Lake Michigan Salmon Stocking Workshop

Milwaukee, May 1, 2012
Green Bay, May 8, 2012

Workshop Informational Items

- Lake Michigan ecosystem is very complicated
- Invasive species are a continual threat
- Model outcomes are only a small part of the process. Other factors will help frame the ultimate decision on future stocking levels
- There will be conflicting information
- Model outcomes should be viewed holistically, don't focus on the percentages
- **Stocking details – locations, numbers, species mix to be decided after a decision is made by each agency – Tactical decision**

Lake Michigan Salmon Stocking Strategy Process

Collaborative Process

- The stocking reductions in 1999 and 2006 were determined by agencies and brought to the public for comment.
- This process involved stakeholders from the beginning.

Establishment of Goals and Objectives (Work Shop 1)

- Stakeholder Meetings
  - April 2011 in Michigan
  - June 2011 in Wisconsin
- Stakeholders represented various Lake Michigan angling organizations from Indiana, Illinois, Wisconsin, and Michigan.
- Both Stakeholders and Agencies Stated Goals and Objectives

Core Stakeholder Group

- Jeff Sadula, Calumet harbor Sport Fish Association (Illinois)
- Ed Makauska, Trollers Unlimited (Illinois)
- Bill Meier, Salmon Unlimited (Illinois)
- Mike Ratter, Salmon Unlimited (Indiana)
- Mike Ryan, Great Lakes Fishery Commission Advisor (Indiana)
- Jeff Guerra, Michiana Steelheaders (Indiana)
- John Robertson, Michigan United Conservation Clubs (Michigan)
- Denny Grinold, Great Lakes Fishery Commission Advisor (Michigan)
- Dennis Eade, Michigan Steelheaders (Michigan)
- Todd Pollesch, Great Lakes Fishery Commission Advisor (Wisconsin)
- John Hanson, Great Lakes Sport Fish Federation (Wisconsin)
- Duane Nadolski, Great Lakes Sport Fish Federation (Wisconsin)

Work Shop 2 Overview

November 5th Portage, Indiana

- Discussed How Managers Make Decisions
- Reviewed Chinook salmon abundance, natural reproduction, growth, condition, and health
- Reviewed prey abundance and forecasts
- Learned about the Lake Michigan Decision Analysis Model
- Developed scenarios to evaluate and refine the model

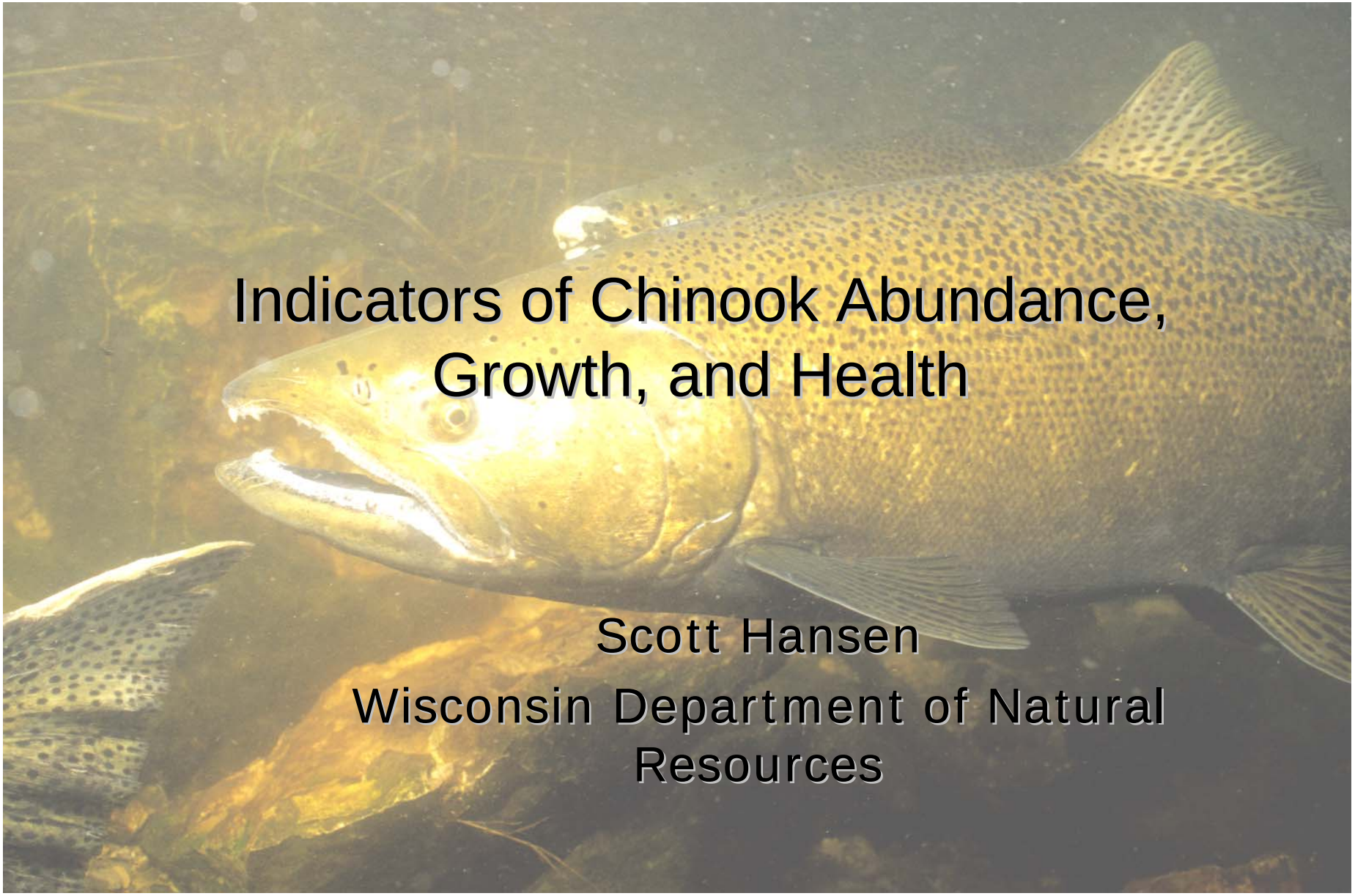
Work Shop 3 Overview

January 23rd Chesterton, Indiana

- Reviewed Lake Michigan Decision Analysis Model outcomes
- Discussed model outcomes
- Began discussions about stocking strategies

Next Steps

- Communicate the State of Lake Michigan to the Public
- Further Discussion of the proposed stocking options
- Assist agencies in making an informed decision to meet fishery goals and objectives
- Conduct workshops (Benton Harbor and Wisconsin) to gather public comments
- **Focus on the concept of a particular stocking option NOT tactical decisions**

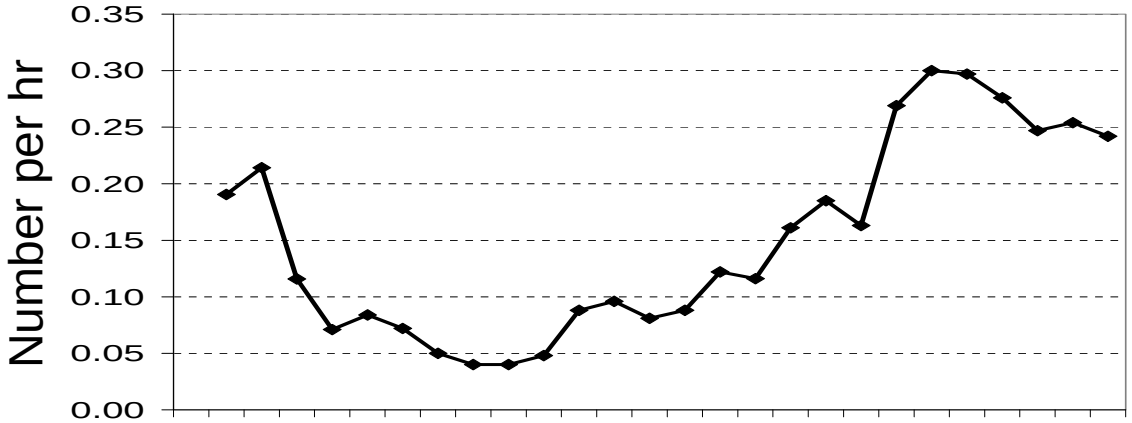


Indicators of Chinook Abundance, Growth, and Health

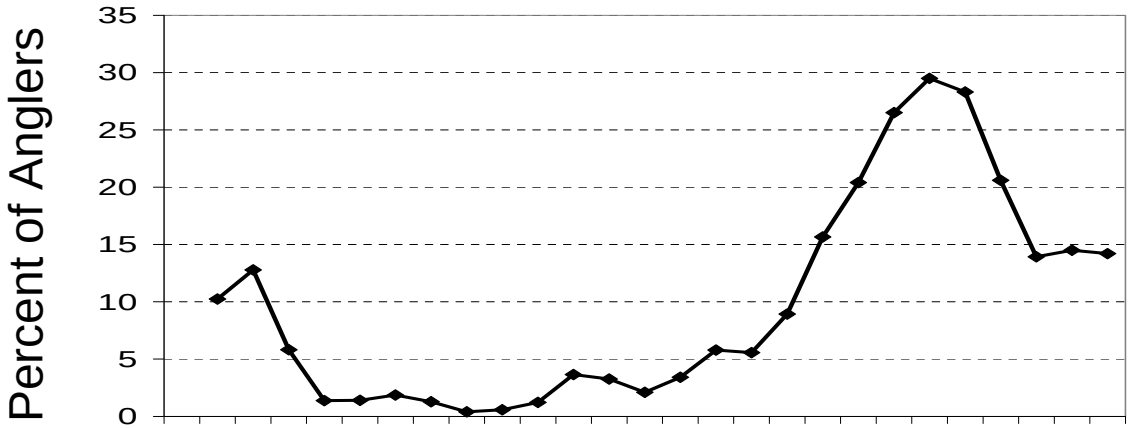
Scott Hansen

Wisconsin Department of Natural Resources

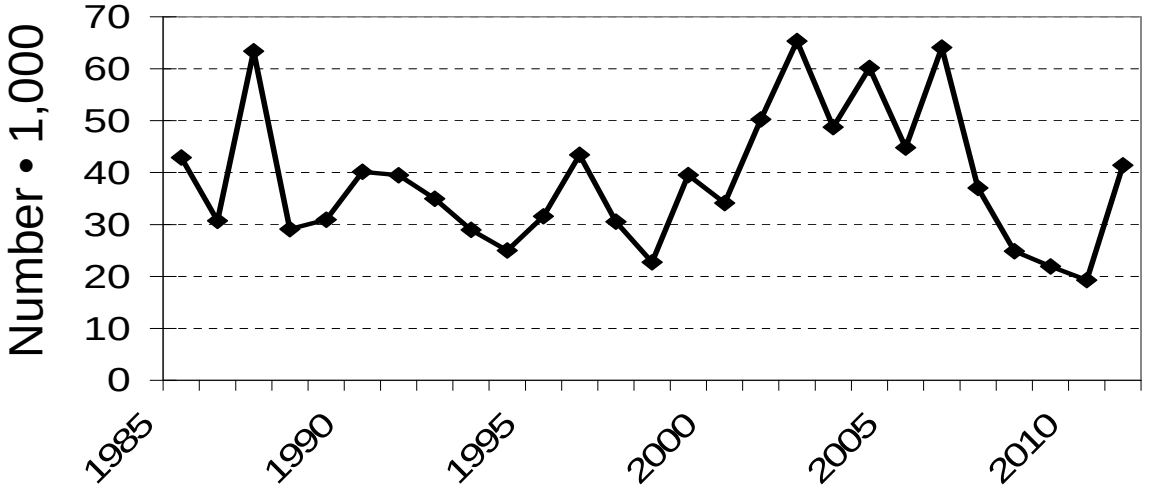
Chinook salmon catch rates (MI charter)



Angler Success (Harvest > 3 Chinook salmon per day MI)

