



Future of Lake Whitefish and Lake Trout Populations in The Great Lakes

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Inter-Tribal Fisheries and Assessment Program

Chippewa Ottawa Resource Authority



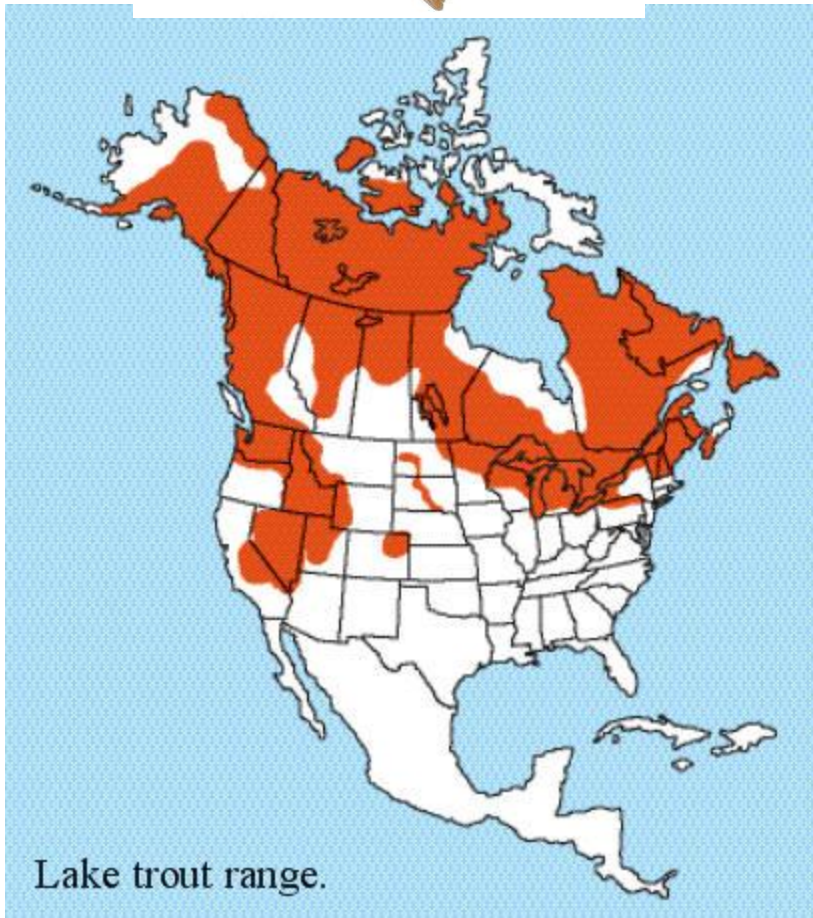
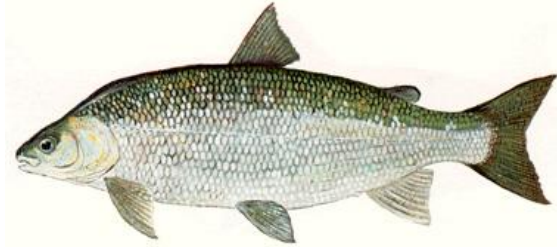


Lake Whitefish
(*Coregonus clupeaformis*)

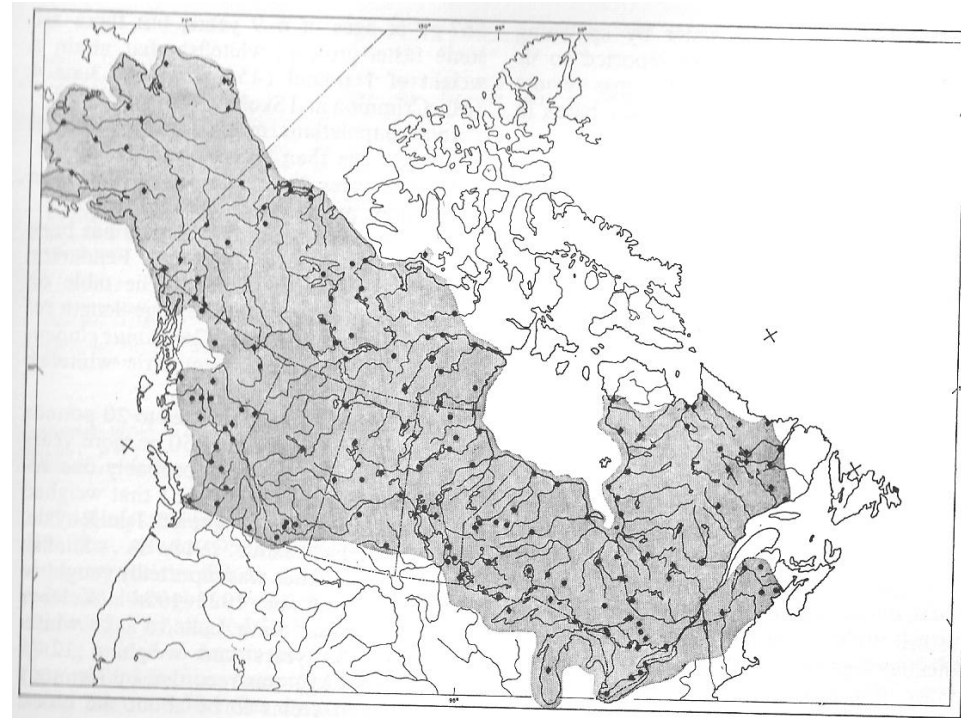
Lake Trout
(*Salvelinus namaycush*)



Geographic Range North America



Lake trout range.



Spawning occurs in the fall months. N. = November, D. = December, F. = February, M. = March, A. = April, J. = June, S. = September, O. = October.

Why Care about Whitefish & Lake Trout

Because they taste good!!!!!!!!!!!!!!

Pan-Fried Whitefish



Grilled Lake Trout



Presentation Outline



- 1. Population Status**
- 2. Habitat Issues**
- 3. Species Interactions**
- 4. Allocation Issues**

