

2016 Lake Ontario

Salmon Symposium

Perspectives from
Lake Huron and Lake Michigan



Port Credit
Salmon and Trout Association



Ontario

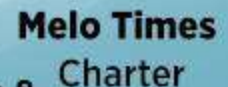
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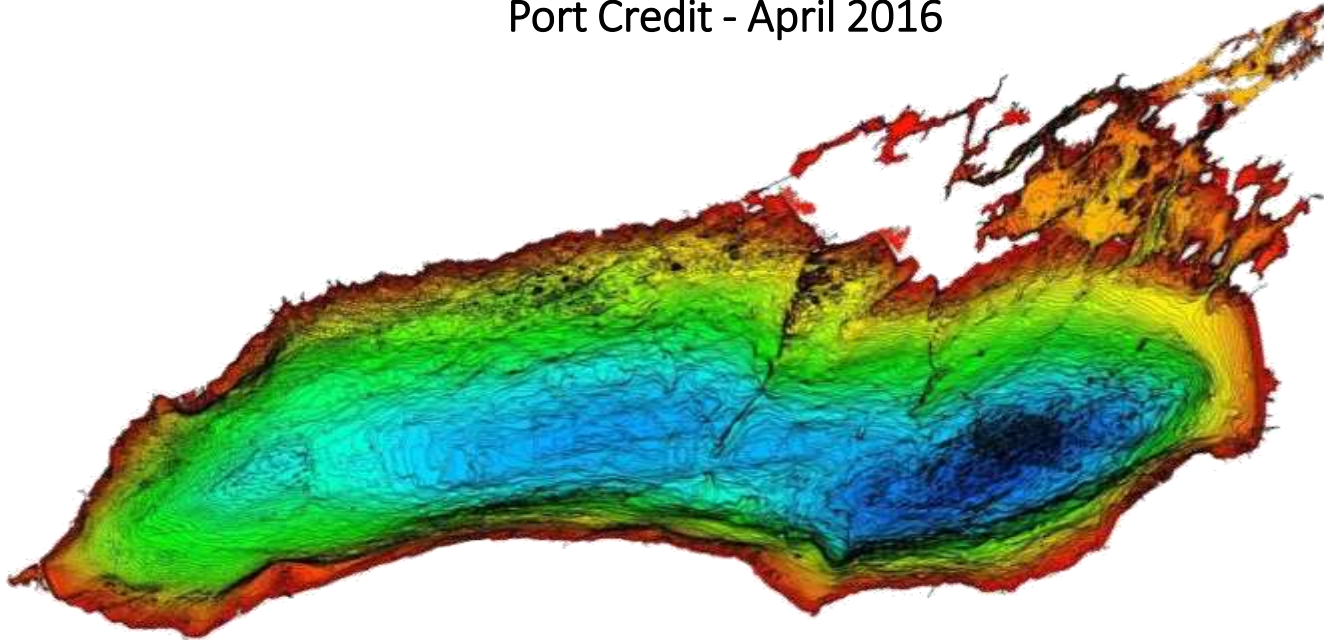
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Lake Ontario - Salmon Symposium
Lake Huron and Michigan Perspectives

Frank Krist

Port Credit - April 2016



Frank Krist

Live 2 blocks from Lake Huron for 41 years

Make over 70 fishing trips annually

Have been involved in fishery issues for 41 years as a stakeholder representing anglers

Environmental law enforcement for 34 years

***Chair MDNR Lake Huron Citizens Fishery Advisory Committee**

***Member MDNR Lake Michigan Citizens Fishery Advisory Committee**

Chair MDNR Northern Inland Lakes Citizens Fishery Advisory Committee

Member of Hammond Bay Area Anglers Association

Michigan Sea Grant Advisor

Member of Coalition to Protect Michigan Resources

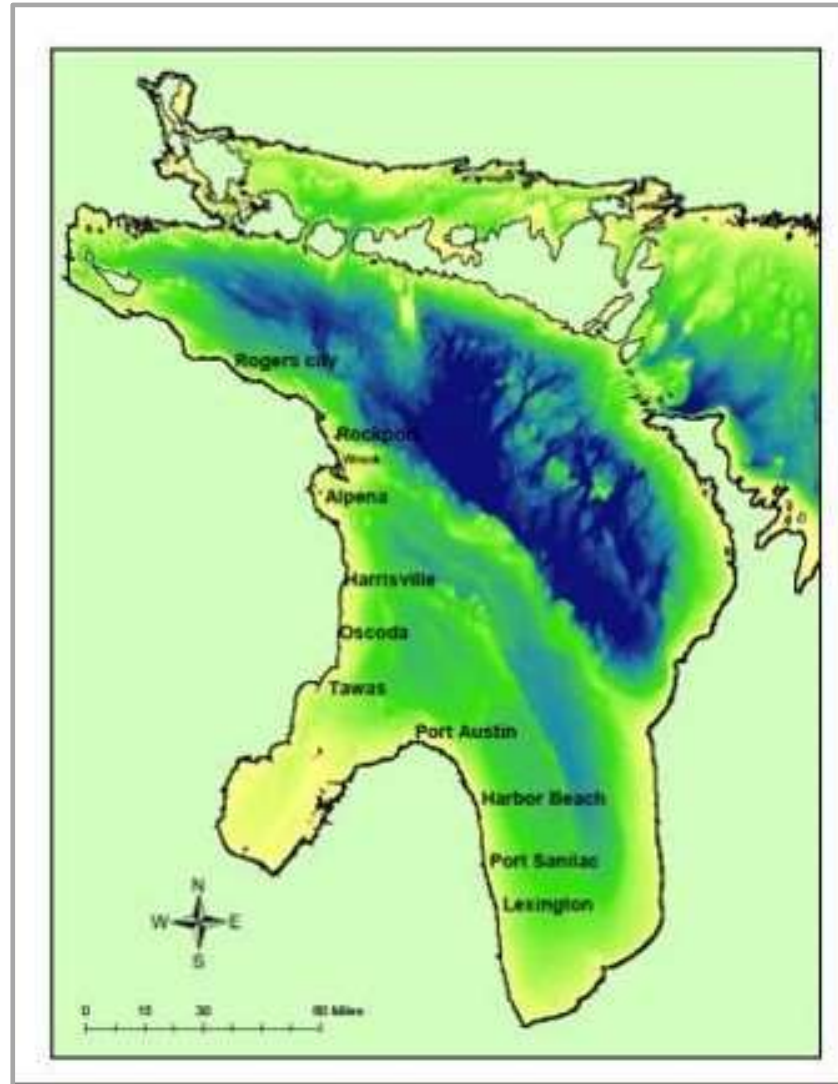
Member of Conservation Coalition

Share with you

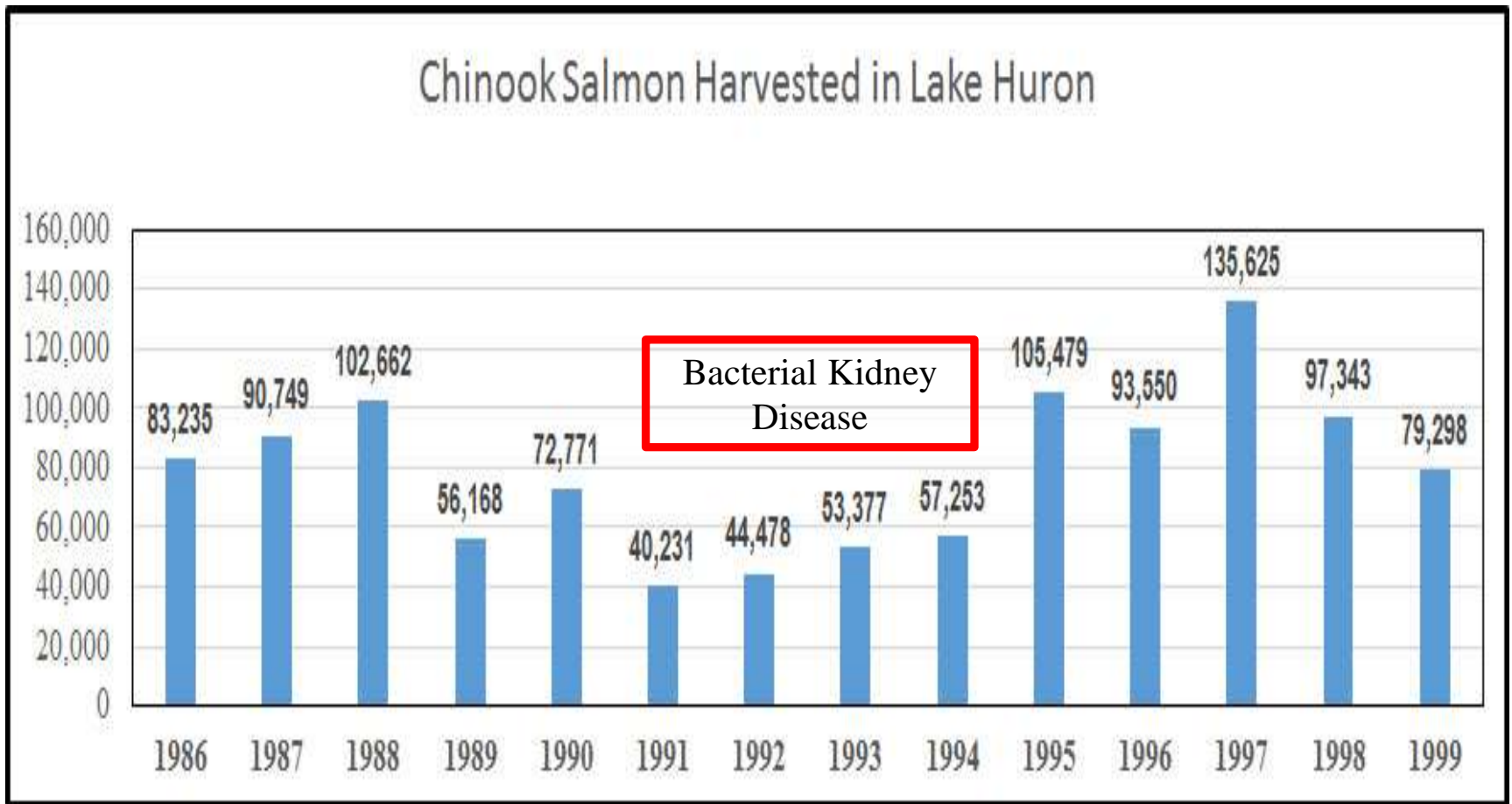
- 1) Collapse of alewife and Chinook salmon fisheries in Lake Huron
- 2) The near collapse of these fisheries in Lake Michigan
- 3) An overview of the new fishery without alewife in Lake Huron
- 4) How the public reacted to the changes
- 5) Compare these changes with Lake Ontario

