

Thiamine status of lake trout eggs in lakes Michigan and Huron

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Objectives

- **Provide background on TDC**
- **Report egg thiamine levels from lake trout in lakes Huron and Michigan**
- **Examine trends in egg thiamine levels**

Thiamine



- **Vitamin B1**
- **Essential cofactor for enzymes in many key metabolic pathways**
- **Involved in nerve function**
- **Deficiency results in disease in many animals**

Thiamine Deficiency

- **Beriberi**
- **Observed in foxes, minks, dogs, cats, chickens, gulls, alligators**
- **Common in domestic animals fed fish**
- **Common in feral Great Lakes salmonines (TDC)**

Thiamine Deficiency Complex

- **Includes Early Mortality Syndrome (EMS)**
- **Caused by low thiamine in tissues or eggs**
- **Linked to consumption of thiaminase**
- **Incidence varies temporally and spatially**
- **May be a major impediment to lake trout restoration**

Thiaminase

- Catalyses the breakdown of thiamine
- Produced by several species of bacteria
- Found in the tissues of marine and freshwater fish and shellfish, zooplankton, insects, and plants
- Alewife and smelt believed to be the sources for lake trout

Effects of low thiamine

< 1.5 nmol/g

Mortality

< 4.0 nmol/g

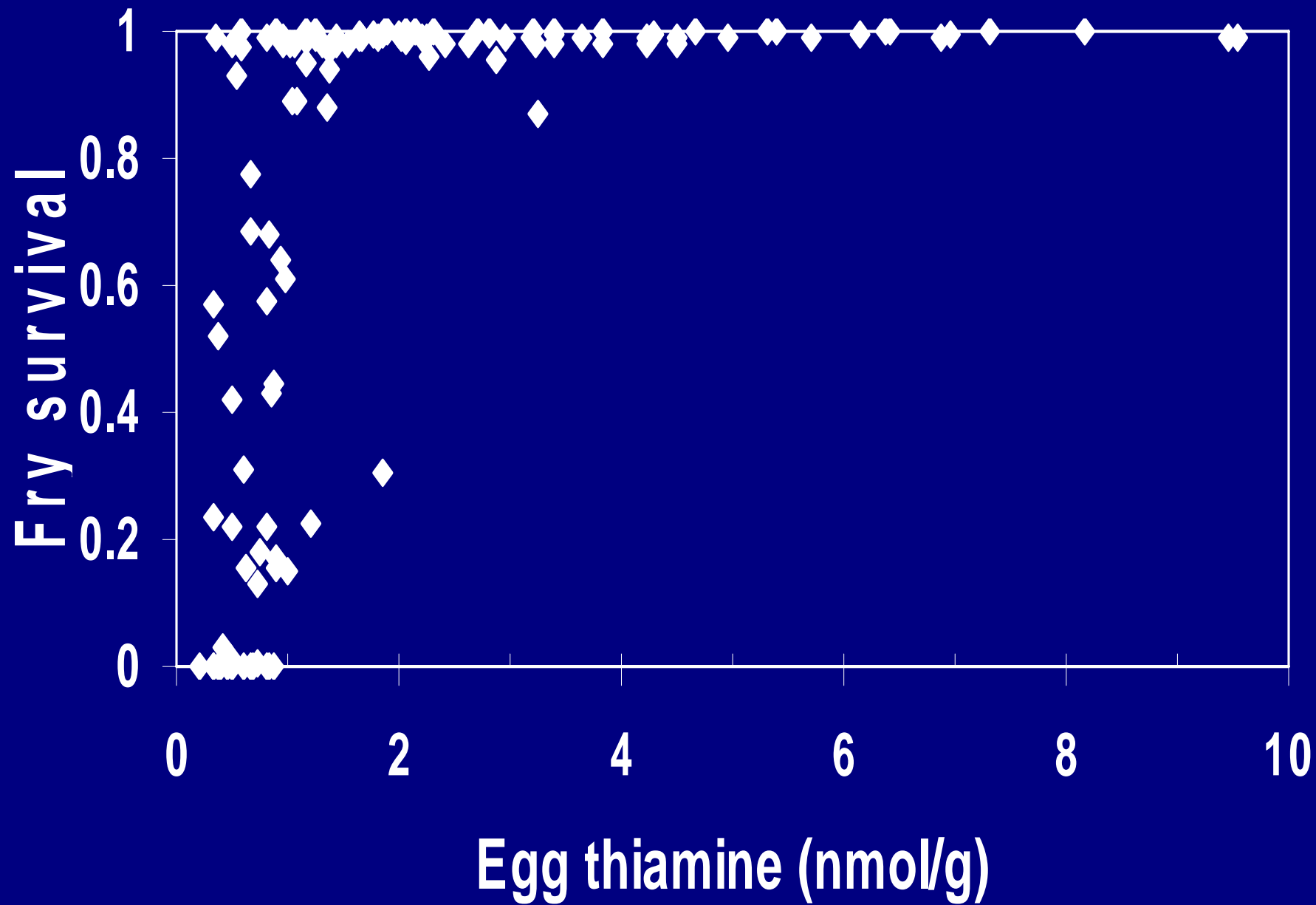
Sublethal effects

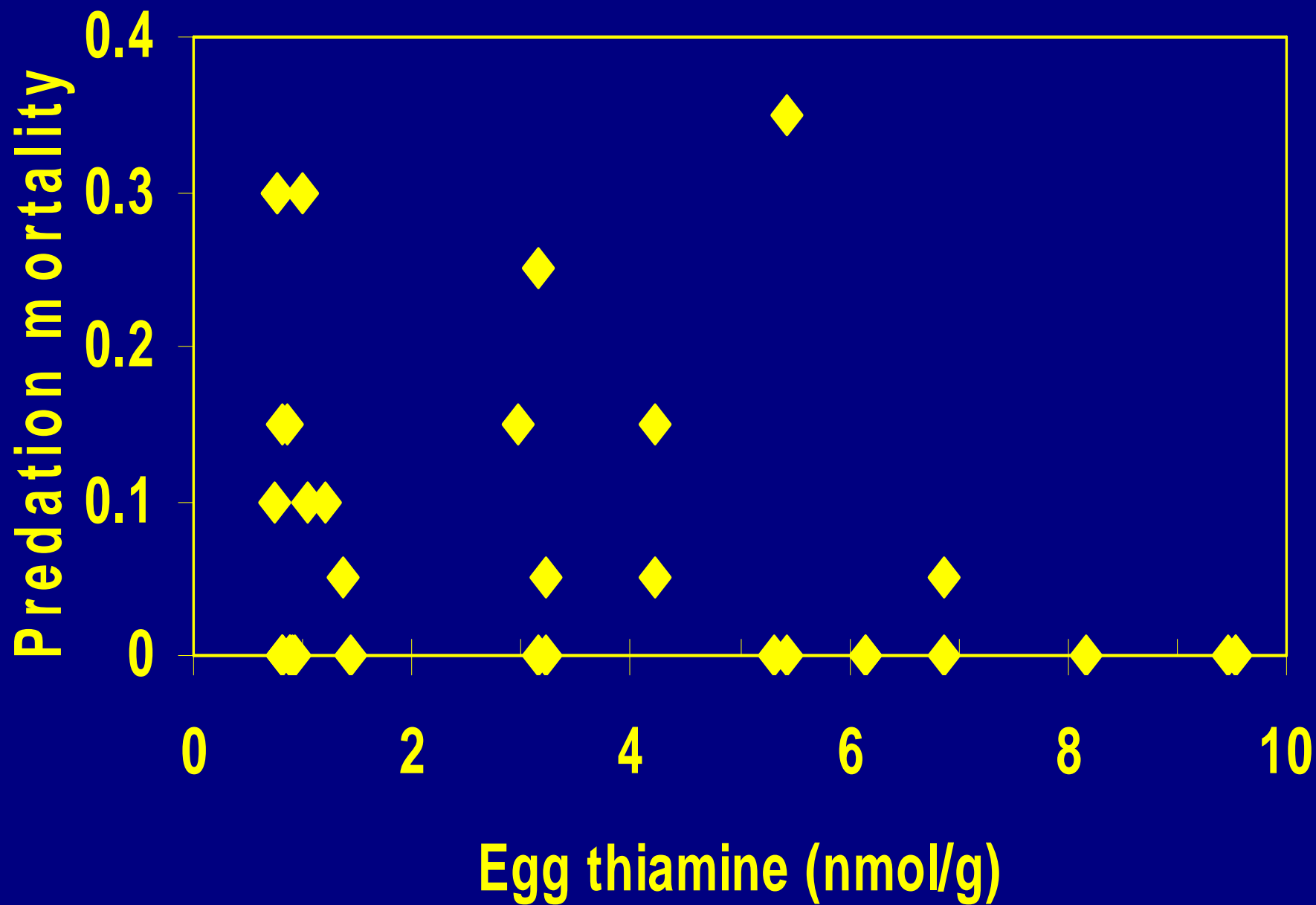