Topic Not Covered but Important



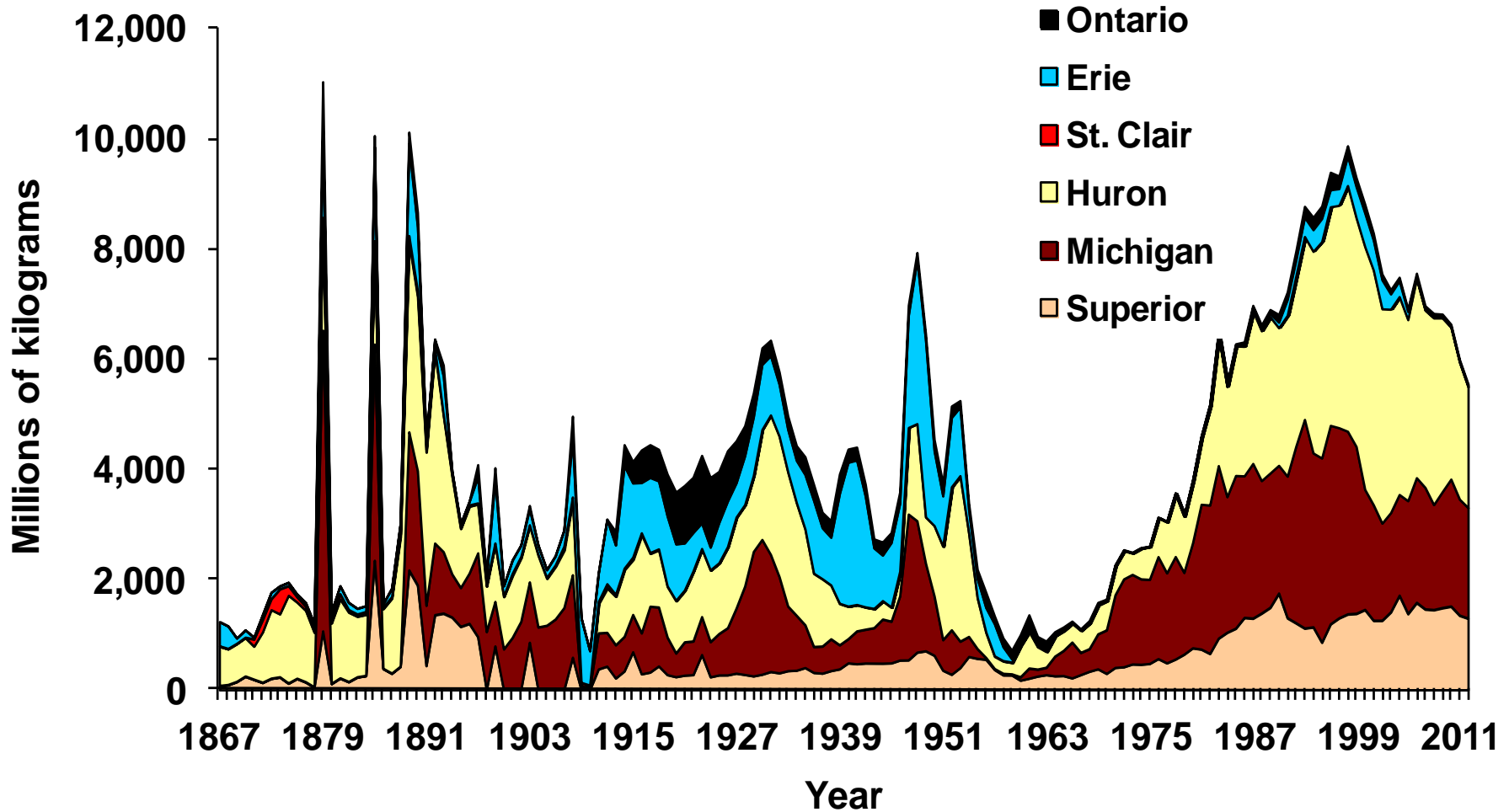


Population Status



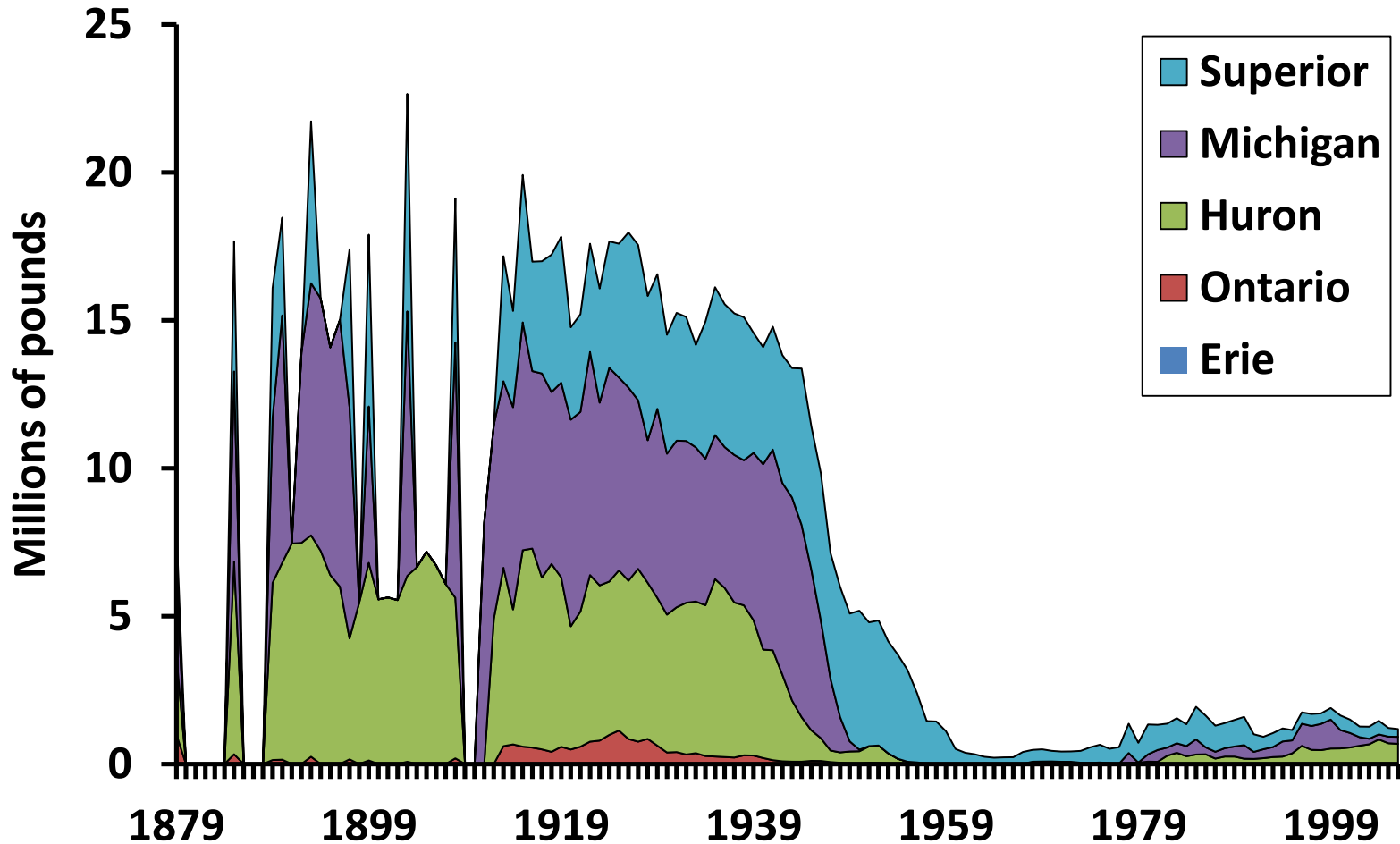
Whitefish Commercial Yield

Great Lakes 1867-2004

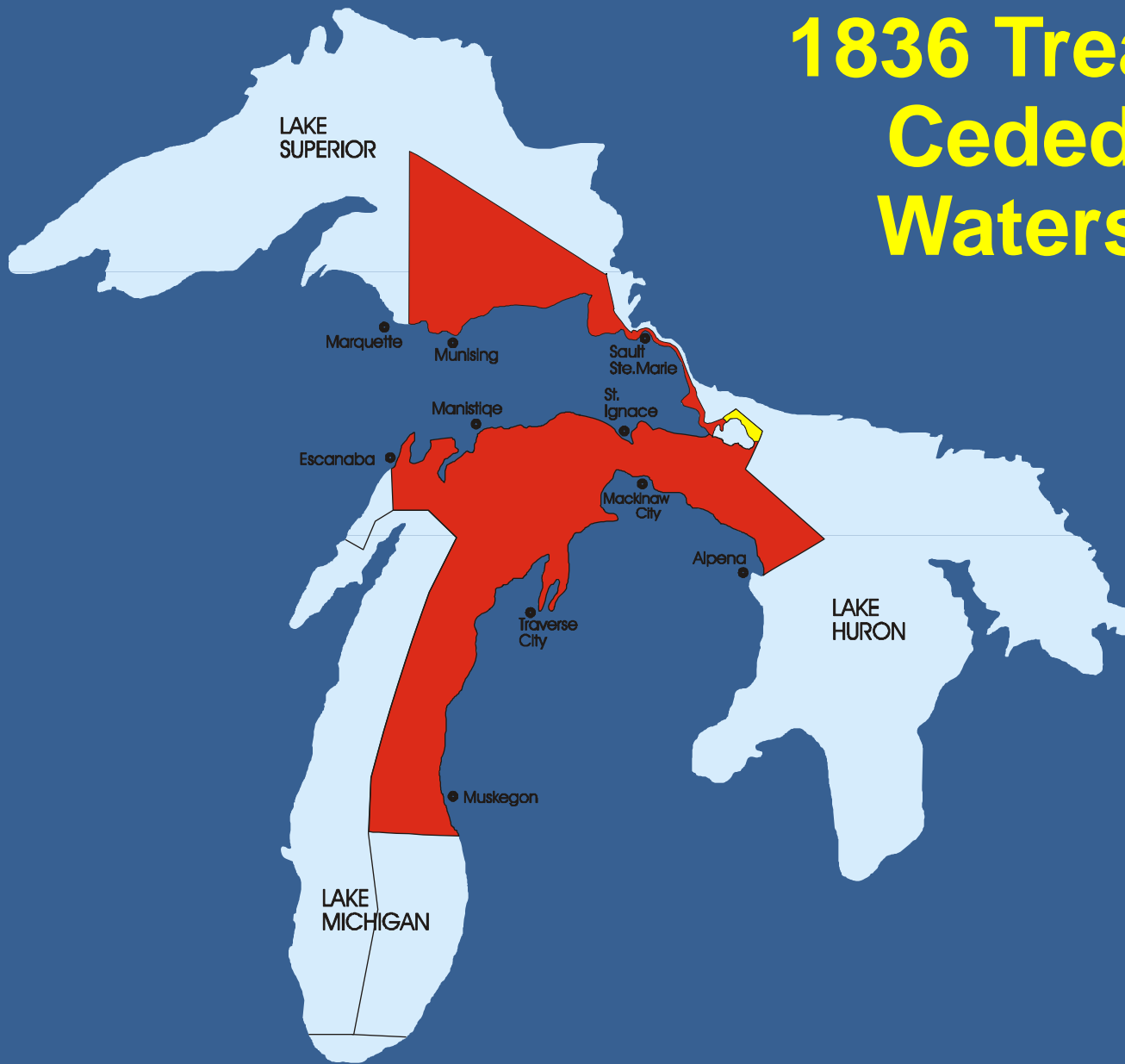


Commercial Harvest Lake Trout

Great Lakes, 1879-2006



1836 Treaty Ceded Waters



Statistical Catch at Age Analysis

Jim Bence



Mike Jones

Bill Taylor

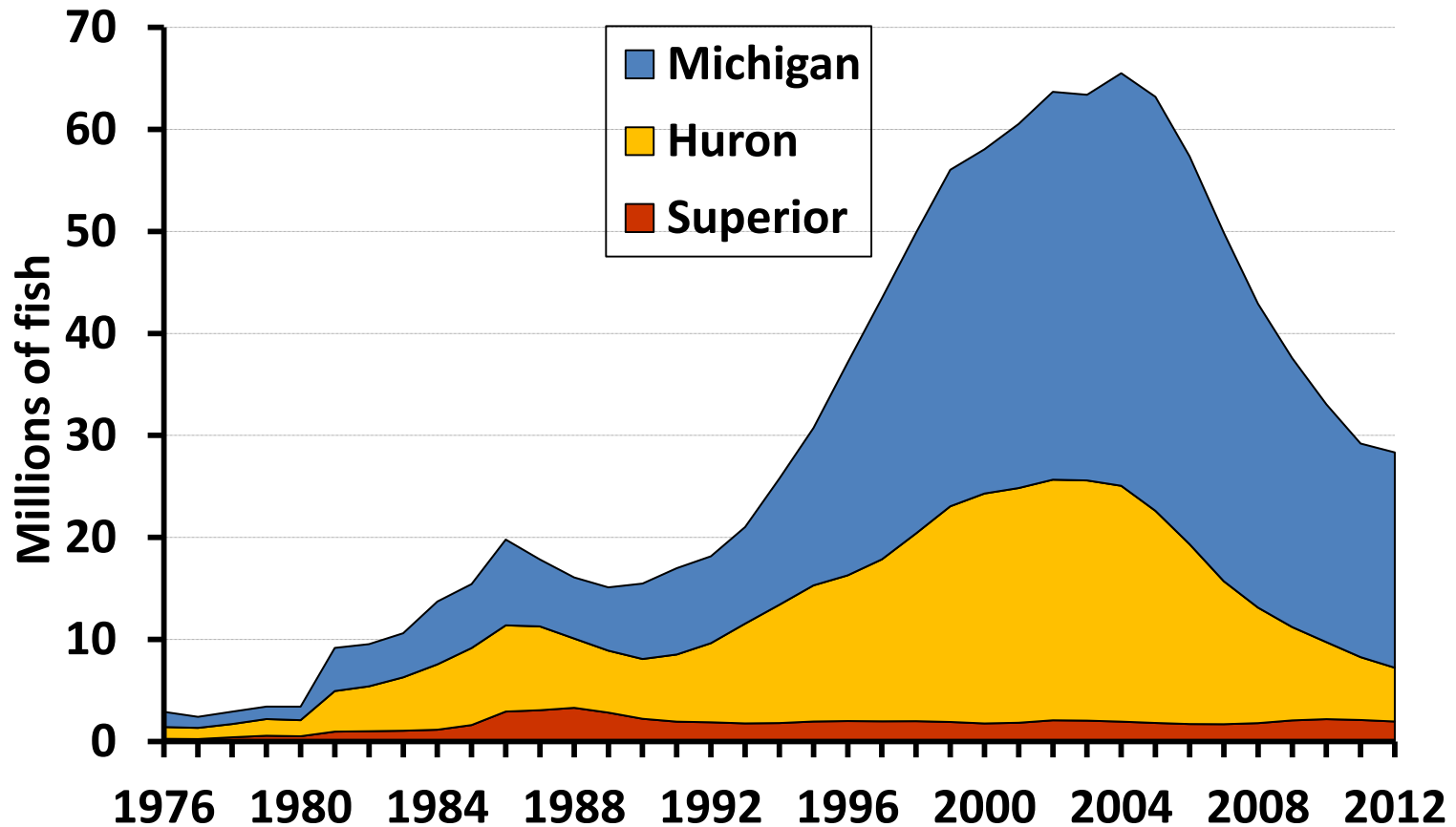
Travis Brenden

SCAA
blender

"SAY, Jim ARE YOU SURE ABOUT THOSE INGREDIENTS?"

Whitefish Abundance 1836 Waters

Millions of Age-4 and older 1976-2012



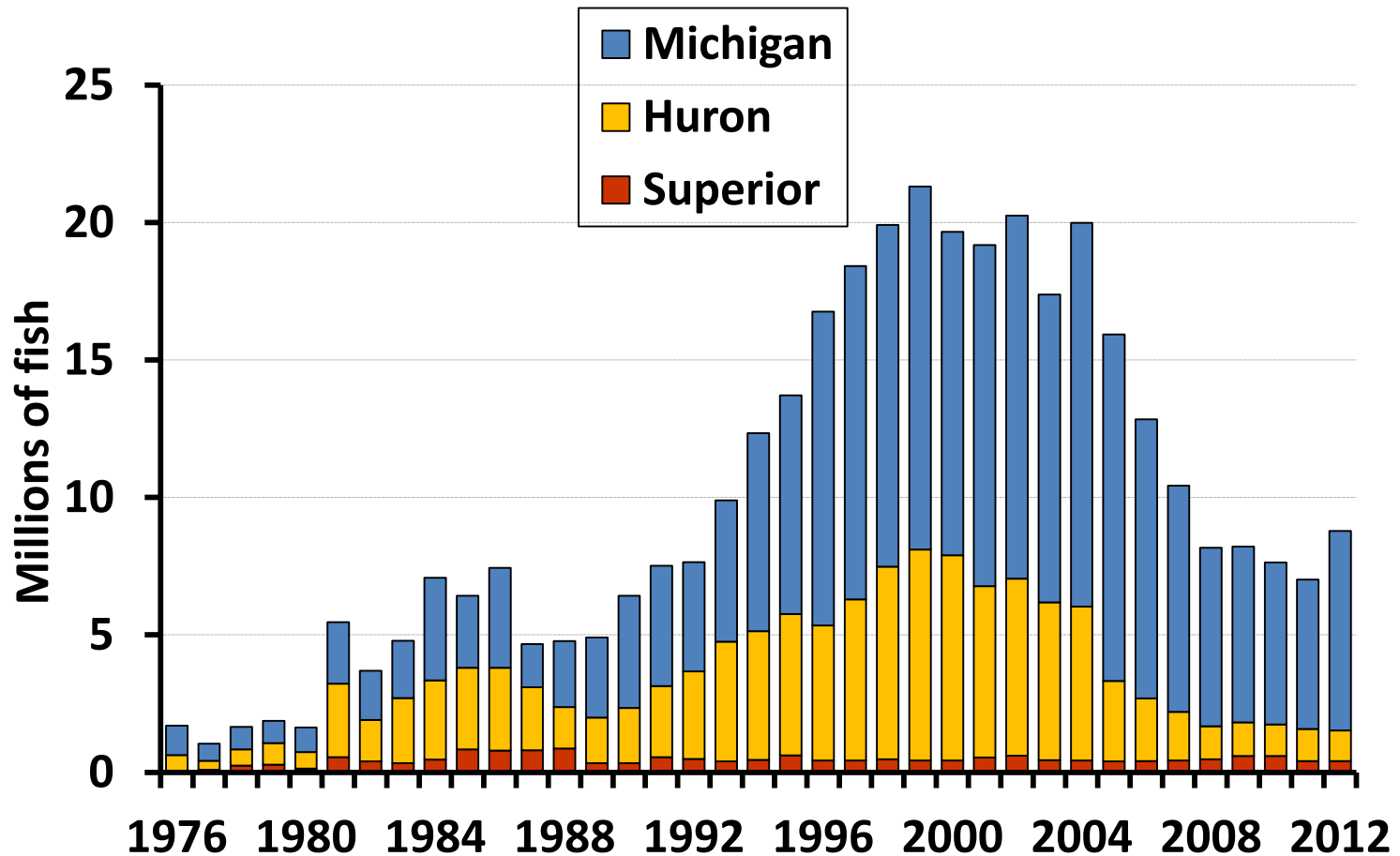
Definition of Recruitment:

“Addition of new fish to the vulnerable population by growth from among smaller size categories”