Will concentrate first on the Lake Huron Chinook fishery

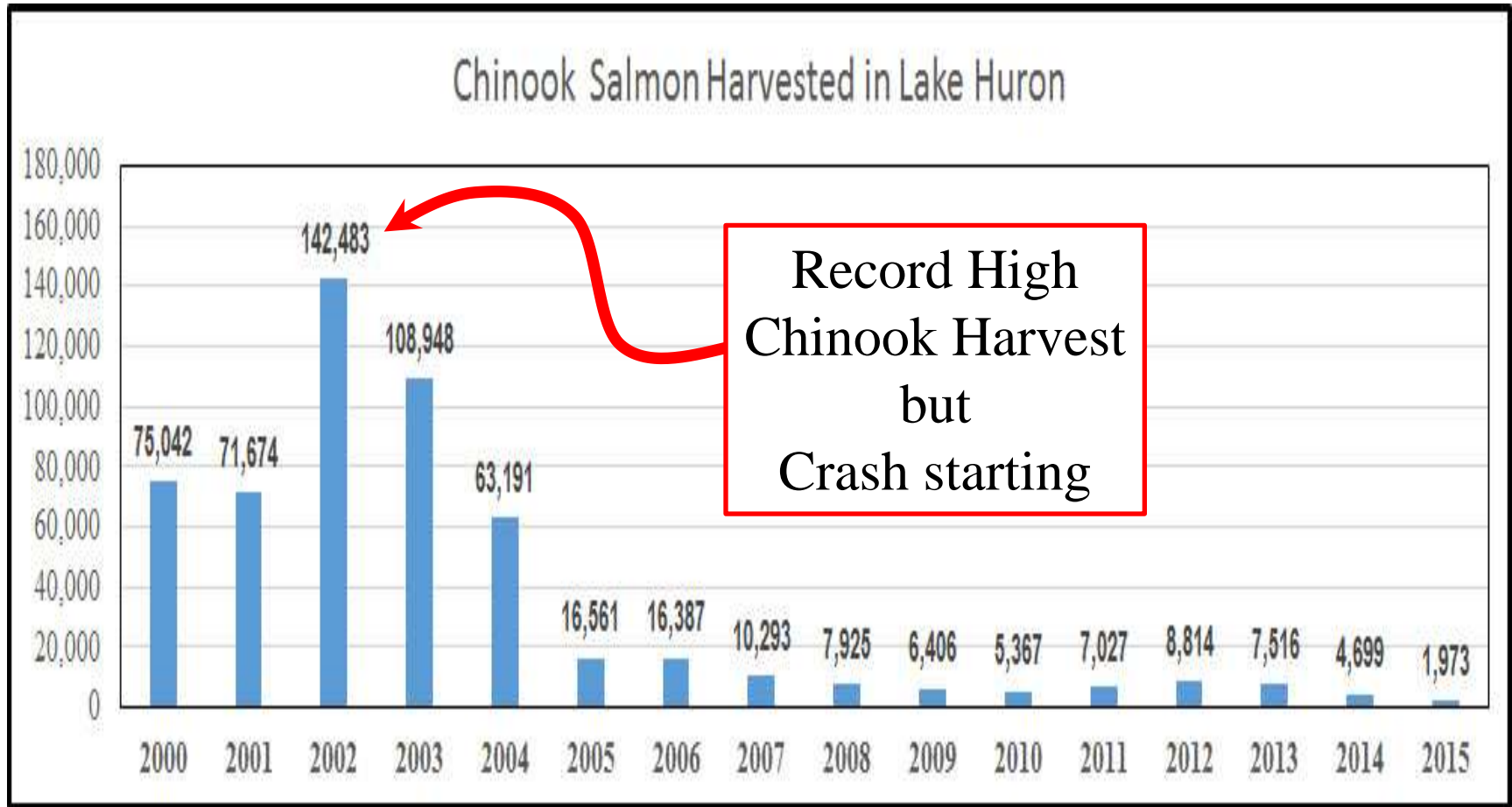
Creel Survey
10 index ports
from
1986-2015



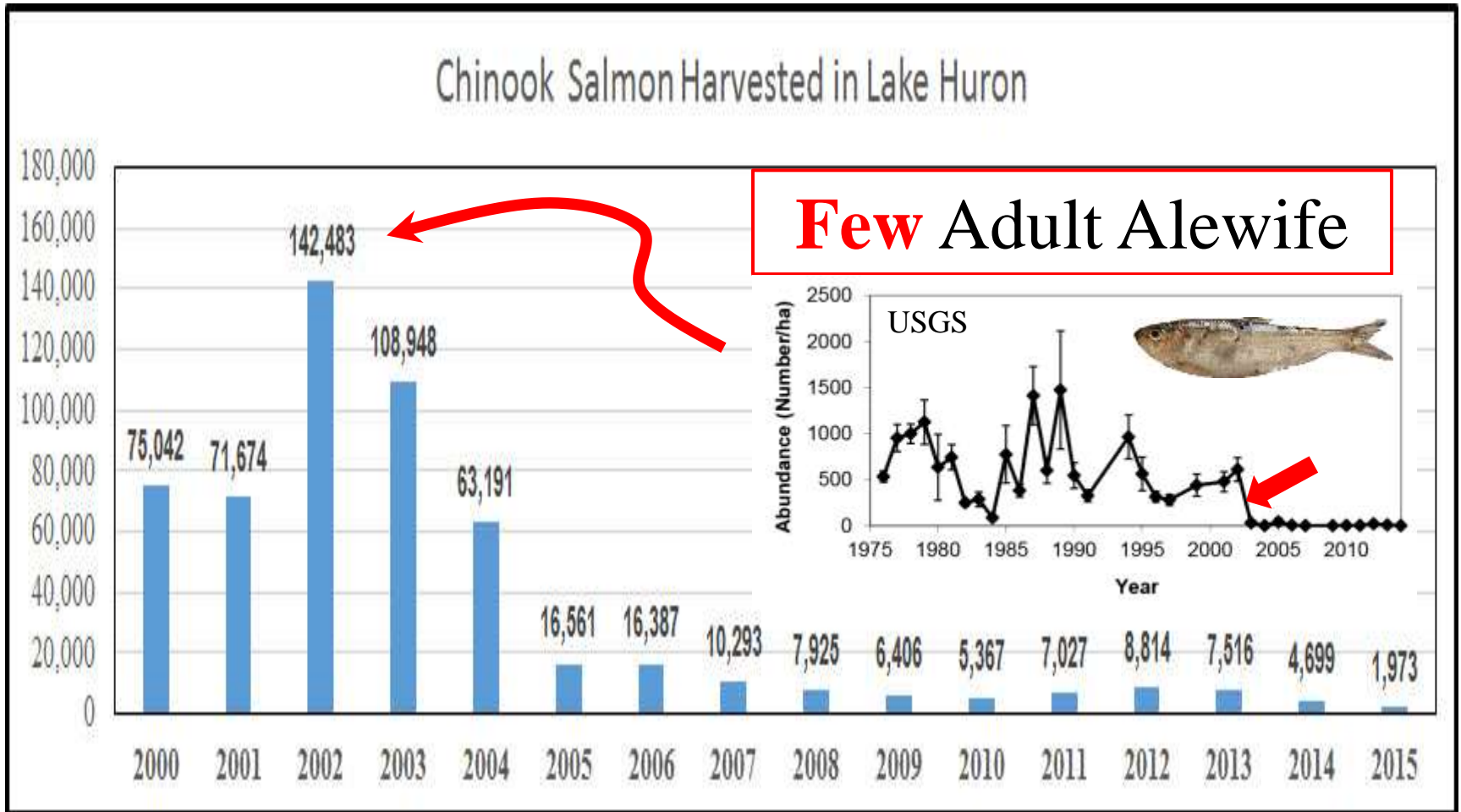
Number of Chinook Salmon harvested Michigan waters Lake Huron 1986-1999



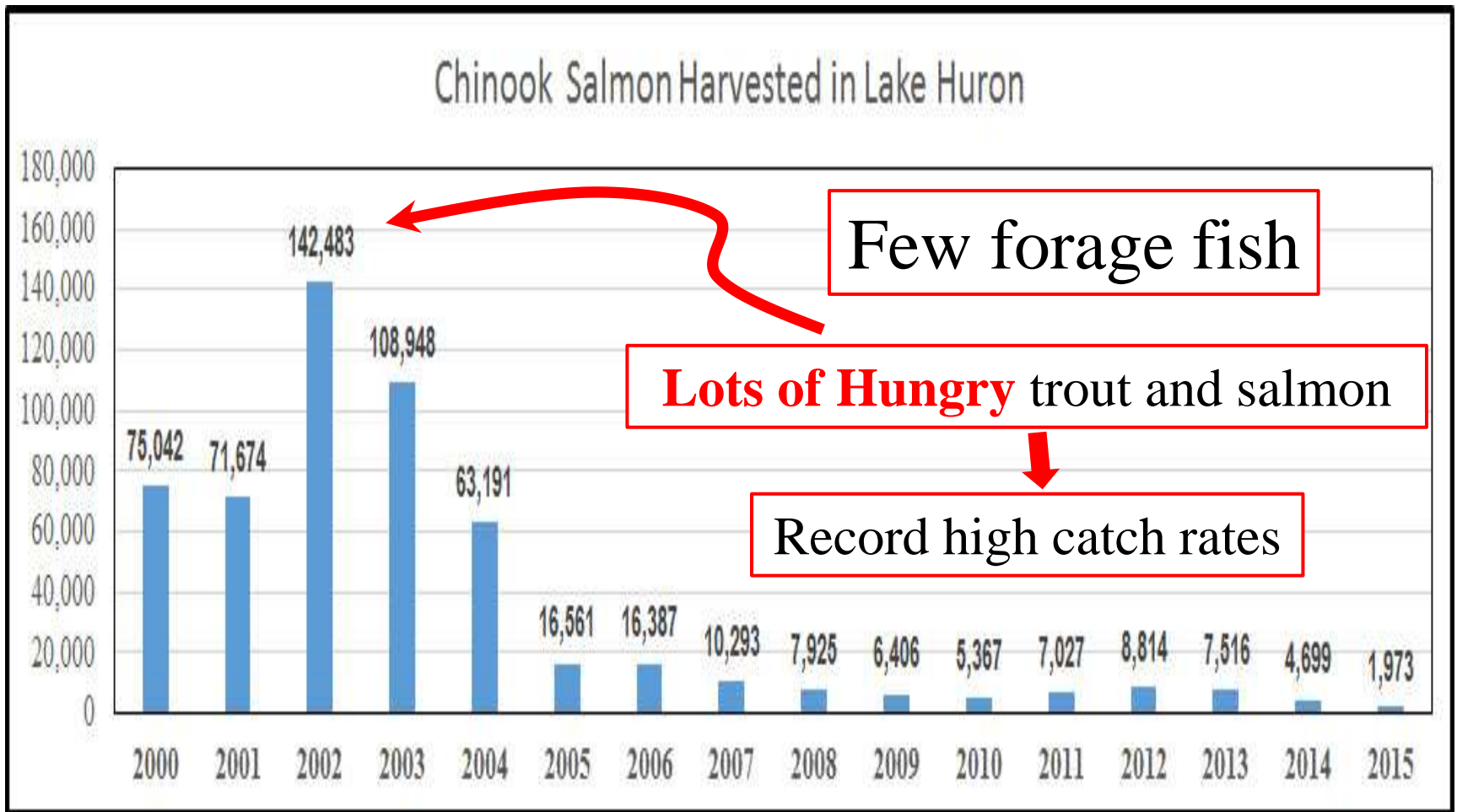
2002 record high harvest but **beginning** of the crash