reduced growth

prey capture

predator avoidance

immune function





Lake trout egg thiamine monitoring

**Prior to 2005: Dale Honeyfield
 USGS Leetown Science Center
 Wellsboro, PA**

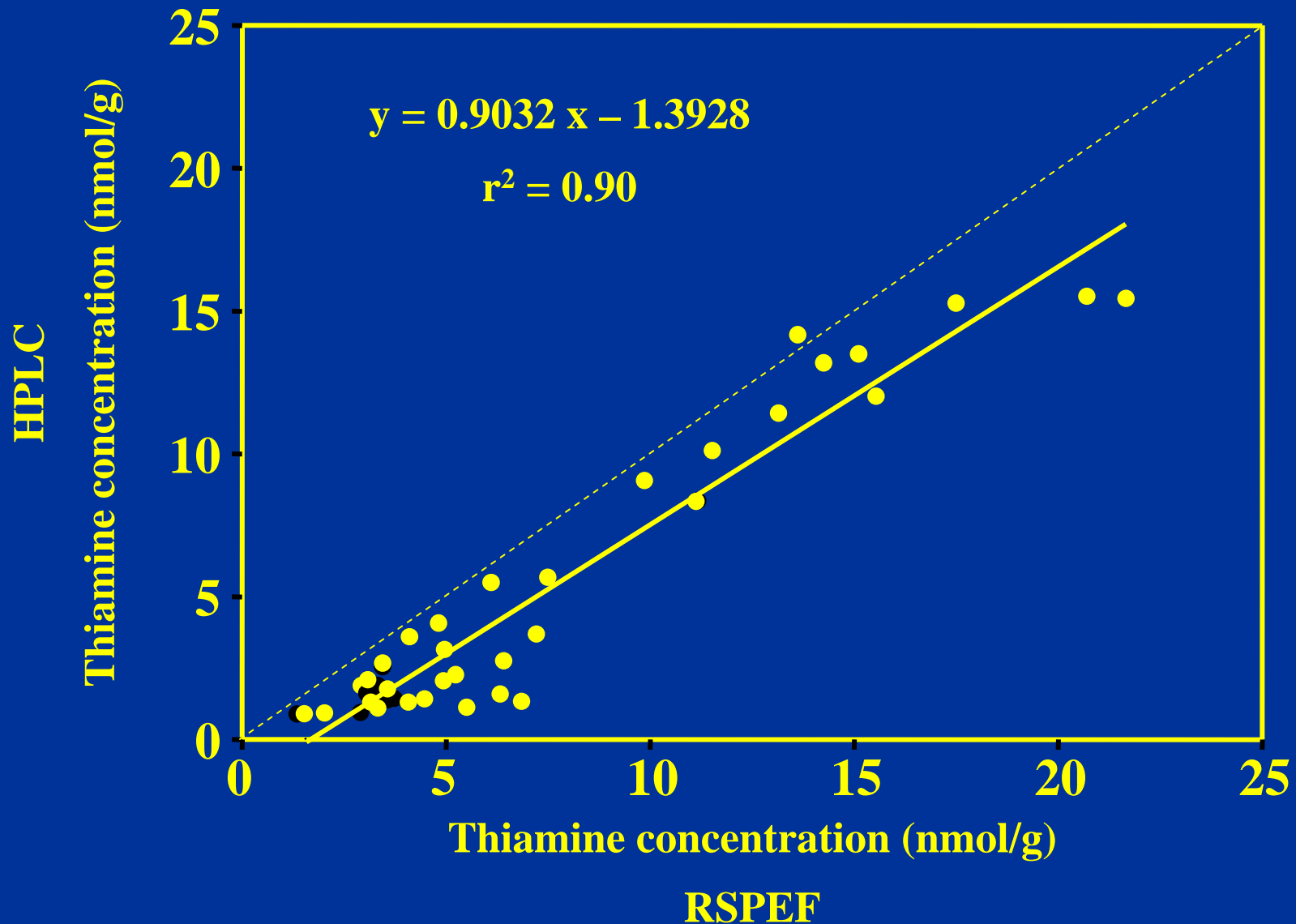
**Since 2005: Jacques Rinchard, Stephen
 Riley, and Linda Begnoche
 USGS GLSC
 Ann Arbor, MI**

Methods

- **Used Rapid Solid-Phase Extraction Fluorometric method**
- **Correction factor developed for old (HPLC) data**

Zajicek, J.L., D.E. Tillitt, S.B. Brown, L.R. Brown, D.C. Honeyfield, and J.D. Fitzsimons. 2005. A rapid solid-phase extraction fluorometric method for thiamine and riboflavin in salmonid eggs. J. Aquat. Anim. Health 17: 95-105.

