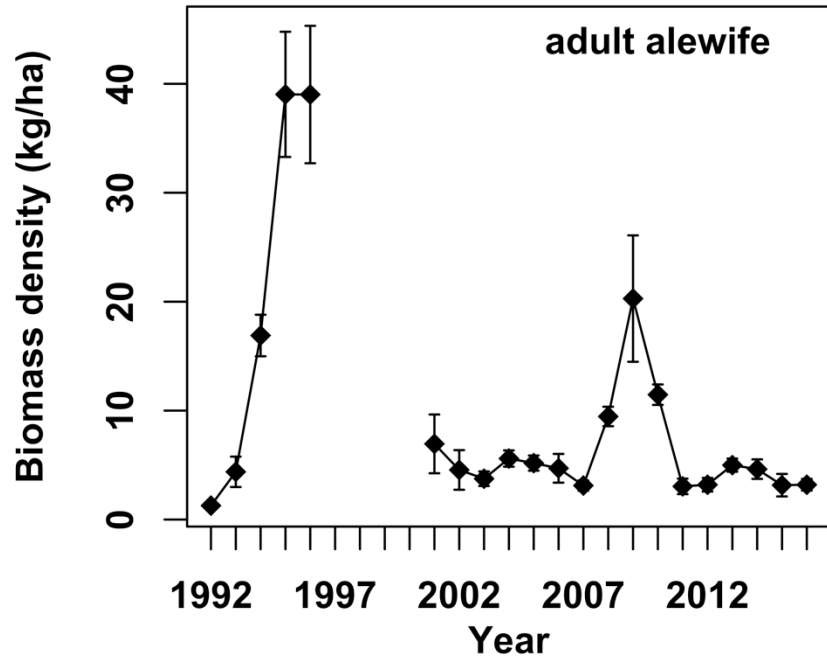
Outline

- Introduction
- Survey methodology
- Temporal and spatial patterns in fish species
 - Species common to lakewide surveys
 - Benthic fish from bottom trawl
- Lakewide survey context
- Conclusions

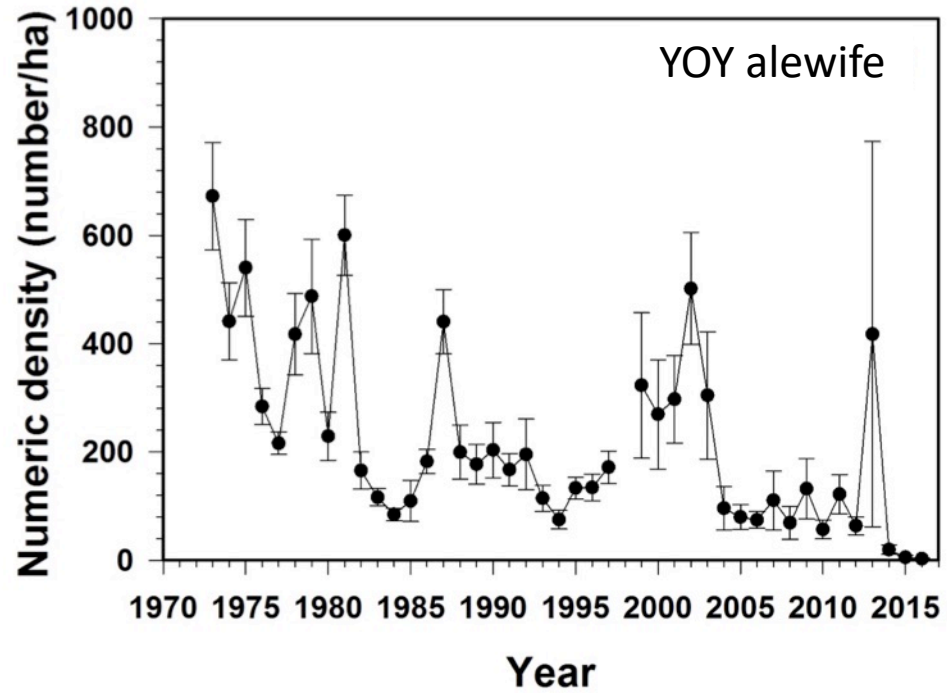
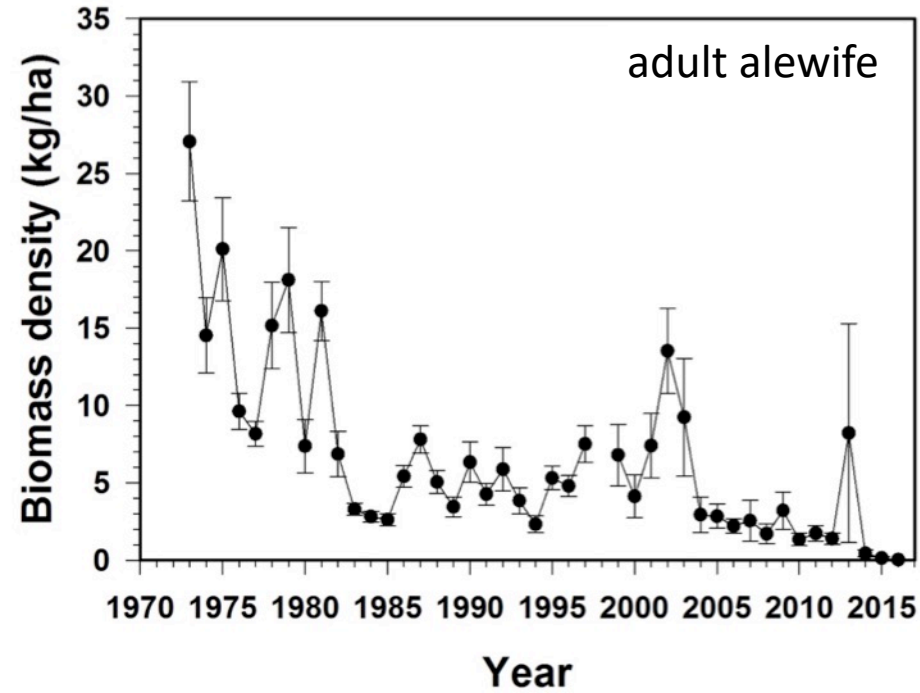
| | Bottom trawl survey | Acoustic/mid-water trawl |
|----------------------|---------------------------------|--|
| Years | 1973-2016 (no 1998) | 1992-1996, 2001-2016 |
| Time of day | Day | Night |
| # trawls | ~69 | ~68 |
| Water column sampled | Bottom ~1.4 m | From 1 m off bottom to ~2 m below the vessel |
| Bathymetry sampled | 9-110 m | 6-240 m |
| Common species | Alewife, Bloater, Rainbow Smelt | |
| Unique species | Gobies, sculpins, perch, burbot | Cisco, emerald shiner |