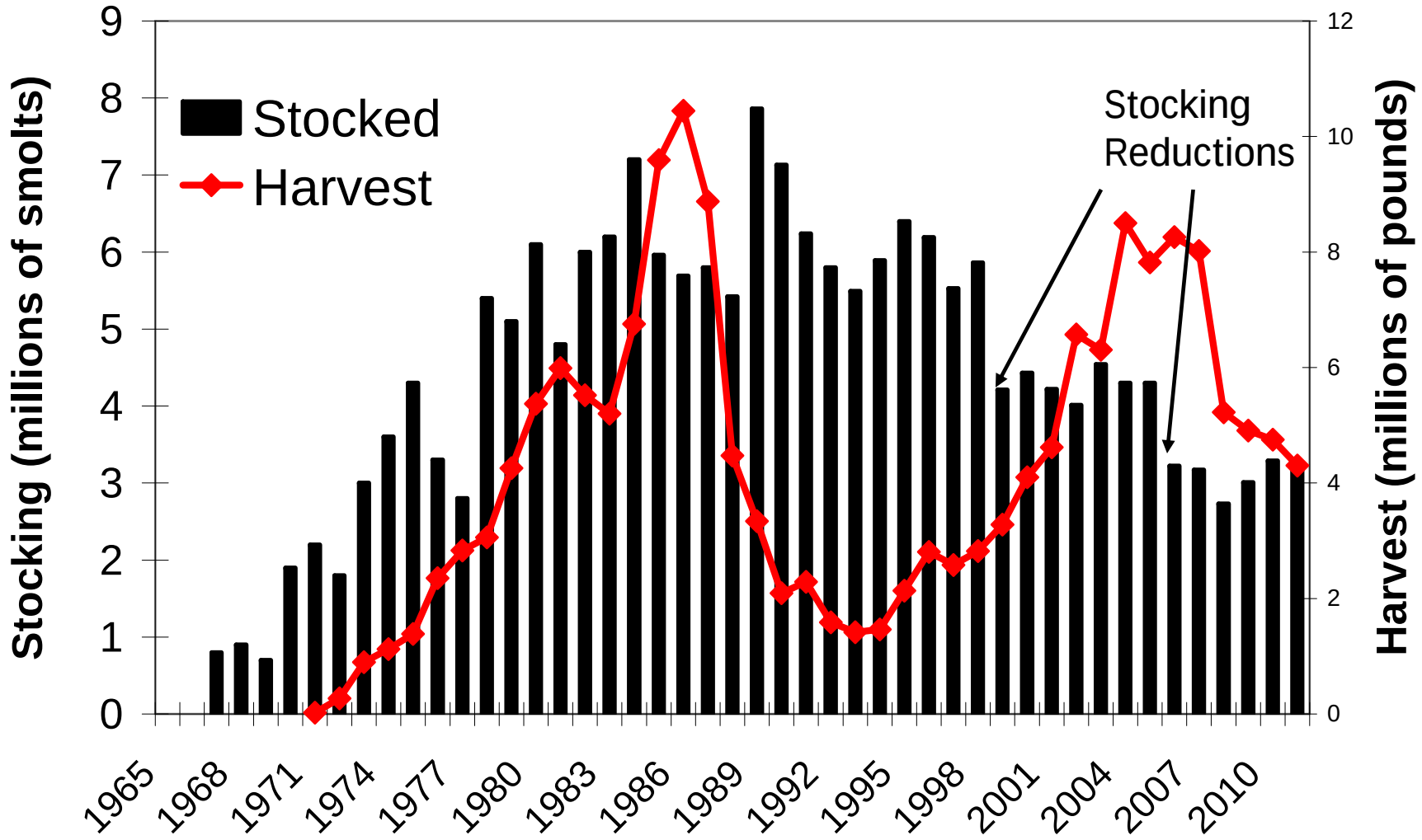


Michigan/Wisconsin Weir Returns

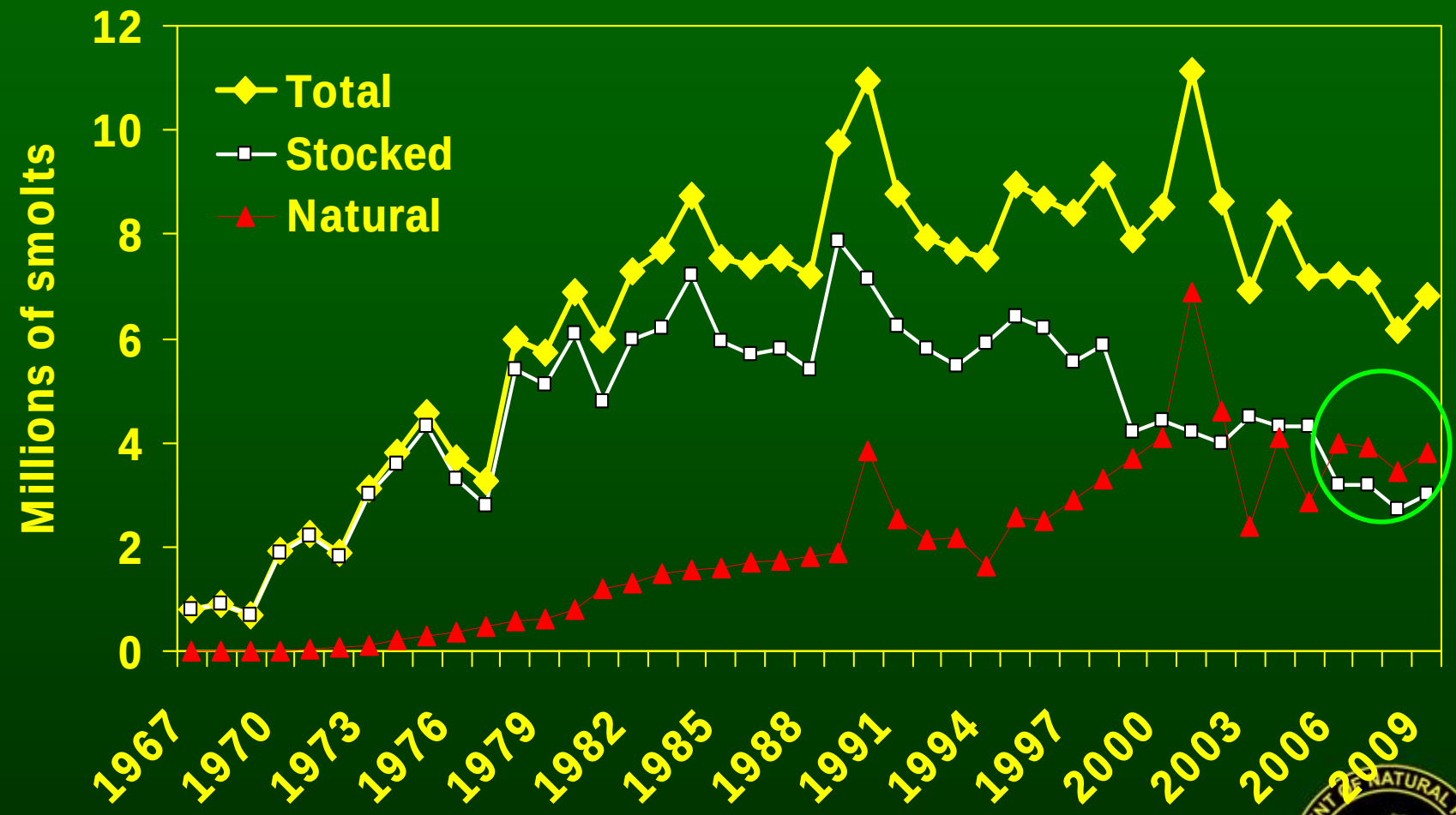


Lake-wide Stocking and Harvest

(Chinook salmon only)

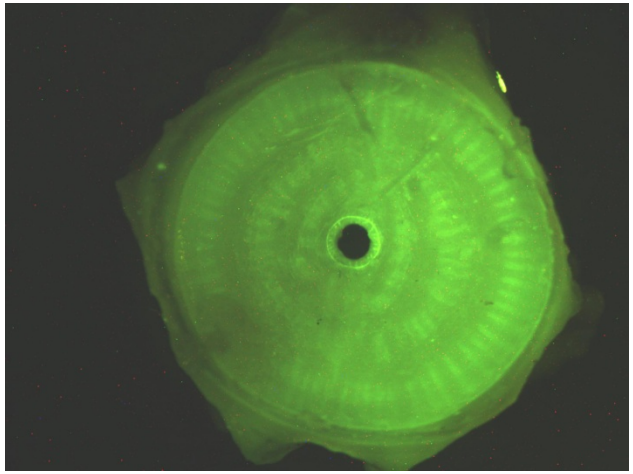


Estimated Chinook Salmon Recruitment in Lake Michigan, 1967-2009



OTC Project Results

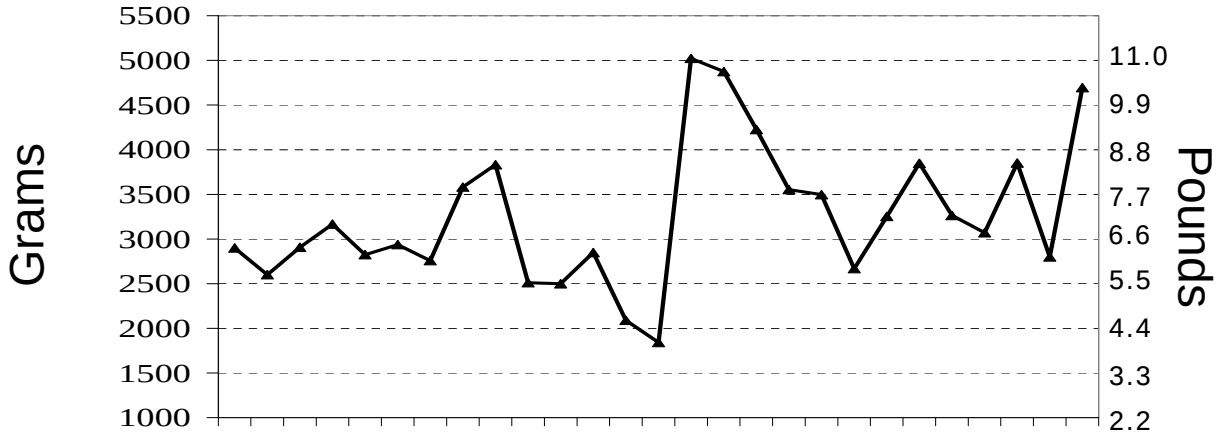
Collection Year	Year Class				
	2006	2007	2008	2009	2010
2007	56.1				
2008	82.9	55.3			
2009	65.7	62.3	53.5		
2010	67.2	61.5	69.1	54.5	
2011	Age-5	Age-4	Age-3	Age-2	Age-1



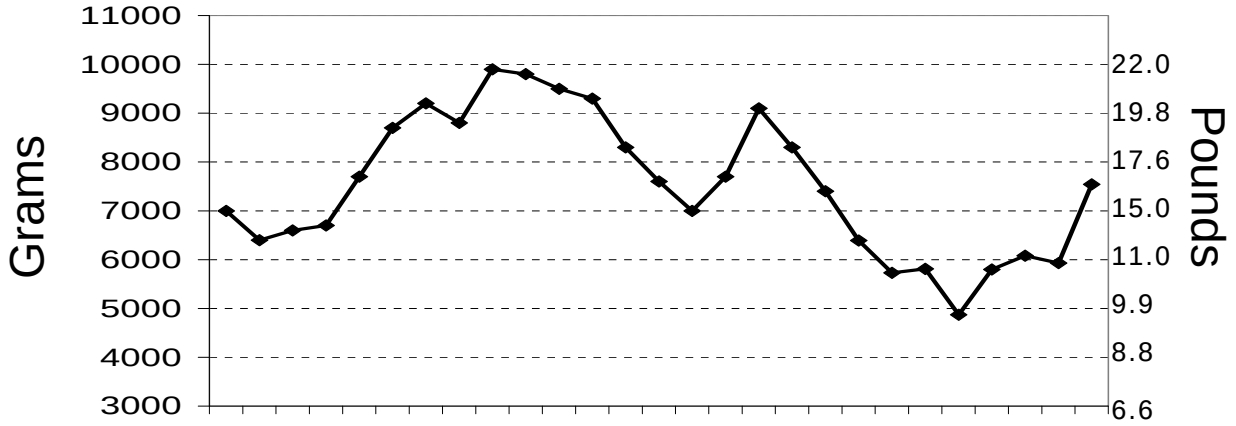
Growth/Condition Indices

- Salmon growth and condition
  - Index of forage availability and pred/prey balance
  - Provides information to aid stocking decisions
  - Several “Red Flags” indices:
    - Creel weight at age 2+
    - Weir weight at age 3+
    - Weir standard weight of a 30” Chinook

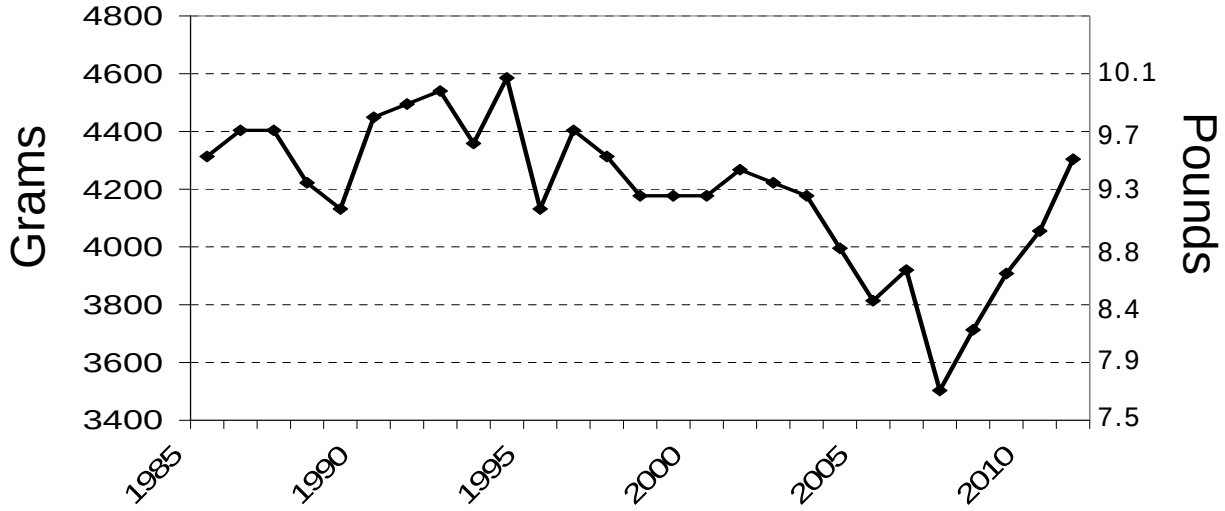
Weight at age 2
(June-July MI fishery)



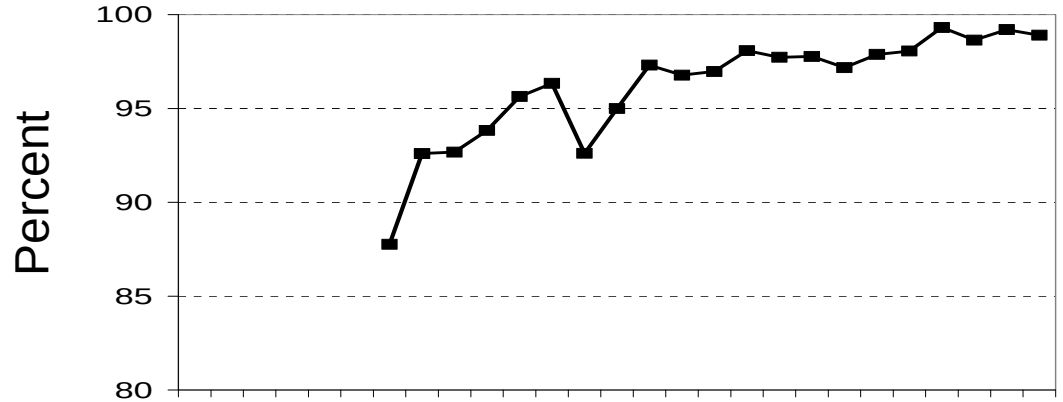
Weight at age 3
(Strawberry Creek weir)