Relationship between RSPEF and HPLC



Lake trout egg collection

Lake Michigan

Illinois DNR – Lake Michigan Program

Indiana DNR – Lake Michigan Fisheries Research Station

Wisconsin DNR – Lake Michigan Fisheries

Little Traverse Bay Band of Ottawa Indians

Grand Traverse Bay Band of Ottawa & Chippewa Indians

Little River Band of Ottawa Indians

Illinois Natural History Survey – Lake Michigan Biological Station

US Fish and Wildlife Service – Green Bay Fishery Resource Office

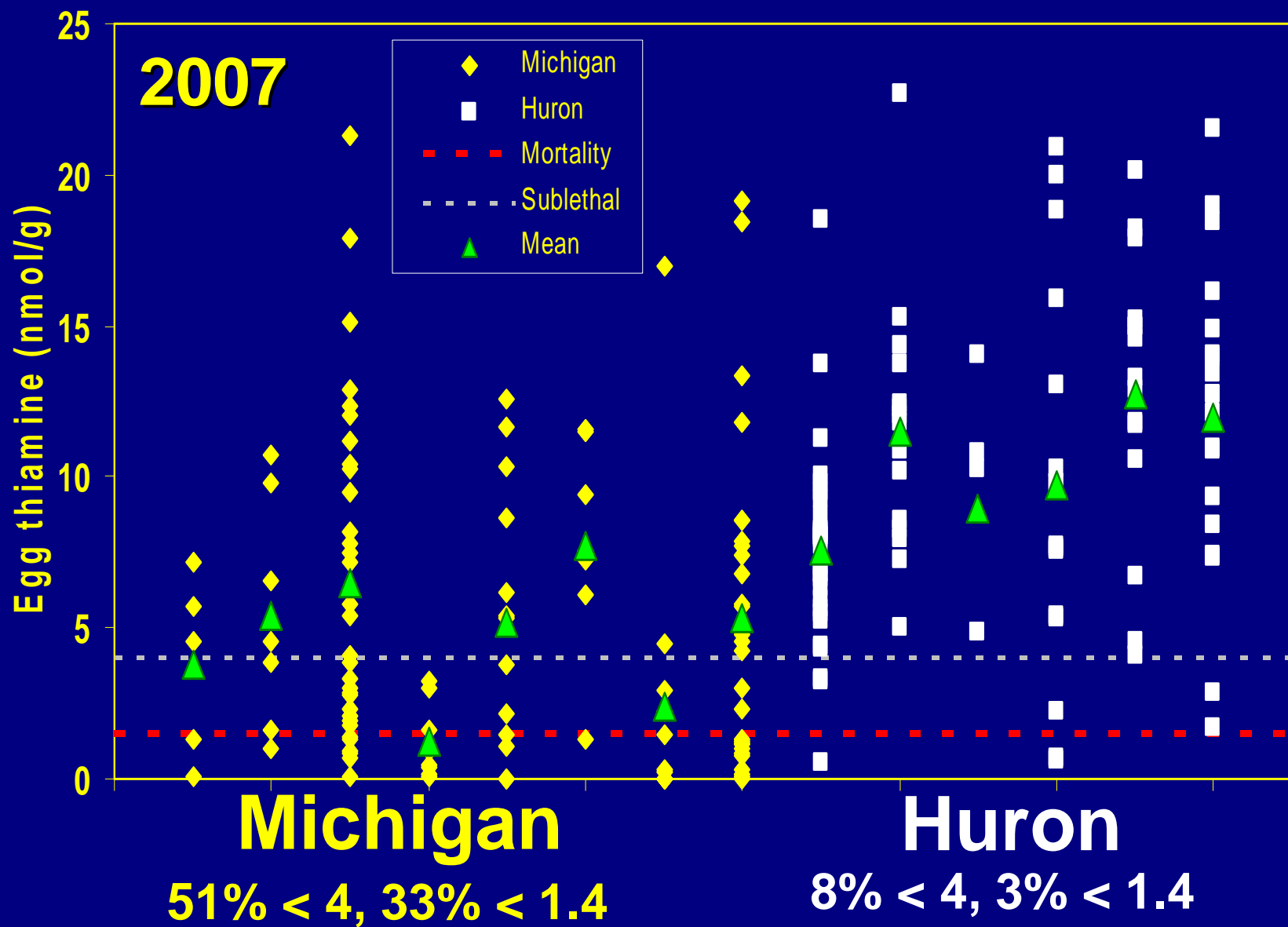