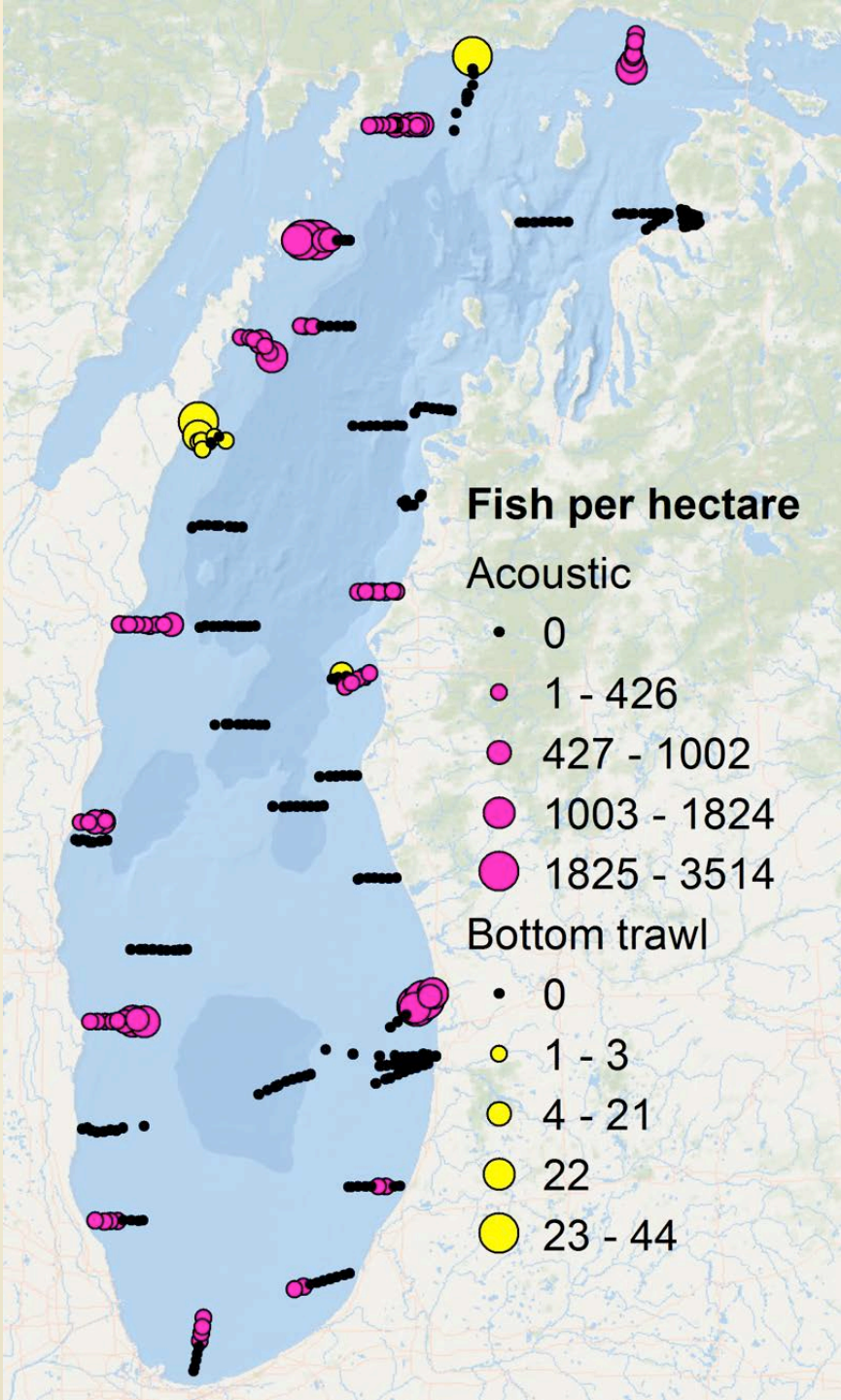
Acoustic Density of Alewife



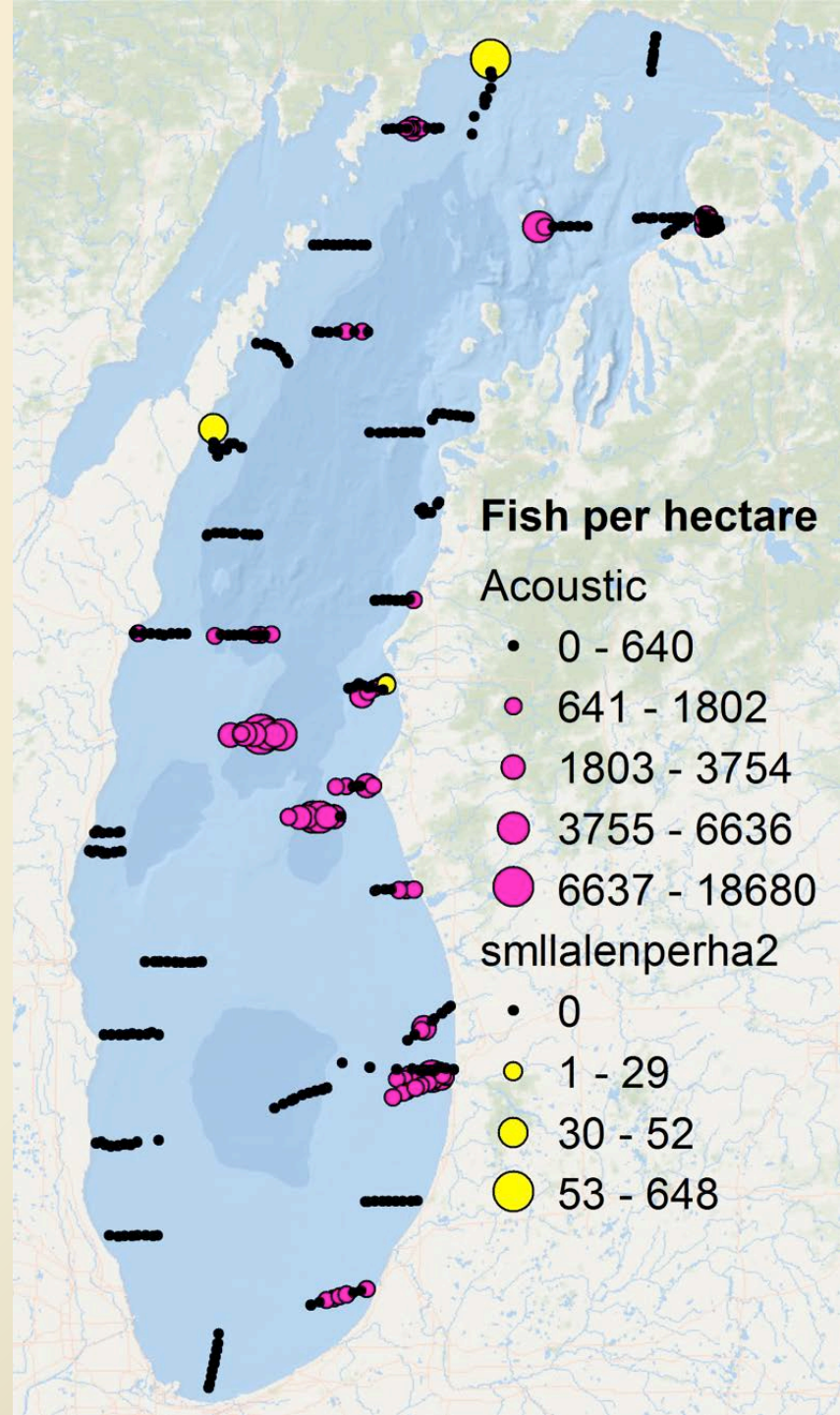
Bottom Trawl Density of Alewife



YAO Alewife Distribution, 2016

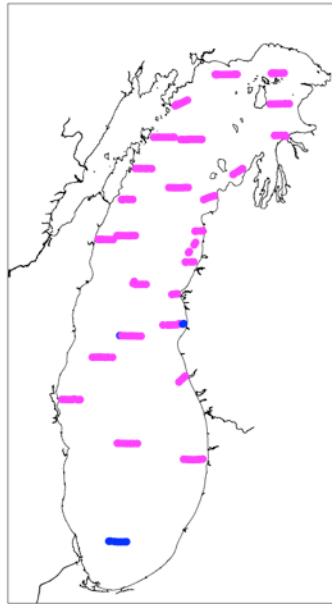


YOY Alewife Distribution, 2016

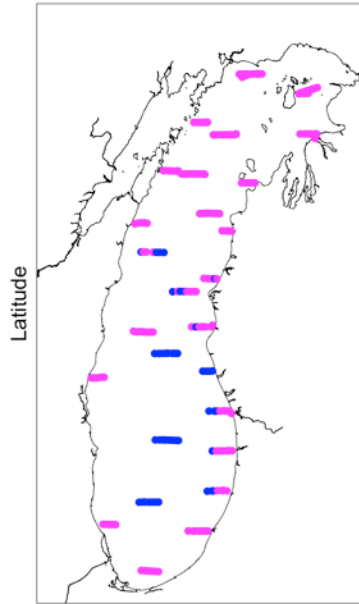


Change in YAO Alewife Distribution

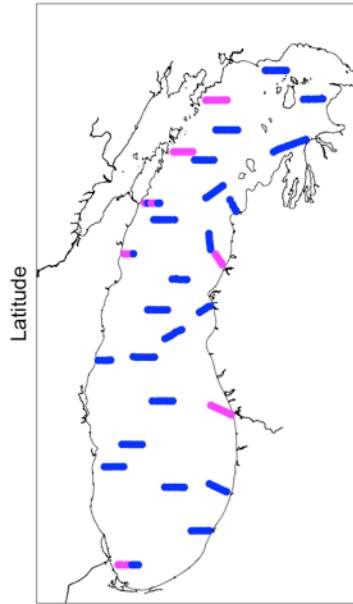
2013 large alewife



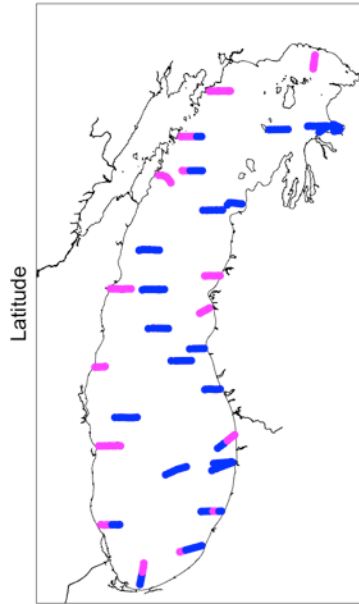