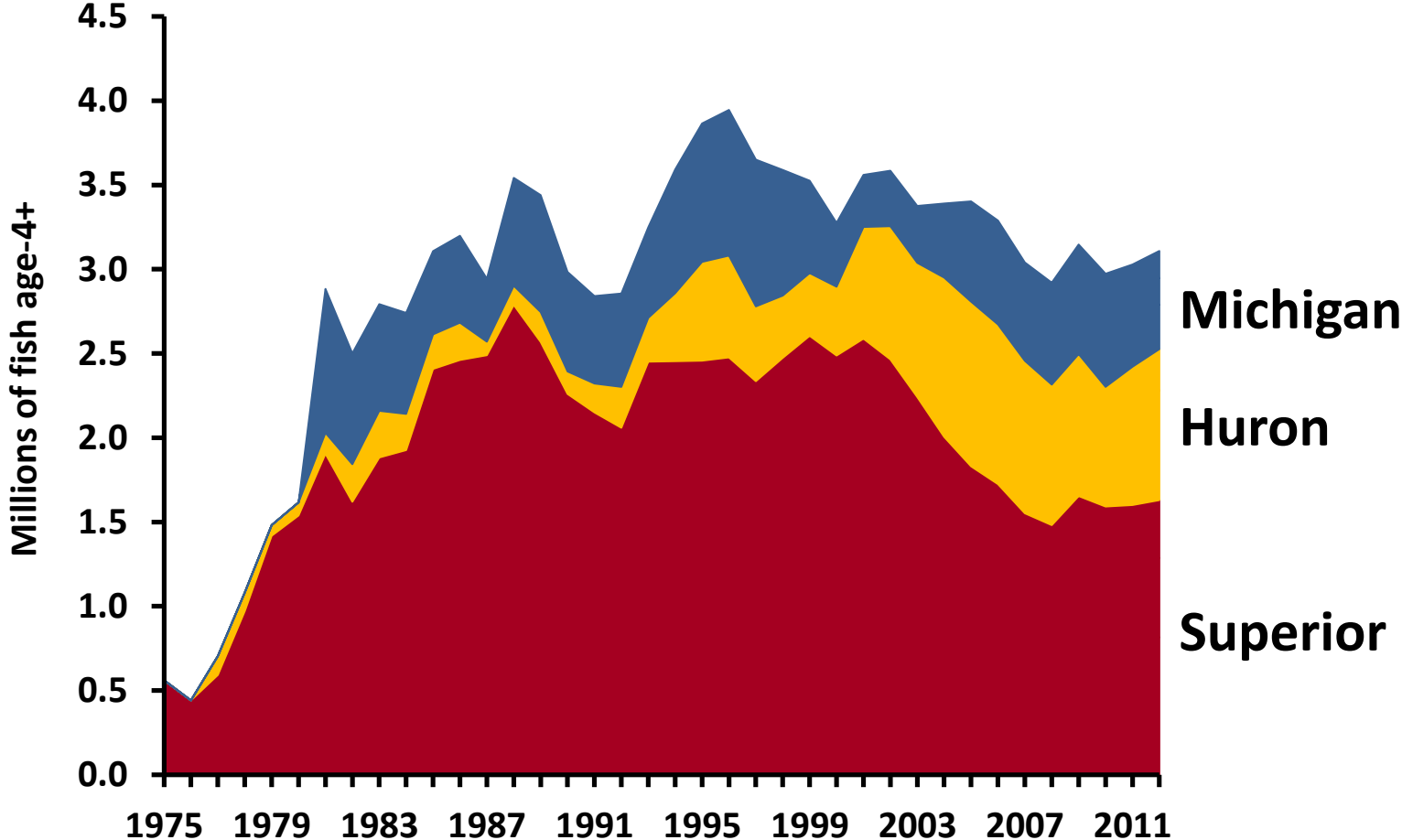
Whitefish Recruitment 1836 Waters

Millions of Age-4 fish 1976-2012



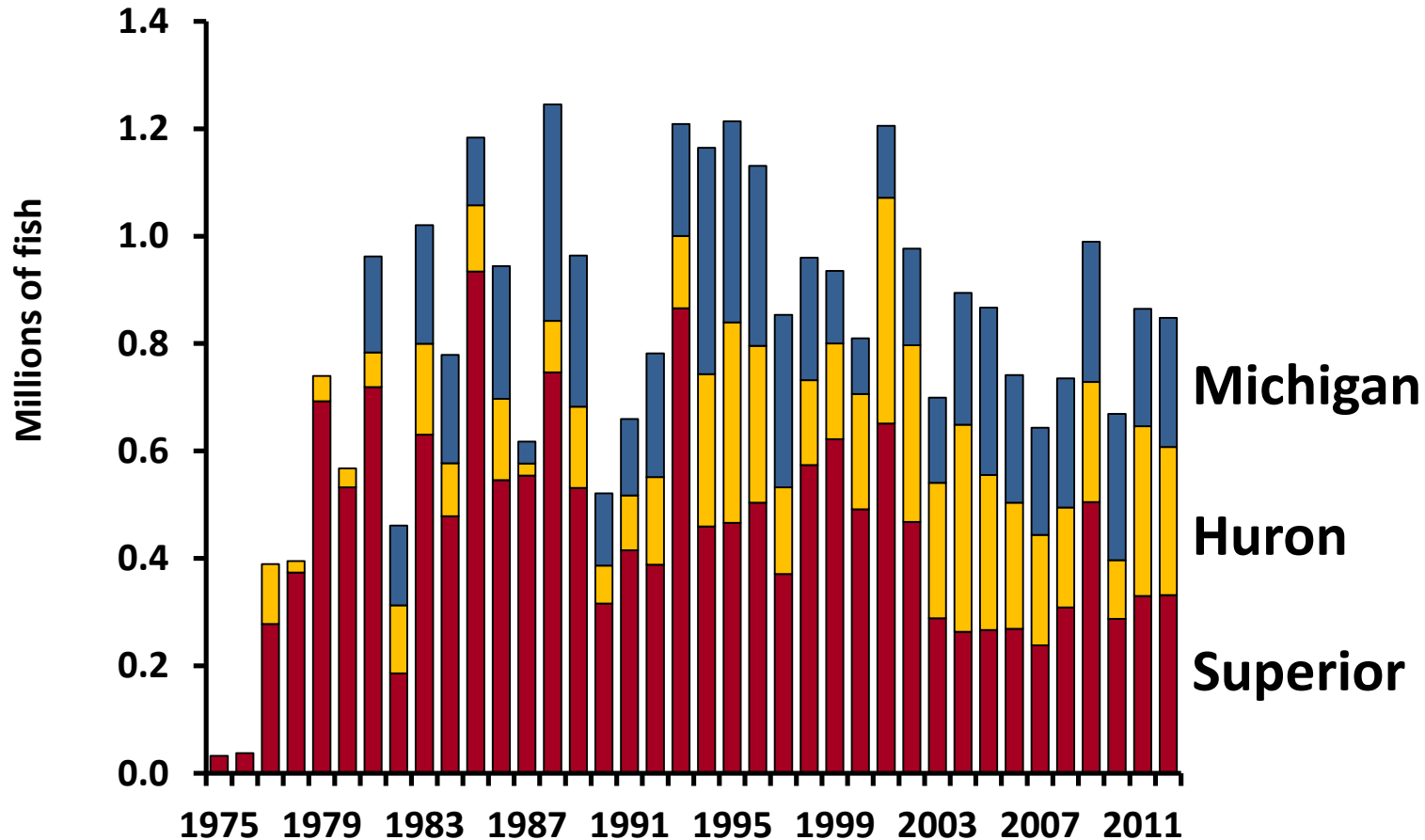
Lake Trout Abundance 1836 Waters

Millions of Age-4 and Older 1975-2012



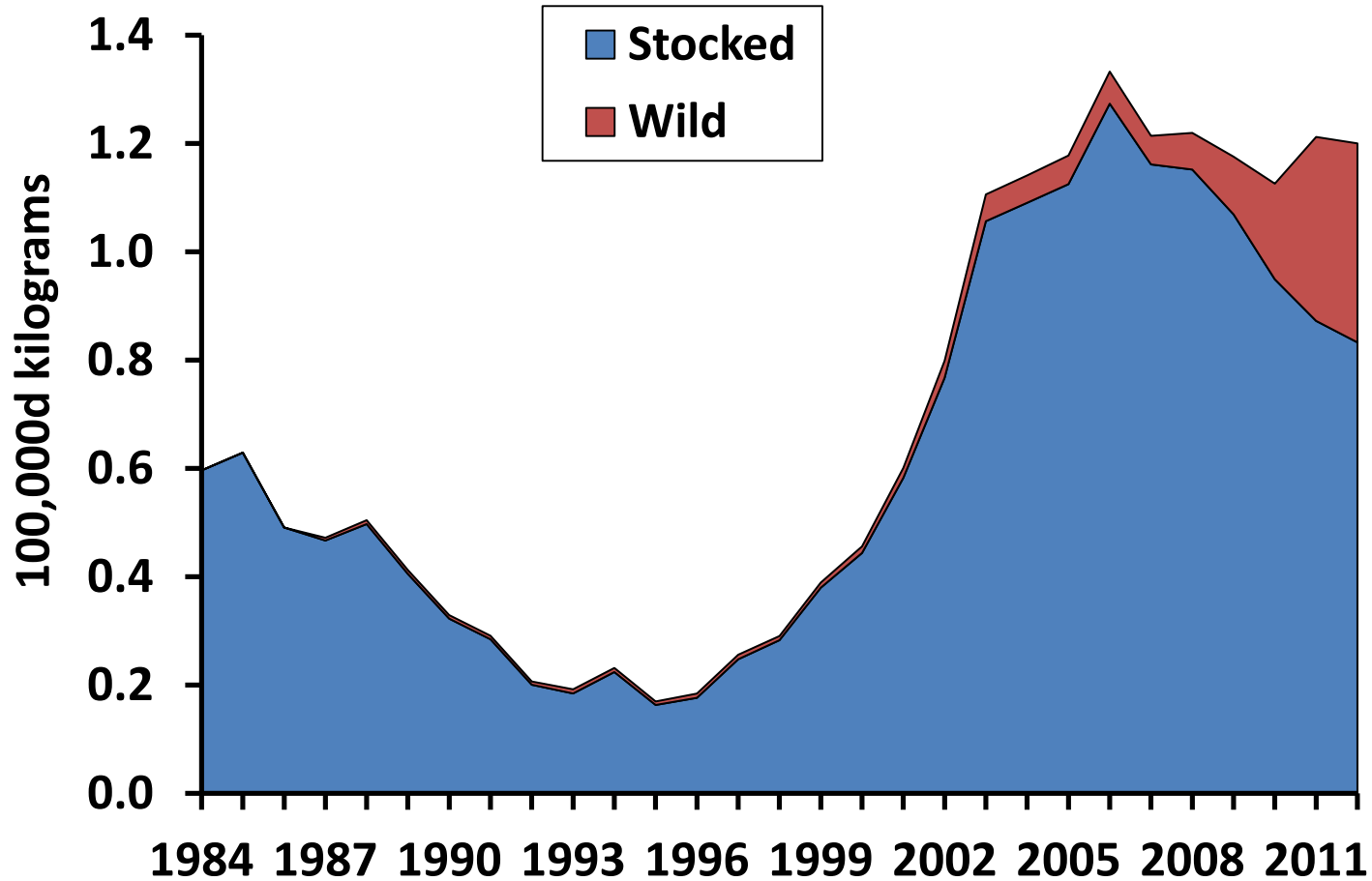
Lake Trout Recruitment 1836 Waters

Millions of Age-4 fish 1975-2012



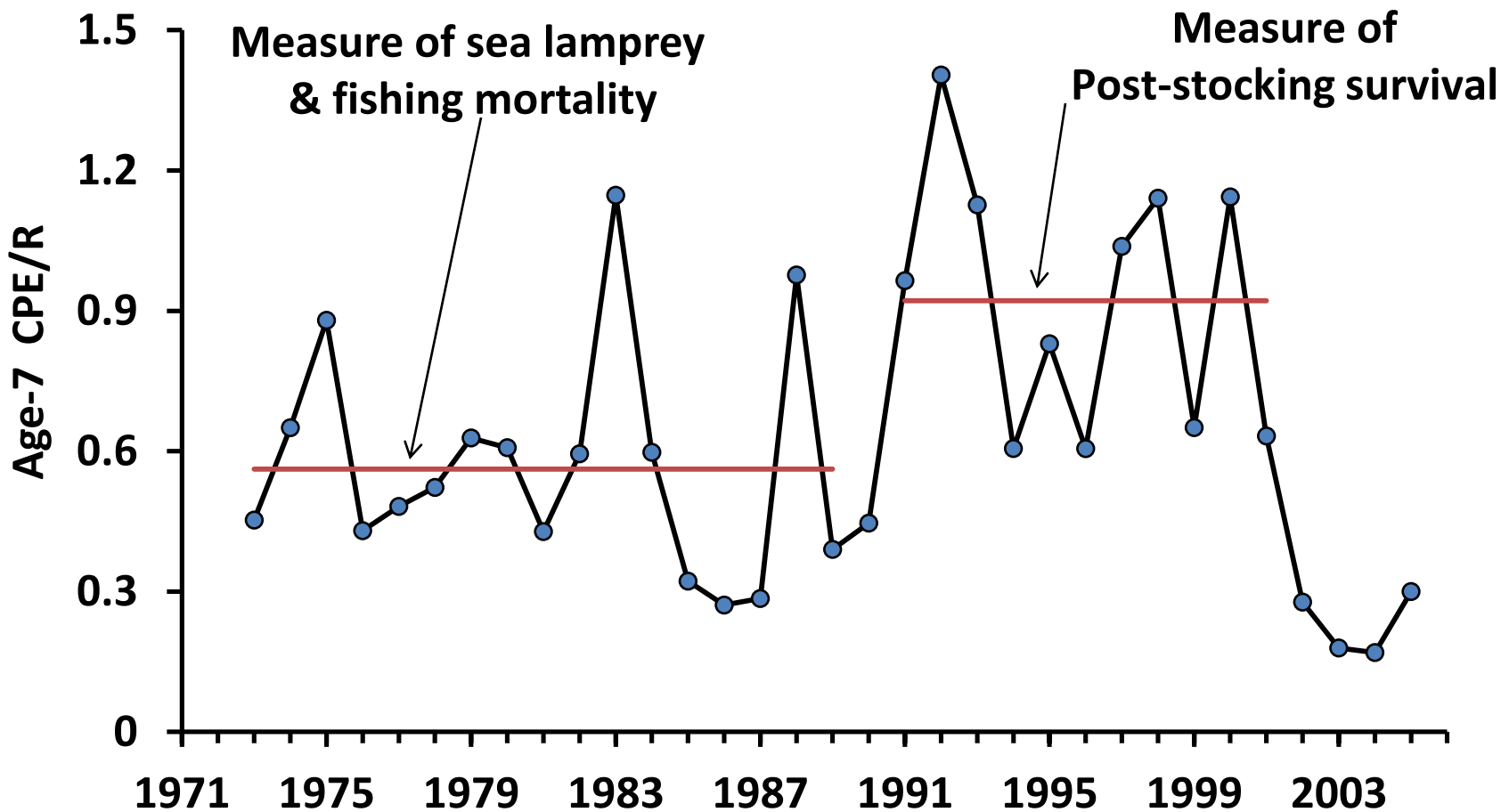
Lake Trout Spawning Biomass Lake Huron

Main Basin 1984 to 2012



Relative Survival Stocked Lake Trout

Lake Huron 1973-2005 year classes



Protocol for Reducing Lake Trout Stocking Lake Huron



1) Relative survival of stocked yearlings

- cease when falls below specific level for 3-5 yr

2) Recruitment of wild fish

- 10 age classes at stable or increased abundance

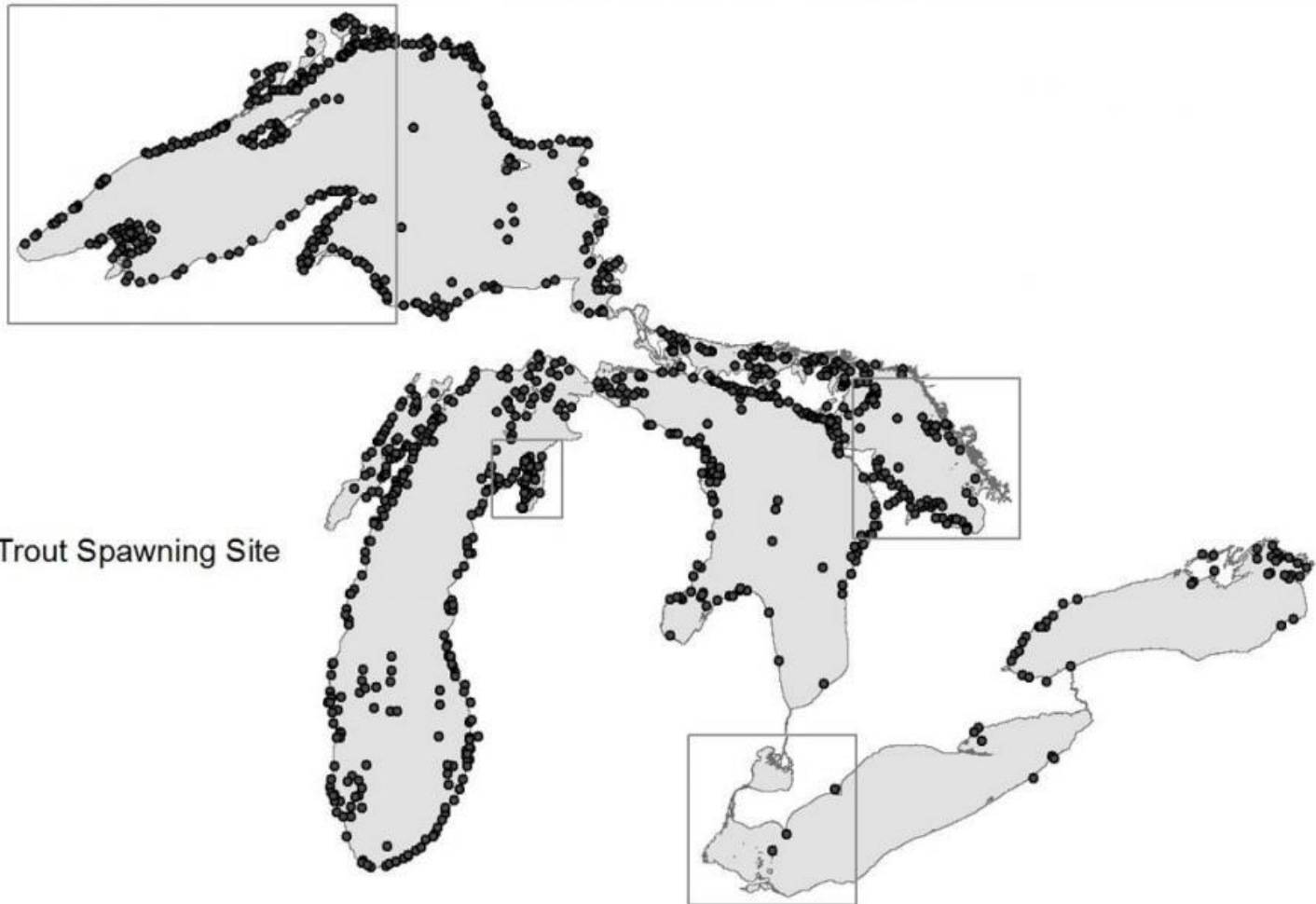
3) Abundance of adult fish

- should be at or greater than 2002-2004 levels



Habitat Issues

Lake Trout Spawning Grounds



Larval Whitefish Habitat