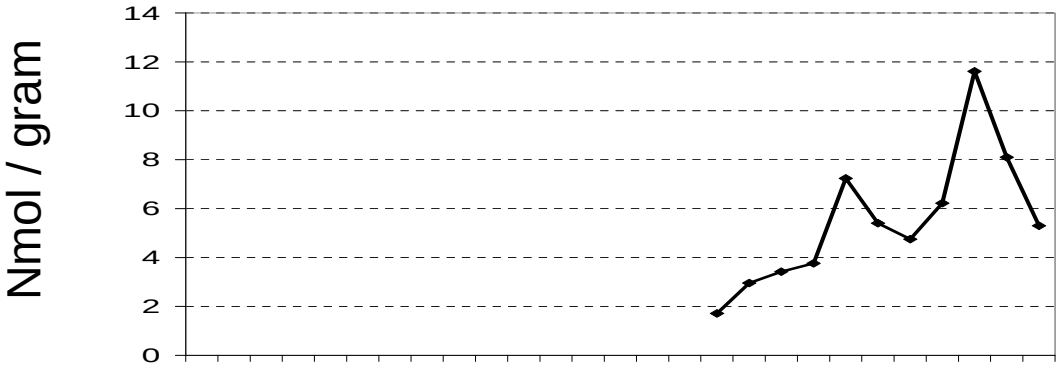
Standard weight
(Strawberry Creek weir)



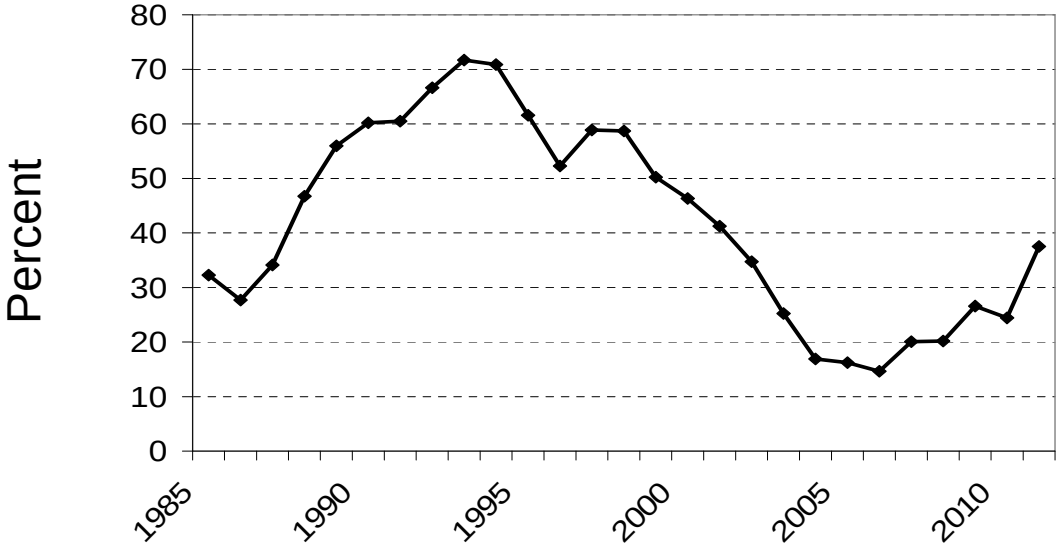
Signs of disease at weirs (percent healthy)



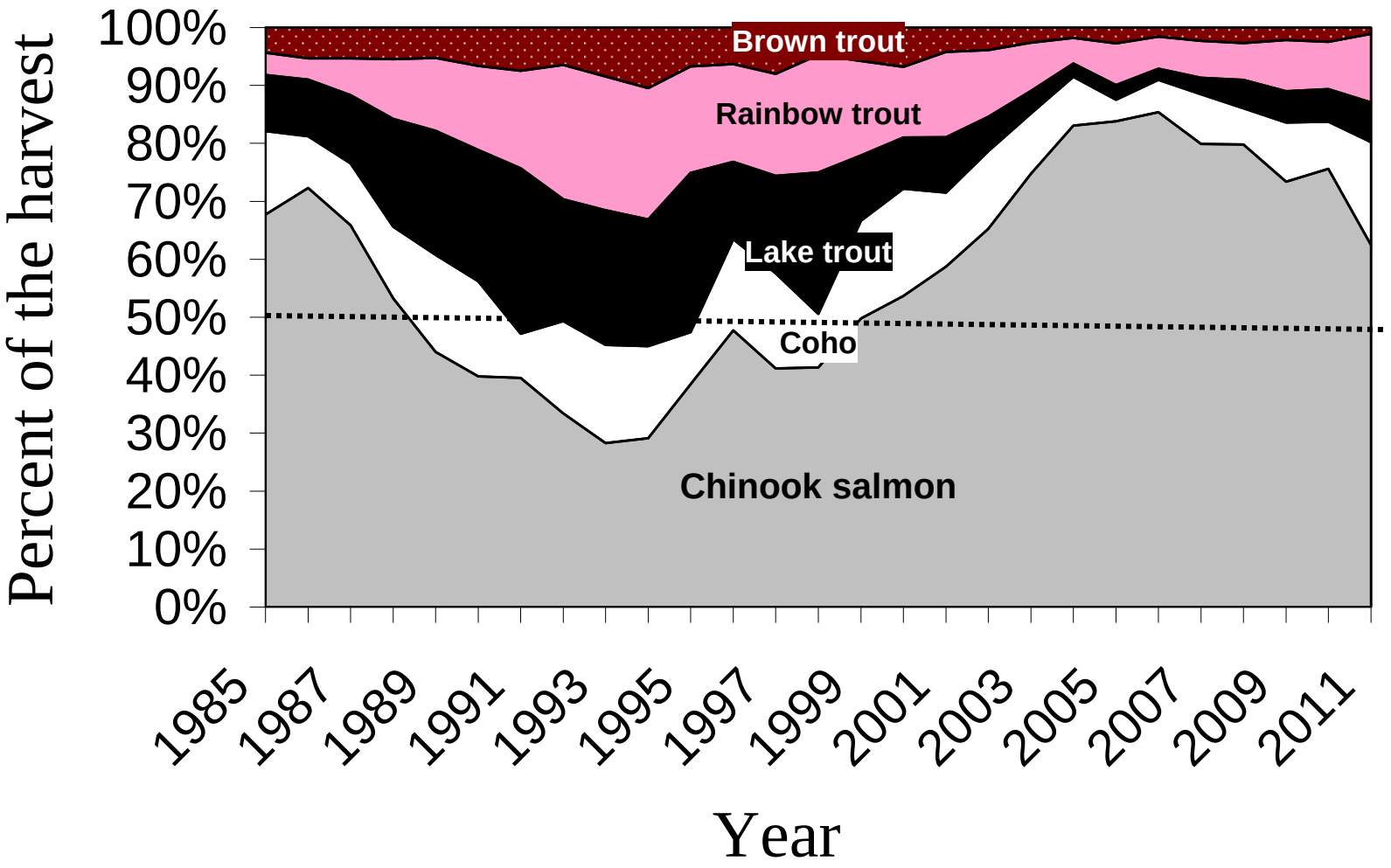
Lake Trout egg thiamine concentration



Salmonine composition (percent non-Chinook)



Salmonid Community Composition



Summary

- Natural reproduction is high (> 50%)
- 2011 alewife recruitment low
- Catch rates recently stabilized (MI waters)
  - Lower Chinook harvest in WI in 2011
- Improving size at age
  - 2010 alewife year class assimilated well into population
- Disease incidence very low
- Salmonine composition improved