2014 large alewife



2015 large alewife



2016 large alewife



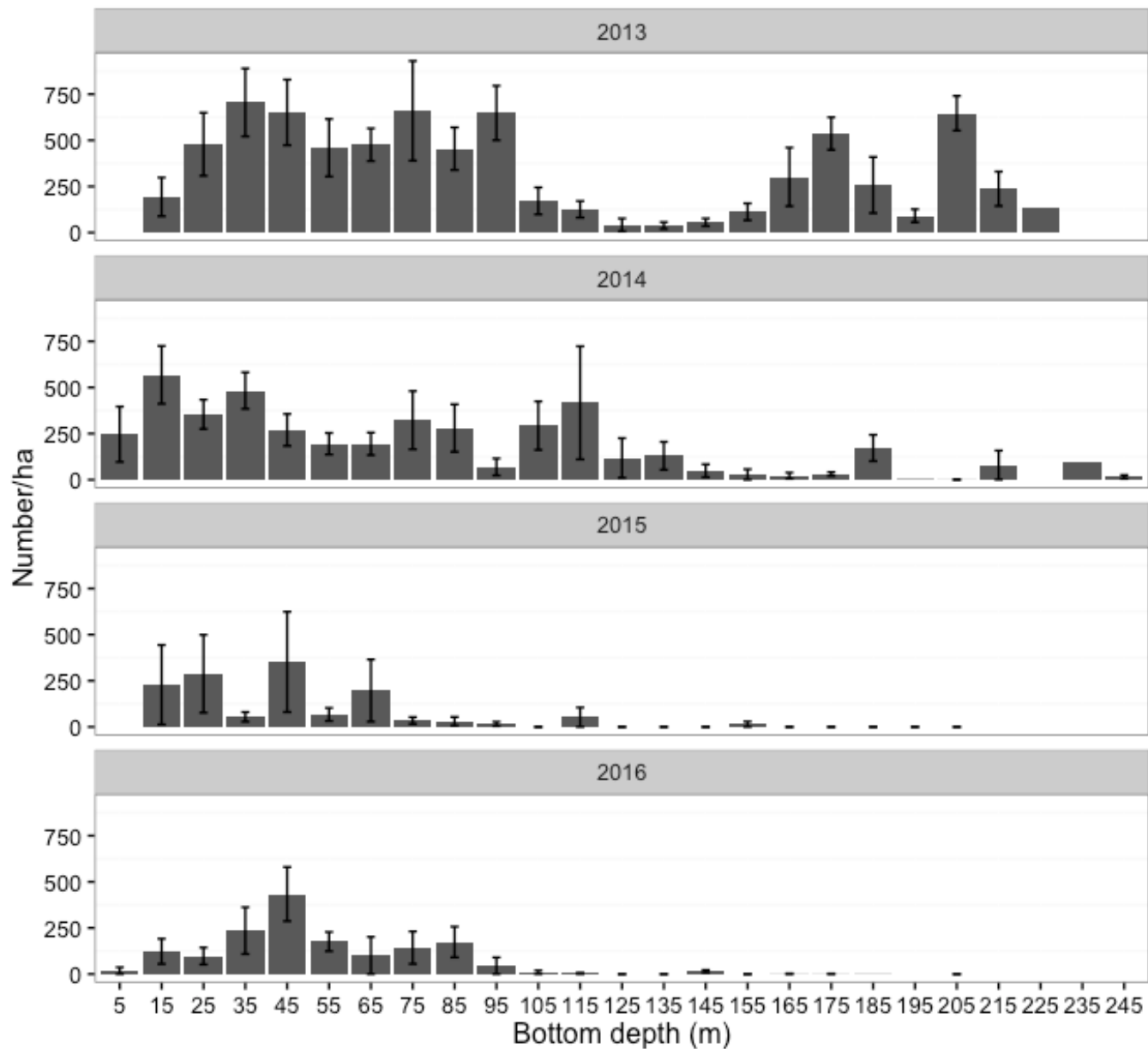
fish/ha
● > 0
● 0

fish/ha
● > 0
● 0

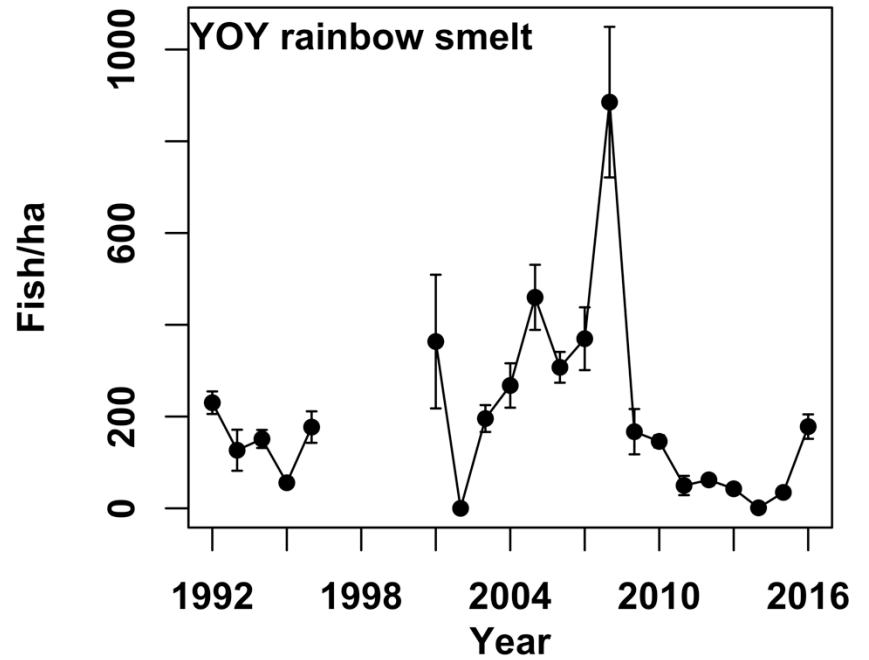
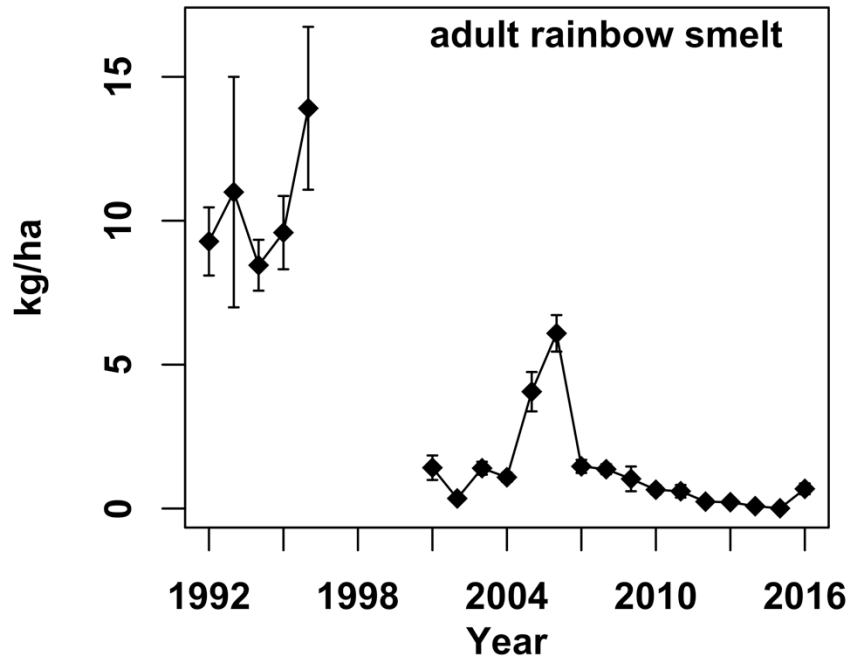
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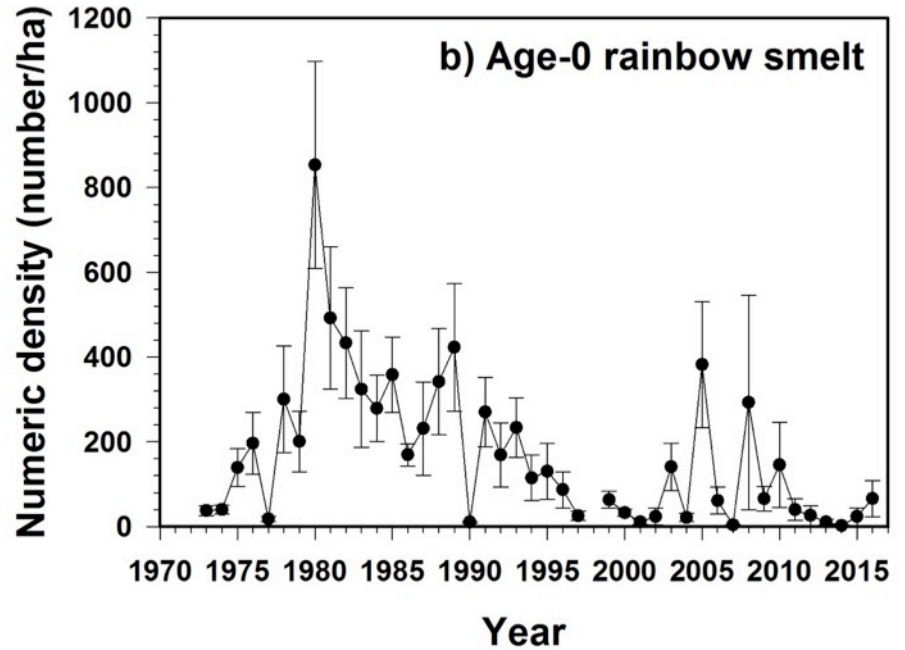
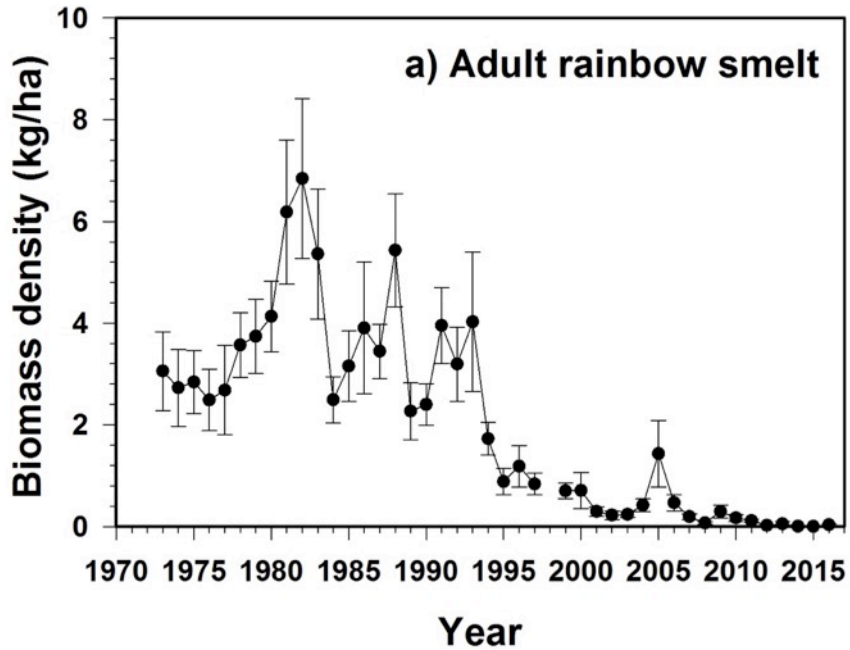
Change in YAO Alewife Distribution