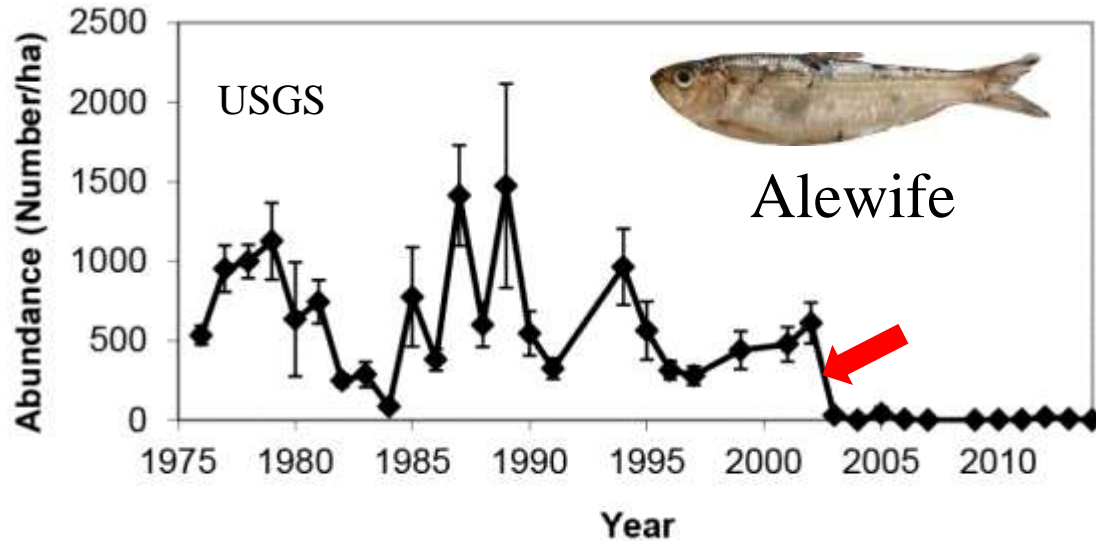
In spite of excellent harvest alewife plummeting to record lows



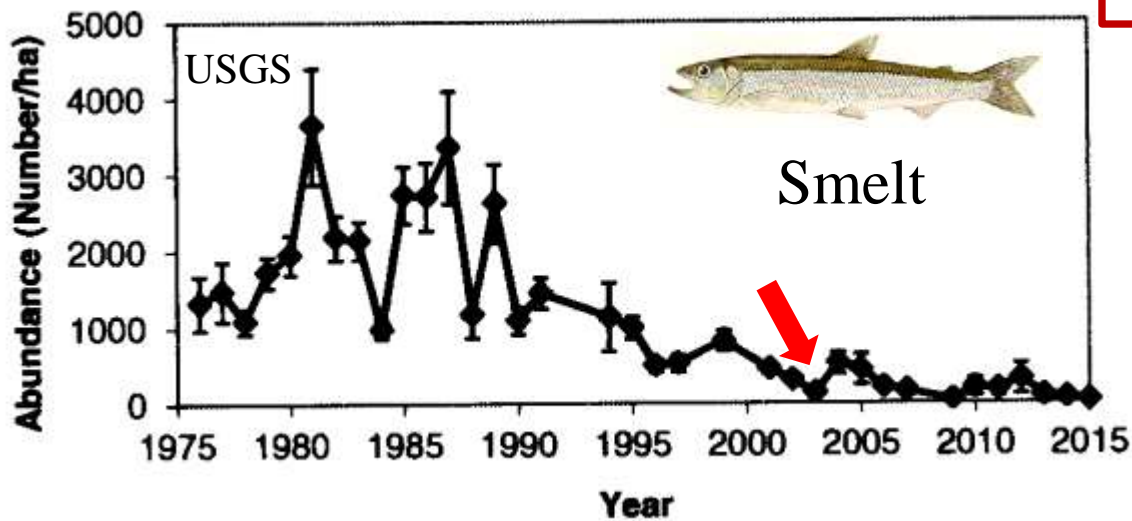
Why the record high Chinook harvest in 2002?



Not only alewife and but also smelt at low levels

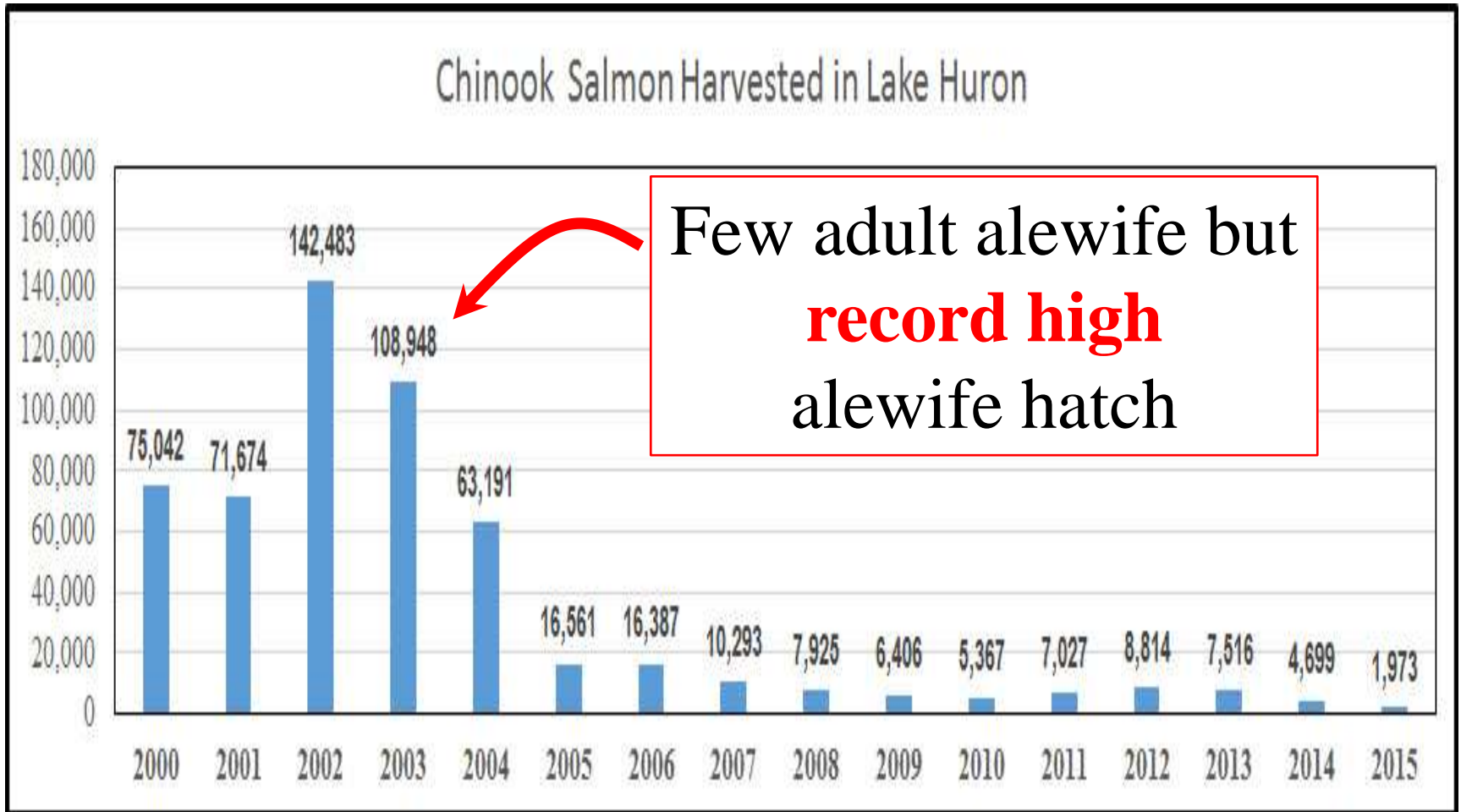


Mid-water
prey fish

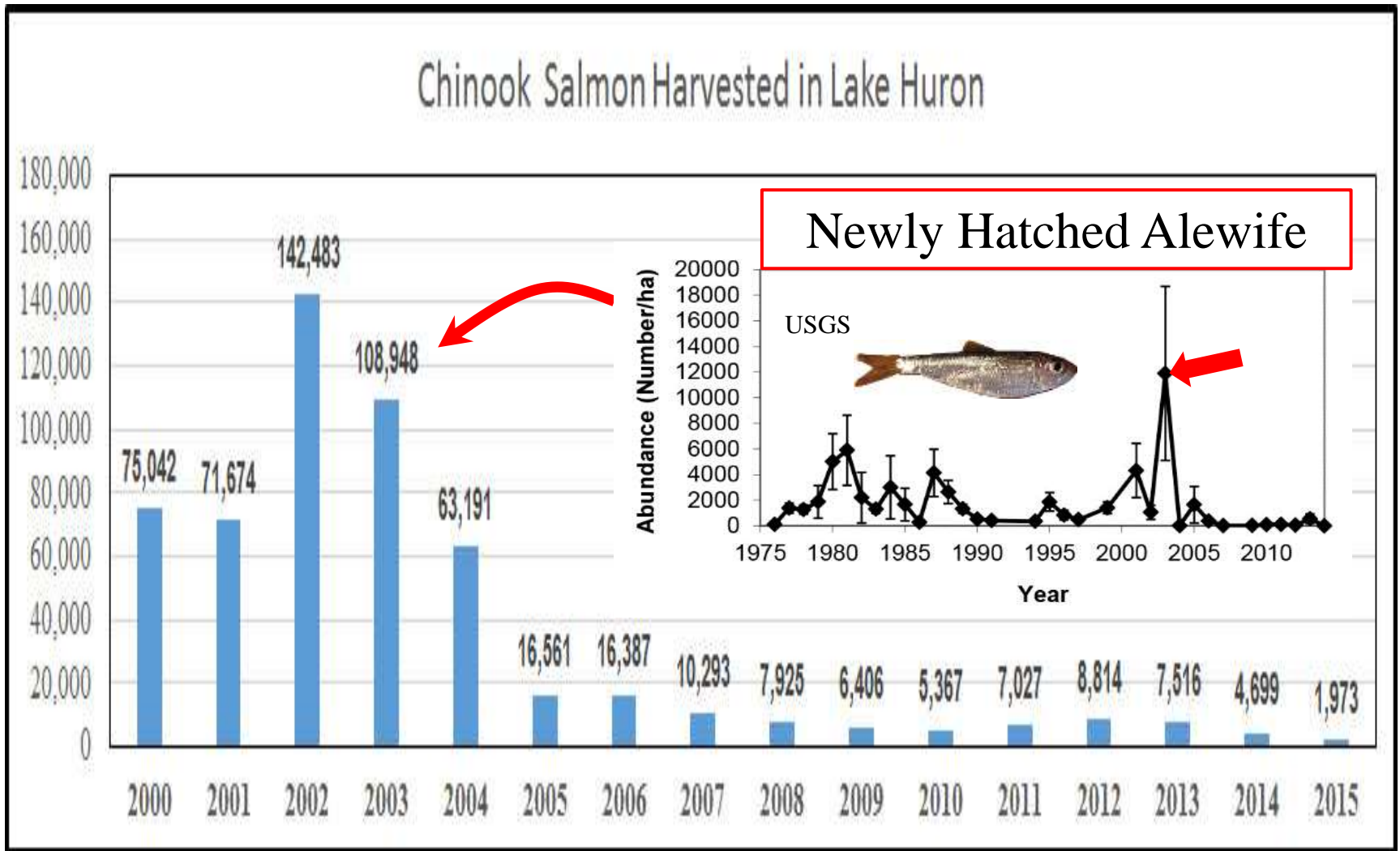


Hope!