Historic & Present-day Tributaries with Whitefish & Trout Spawning



Dip-netting Whitefish in the Rapids Sault Ste. Marie, circa 1901



St. Marys River Rapids 2014



Whitefish Seine Fishery Detroit River 1800s to 1920

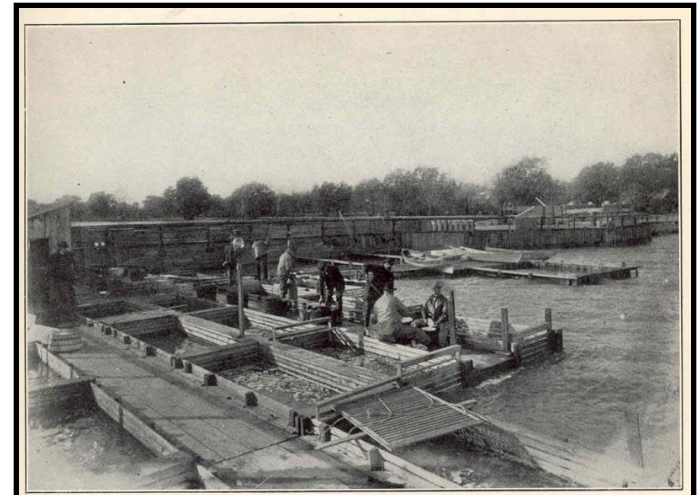
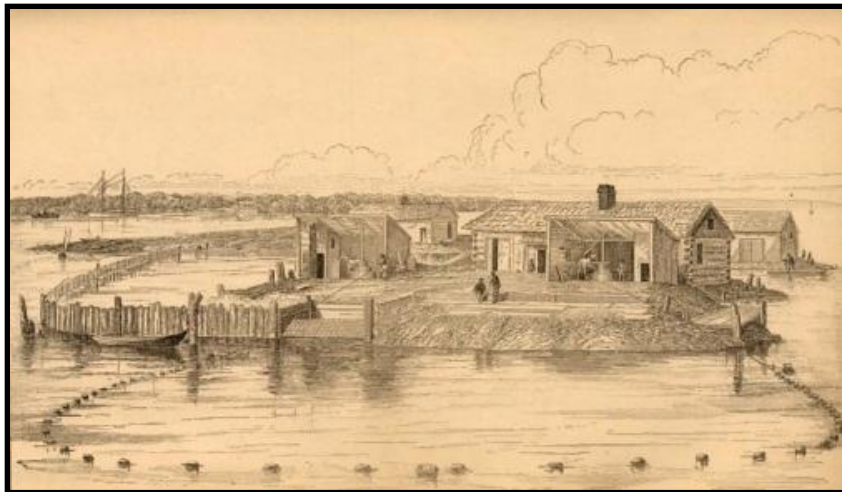
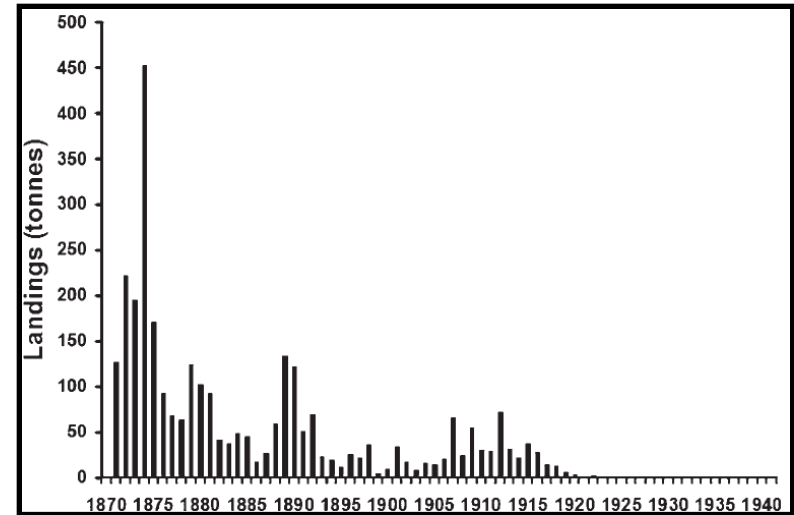
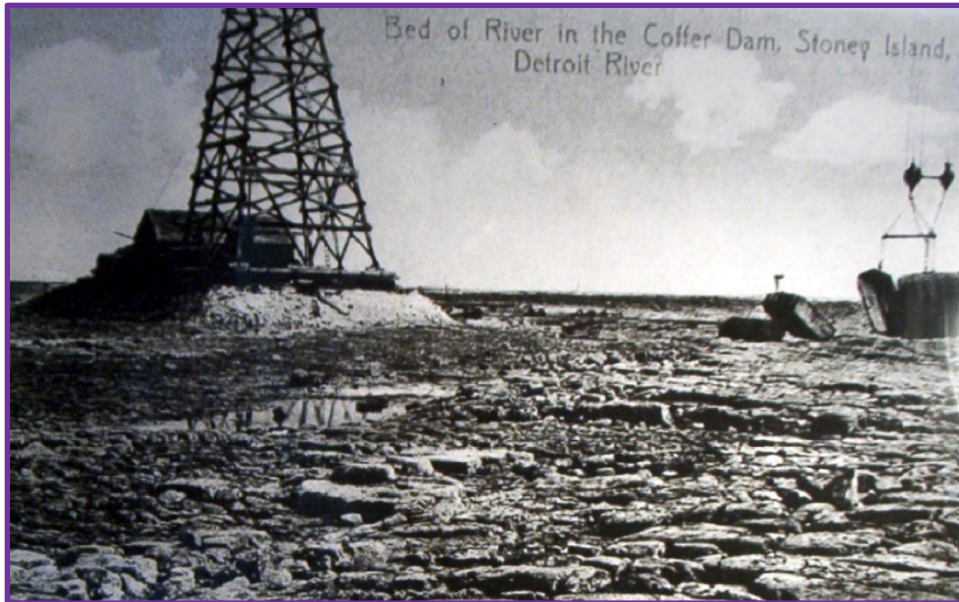


FIG. 5.—Spawning operations on the Detroit River, Michigan. Whitefish caught in commercial fishing are held in crates and pounds until ripe. The crates are provided with false bottoms, which may be raised for easier access to the fish.

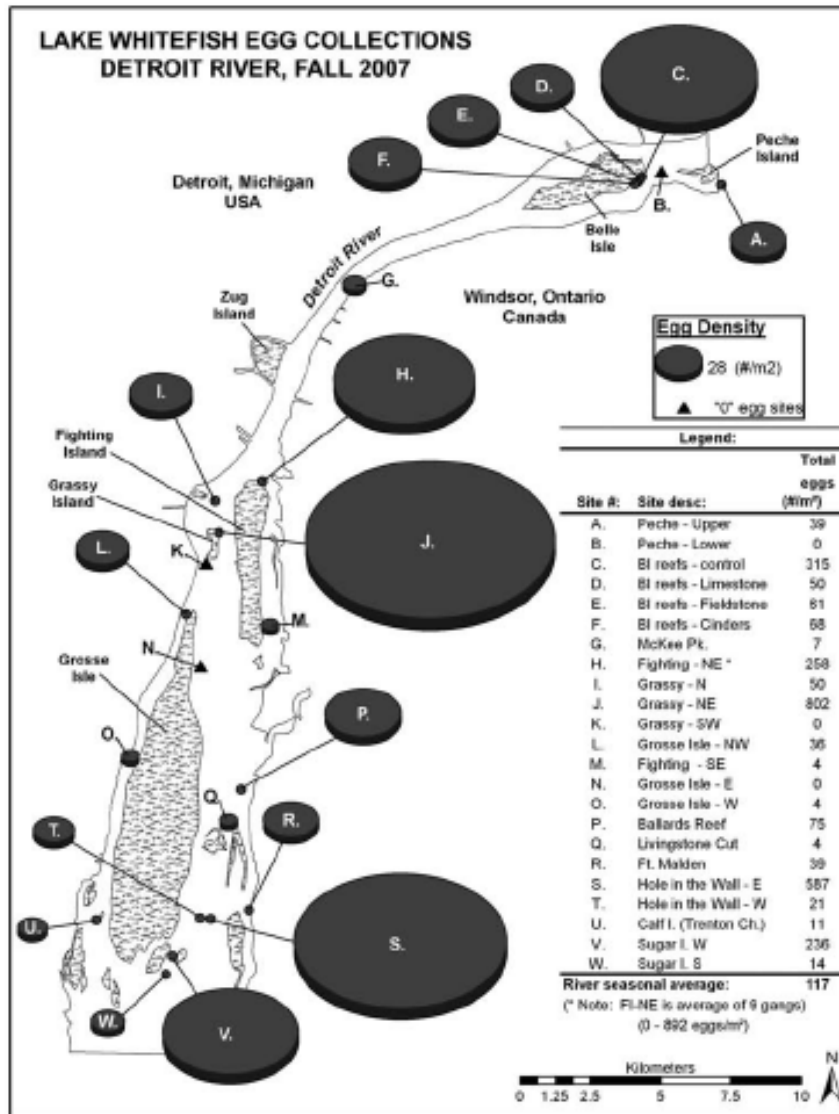
Livingston Cut Construction

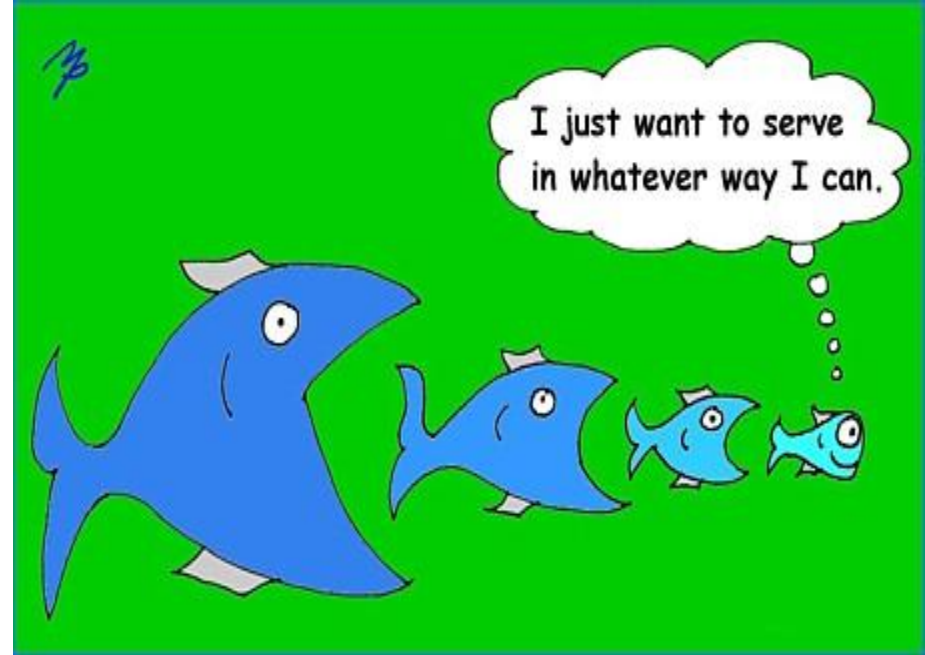
Detroit River 1910



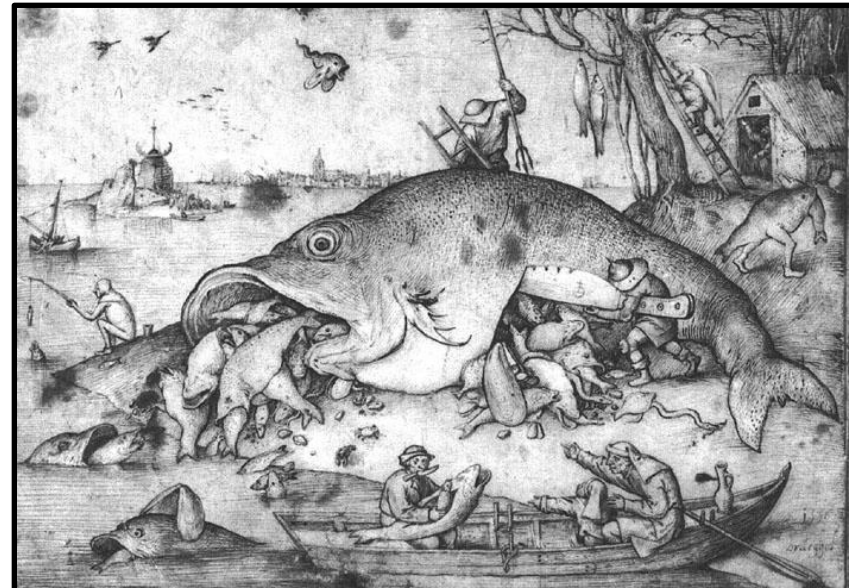
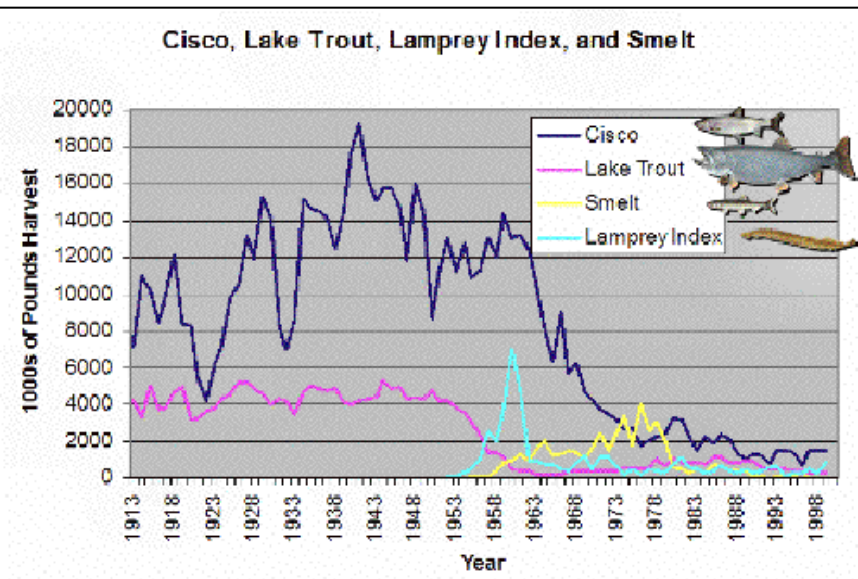
Restoration Lake Whitefish Detroit River

(Roseman et al. (2012) Advances in Limnology 63)