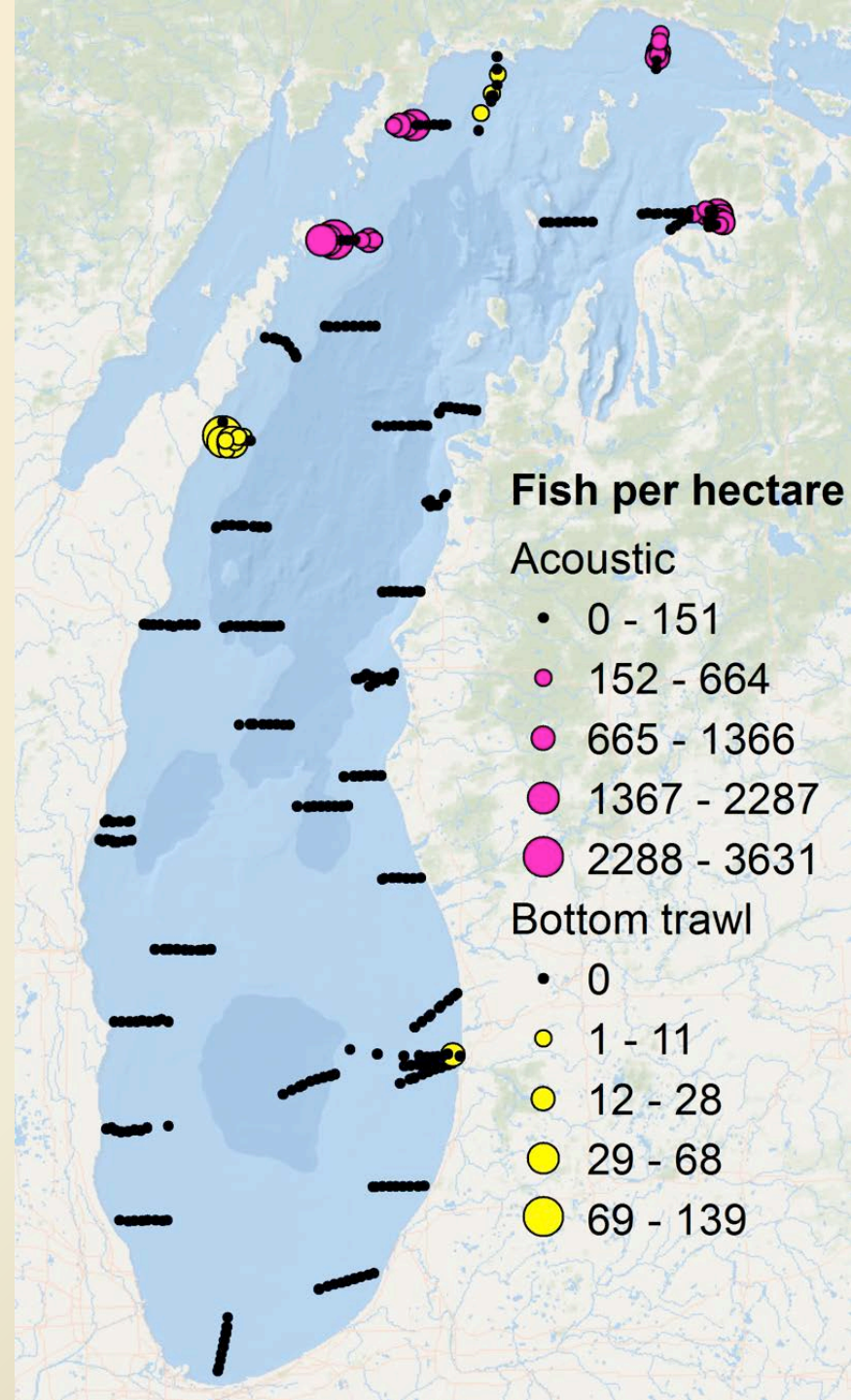
Acoustic Density of Rainbow Smelt



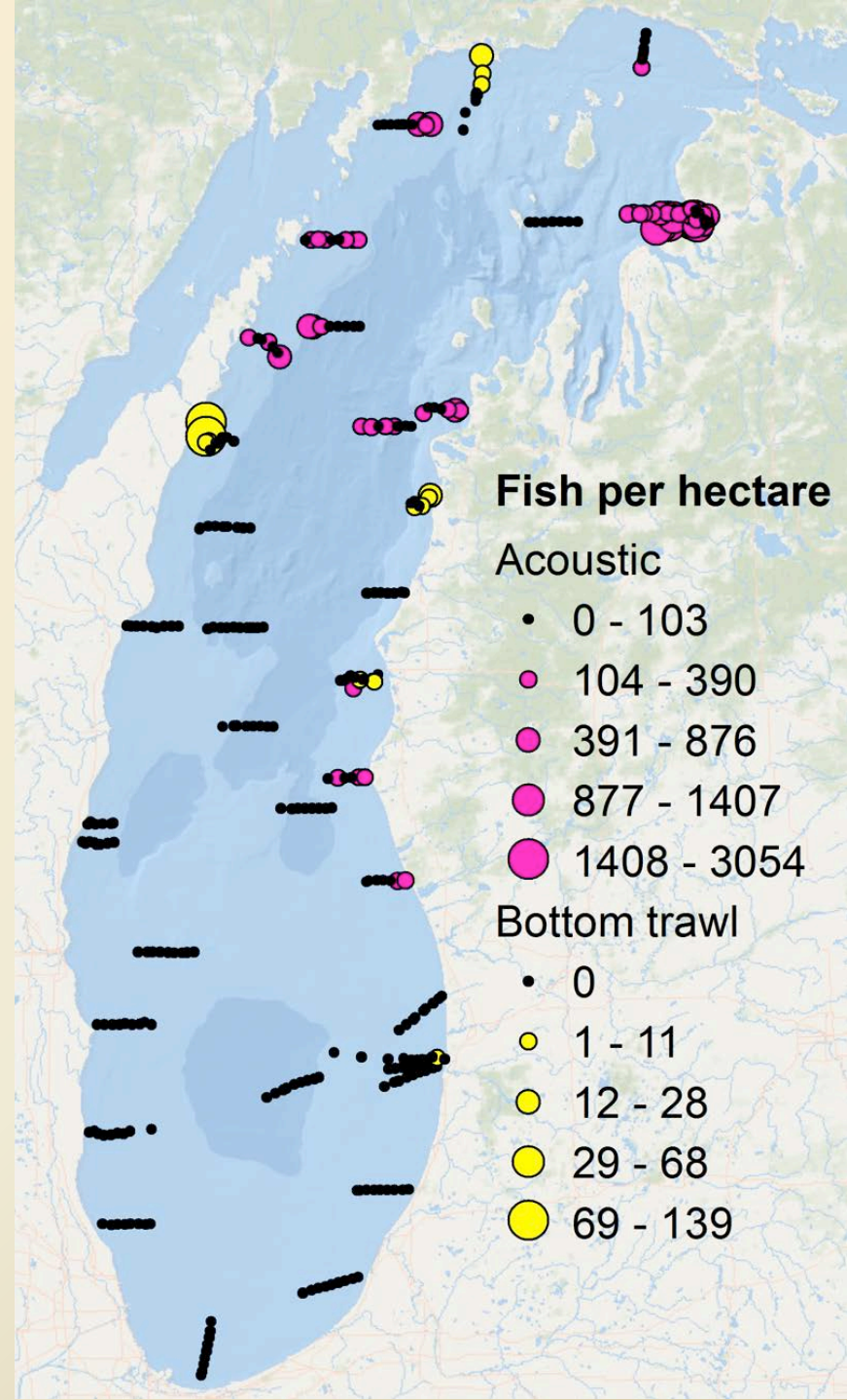
Bottom Trawl Density of Rainbow Smelt



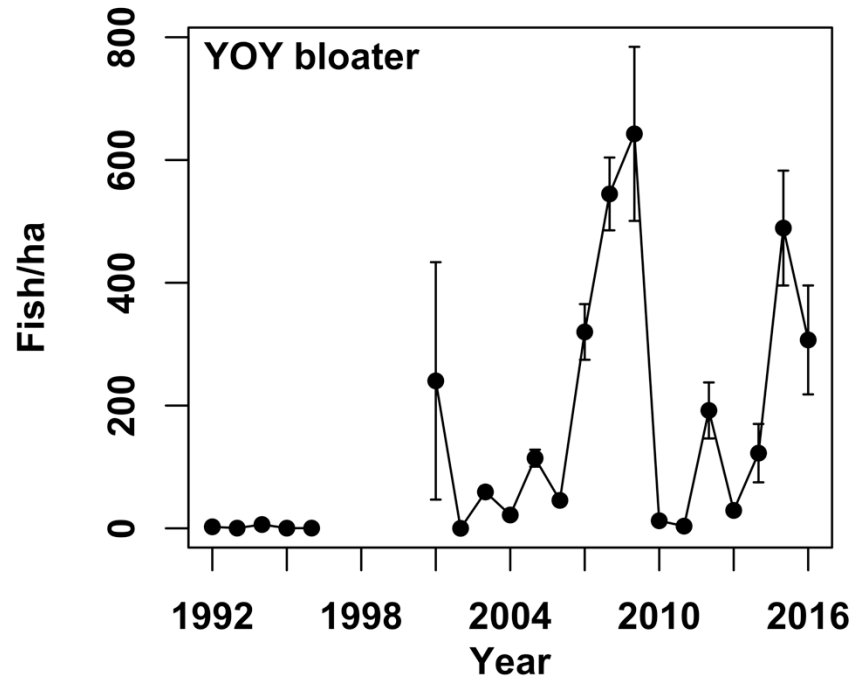