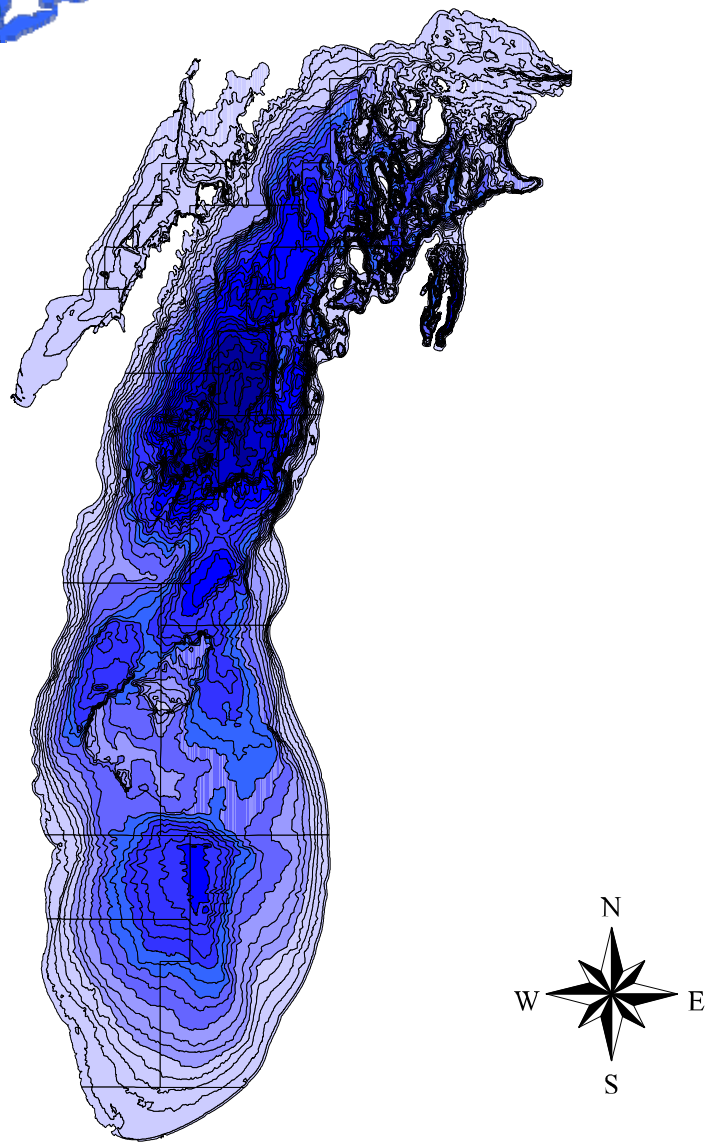
USGS
science for a changing world

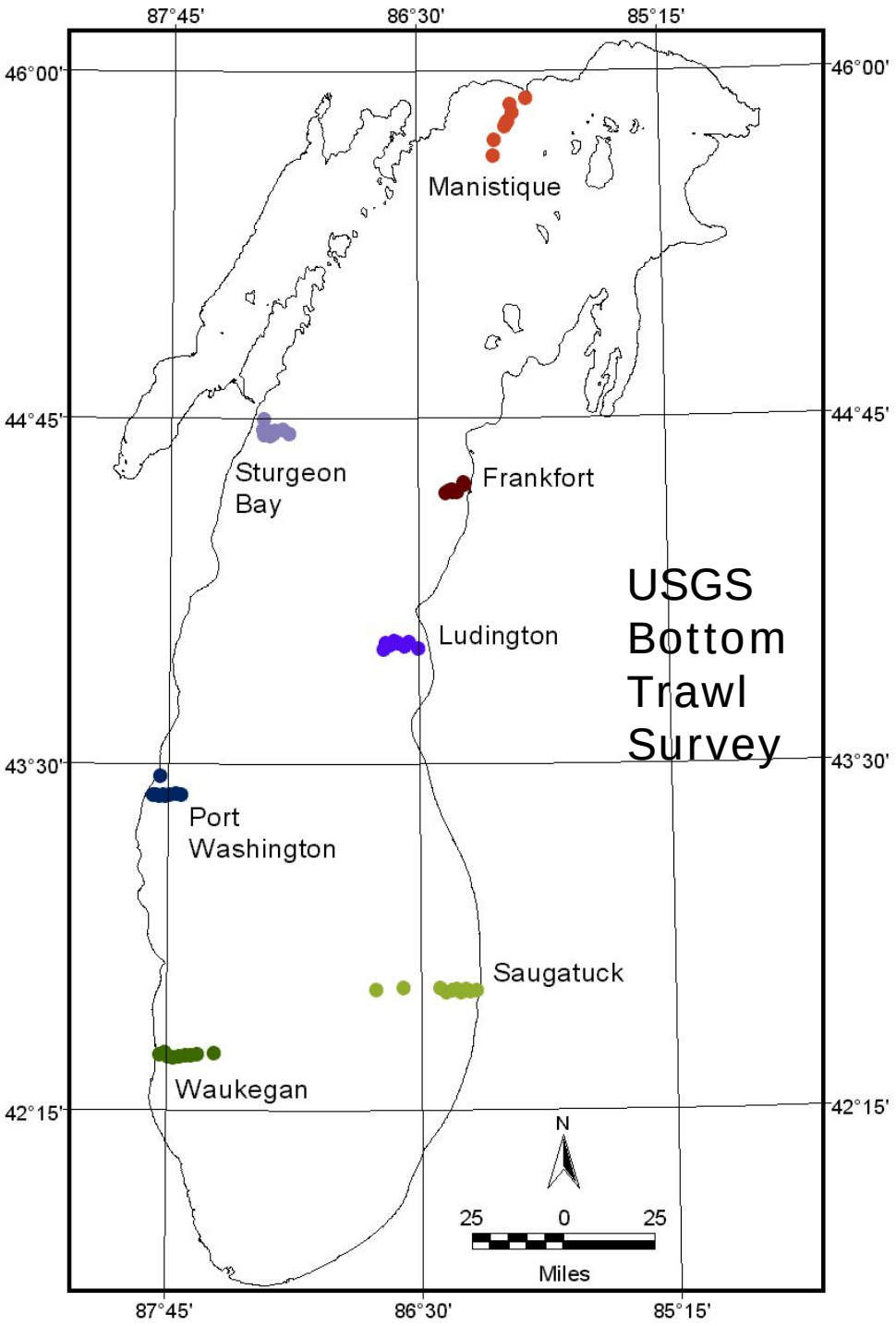
Lake Michigan 2011

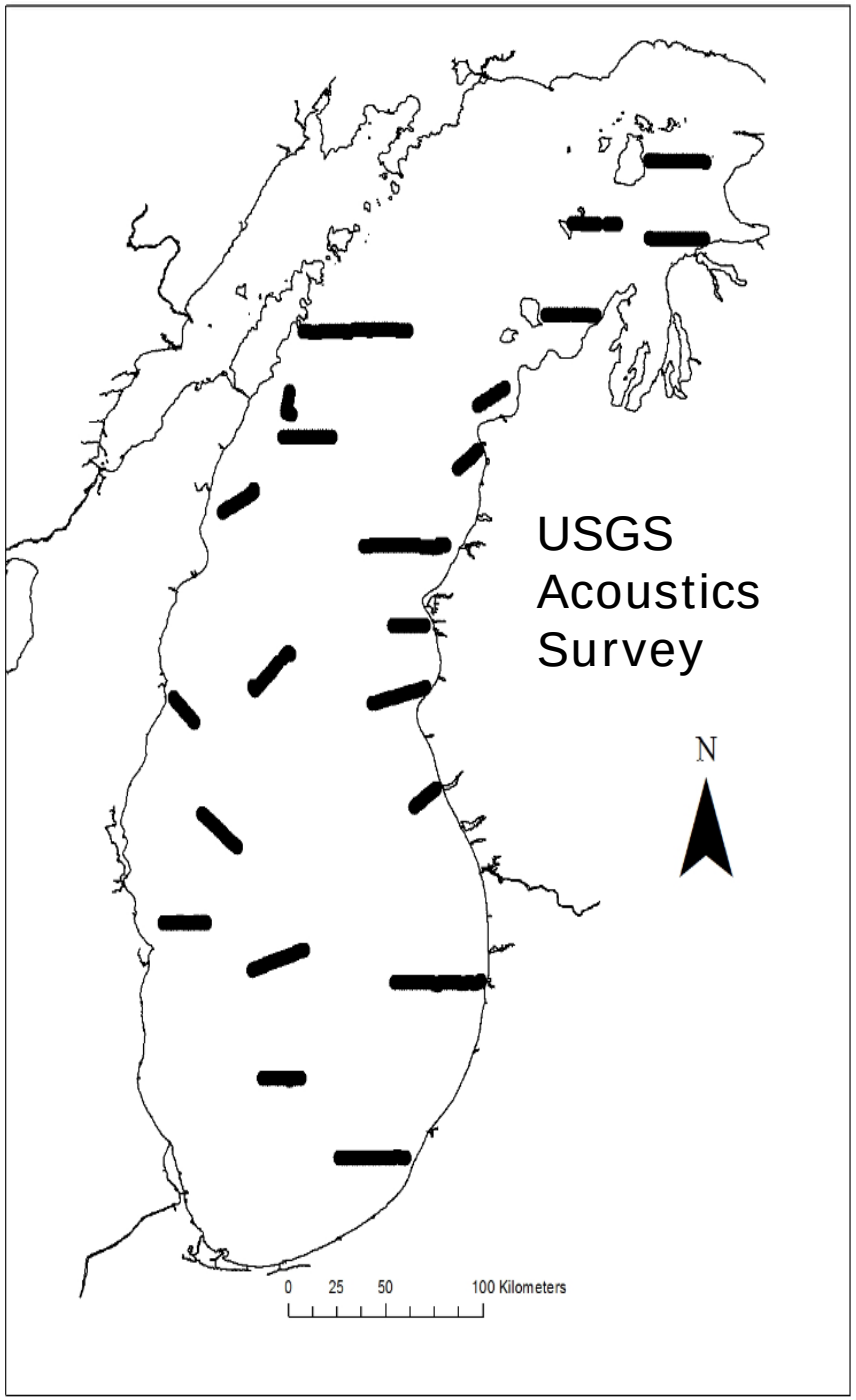
Status and Trends of Prey Fish Populations

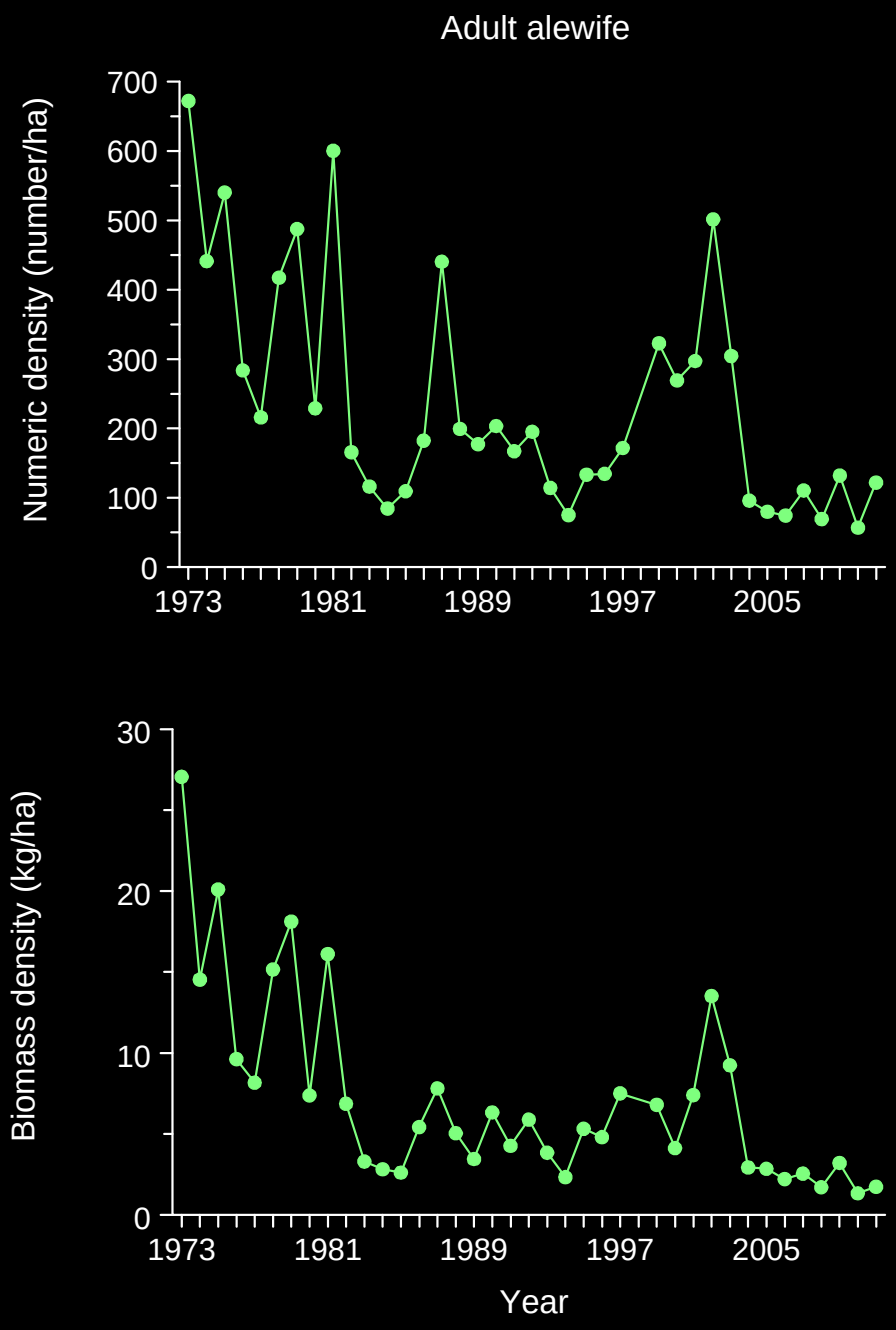
Chuck Madenjian, Bo Bunnell,
Tim Desorcie, Margi Chriscinske,
Melissa Kostich, and Jean Adams

USGS Great Lakes Science Center
Ann Arbor, MI

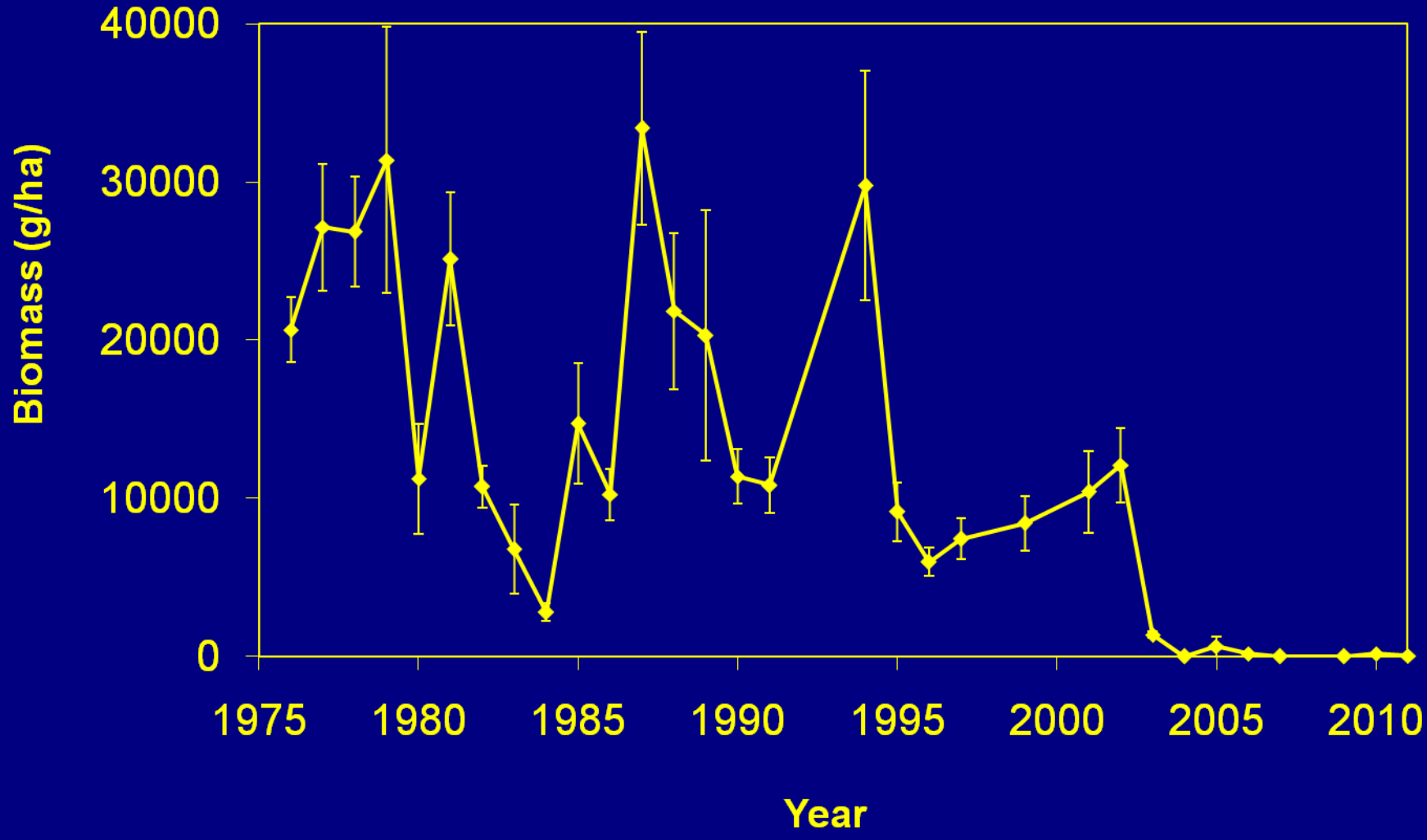



87°45'
86°30'
85°15'
46°00'
44°45'
43°30'
42°15'
Manistique
Sturgeon Bay
Frankfort
Ludington
Port Washington
Saugatuck
Waukegan
USGS Bottom Trawl Survey
N
25 0 25
Miles


USGS
Acoustics
Survey
N
0 25 50 100 Kilometers

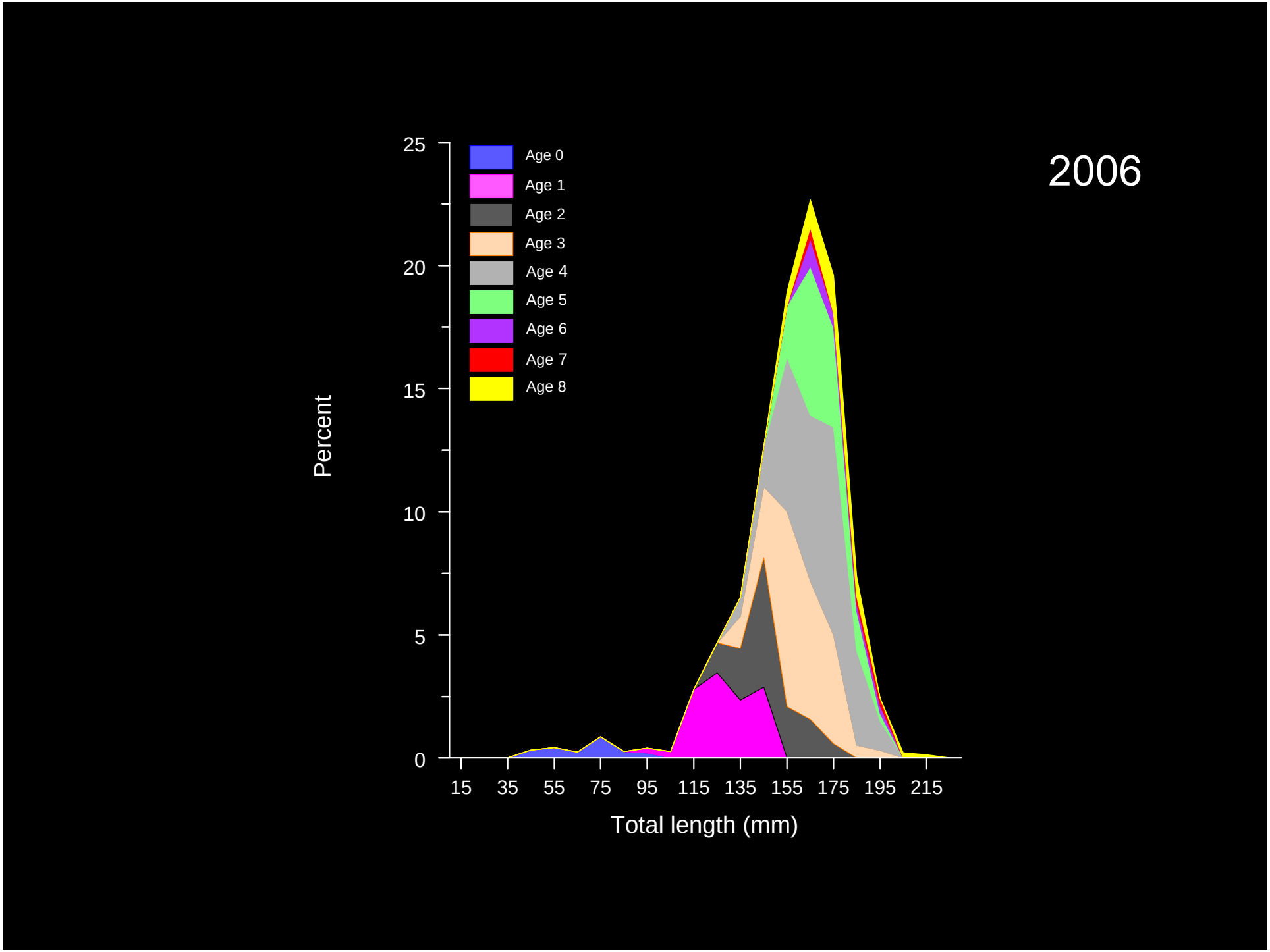

Adult alewife
Numeric density (number/ha)
700
600
500
400
300
200
100
0
1973
1981
1989
1997
2005
Biomass density (kg/ha)
30
20
10
0
1973
1981
1989
1997
2005
Year