Species Interactions

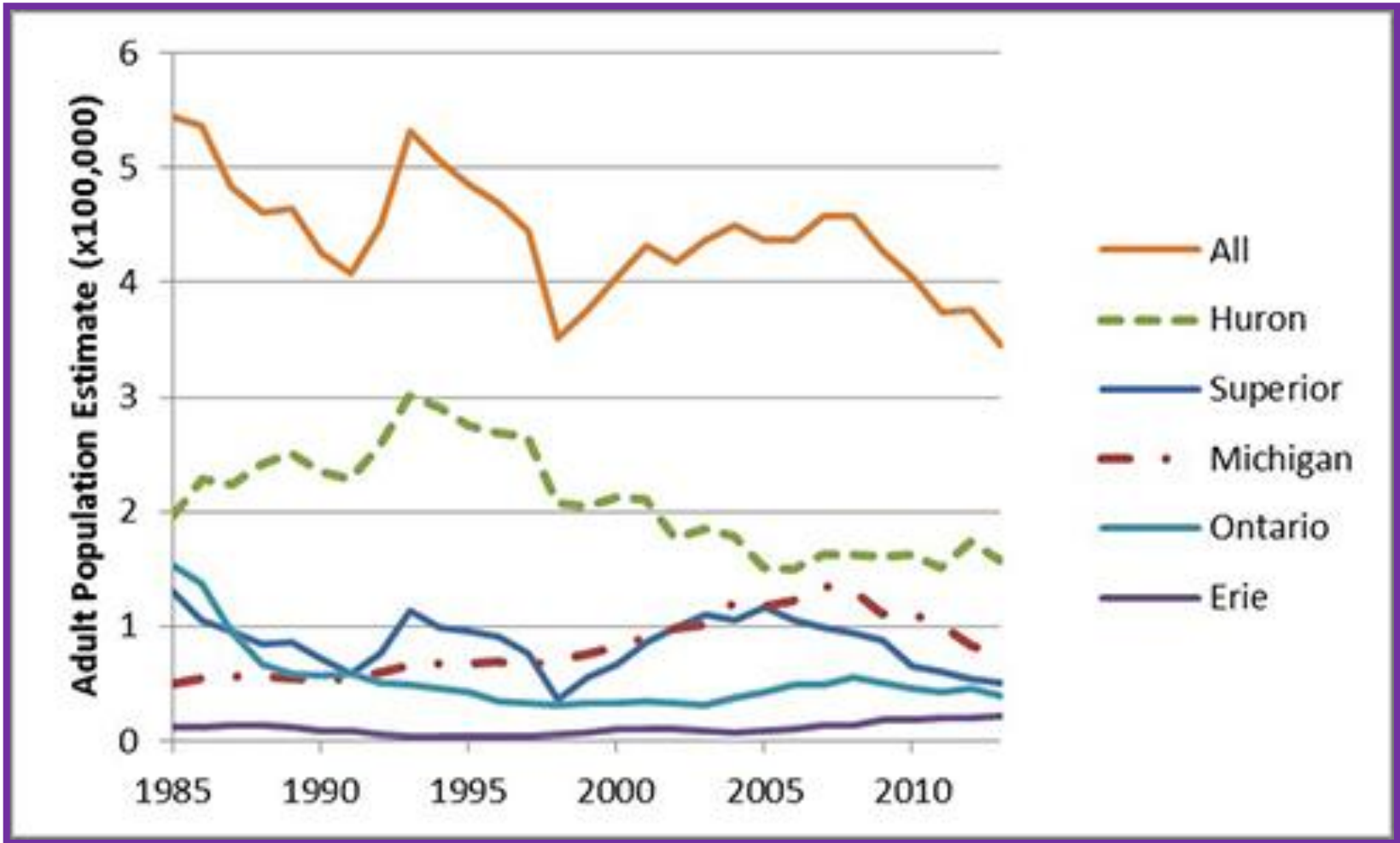


Ice Conditions on the Great Lakes 2013-2014

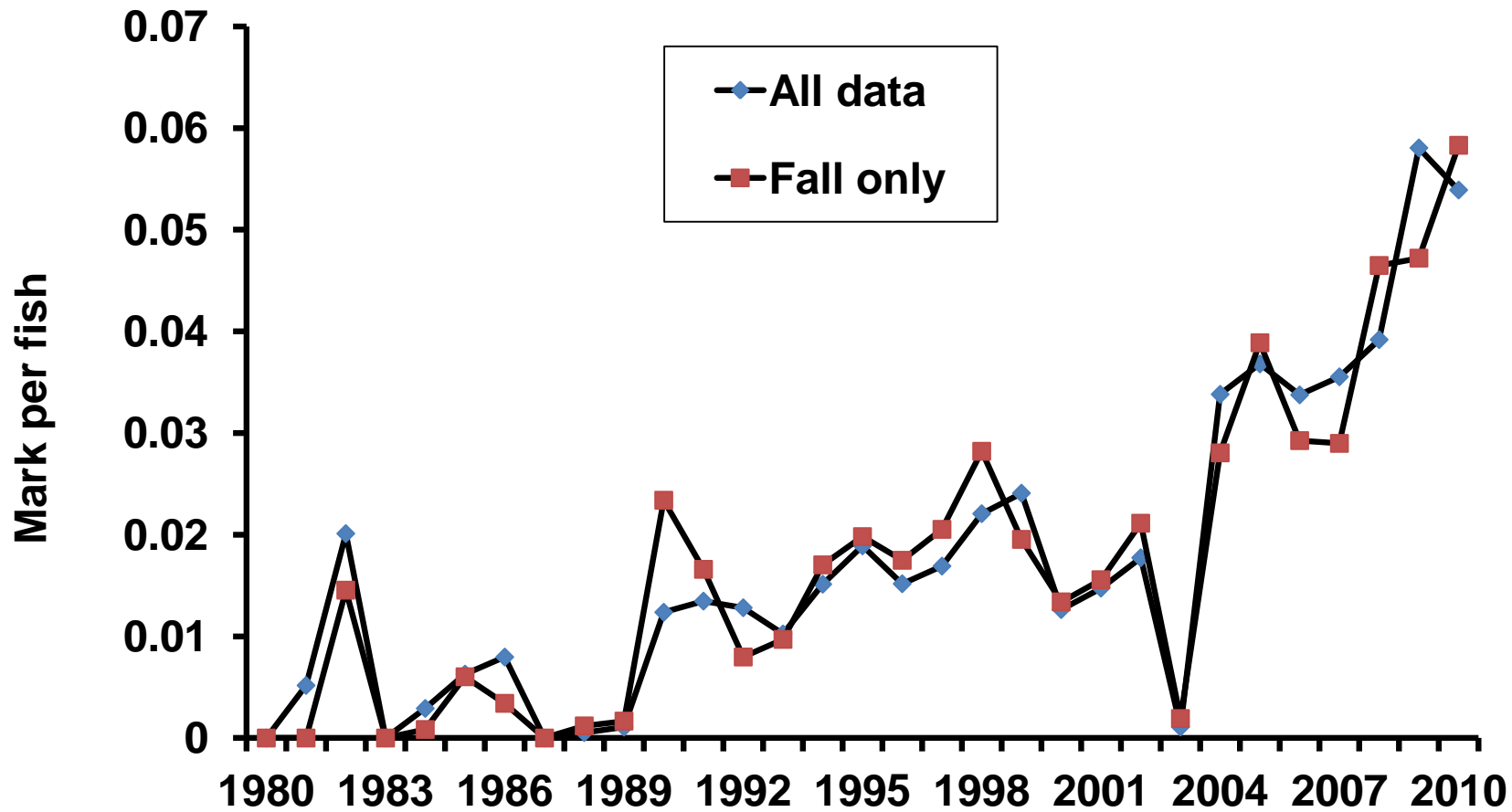


5-yr Avg Sea Lamprey Abundance

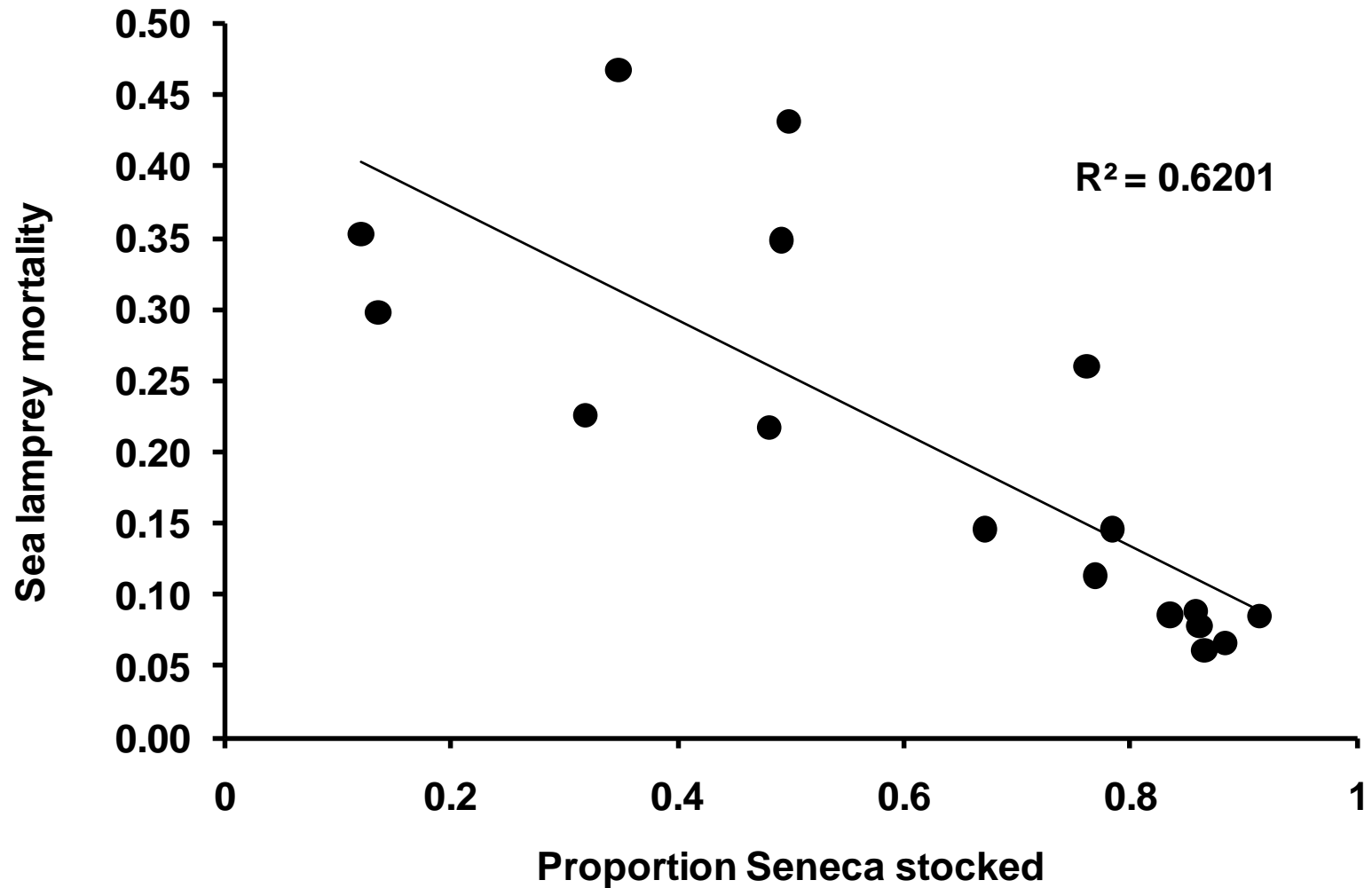
Great Lakes 1985-2013 (GLFC website)



Marks per Fish MH-1 Northern Lake Huron



Lamprey Mortality Age 5+ & Proportion Seneca Northern Huron 1977-2008



Cisco
(Coregonus artedii)

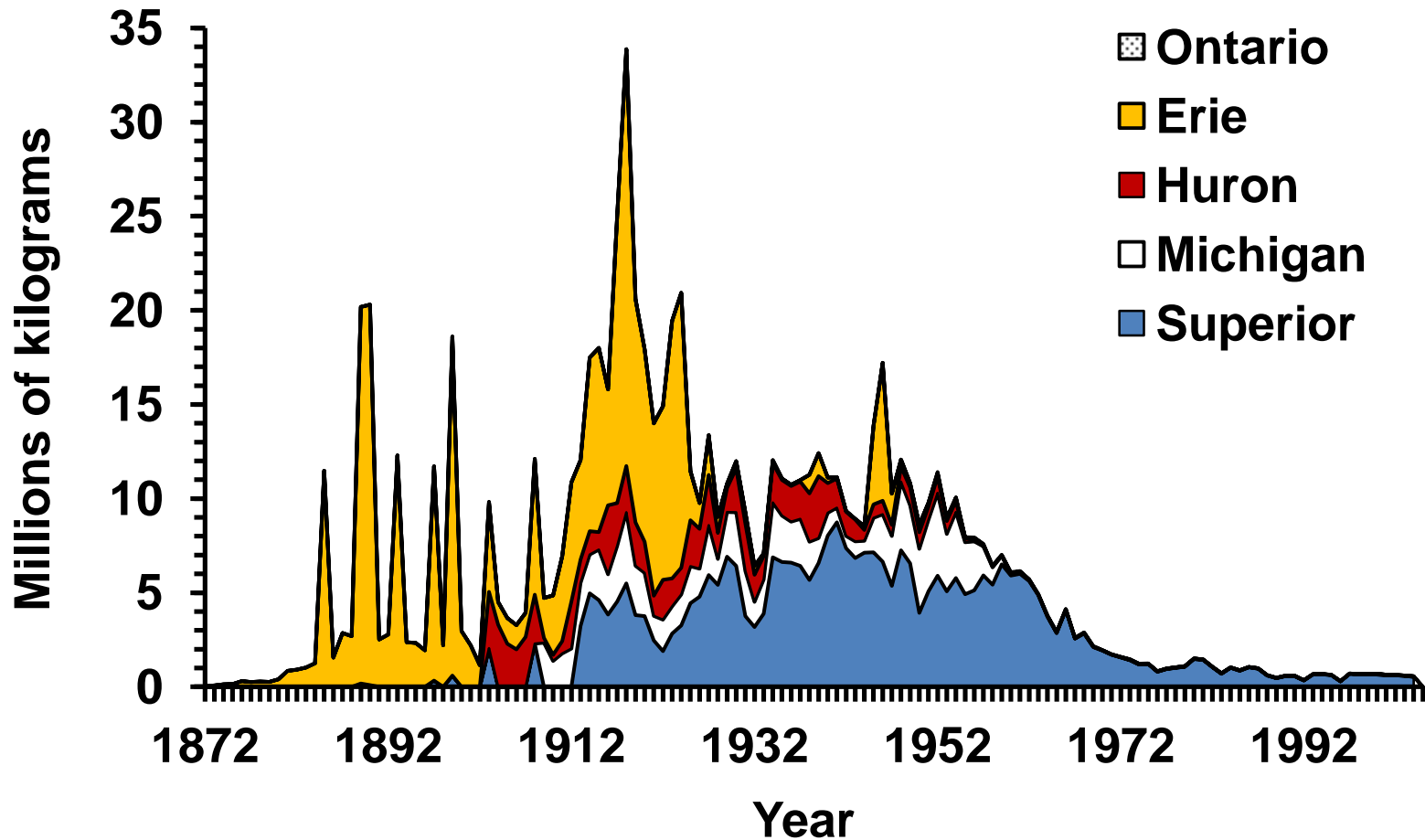
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Salting and Packing Cisco