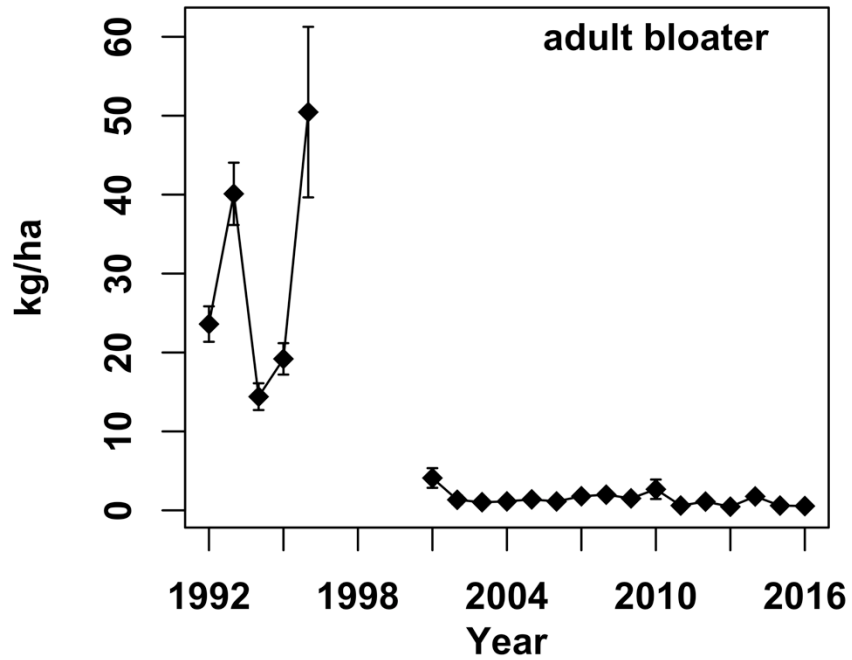
Large Rainbow Smelt Distribution, 2016



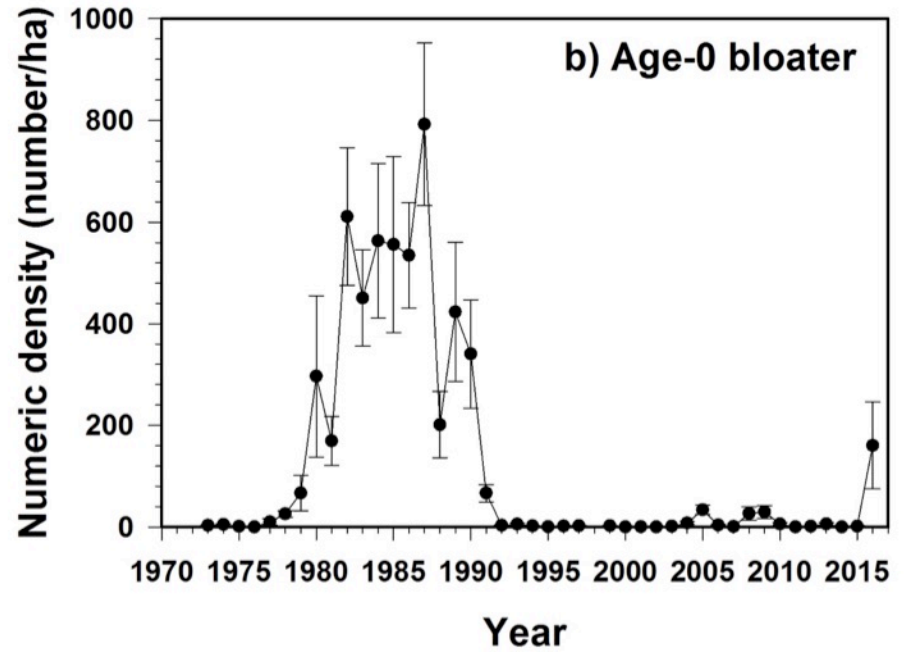
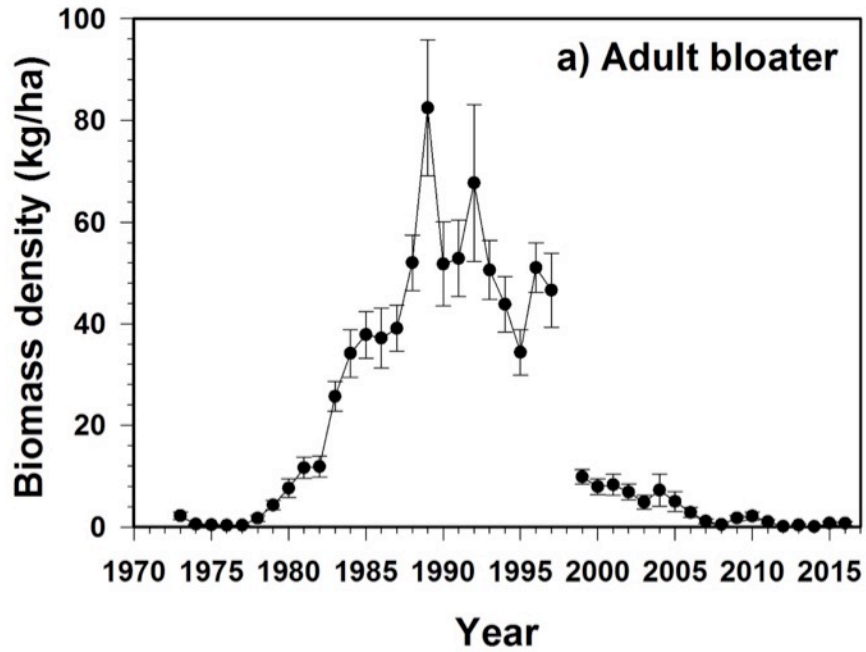
Small Rainbow Smelt Distribution, 2016