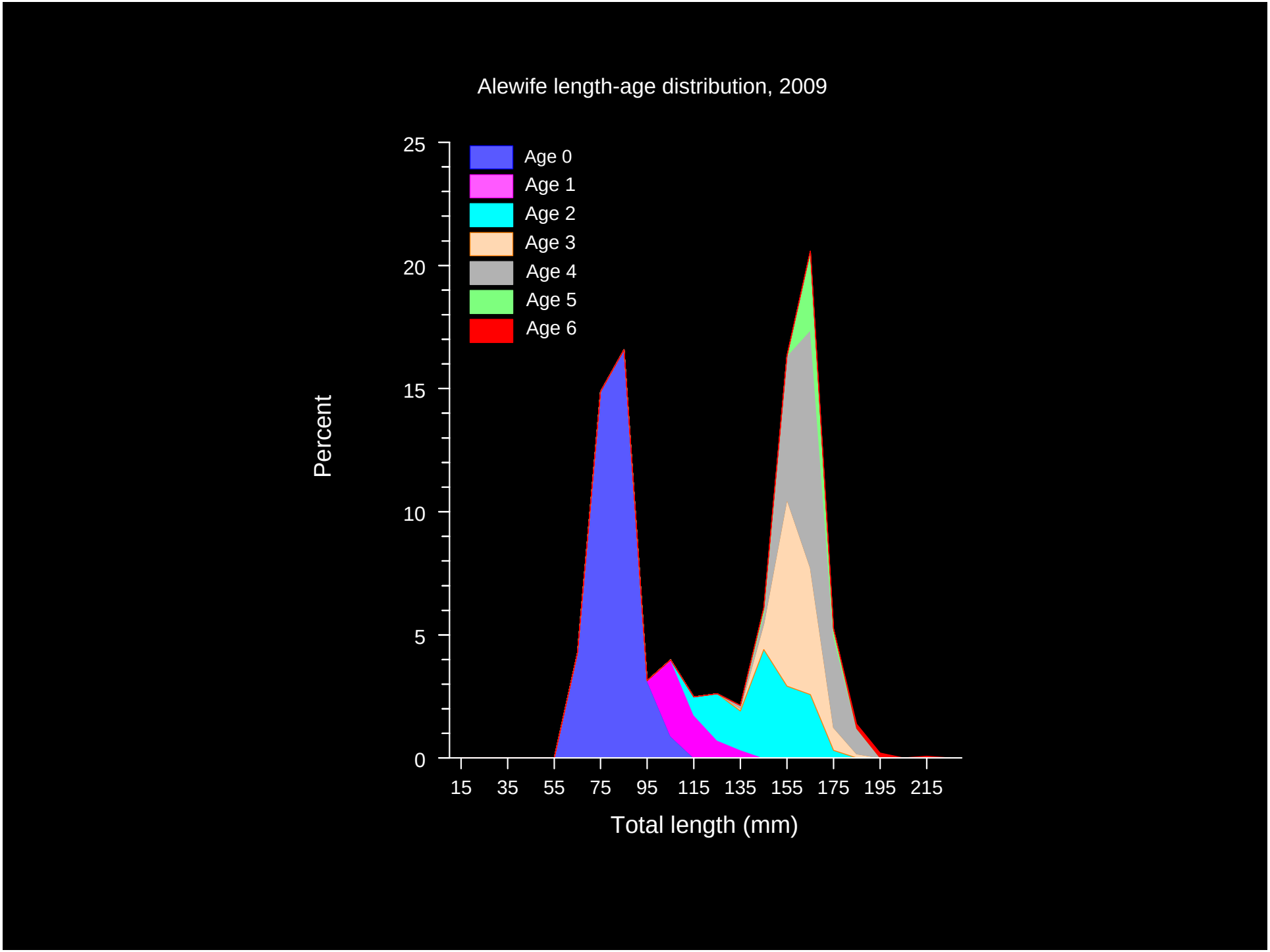
Lake Huron

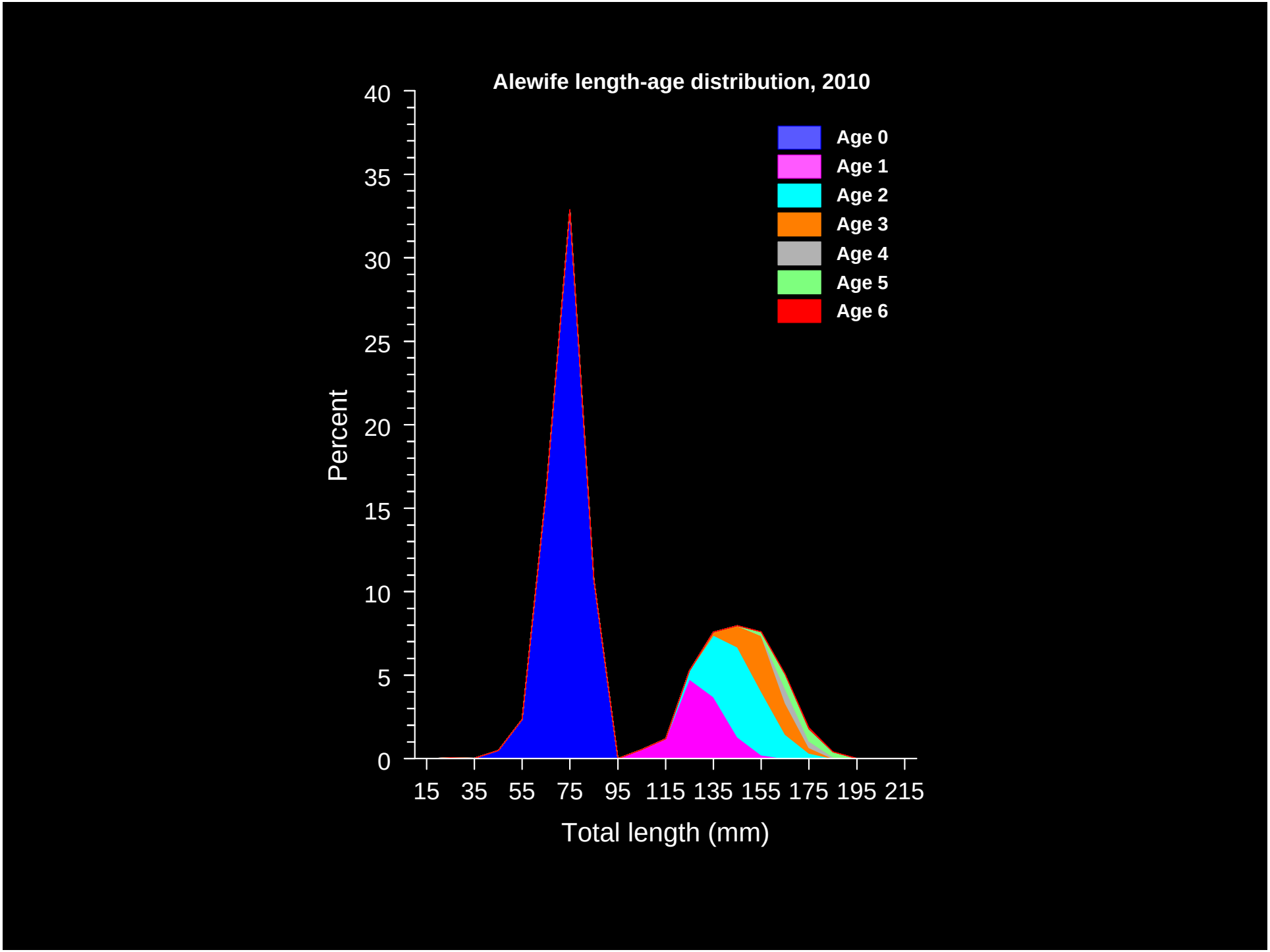

40000
30000
20000
10000
0
Biomass (g/ha)
1975
1980
1985
1990
1995
2000
2005
2010
Year

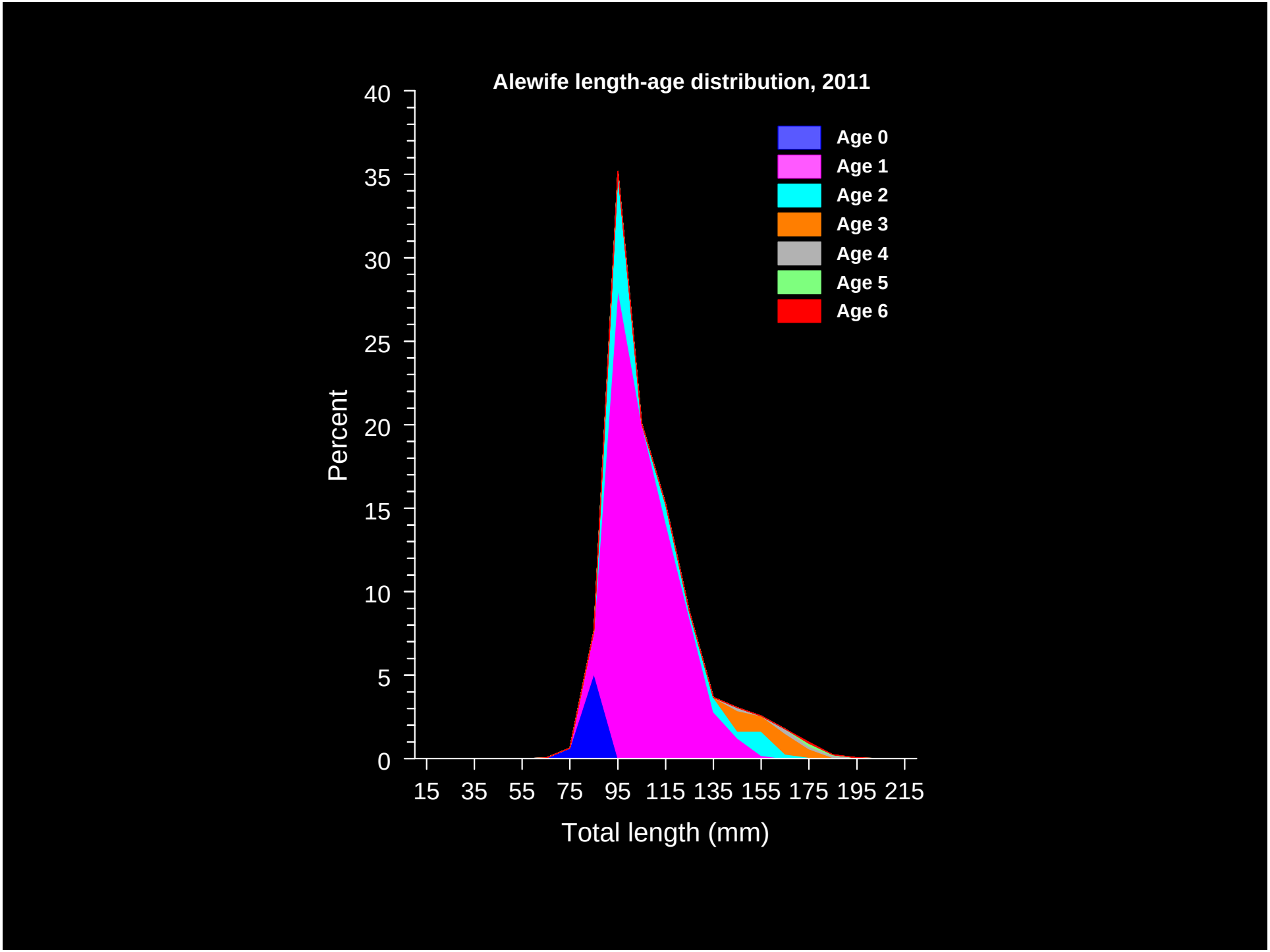
Concern that salmonine consumption is exceeding alewife production