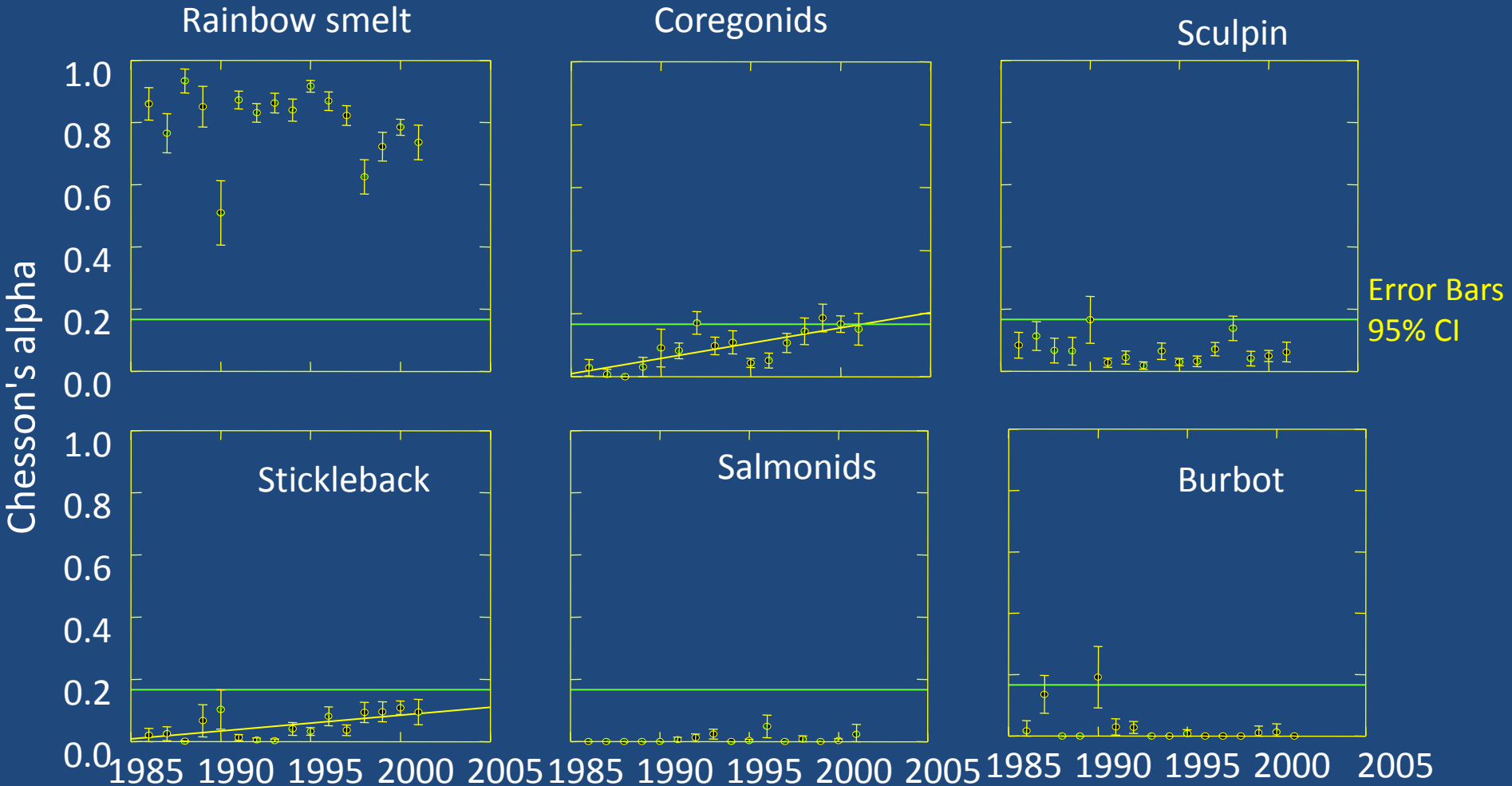
Cisco Commercial Yields 1872-2004





Time On The Water

Lake Trout Prey Selection Through Time in Lake Superior

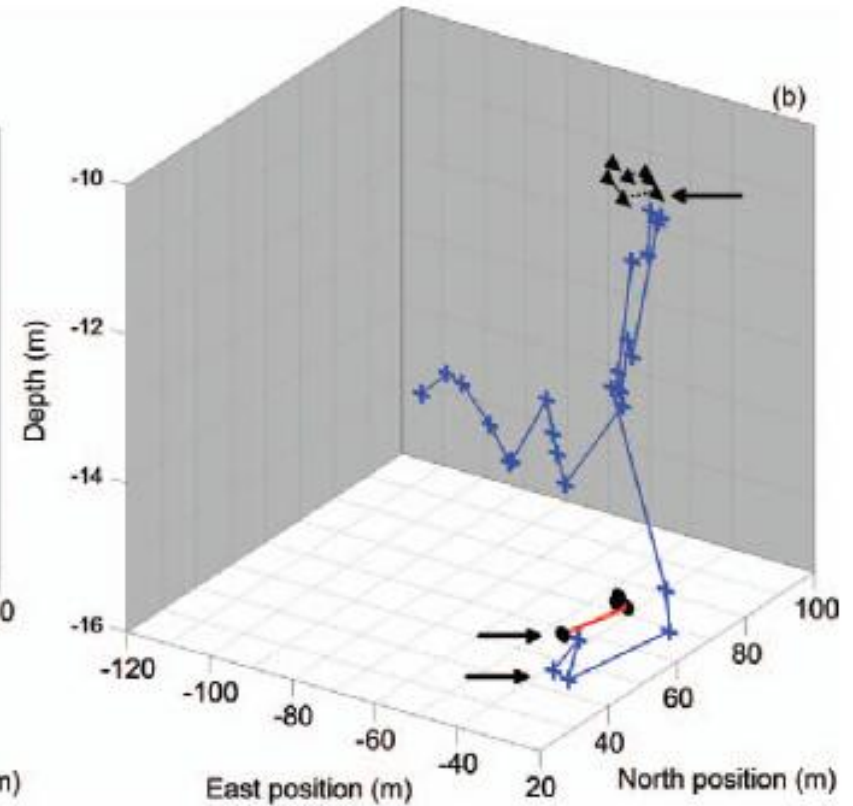
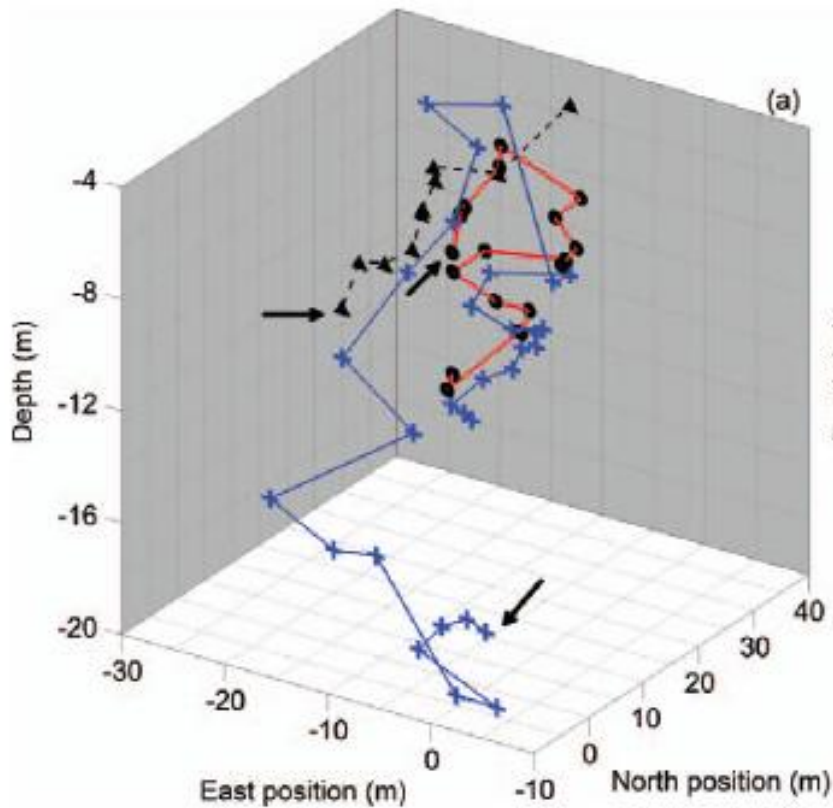


Association of Tagged Lake Trout to Cisco Schools

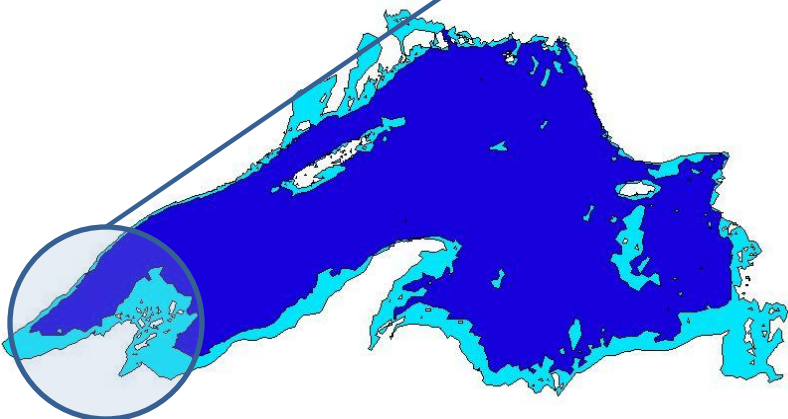
Lake Openongo, Dunlap et al. (2010) TAFS 139

LAKE TROUT SWIMMING BEHAVIOR

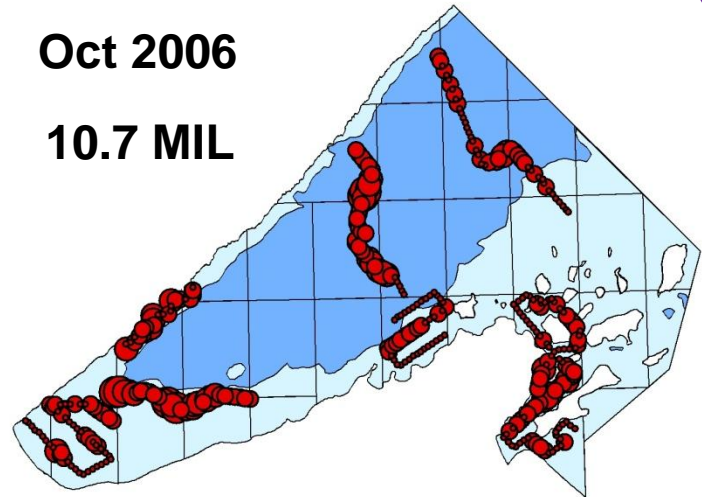
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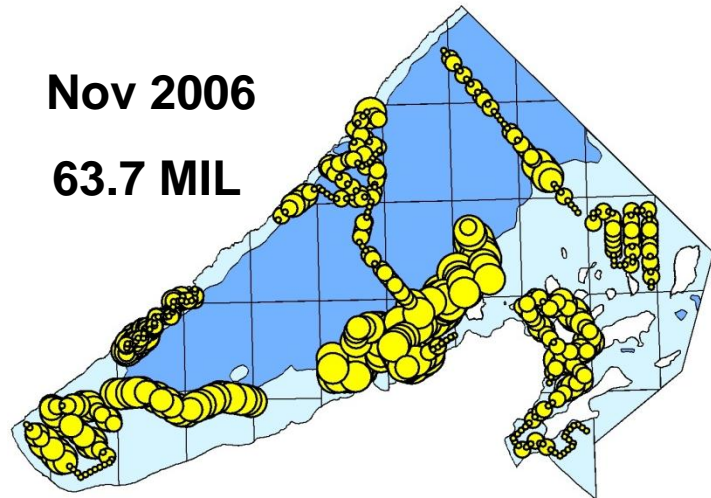
Cisco Abundance Western Arm 2006