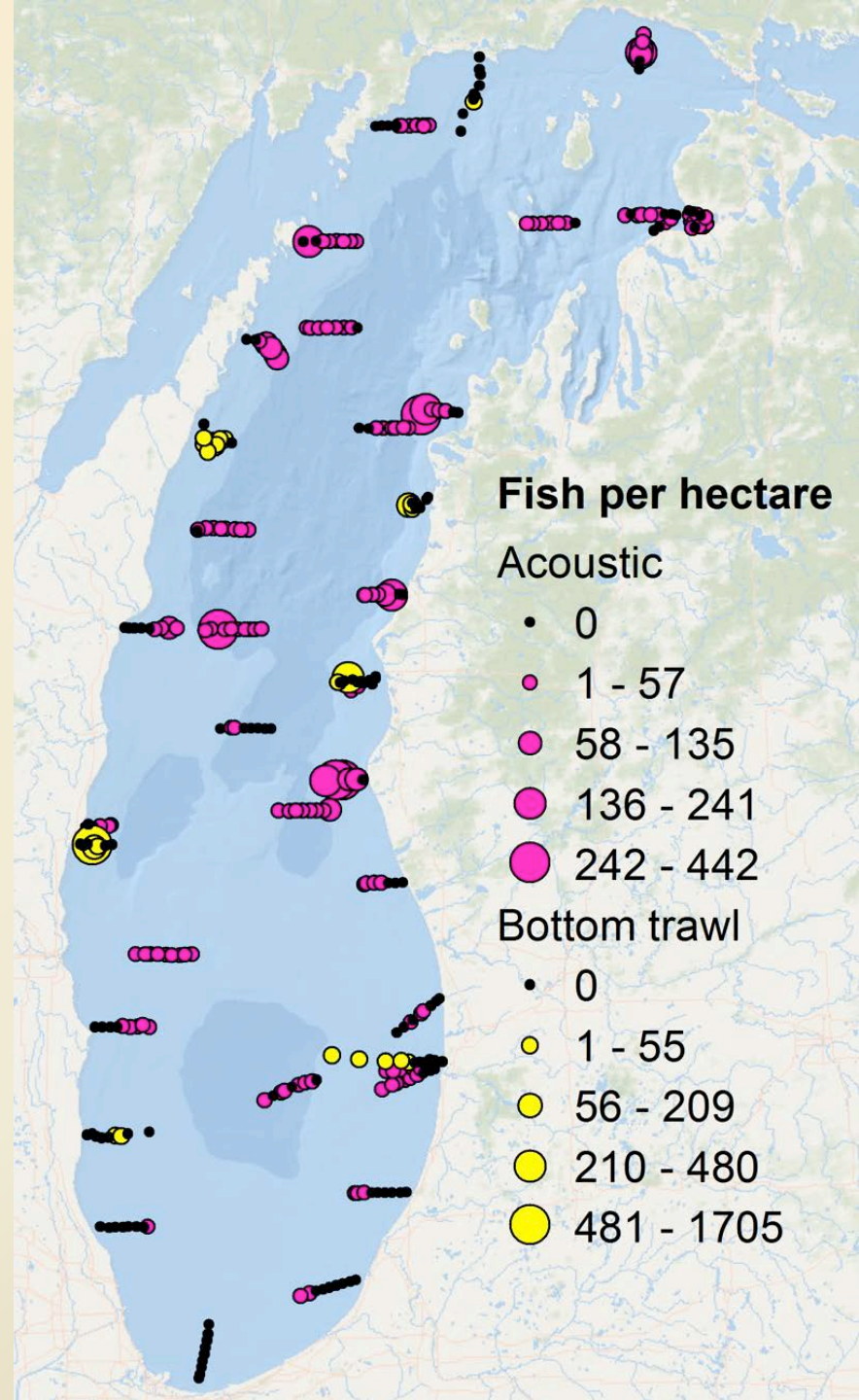
Acoustic Density of Bloater



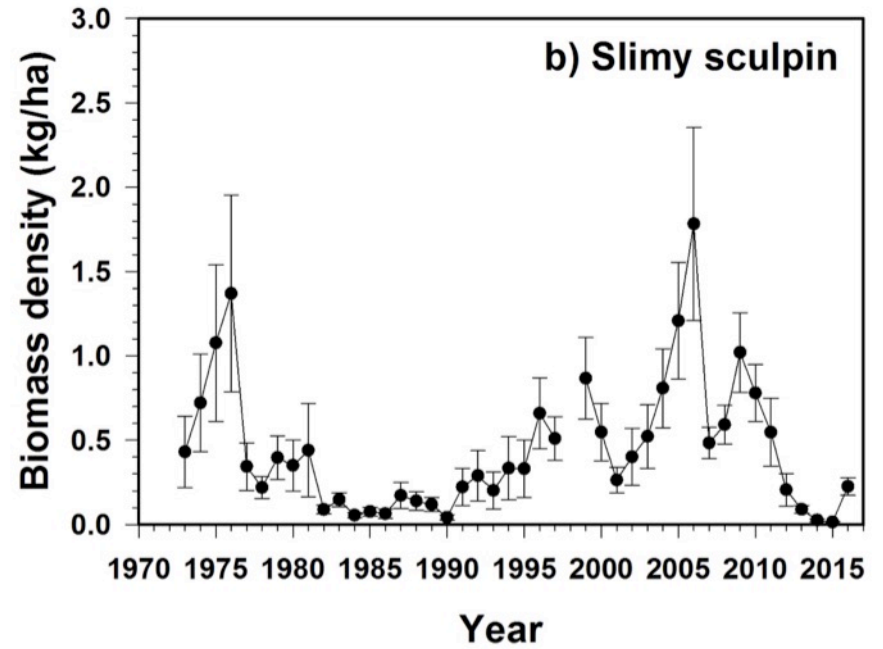
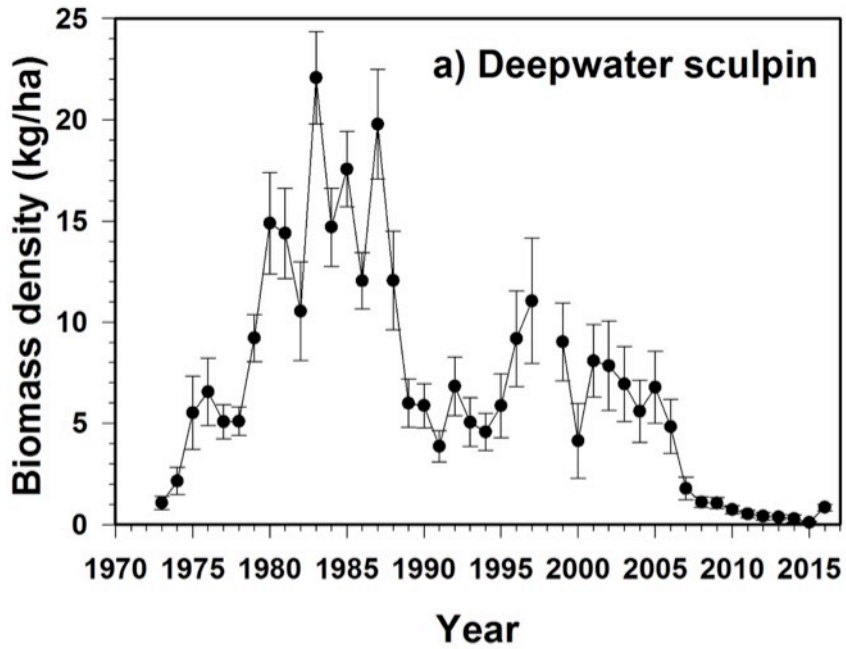
Bottom Trawl Density of Bloater