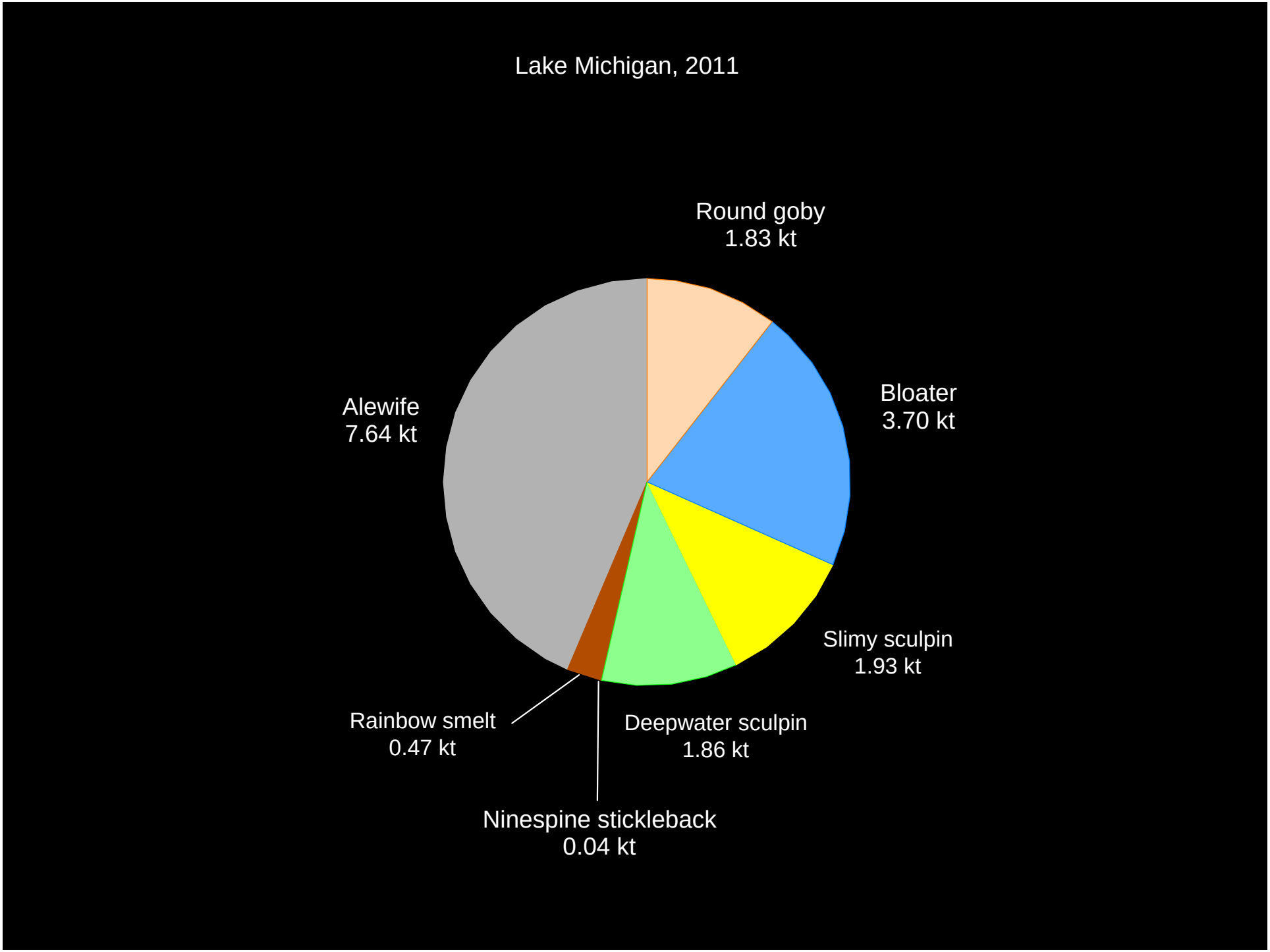
- ✓ Alewife energy density has declined (need to eat 22% more alewife to maintain constant growth)- Madenjian et al. 2006.
- ✓ Chinook salmon have increased their reliance on alewife as a prey (maybe not the case for lake trout?).
- ✓ Alewife age-class distribution is more truncated (similar to Lake Huron pre-2003). 2011: up to 80% age-1.

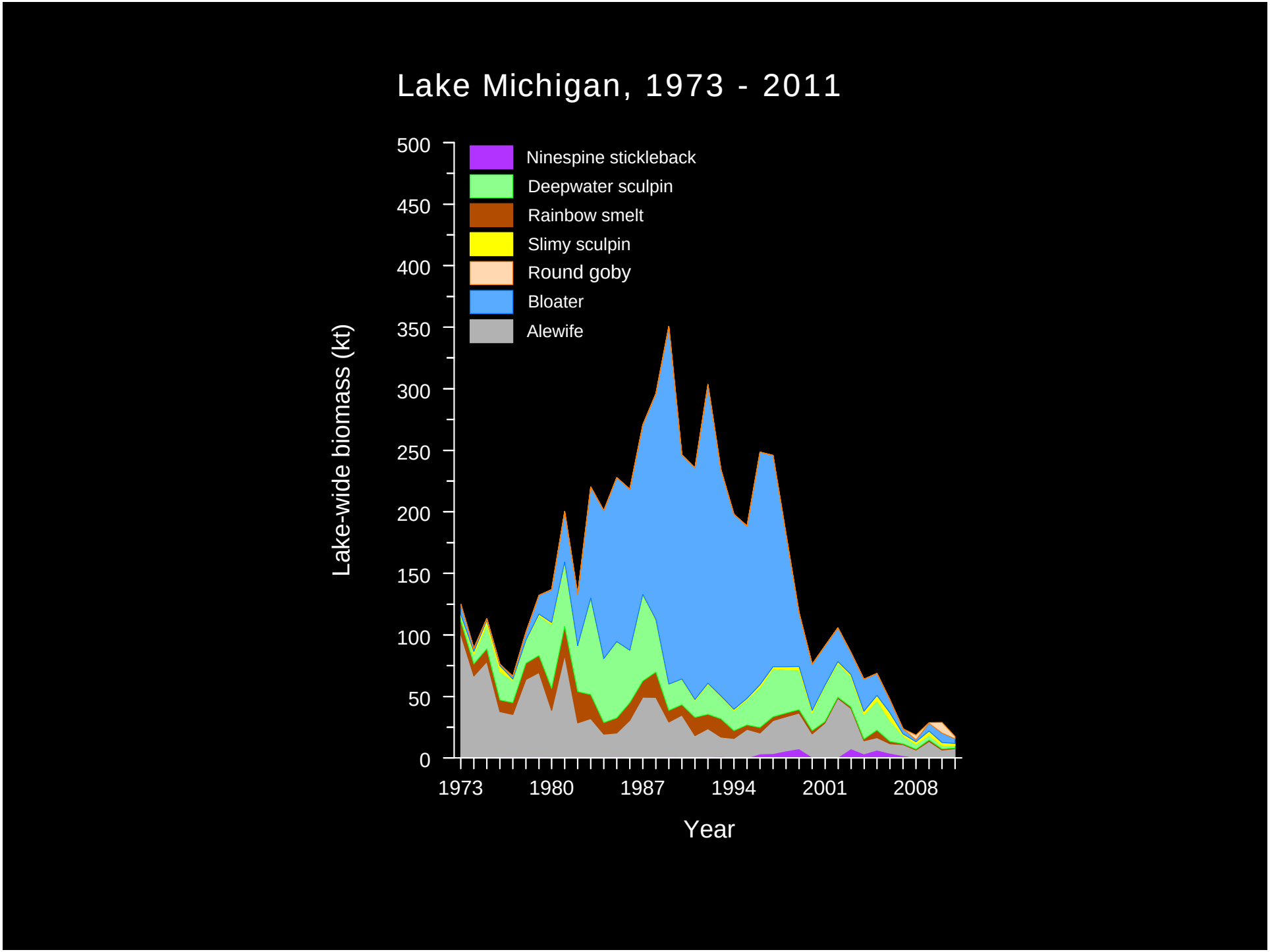

2006
Age 0
Age 1
Age 2
Age 3
Age 4
Age 5
Age 6
Age 7
Age 8
Percent
0
5
10
15
20
25
15
35
55
75
95
115
135
155
175
195
215
Total length (mm)


Alewife length-age distribution, 2009
Age 0
Age 1
Age 2
Age 3
Age 4
Age 5
Age 6
Percent
25
20
15
10
5
0
15
35
55
75
95
115
135
155
175
195
215
Total length (mm)


Alewife length-age distribution, 2010
Age 0
Age 1
Age 2
Age 3
Age 4
Age 5
Age 6
Percent
0
5
10
15
20
25
30
35
40
15
35
55
75
95
115
135
155
175
195
215
Total length (mm)


Alewife length-age distribution, 2011
Age 0
Age 1
Age 2
Age 3
Age 4
Age 5
Age 6
Percent
0
5
10
15
20
25
30
35
40
15
35
55
75
95
115
135
155
175
195
215
Total length (mm)


Lake Michigan, 2011
Round goby
1.83 kt
Bloater
3.70 kt
Slimy sculpin
1.93 kt
Deepwater sculpin
1.86 kt
Ninespine stickleback
0.04 kt
Rainbow smelt
0.47 kt
Alewife
7.64 kt


Lake Michigan, 1973 - 2011
Ninespine stickleback
Deepwater sculpin
Rainbow smelt
Slimy sculpin
Round goby
Bloater
Alewife
Lake-wide biomass (kt)
500
450
400
350
300
250
200
150
100
50
0
1973
1980
1987
1994
2001
2008
Year

Conclusions and prognosis

- Total prey fish biomass, as estimated by the bottom trawl, in 2011 was 17.47 kt, the lowest value in the time series
- Total prey fish biomass has remained below 30 kt since 2007
- Two factors contributing to low prey fish biomass: prolonged period of low bloater recruitment and intensified predation by Chinook salmon on alewives
- Adult alewife biomass density has remained low for an eight-year period and age distribution has been truncated during the past three years; characteristics similar to Lake Huron alewife population prior to collapse during 2003-2004

Conclusions and prognosis (continued)

- Whether or not alewife population collapses in Lake Michigan depends on several factors: Chinook salmon abundance, alewife year-class strength in 2012, environmental effects on alewife survival
- To quantify bottom-up effects, additional years of surveillance and additional analyses needed
- Prey fish biomass in 2011 was far below FCO
- Whether prey fish biomass will ever exceed 100 kt in the near future will depend on the ability of the bloater population to recover

Searching for a good stocking policy for Lake Michigan salmonines

Dr. Michael L. Jones and Iyob Tsehaye
Quantitative Fisheries Center, Fisheries and Wildlife
Michigan State University

Decision Analysis

Structured, formal method for comparing alternative management actions

Main components:

- Specify objectives
- Identify management options
- Assess knowledge and account for uncertainties
- Use model to forecast possible outcomes

The Big Question

How many salmon and trout should we stock into Lake Michigan each year?

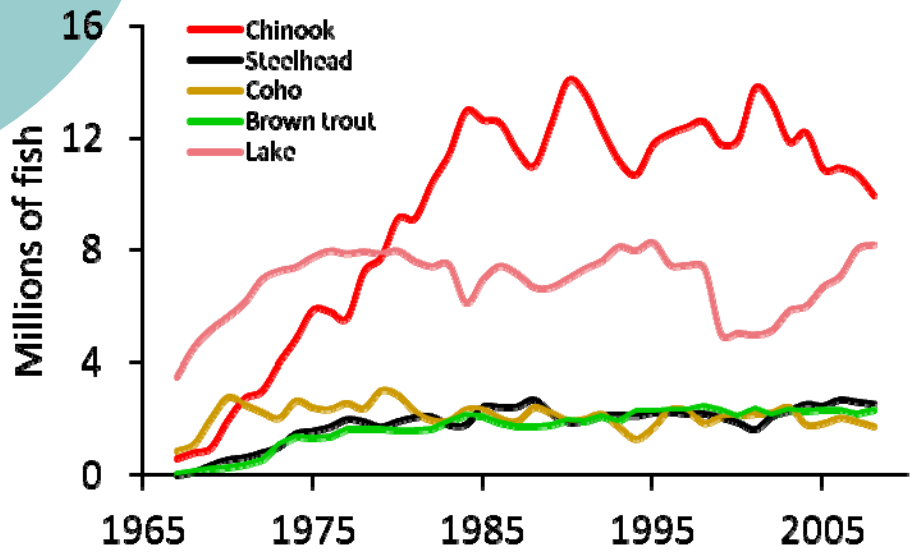
- more stocking leads to greater harvest, and thus benefits - unless…
- too much stocking leads to poor feeding conditions and increased mortality, but
- too little stocking may lead to negative effects of alewife on other species

How many salmon and trout are out there?

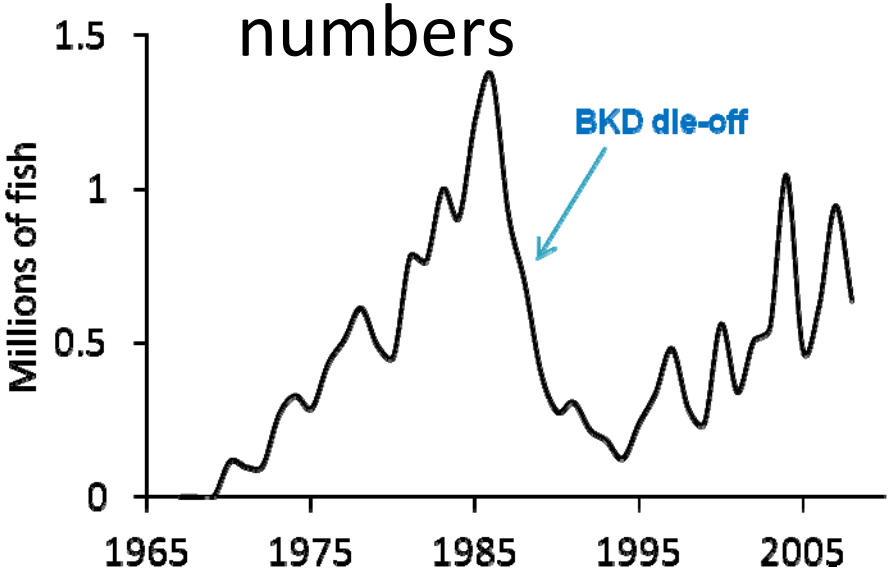
- Total salmonine numbers have remained relatively stable since 1990
- Reduced Chinook stocking has been offset by increased wild fish production
- More recently, improved survival of older Chinook salmon has also offset reduced stocking

How many salmon and trout are out there?

Salmonine abundance



Age-3 Chinook numbers



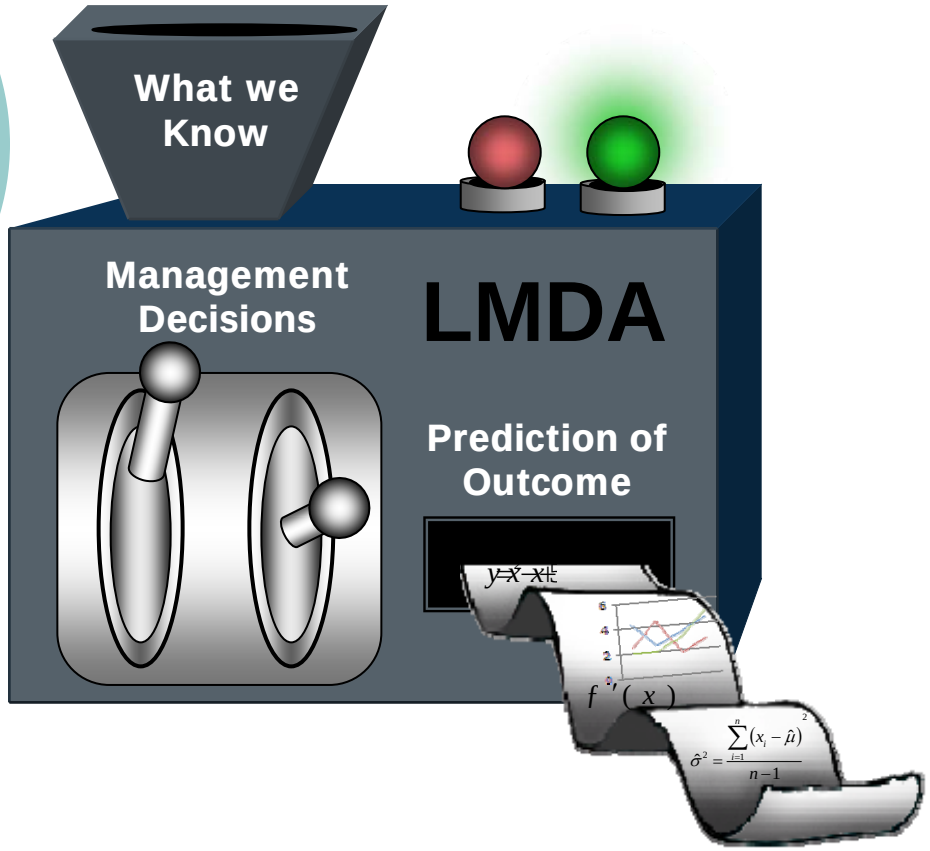
How much do they eat?