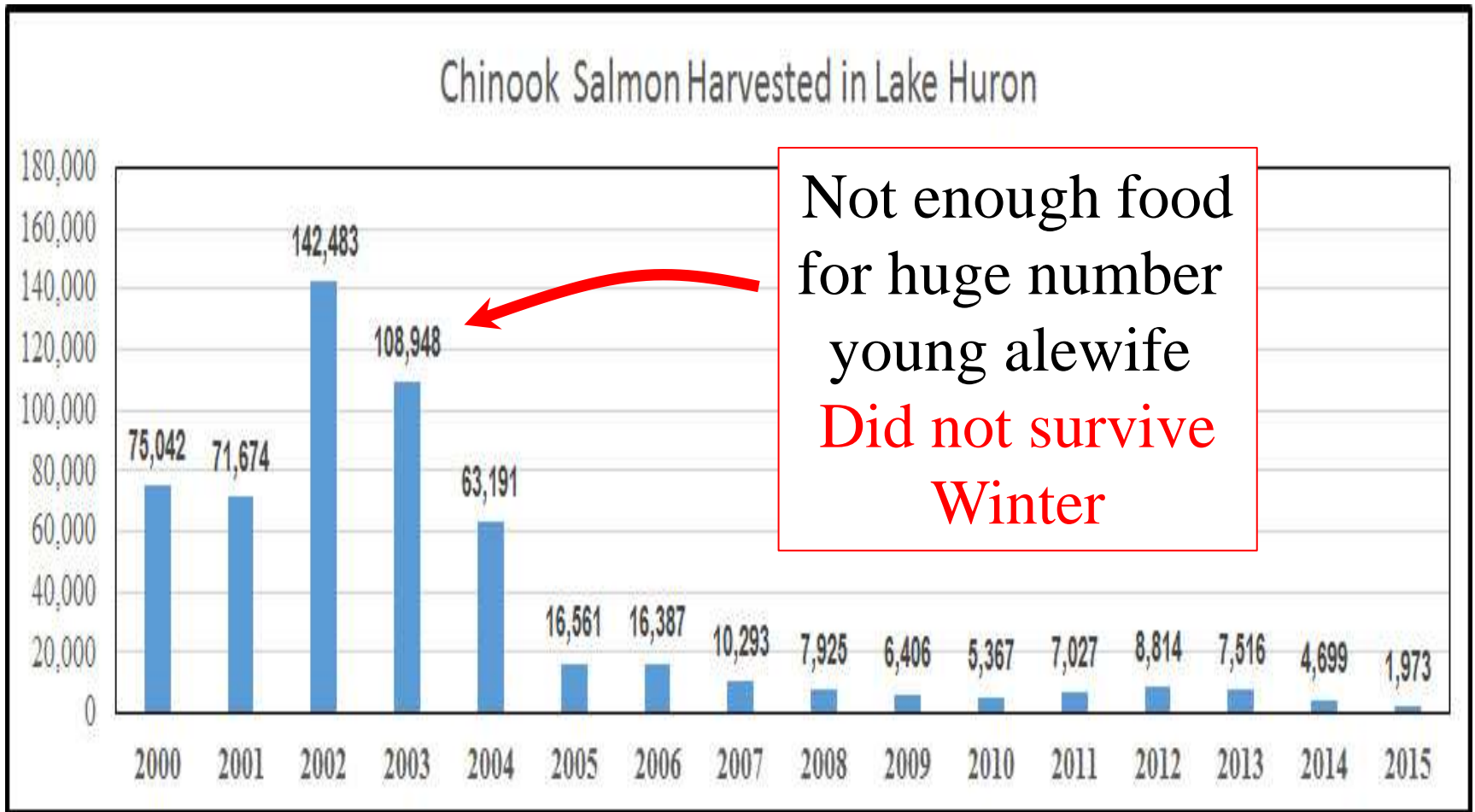
Lots of newly hatched alewife in 2003



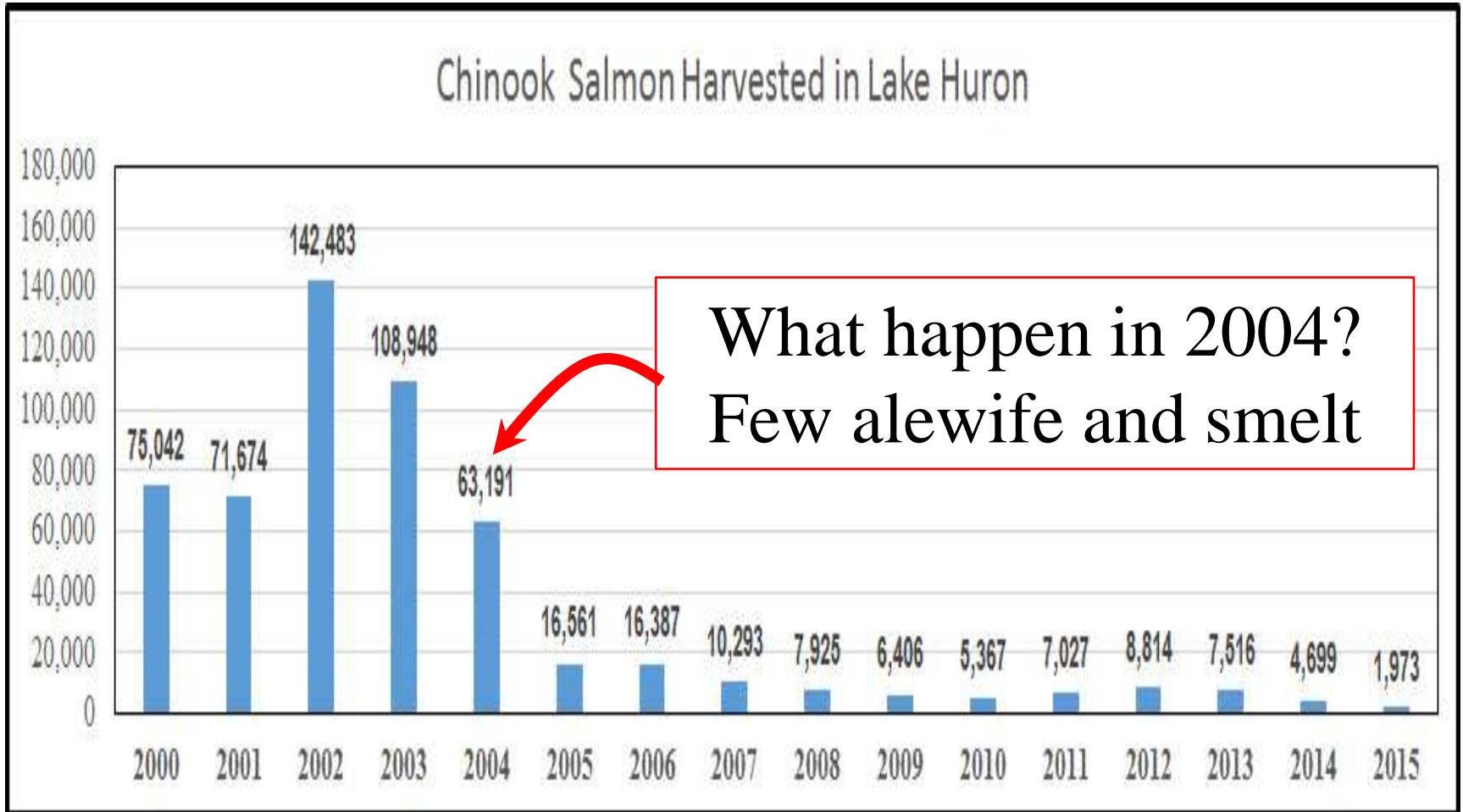
Explosion of newly hatched alewife in **2003**



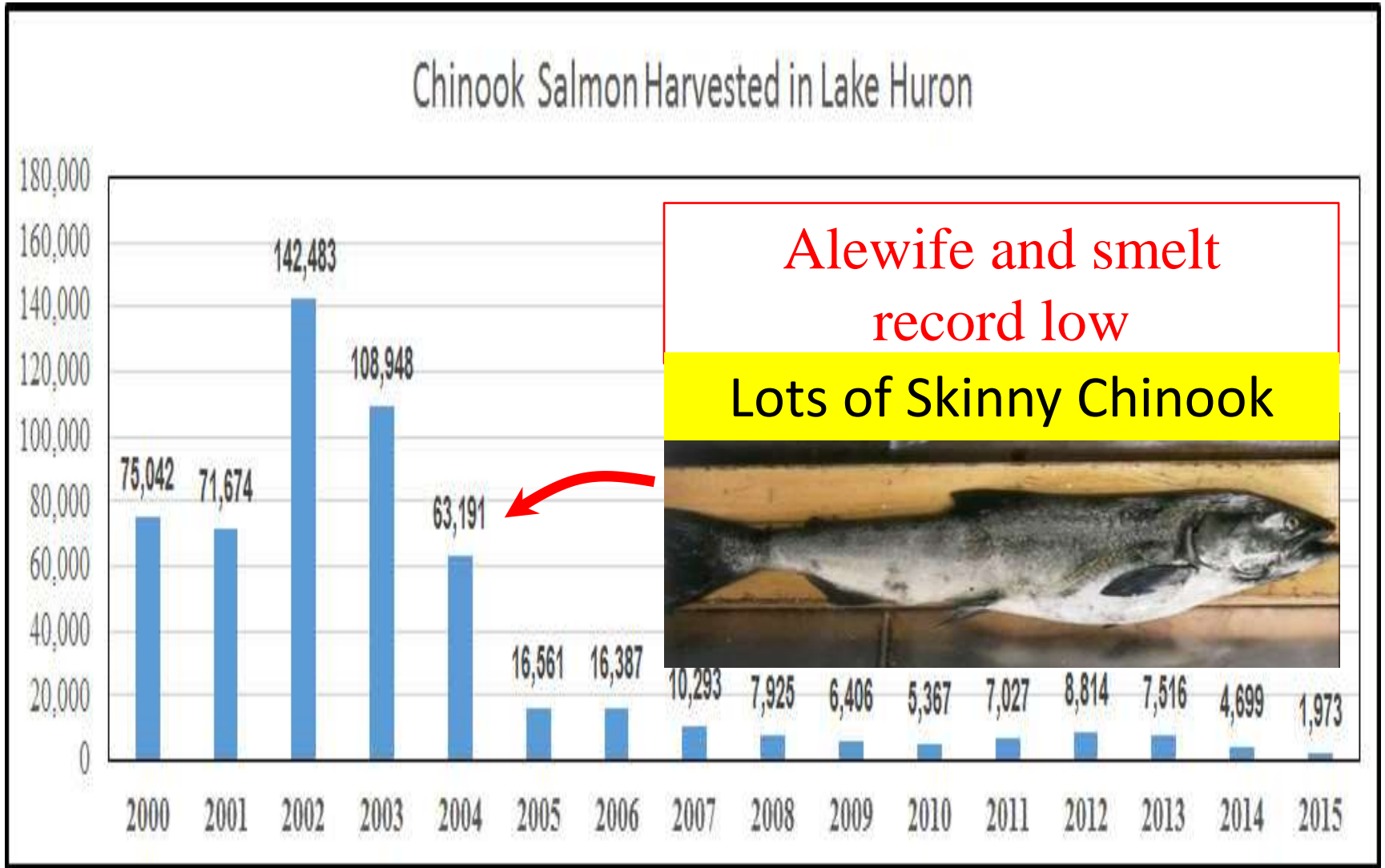
Hope turned to dismay!