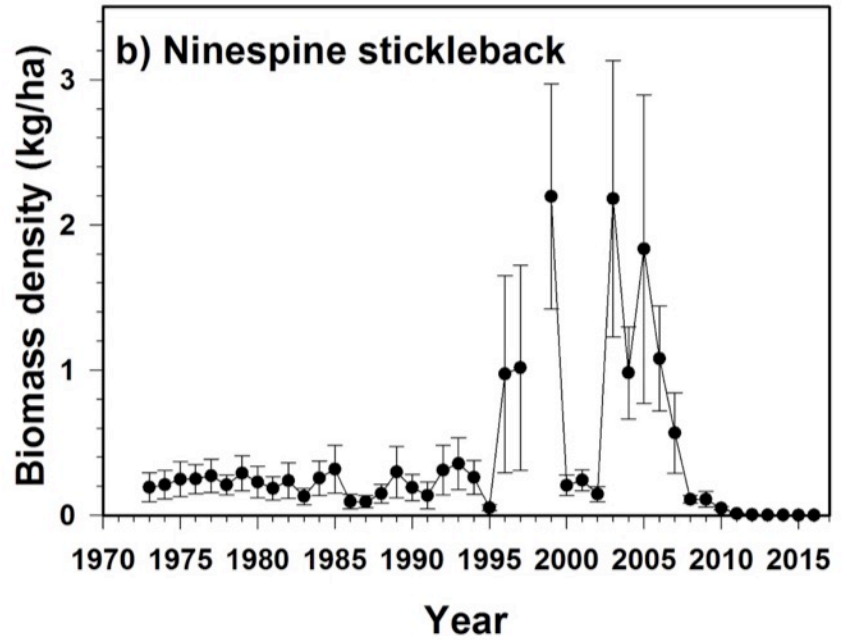
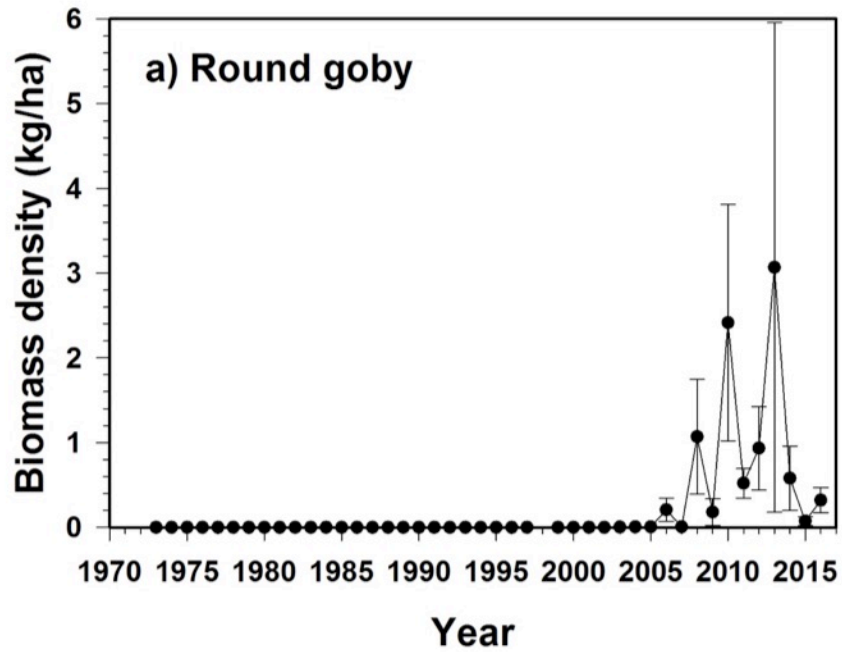
Large Bloater Distribution, 2016



Bottom Trawl Density of Sculpins



Density of Round Gobies



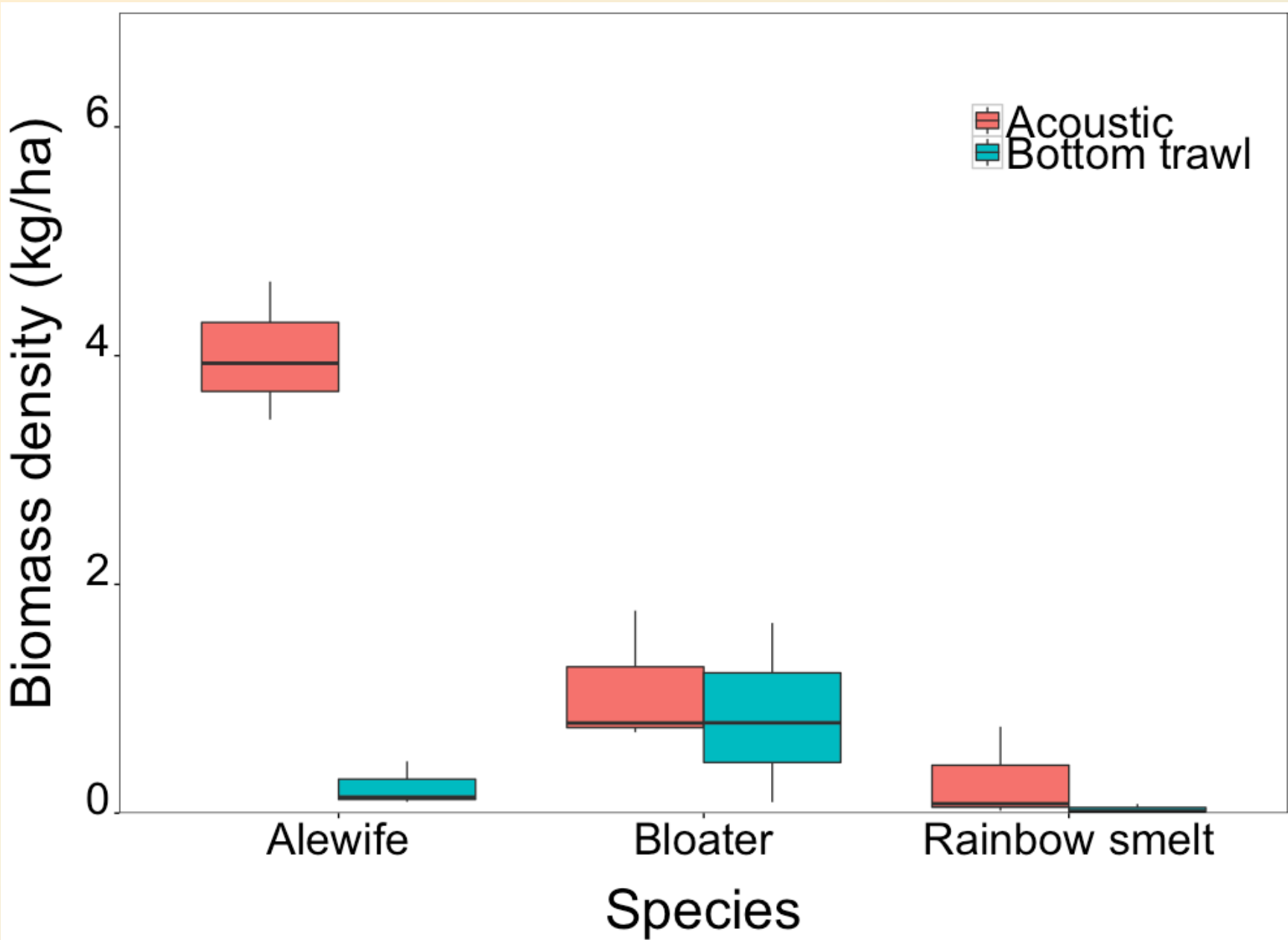
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- **Lakewide survey context**
- Conclusions

Lakewide Survey Results Context

- Are survey results always identical?
 - No.
 - Need both surveys to develop an adequate picture
 - Both surveys are used in stock assessment modeling

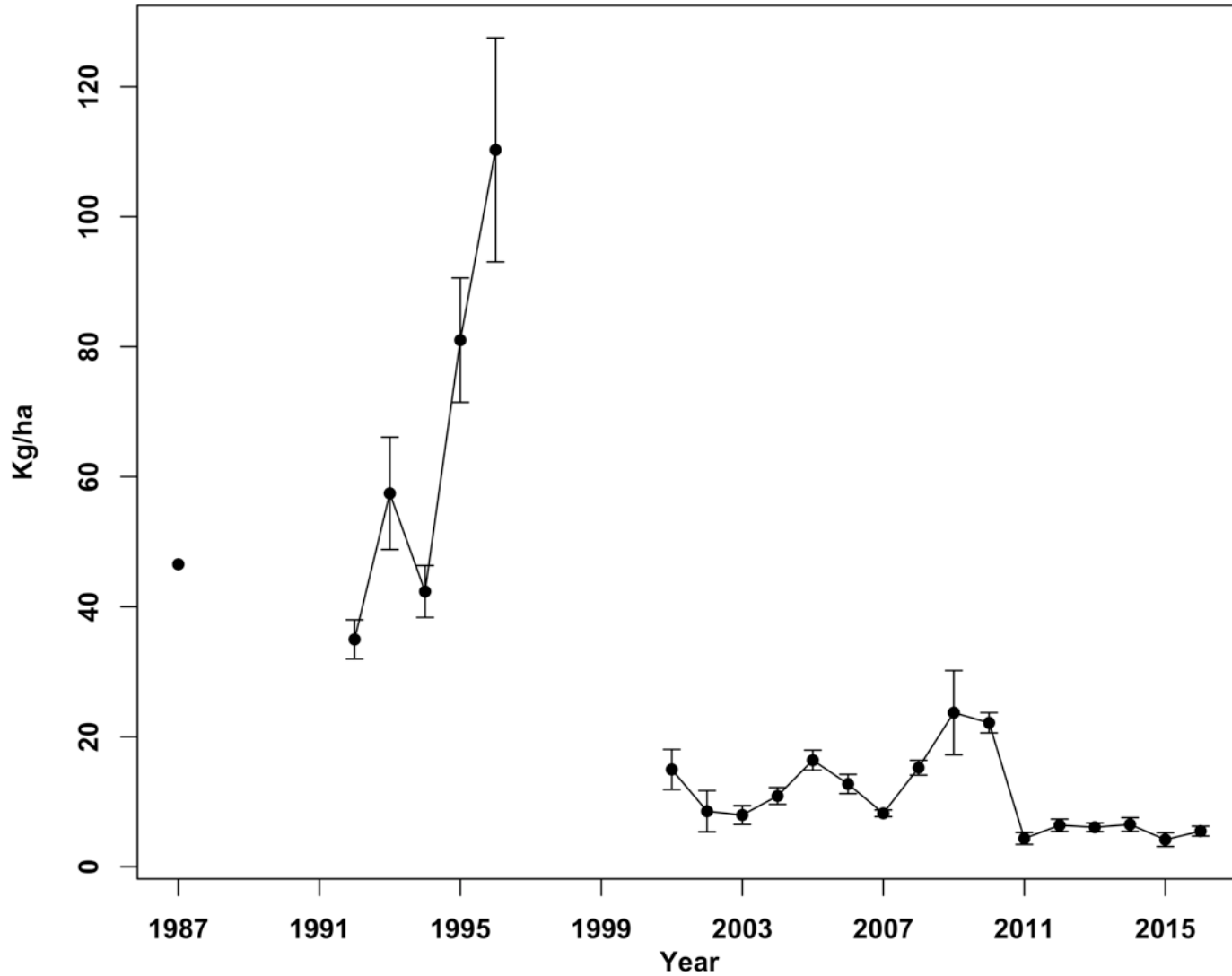
Comparison of Acoustic and Bottom Trawl Biomass Density, 2014-2016