- Total consumption has remained fairly stable for last decade
- Chinook salmon have accounted for more than half of total demand consistently since 1980
- Large alewife accounted for more than 40% of total prey consumed since 1980, except in the late 1980s when small alewife dominated

What happens to salmon and trout feeding when prey numbers are low?

- Chinook salmon consumption has declined when alewife abundance declined
- Chinook salmon size and condition decrease
- Similar, but weaker pattern for lake trout

Policy simulation model

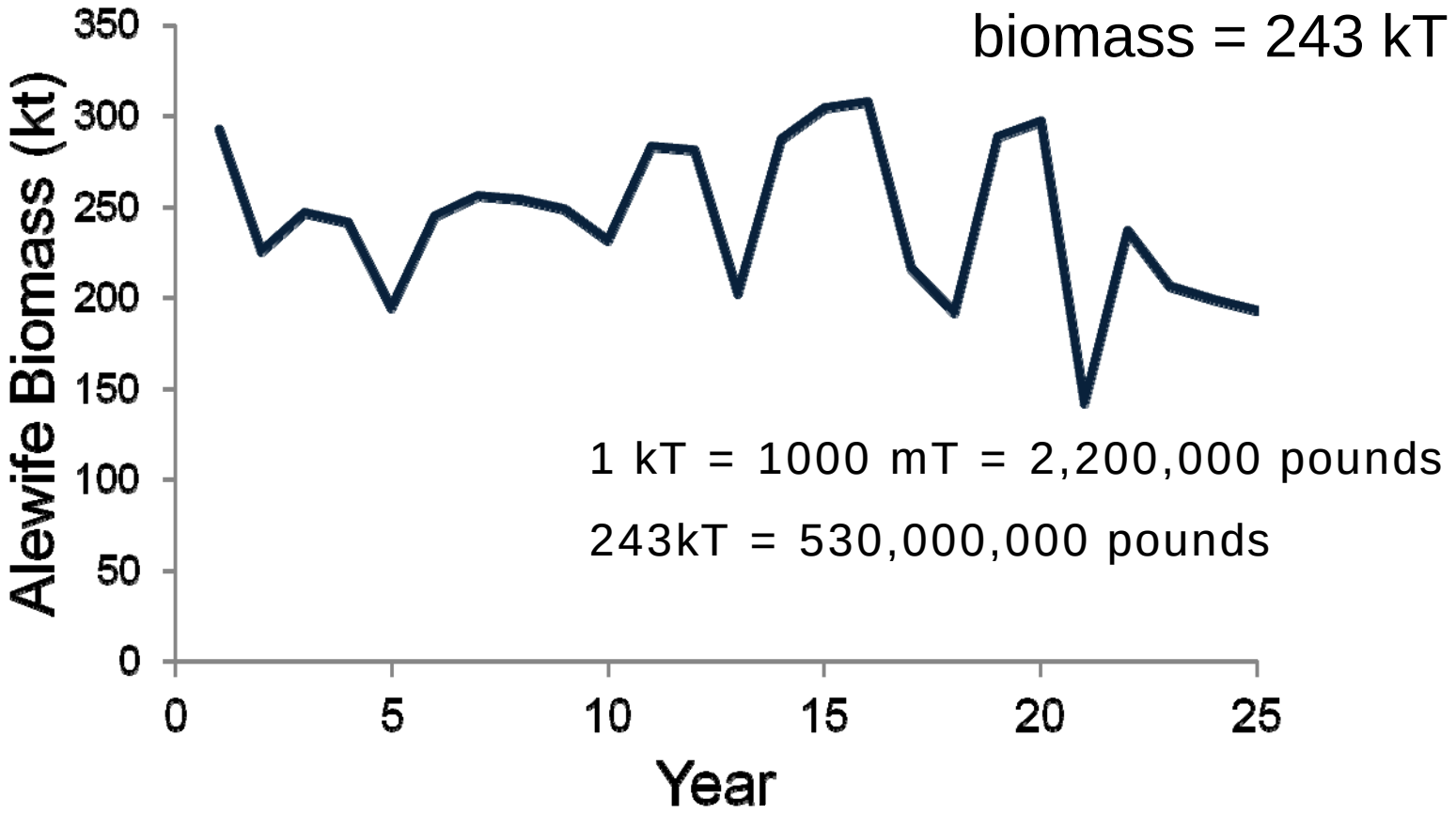


Accounts for uncertainties: key uncertainties concern prey recruitment (supply) and predator feeding (demand)

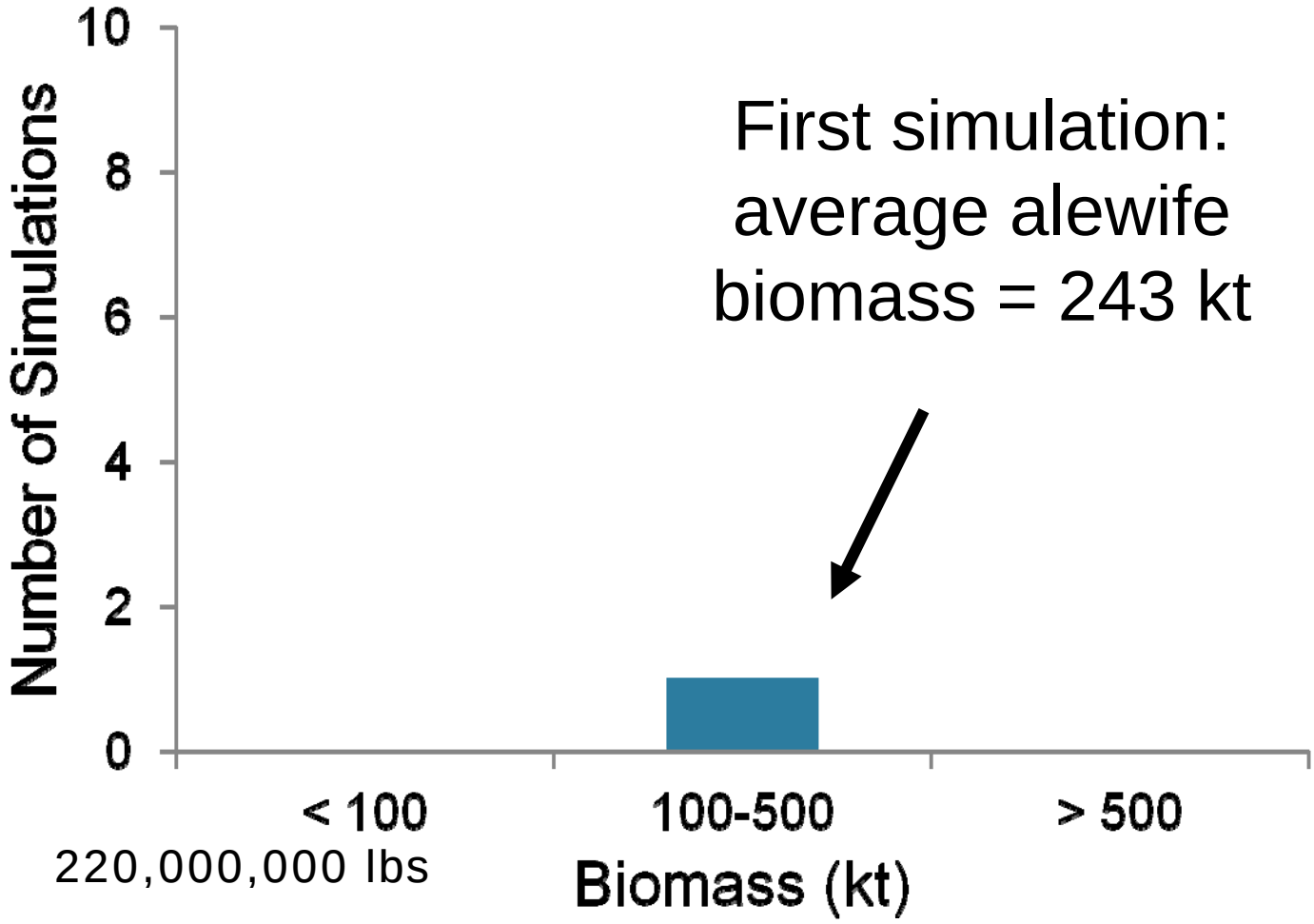
Model results

- The model forecasts possible future changes in fish populations and harvest, given a stocking policy
- There are many possible futures, so we need to look at the range of possible (likely) outcomes
  - This range tells us what we think is most likely, but also what might happen
  - Mainly we're interested in how likely it is that bad things will happen
- Here's how it works…