2004 ?

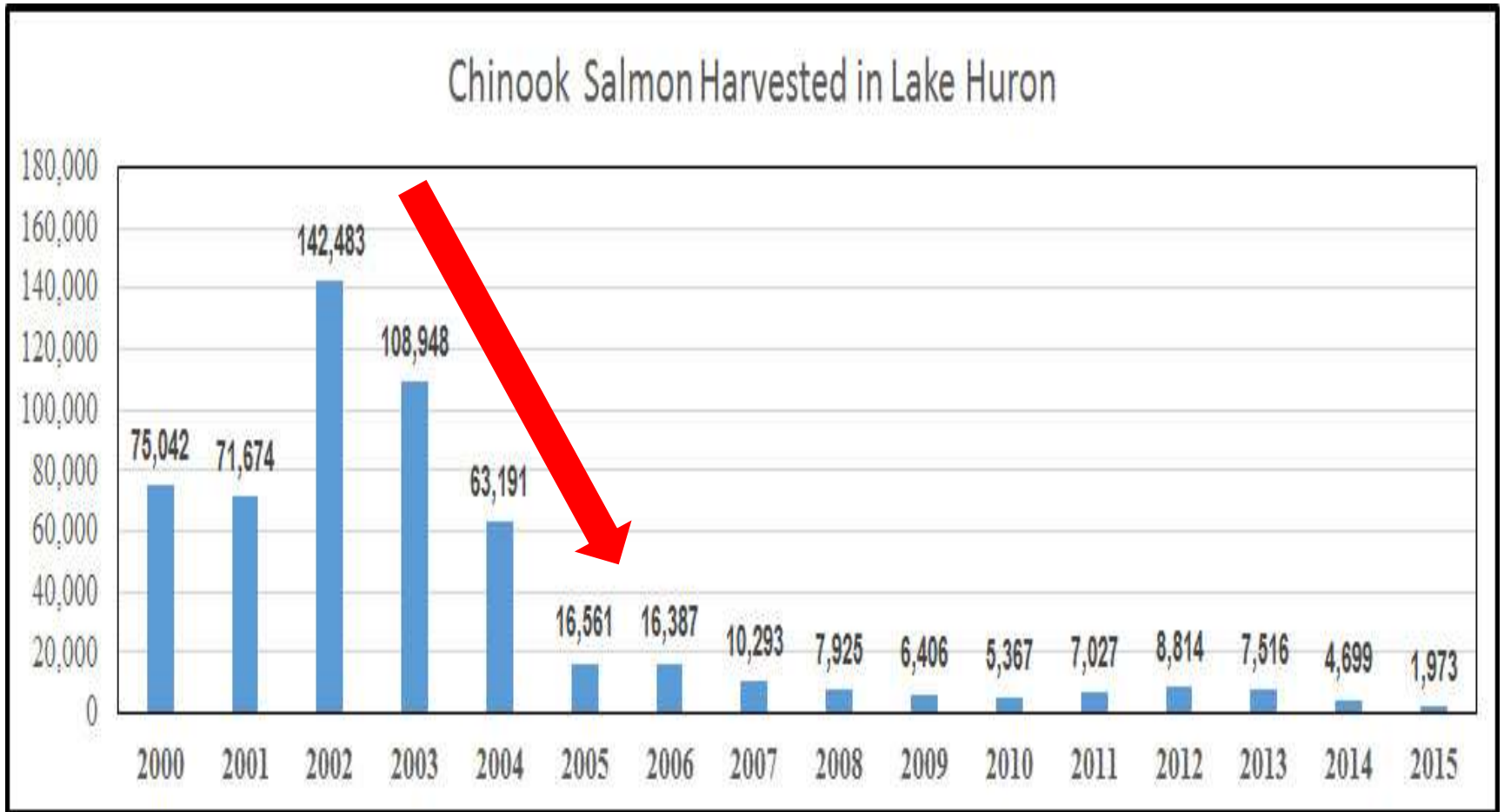


Alewife crash complete in only 2 years!



Why did the alewife and Chinook crash occur?

Were there any warning signs?



1) Chinook salmon feed almost exclusively on midwater forage fish like alewife and smelt

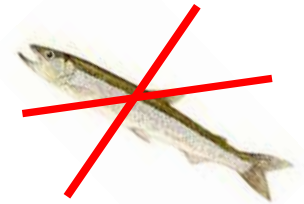
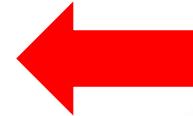
**Stubborn feeder
Refused to eat
gobies**



Chinook Salmon



Alewife



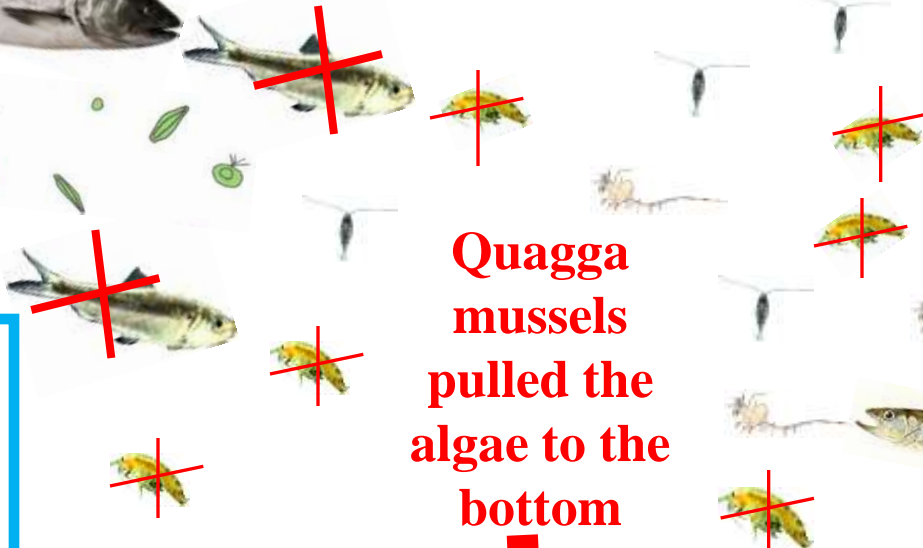
Smelt

2) Quagga Mussel Invasion

The larger zooplankton disappeared and the alewives and some smelt starved



← Smaller zooplankton replaced much of the bigger zooplankton



Quagga mussels pulled the algae to the bottom



Goby population exploded



Instead of lots of algae in midwaters

Cladophora grows on the bottom



Cladophora

Cladophora washing up on shore

Cladophora Muck



3) Decreasing Nutrients in mid-water Phosphorus (Fertilizer)

Caused by the Water Quality Agreement and quagga mussels

Spring Total Phosphorus (parts per billion = microgram per liter)

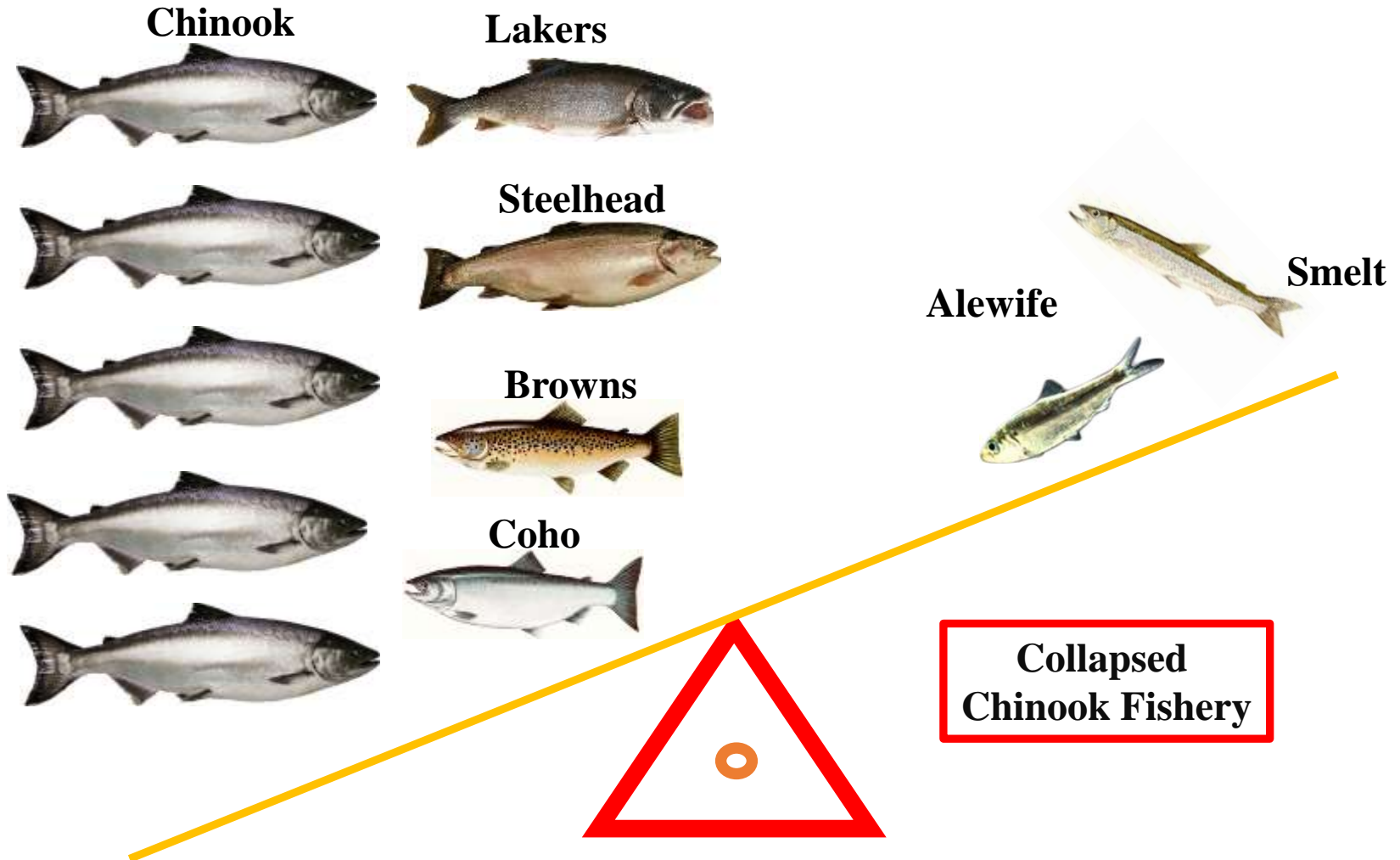
Lake	1970	1980	1990	2000	2010	2014
Huron	5	5	5	4	3	<3
Michigan	8	6	5	4	>3	3
Ontario	22	14	10	8	7	6