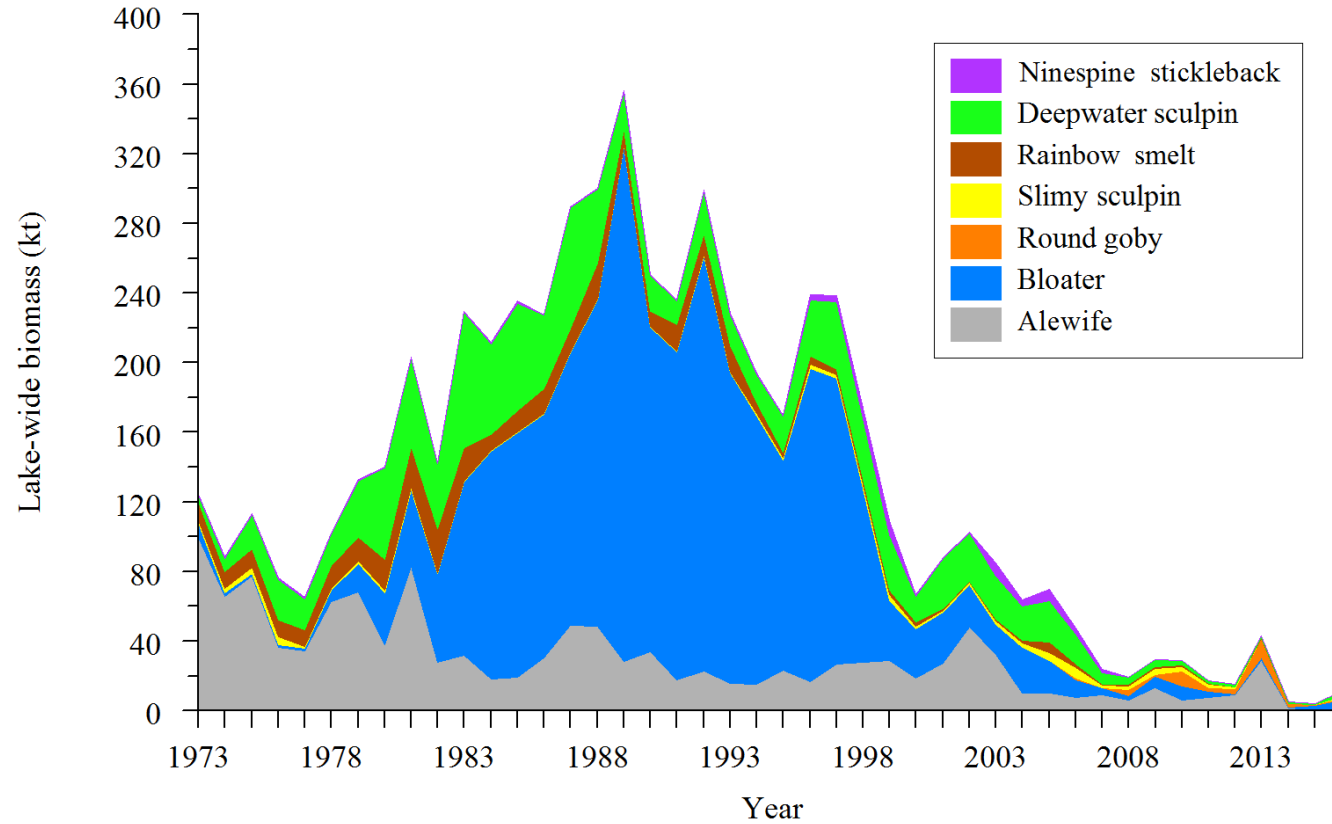
Survey Results Context

- Are species results always identical?
- No, but this is expected
- Do surveys tell us the same thing in general?
- Yes – prey fish biomass is at or near all time low

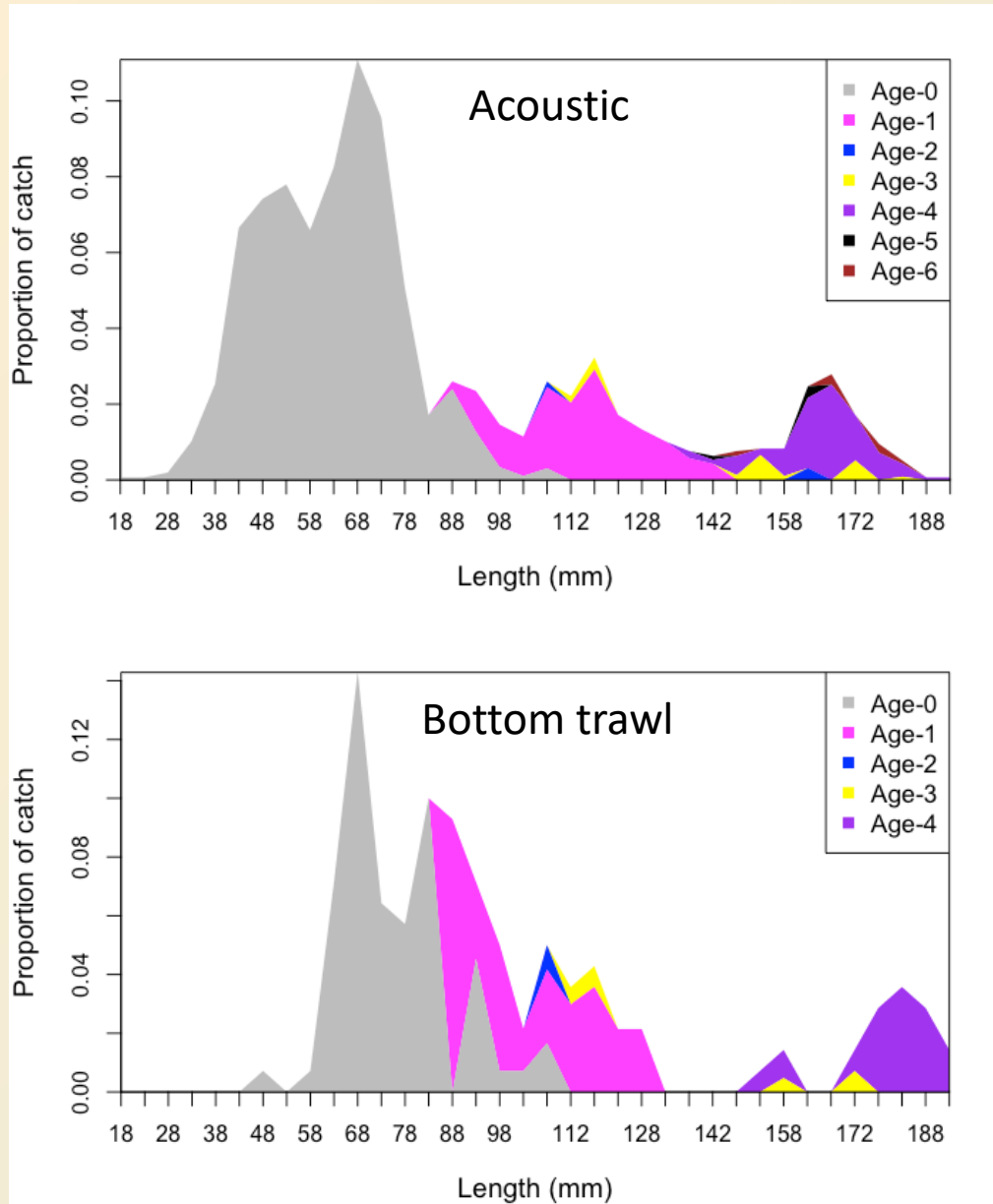
Total Biomass Density, Acoustic Survey



Total Biomass Density, Bottom Trawl Survey



2016 Alewife Age Composition from Surveys



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Conclusions

- Lakewide surveys indicate low biomass of prey fish
 - Bottom trawl all-time low
 - Acoustic 4th lowest
- Recent period (2010-2016) marked by single strong year class, six relatively weak ones
- Adult alewife have become more coastal