Oct 2006
10.7 MIL

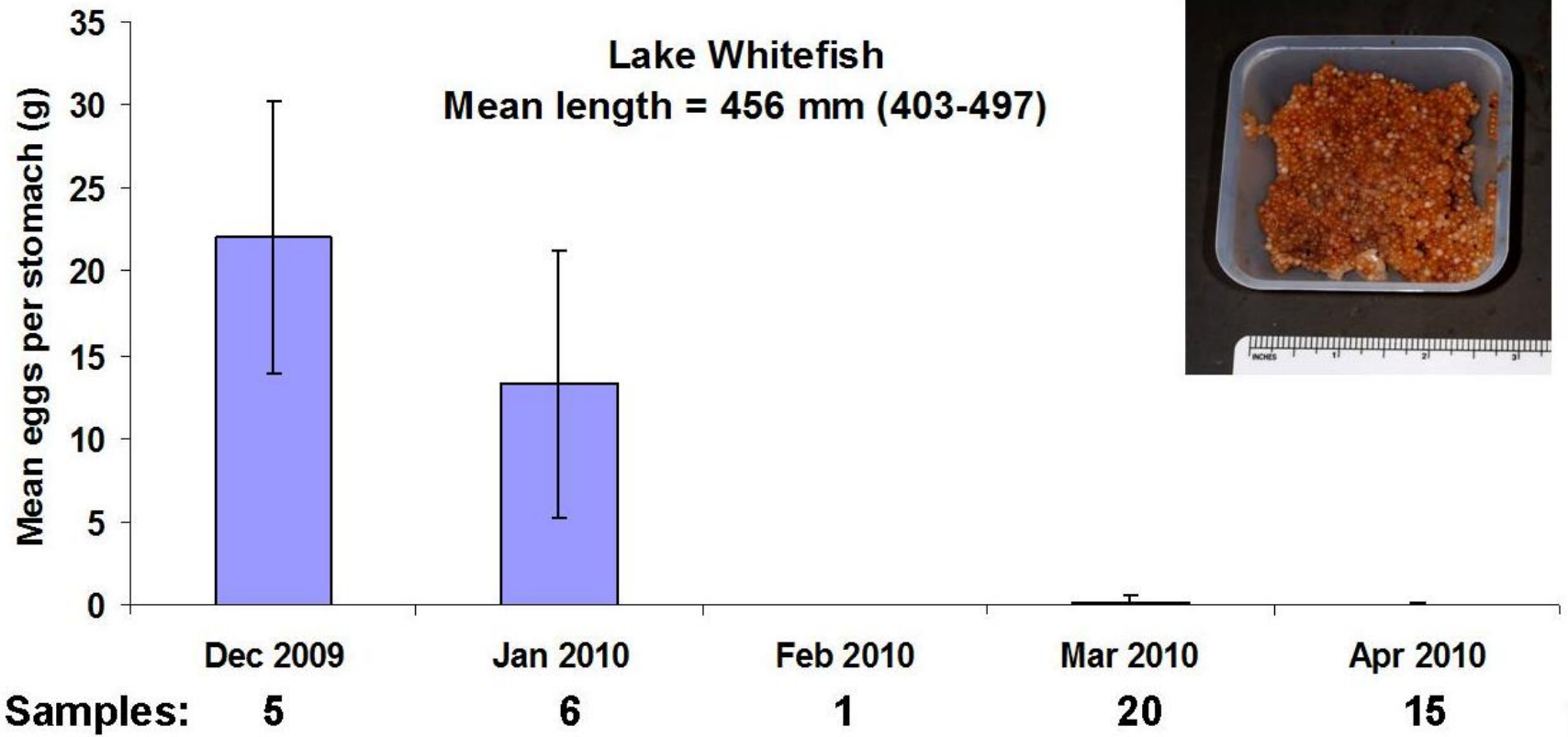


Nov 2006
63.7 MIL

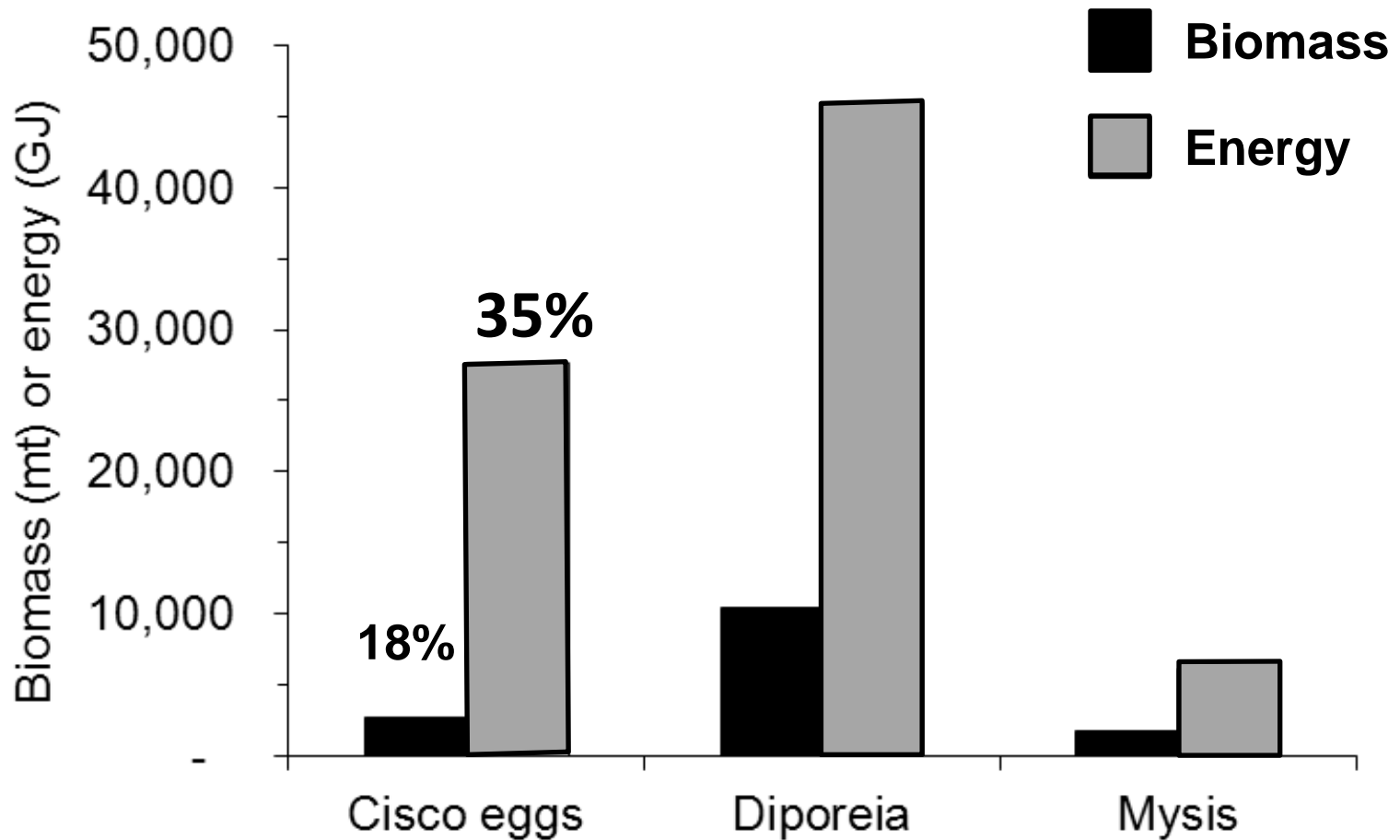


Lake Whitefish Winter Diet

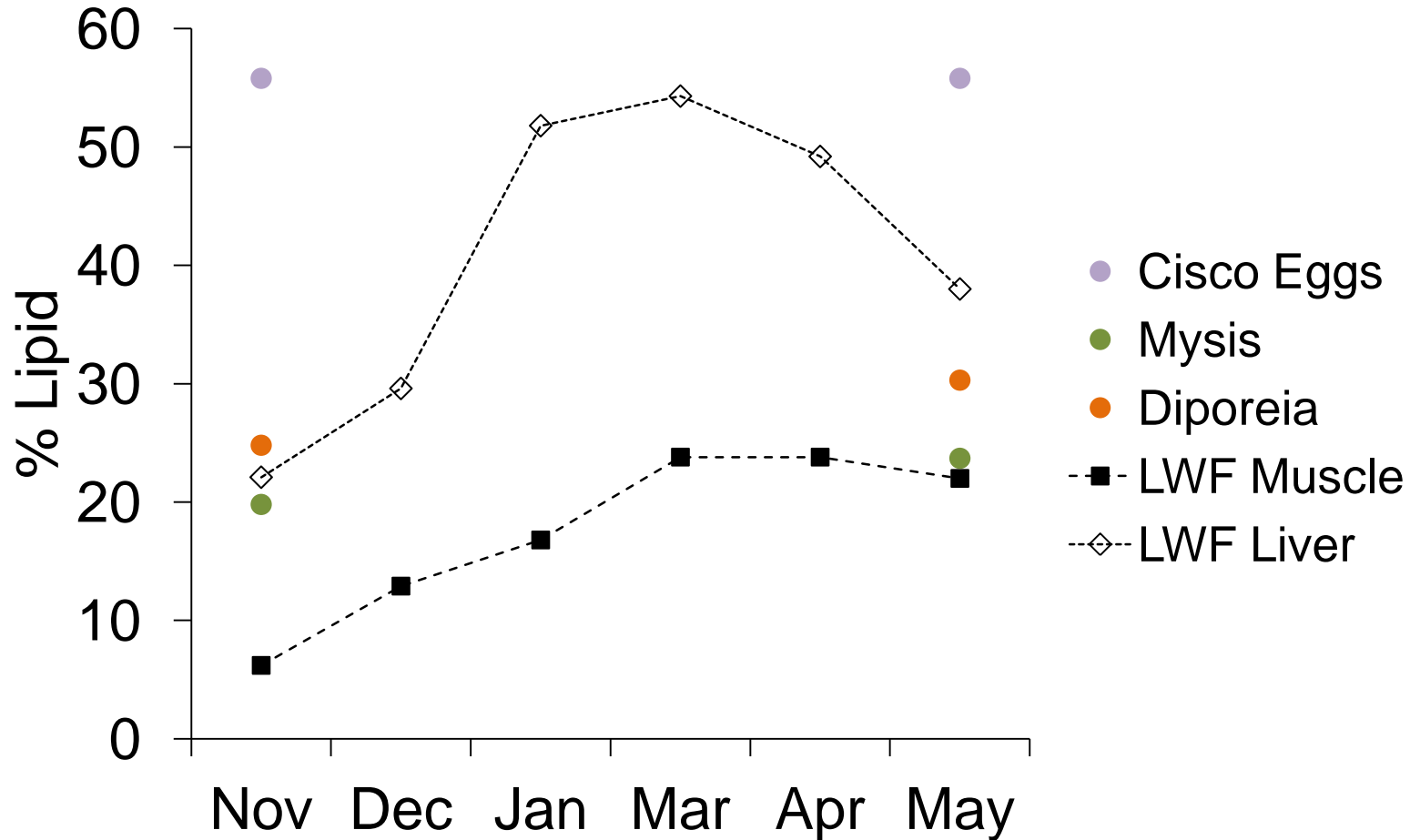
Stockwell et al. (2012)



Cisco Eggs vs Macro-invertebrates



Whitefish Percent Lipid Data



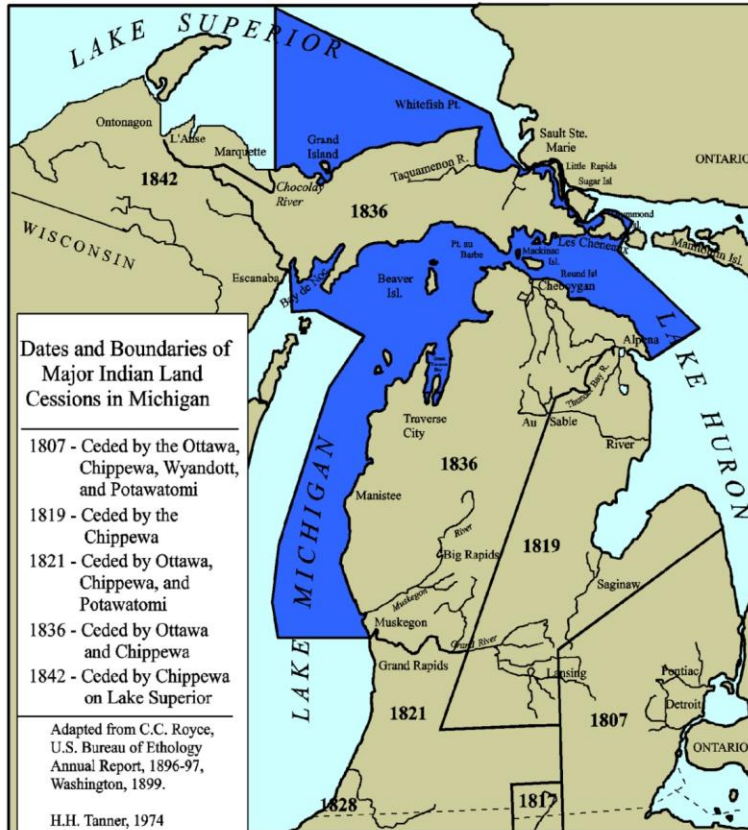
Conclusions from Stockwell et al.



- **Cisco eggs significant % of available benthic prey in nearshore areas during winter**
- **Important prey source for lake whitefish**
 - **79% of energy consumed over winter**
 - **35% of energy consumed on annual basis**
- **Historic coupling replaced by non-native species throughout the Great Lakes?**
 - **Additional benefits to cisco rehabilitation**

Allocation Issues

1836 Treaty-Ceded Waters In State of Michigan



Ceded waters of Chippewa-Ottawa Treaty of 1836

Negotiated Settlements Tribes/State/Feds

1985
2000
2020
2040?

- Allocate fishery resources
- Establish joint management
- Set harvest guidelines

Commercial Trap Net Fishing Oscoda, Lake Huron



Ice Fishing for Whitefish Southern Green Bay, Lake Michigan



The Future



- 1. Reduce levels of whitefish harvests Lake Huron**
- 2. Increased contributions of tributaries to whitefish**
- 3. Continued rehabilitation of tributary habitat**
- 4. Reductions in lake trout stocking Lake Huron**
- 5. Promote recovery of cisco lower lakes**