Less Phosphorus
Lots of Mussels

=     
Less algae, zooplankton and alewife
In Mid-water

4) Too many stocked and wild Trout and salmon

80% wild



4) Too many stocked and wild trout and salmon

	Stocked	Chinook	Coho	Rainbow	Browns	Atlantics	Lakers	Total
Lake Huron	2004							
Ontario		567,745	0	116,372	203,822	0	1,919,317	2,807,256
Michigan		2,901,282	0	371,380	210,000	24,811	1,502,043	5,009,516
Total		3,469,027	0	487,752	413,822	24,811	3,421,360	7,816,772



+



80% wild
Chinook

	Stocked	Chinook	Coho	Rainbow	Browns	Atlantics	Lakers	Total
Lake Huron	2013							
Ontario		178,052	0	334,073	158,337	0	1,696,464	2,366,926
Michigan		692,692	0	543,989	0	135,865	1,401,816	2,774,362
Total		870,744	0	878,062	158,337	135,865	3,098,280	5,141,288



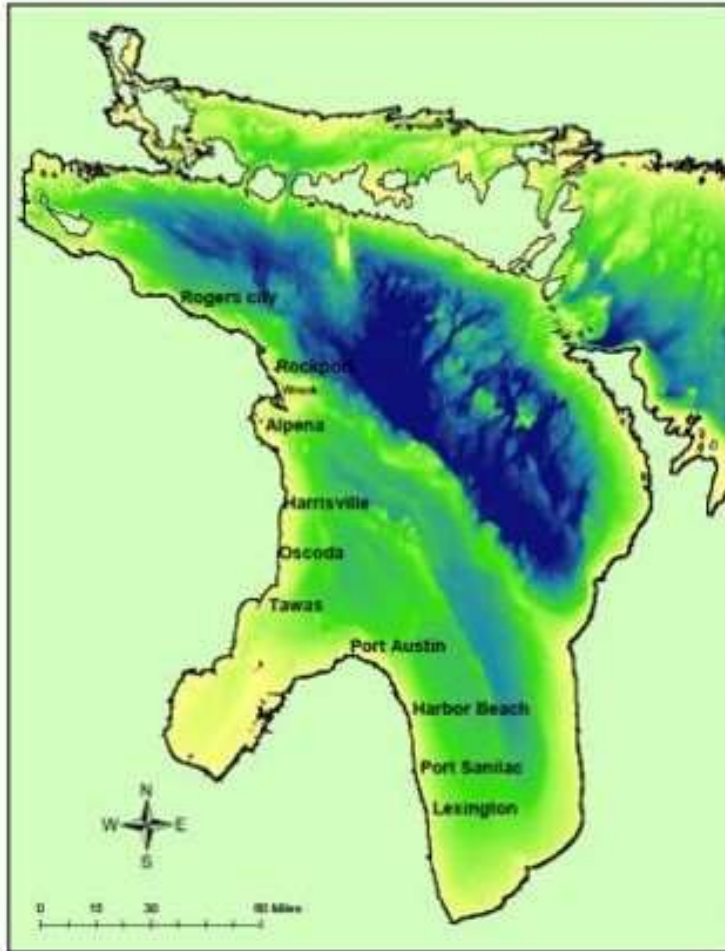
5) Not many healthy year classes of alewife

Normally alewife had 8 or 9 year classes

Fewer year classes are more vulnerable to failure

In **Lake Huron** during the alewife crash it had
5 year classes
but dominated by one year class

6) Once alewife crashed **few** newly stocked Chinook survived in most of Lake Huron



Could not successfully restock Chinook after the Crash

Walleye
Lake Trout
Cormorants

Ate Chinook as fast as they could be stocked

Nearly all stocked Chinook
were quickly eaten

**Huge
Problem**



8 pound
lake trout
Ate 35
Chinook
7 goby

Newly stocked Chinook without an alewife predator buffer are eaten quickly



Chinook stay
in shallow
water
after stocking

Highly
vulnerable
to predators

Summary why the Chinook-Alewife fisheries collapsed in Lake Huron

1. Chinook would only feed in the midwaters:
ignored gobies
2. Too many stocked, and wild salmon and trout
3. Smelt population was also record low
4. Mussel invasion and pollution control reduced phosphorus and algae in the mid-water so less food
5. Year class structure of alewife was not healthy
6. Could not restart the Chinook fishery with most stocked Chinook eaten shortly after stocking

After the alewife crashed

How did Lake Huron fishery change?



Chinook Salmon



~~Brown Trout~~



Lake Trout
Dominant



Walleye



Why are lake trout dominant?



1) Highly adaptive **generalist feeders**
Feed bottom to top

2) After alewife crash

Lack of thiaminase **poison**

No more birth control pills for Lake Trout



3) Lake trout **wild reproduction**

Exploding

80%

Walleye are doing very well



Alewife before the crash were eating the newly hatched walleye and competing for food with the larval walleye

Walleye surged after the alewife crashed
and
the current fishery has gone from
15% wild to 100% wild in 3 years

Why did brown trout collapse?



Brown trout are a generalist feeder
but browns are similar to Chinook: remained
near shore after stocking and were **quickly eaten**

Experiments showed that even stocked late
fall yearlings
11 to 13 inches long could not survive

Other species that have a role

1) Must be a generalist feeders

Feed top to bottom

2) Must move offshore quickly after stocking
to avoid being eaten



Steelhead



Atlantic Salmon



Coho?

Currently Lake Huron has an excellent diverse fishery



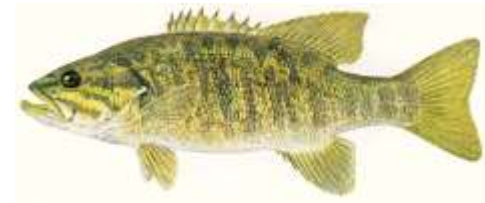
Lake trout



Chinook



Walleye



Bass



Steelhead



Yellow Perch



Atlantics

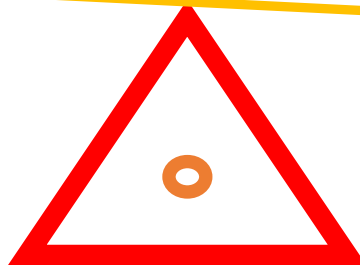
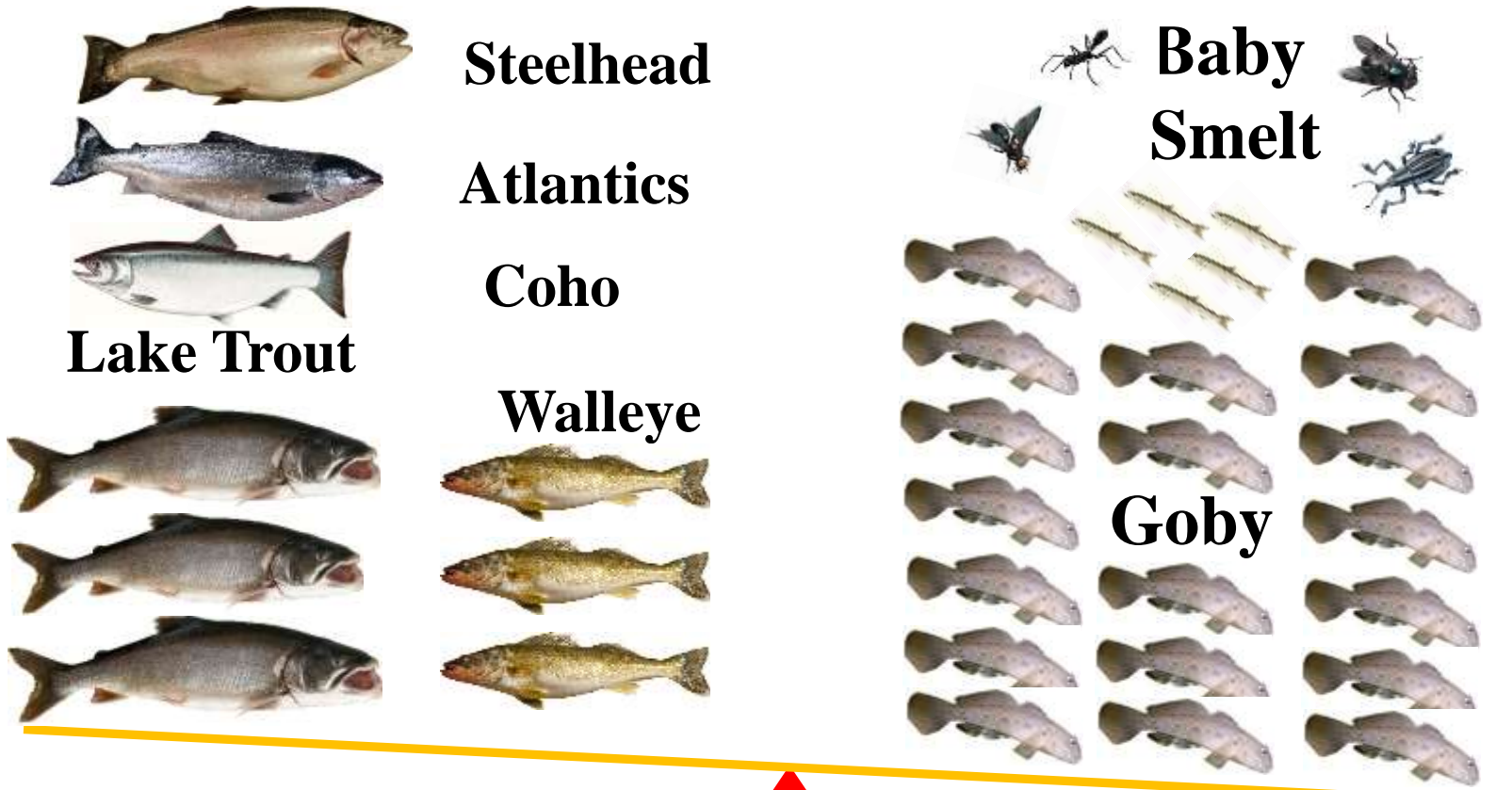


Pink Salmon



Coho

New more balanced fishery
Lots of lake trout and walleye



Couple hundred rose chafer insects in a steelhead



Baby smelt have been hatching every year
Few survive through the winter from heavy predation



Early July 1 to 1.5 inch
smelt

Some midwater prey fish



September
2 to 2.5 inch smelt

Still lots of happy anglers!