Generating results:
First simulation

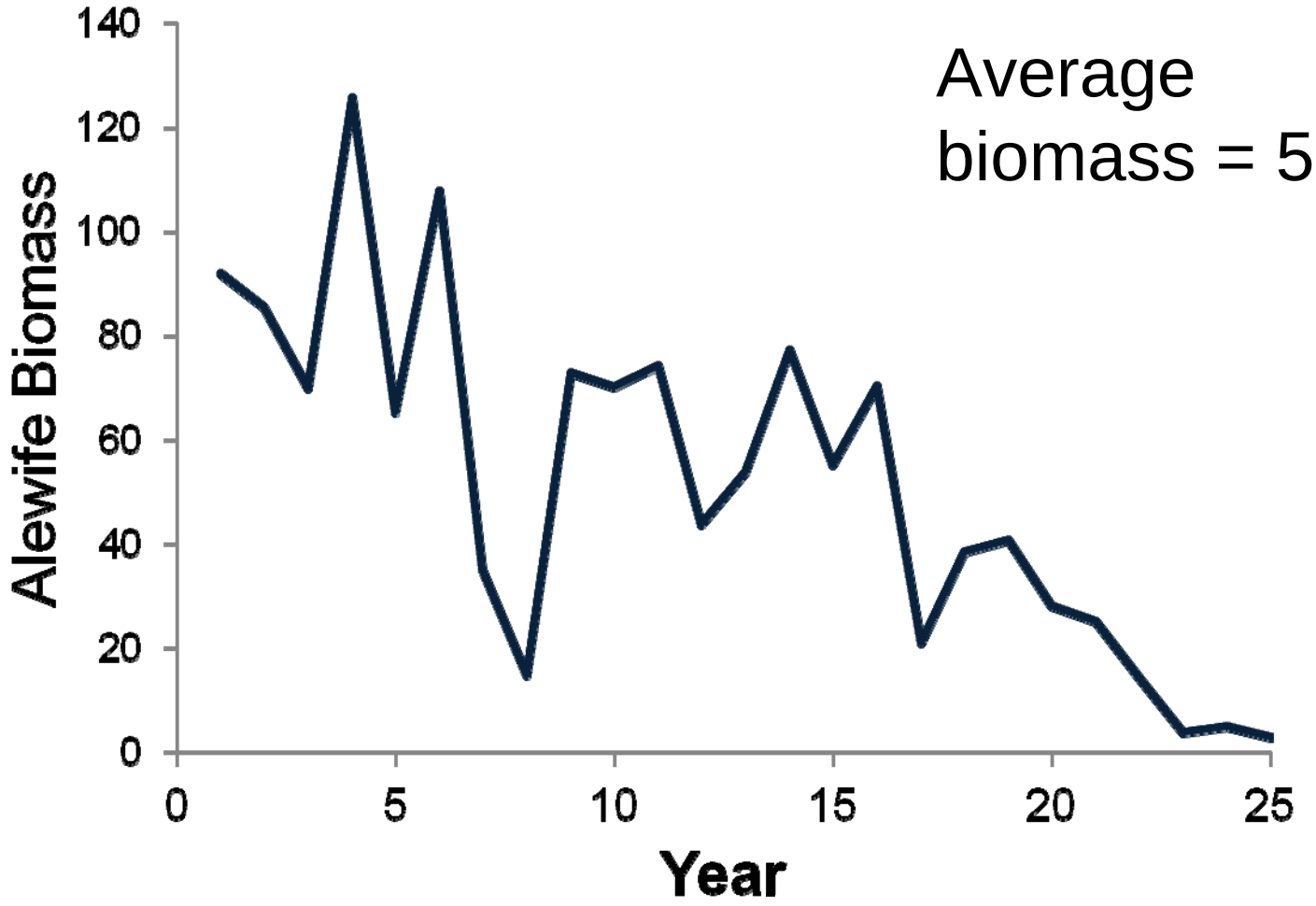


Generating results



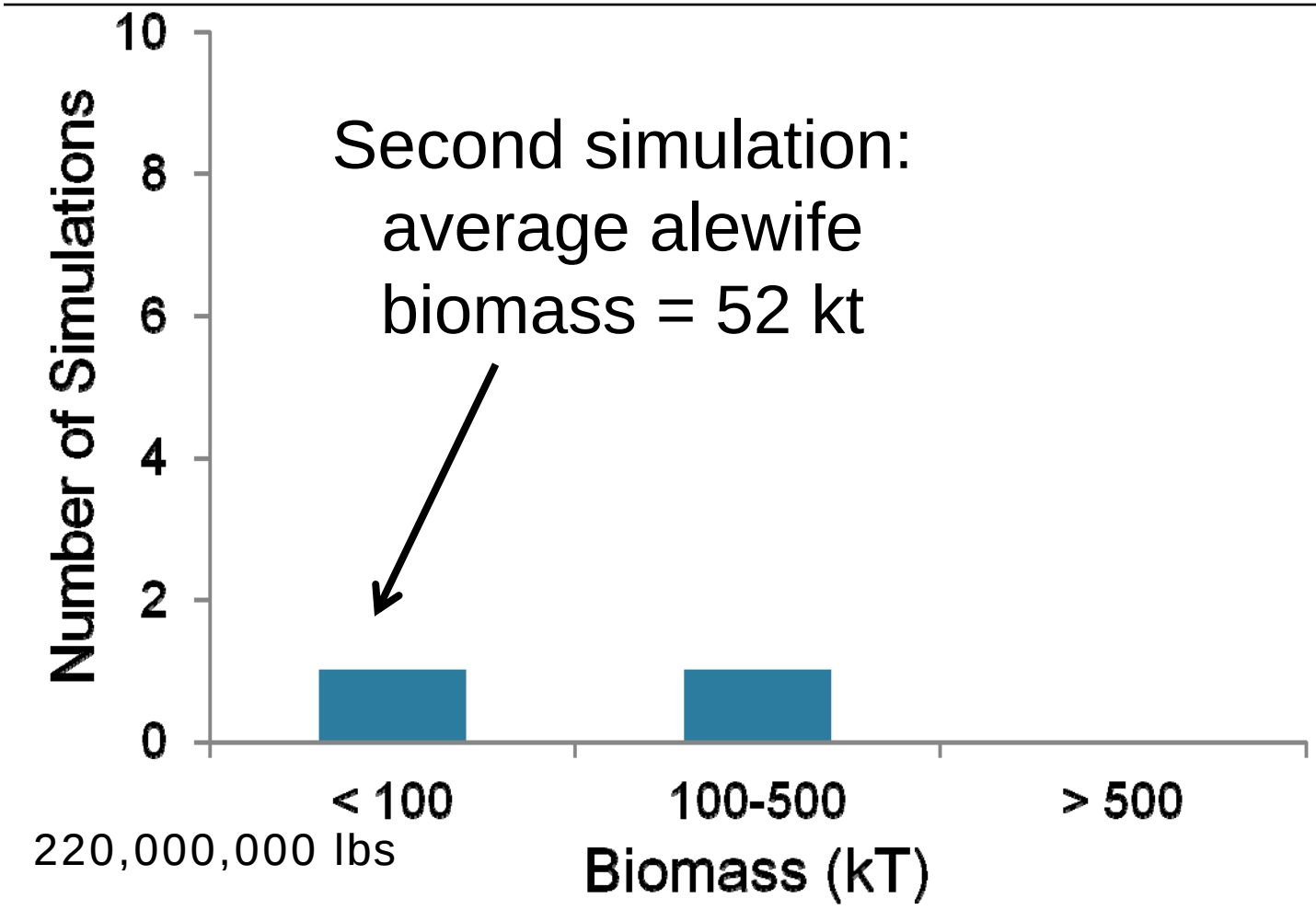
Generating results:

Second simulation

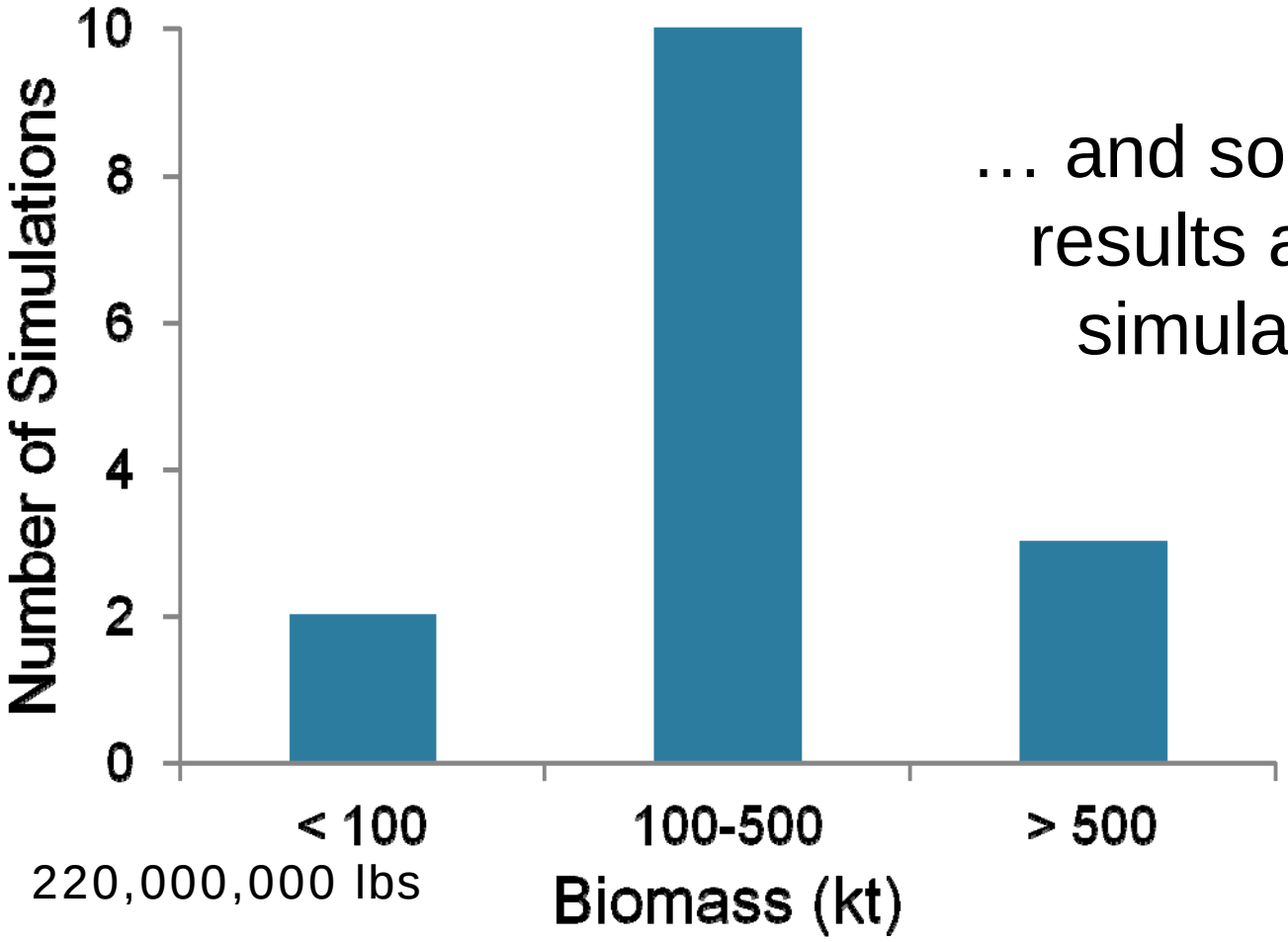


Average biomass = 52 kT

Generating results



Generating results

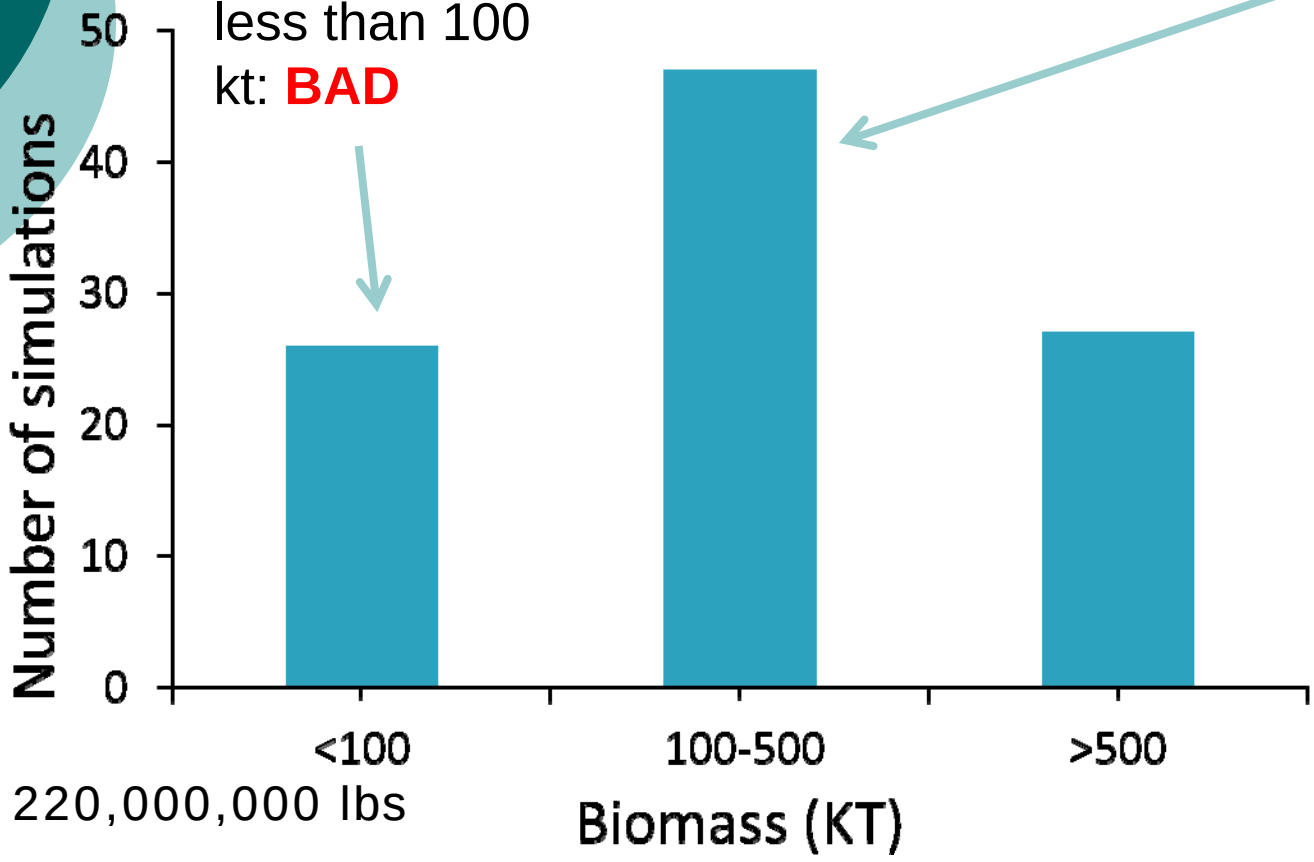


… and so on (e.g., results after 15 simulations)

An example result: Status quo policy

In 26 of 100 cases alewife biomass was less than 100 kt: **BAD**

In 45 of 100 cases alewife biomass was between 100 and 500 kt: **OK**



220,000,000 lbs

Evaluating Options

Evaluating Options

Each of the 4 options lowers risk using different species mixes

All involve stocking reductions for 2013

Public feedback, model outputs, and field data for determination of management strategy

Stocking Options

Option 1 - 50% reduction in Chinook salmon, then evaluate after 5 years

Option 2 - 50% reduction in Chinook salmon, alter Chinook stocking based on feedback policy

Option 3 - 30% reduction in Chinook salmon and 10% others (except lake trout), alter stocking based on feedback policy

Option 4 - 30% reduction in Chinook salmon and 10% others, alter stocking based on feedback policy

Feedback Policy

- Based on weight of age-3+ Chinook salmon
- Chinook salmon weight strongly influenced by abundance of alewife
- Weight below 15.4 lbs - reduce stocking
- Weight above 17.6 lbs - increase stocking
- Potentially adjustments every 3 years

Model output for Option 1

50% reduction in Chinook salmon, then evaluate after 5 years

Probability

	Low Alewife biomass	Low Chinook weight (<13 lbs)	Low Chinook harvest	Low Chinook catch rates (<8 / 100 hrs)
Option 1	14%	23%	21%	19%
Status Quo	23%	35%	20%	20%

Model output for Option 2

50% reduction in Chinook, use Chinook weight as feedback to determine actions (3 year interval)

Probability

	Low Alewife biomass	Low Chinook weight (<13 lbs)	Low Chinook harvest	Low Chinook catch rates (<8 / 100 hrs)
Option 2	12%	20%	21%	19%
Status Quo	23%	35%	20%	20%

Model output for Option 3

30% reduction in Chinook and 10% others (excluding LAT), use Chinook weight as feedback to determine actions (3 year interval)

Probability

	Low Alewife biomass	Low Chinook weight (<13 lbs)	Low Chinook harvest	Low Chinook catch rates (<8 / 100 hrs)
Option 3	4%	12%	10%	9%
Status Quo	23%	35%	20%	20%

Model output for Option 4

30% reduction in Chinook and 10% all others, use Chinook weight as feedback to determine actions (3 year interval)

Probability

	Low Alewife biomass	Low Chinook weight (<13 lbs)	Low Chinook harvest	Low Chinook catch rates (<8 / 100 hrs)
Option 4	3%	11%	7%	6%
Status Quo	23%	35%	20%	20%

Comparison of Options

	Low Alewife biomass	Low Chinook weight (<13 lbs)	Low Chinook harvest	Low Chinook catch rates (<8 / 100 hrs)
Option 1	14%	23%	21%	19%
Option 2	12%	20%	21%	19%
Option 3	4%	12%	10%	9%
Option 4	3%	11%	7%	6%
Status Quo	23%	35%	20%	20%

Stocking Options

Option 1 - 50% reduction in Chinook salmon, then evaluate after 5 years

Option 2 - 50% reduction in Chinook salmon, alter Chinook stocking based on feedback policy

Option 3 - 30% reduction in Chinook salmon and 10% others (except lake trout), alter stocking based on feedback policy

Option 4 - 30% reduction in Chinook salmon and 10% others, alter stocking based on feedback policy

You may provide comments via an online survey found at:

www.miseagrant.umich.edu/fisheries/stocking

Comments will be accepted through May 15, 2012

Written comments will also be accepted

Meeting Agenda – final hour

- Break – 5 minutes
- Discussion and questions – 50 minutes
- Next Steps – 5 minutes
- Adjourn

Next Steps

- Lake Michigan Committee (WI, IL, IN, MI, CORA) will make the decision on most appropriate option
- Various inputs will be used to make the decision including model results, public comments, public review of options, best available data and information
- Decision on appropriate option will be made by September 1st
- Tactical plan will be decided by early winter