Quantitative Fishery Center – MSU



Dr. Jim Bence



Dr. Travis Brenden

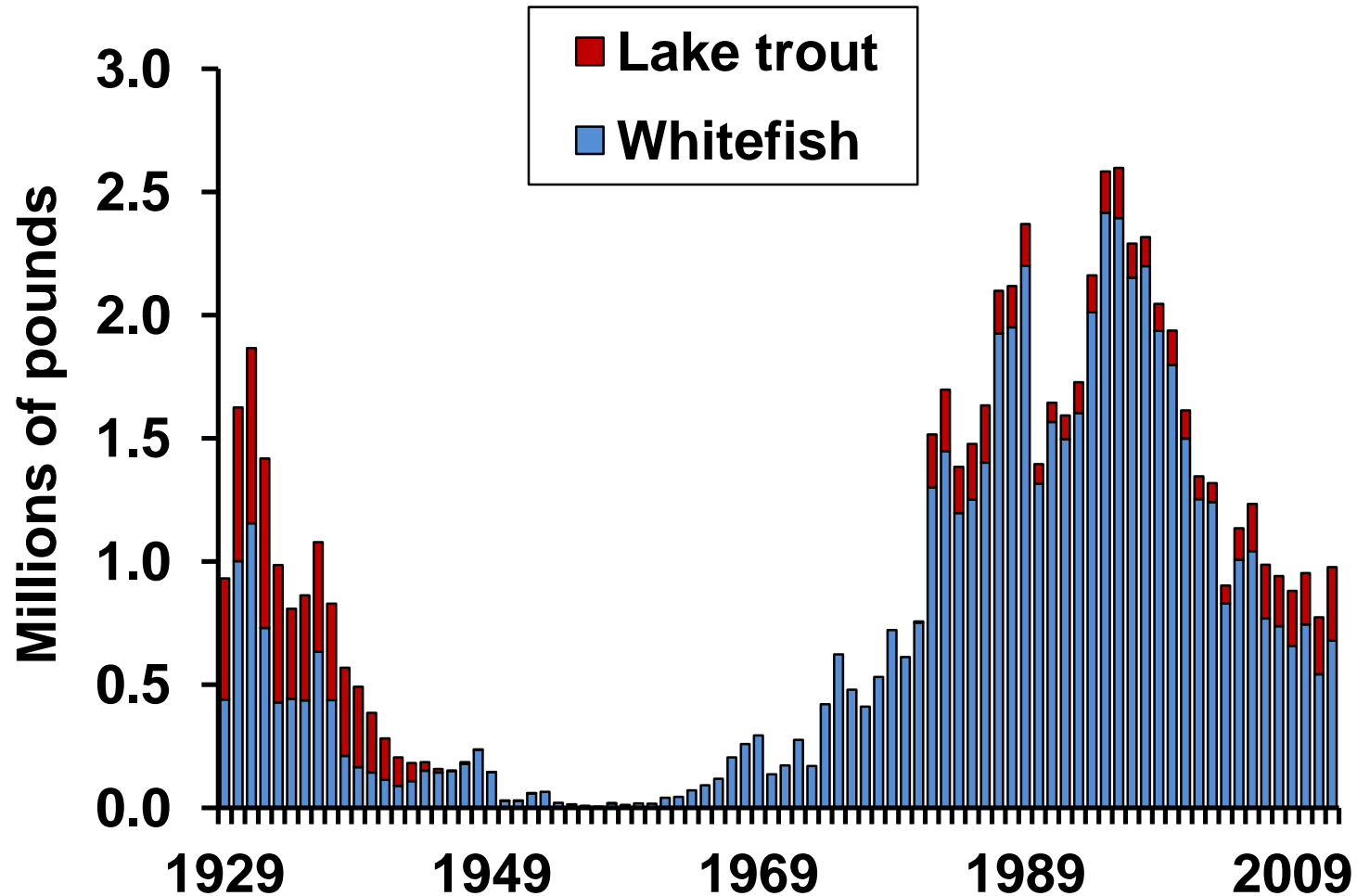


Dr. Mike Jones

The End

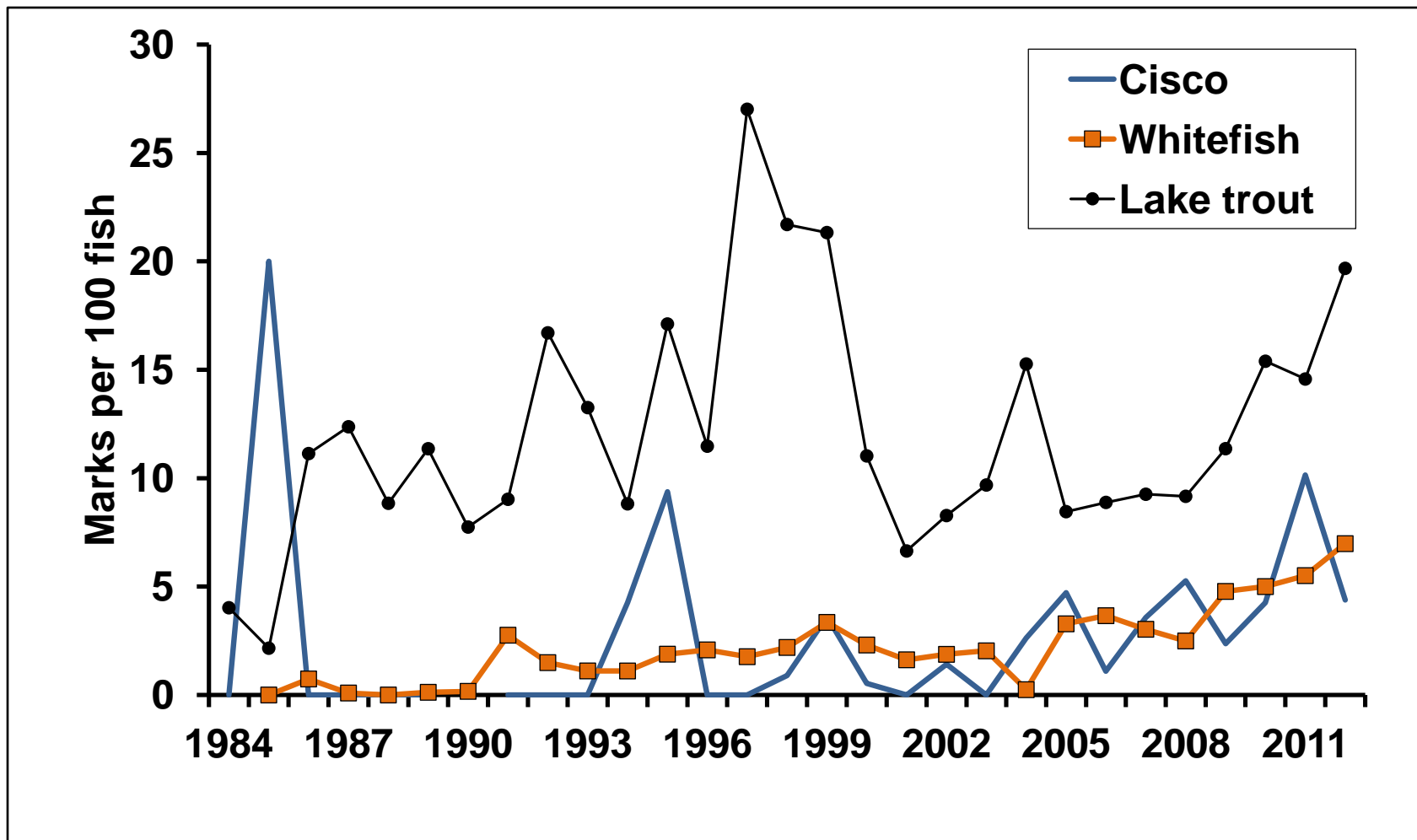


Commercial Yields MH-1 1929-2012



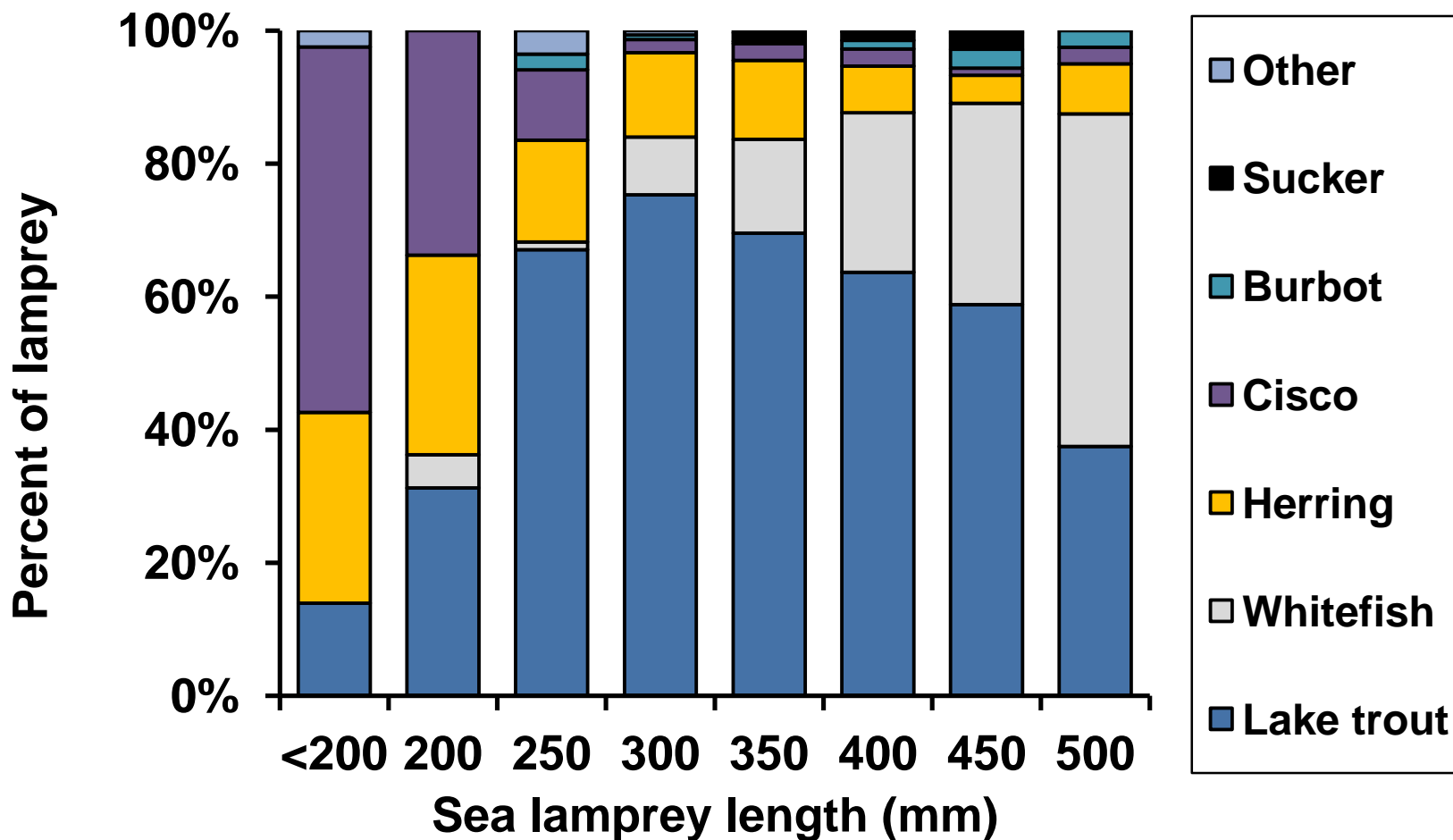


Species-Specific Sea Lamprey Marking MH-1 1984-2011



Lamprey Host Selection

Lake Superior 1969-1978 (Johnson & Anderson 1980)





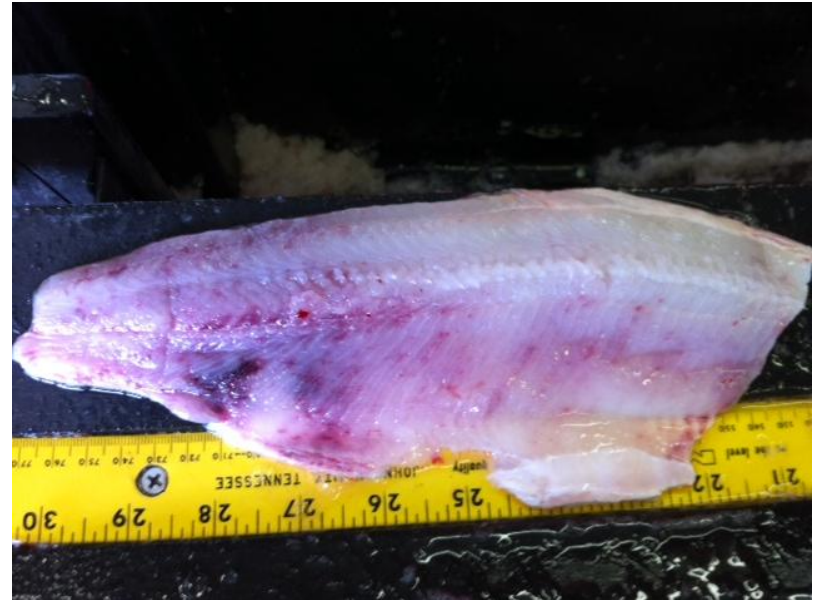
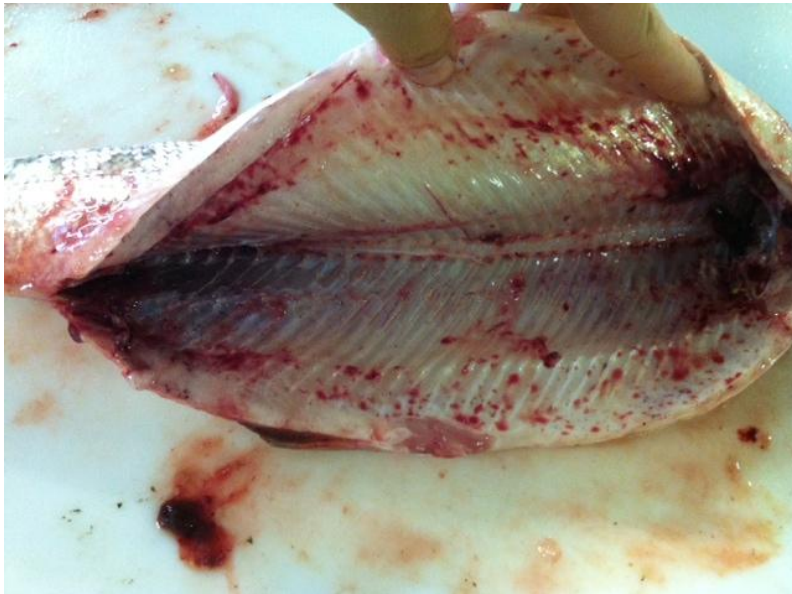
Fish Health



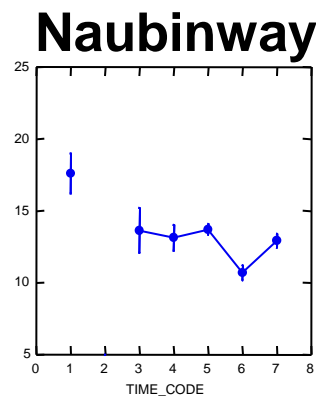
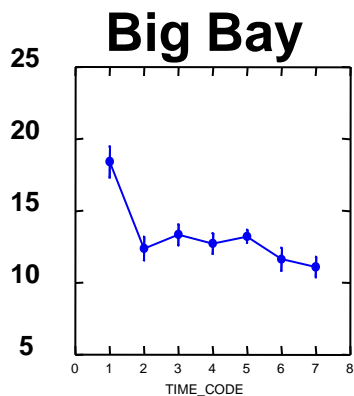


VHS

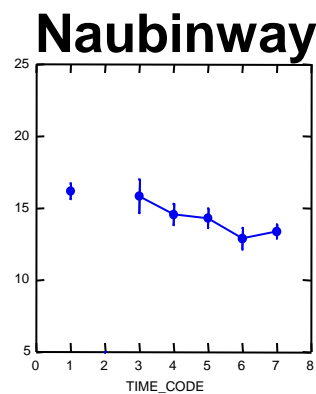
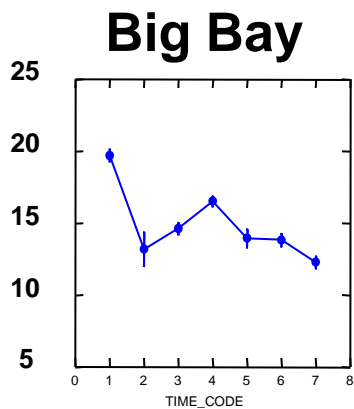
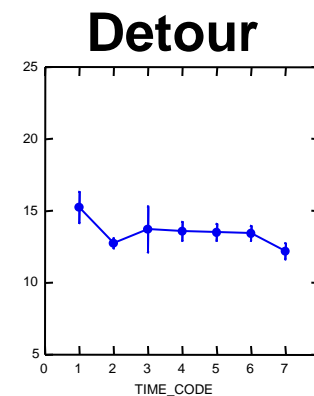
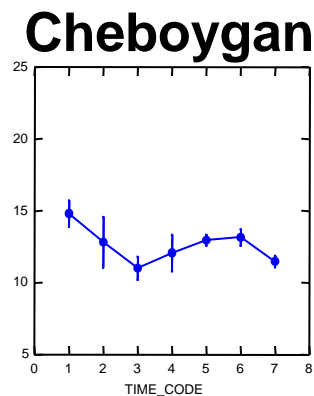
- Viral Hemorrhagic Septicemia -



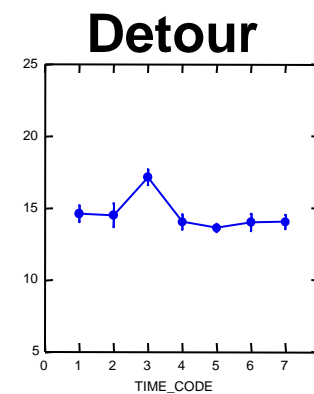
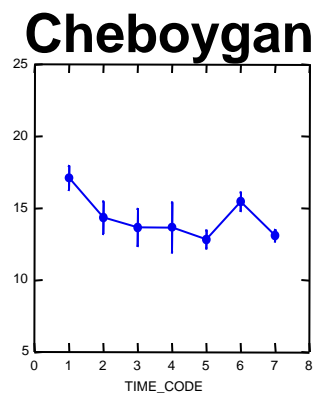
Omega-3 FA in Whitefish Muscle



Females



Males



Fall 2003 → Spring 2005

Fall 2003 → Spring 2005

Swimbladder Nematode

Cystidicola farionis



Estimated Consumption of Prey Fish

Main Basin Lake Huron 1984-2010