How did the public respond to the alewife crash in Lake Huron?



Skinny Chinook Salmon

Public was alarmed and willing to listen

Excellent response from the public

The Lake Huron Citizens Fishery Advisory Committee worked with the MDNR and other agencies to review the science and prepared to meet with the public

Concluded a Chinook cut was the best hope

- 7 public workshops
- 3 public hearings
- Online background information
- Online input taken
- Results: total 75% Chinook cut

What was learned?

Lake Huron

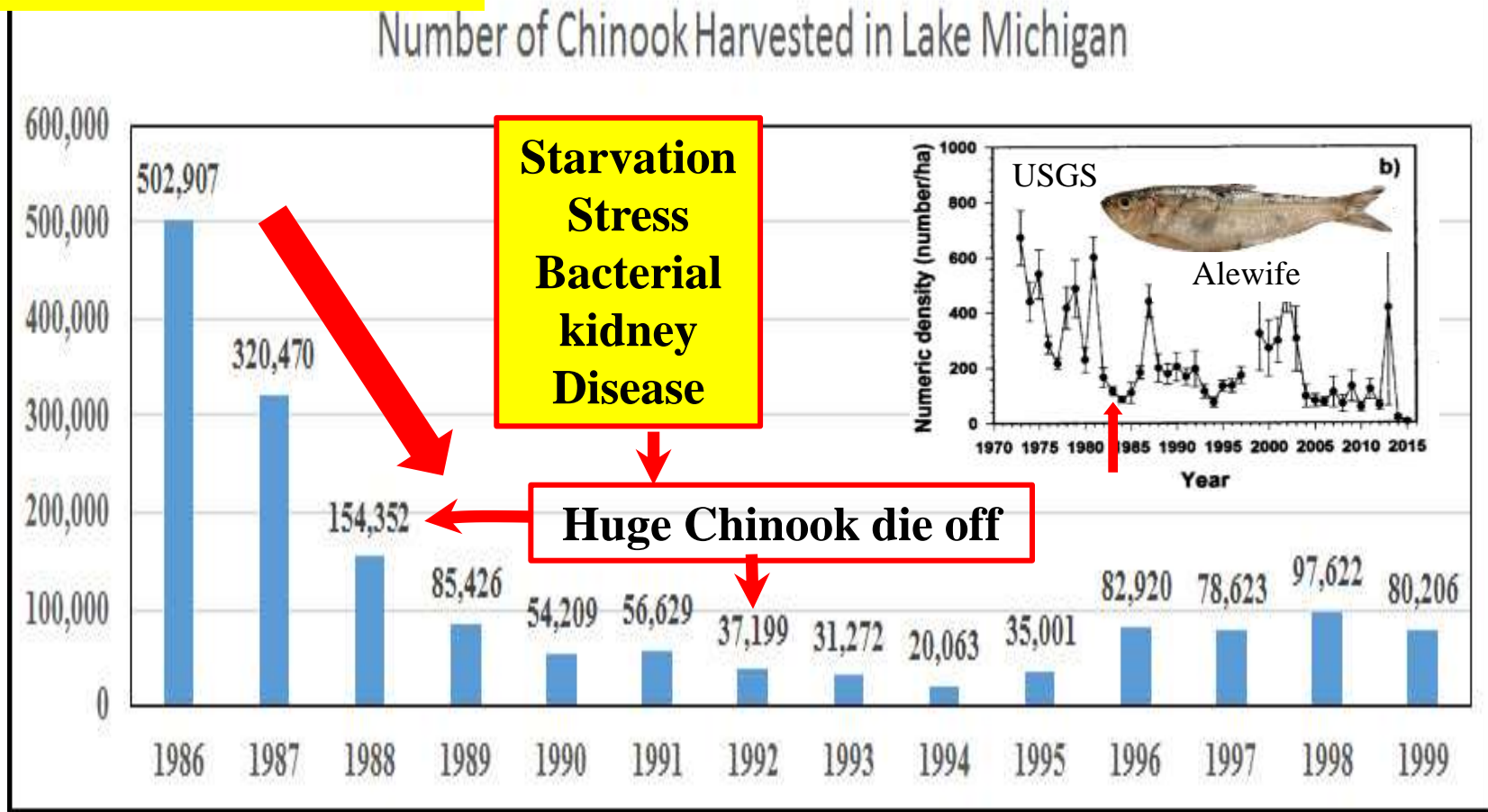
Chinook cuts were too late

Heavy trout and walleye
predation

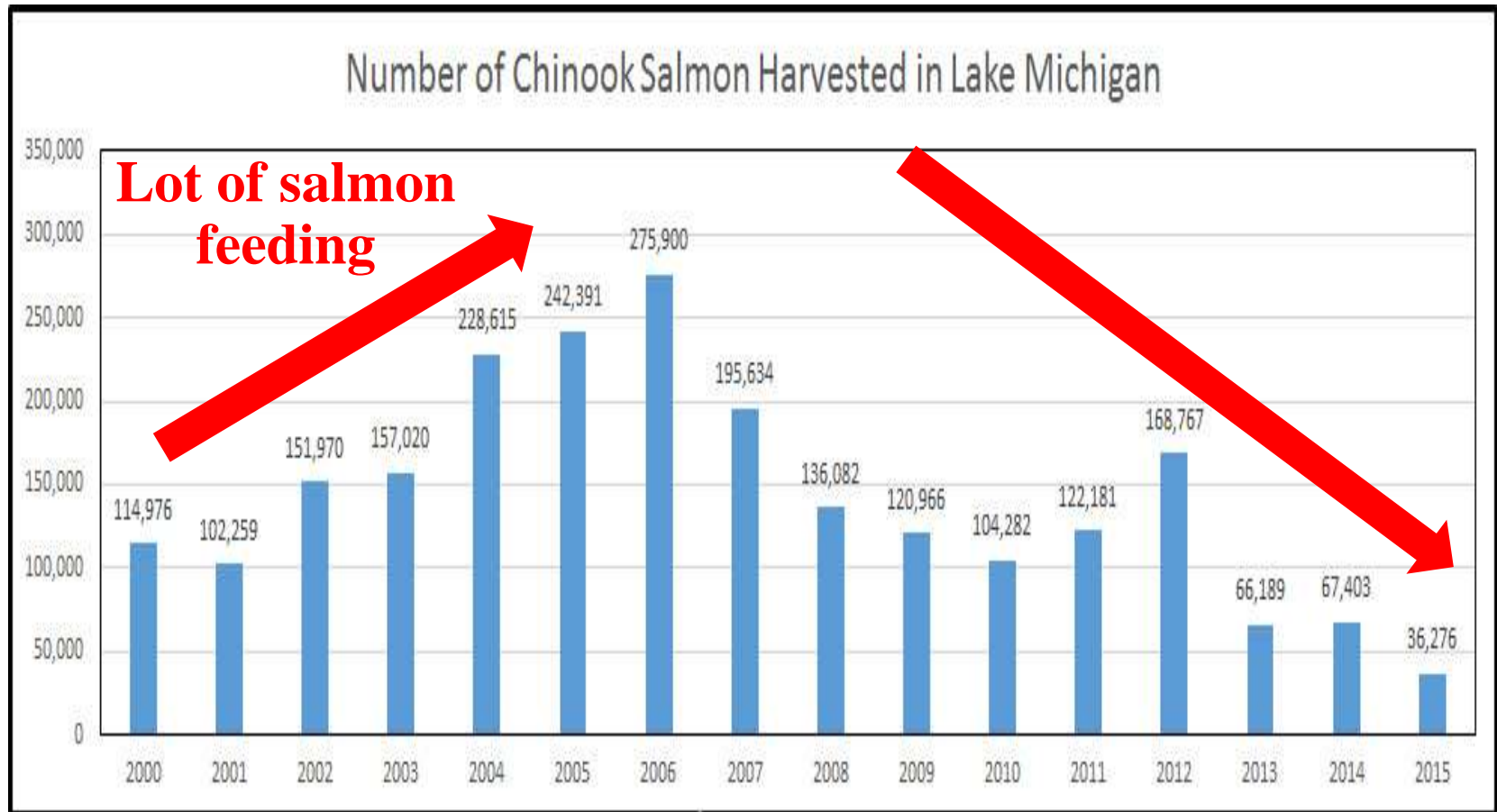
Prevented a recovery

Lake Michigan had 2 steep declines Caused by too many salmon and trout

Steep alewife, smelt
& Chinook decline

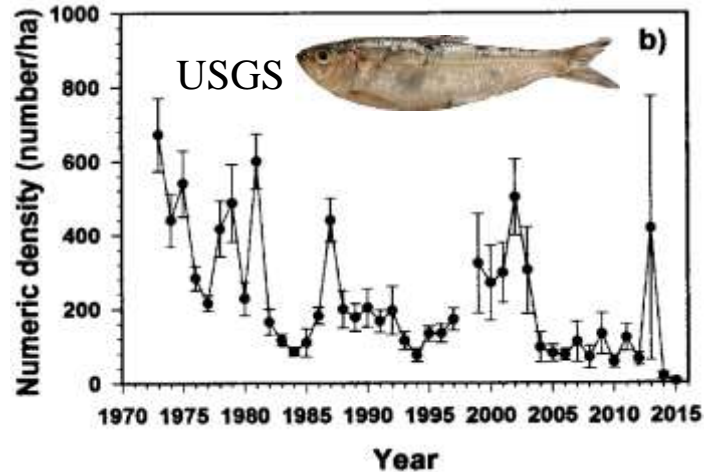


Second Lake Michigan decline started in 2007 After another peak Chinook Harvest

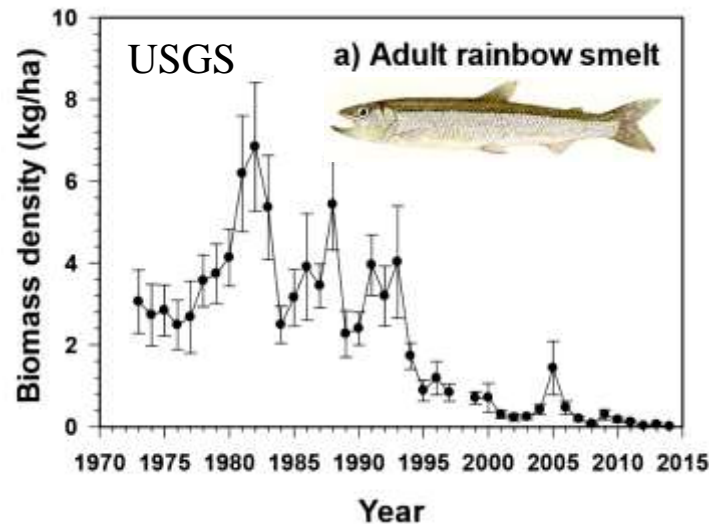


Much concern with the Chinook, alewife and smelt trending downward

Lake
Michigan



Alewife



Smelt

How is the public responding to the continued Chinook and alewife decline in Lake Michigan?

Because the fishery had not
completely collapsed:

**The response has been mixed from the public
Much Debate**

Efforts to deal with the decline began in 2011

The Lake Michigan Citizens Fishery Advisory Committee working with MDNR, other agencies and university researchers

reviewed the science and recommended

reduced stocking

The MDNR and Committee prepared to meet with the public:

Discussion and Debate

Biologists and managers

Stakeholder groups

Michigan

Illinois

Indiana

Wisconsin

Results: A large workshop was held in 2012
Representatives from around the Lake were present

After much debate it was decided to cut Chinook salmon
stocking in **Lake Michigan** by **50%**

A method to monitor the need for more cuts was developed

Currently a **Predator Prey ratio model** is being used

$$\text{Predator-Prey ratio} = \frac{\text{Lake wide weight of Chinook}}{\text{Lake wide weight of alewife}}$$

How does the Predator Prey Model work?

Target = 20 pounds of alewife for each pound of Chinook

Danger < 10 pounds of alewife for each pound of Chinook

In Lake Huron just before the crash it was estimated that there were slightly less than 10 pounds of alewife for each pound of Chinook

Drawbacks: The model does not consider other predators

Challenge to obtain enough survey data

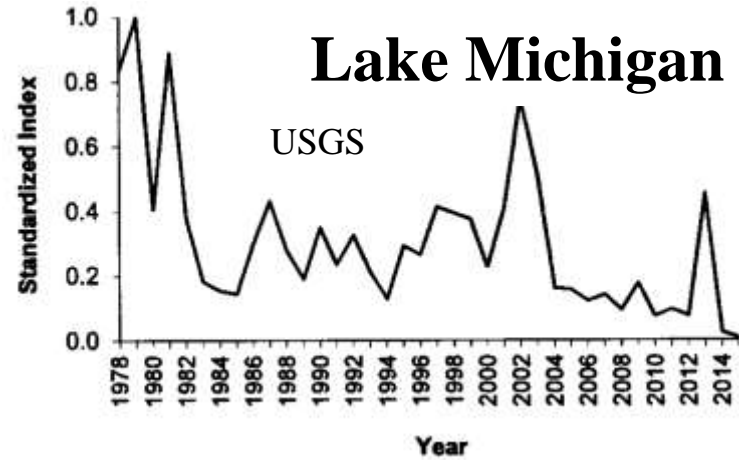
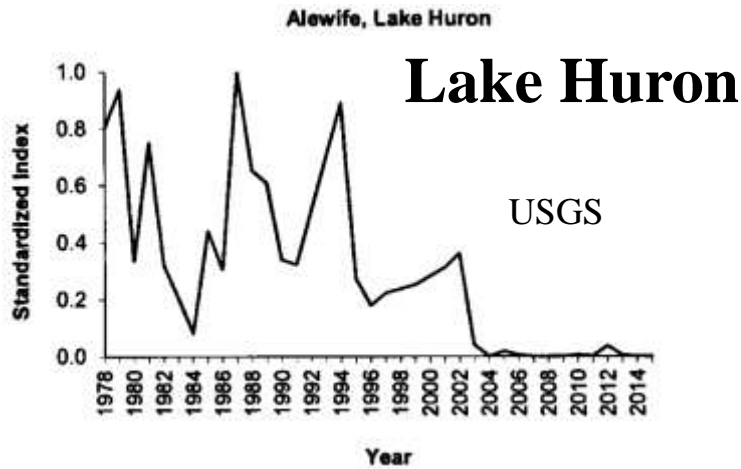
The Lake Michigan debate will continue during 2016

The critical question is:

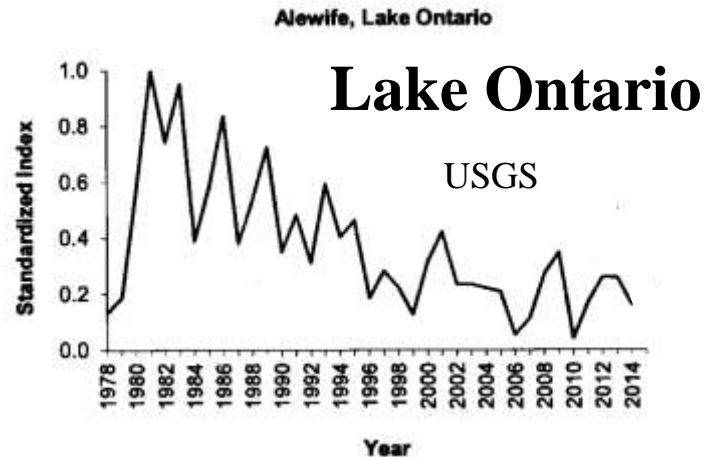
Can Lake Ontario be managed as a sustainable trophy fishery?

Are the Chinook salmon and alewife fisheries in Lake Ontario vulnerable to collapse?

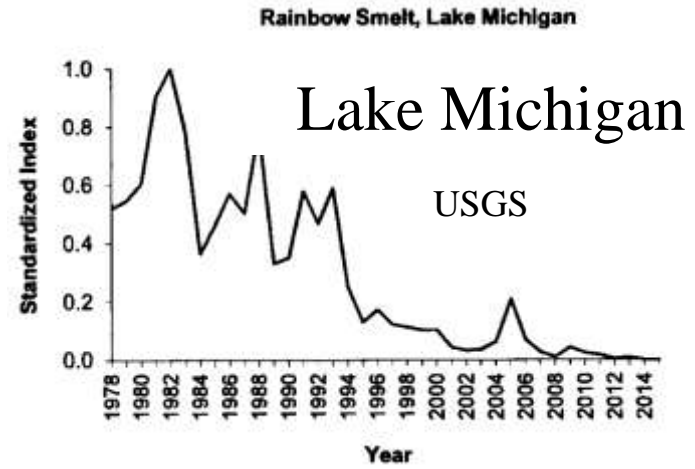
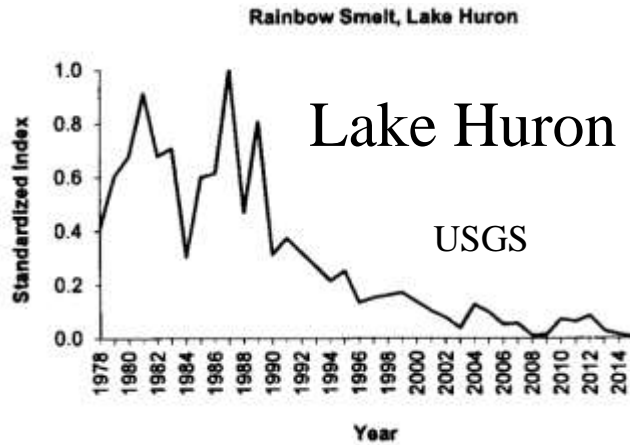
Alewife are trending down in Lakes Huron, Michigan and Ontario



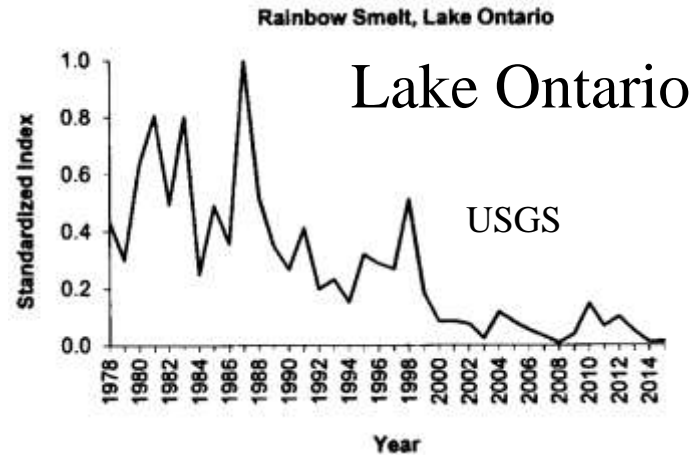
Adult
Alewife



Smelt are trending down in Lakes Huron, Michigan and Ontario



Rainbow Smelt



3) Decreasing Nutrients in mid-water Phosphorus (Fertilizer)

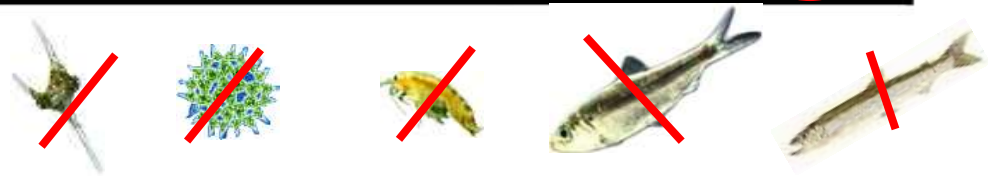
Caused by the Water Quality Agreement and quagga mussels

Spring Total Phosphorus (parts per billion = microgram per liter)

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Huron	5	5	5	4	3	<3
Michigan	8	6	5	4	>3	3
Ontario	22	14	10	8	7	6

Less Phosphorus
Lots of Mussels

=



Less algae, zooplankton and alewife
In Mid-water

The current phosphorus level in Lake Ontario is near the level in Lake Michigan during the dramatic Lake Michigan 1987 Chinook and alewife near collapse

Lake Ontario stocking is extremely **High**

Lake Huron
23,000
Square Miles



Lake Ontario
7,300
Square Miles

+ Wild salmon & trout



Lake Michigan
22,300
Square Miles

	Stocked	Chinook	Coho	Rainbow	Browns	Atlantics	Lakers	Total
Lake Ontario	2014							
Ontario		600,000	80,000	140,000	140,000	75,000	500,000	1,535,000
NY		1,970,000	130,000	575,000	457,000	142,000	971,000	4,245,000
Total		2,570,000	210,000	715,000	597,000	217,000	1,471,000	5,780,000

	Stocked	Chinook	Coho	Rainbow	Browns	Atlantics	Lakers	Total
Lake Huron	2013							
Ontario		178,052	0	334,073	158,337	0	1,696,464	2,366,926
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Total		870,744	0	878,062	158,337	135,865	3,098,280	5,141,288

	Stocked	Chinook	Coho	Rainbow	Browns	Atlantics	Lakers	Total
Lake Michigan	2013							
Wisconsin		1,131,920	433,124	498,986	857,065	0	708,000	3,629,095
Illinois		227,336	310,288	99,268	102,264	0	124,000	863,156
Indiana		169,451	262,373	685,141	47,500	0	42,000	1,206,465
Michigan		562,223	1,589,829	711,087	566,290	0	2,142,912	5,572,341
Total		2,090,930	2,595,614	1,994,482	1,573,119	0	3,016,912	11,271,057

Stocking rate in Lake Ontario is **3X** higher than
Lake Huron and **1.5X** Lake Michigan

Alewife age structure
dominated by few
age classes:
More vulnerable to failure

**Challenging management debates and
decisions are ahead
for both
Lake Ontario and Lake Michigan
while
the discussion continues with
Lake Huron**

THE END