Lake Huron

Michigan DNR – Alpena Fisheries Research Station

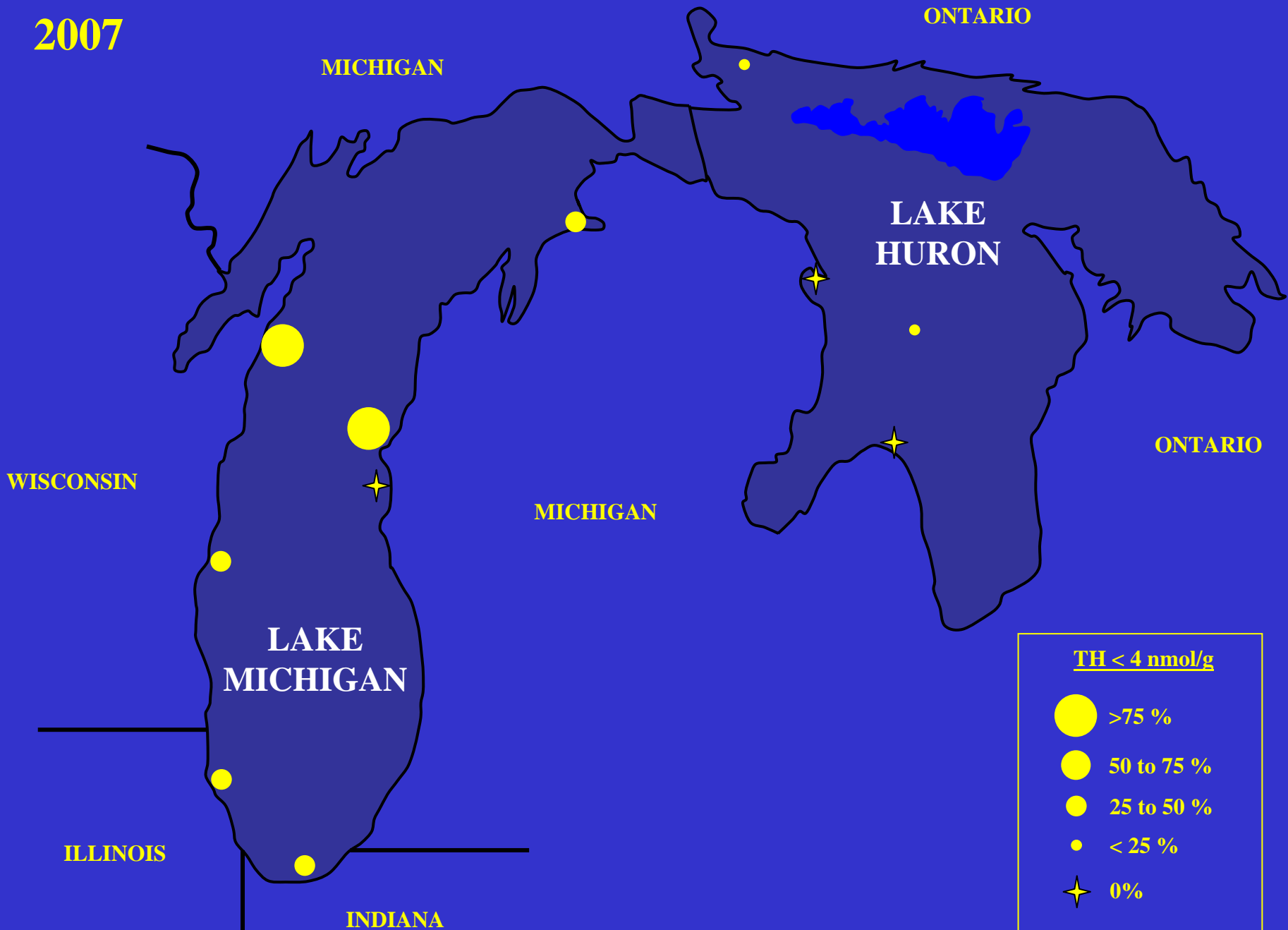
Chippewa Ottawa Resource Authority

Ontario Ministry of Natural Resources

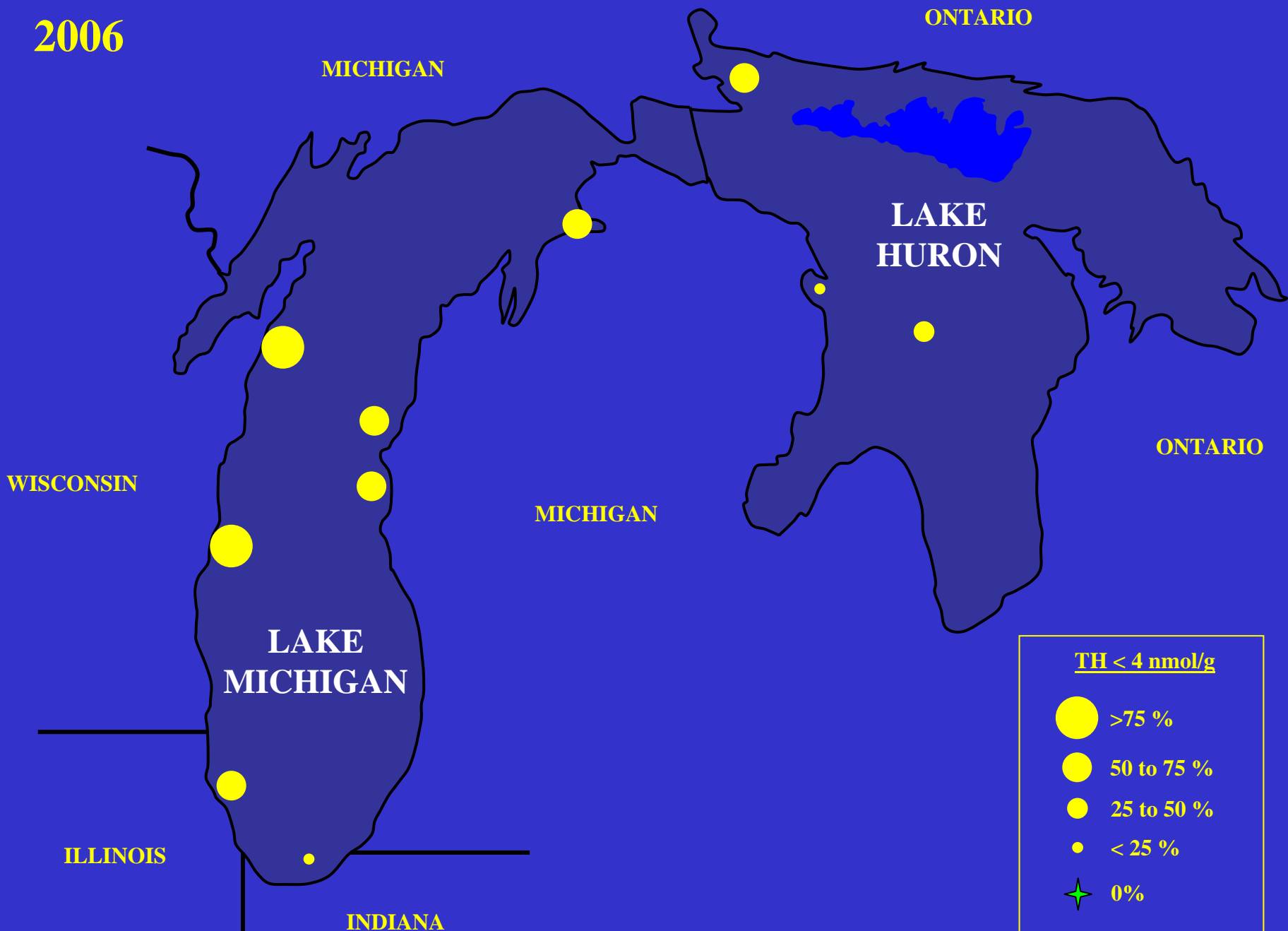
U. S. Fish and Wildlife Service



2007



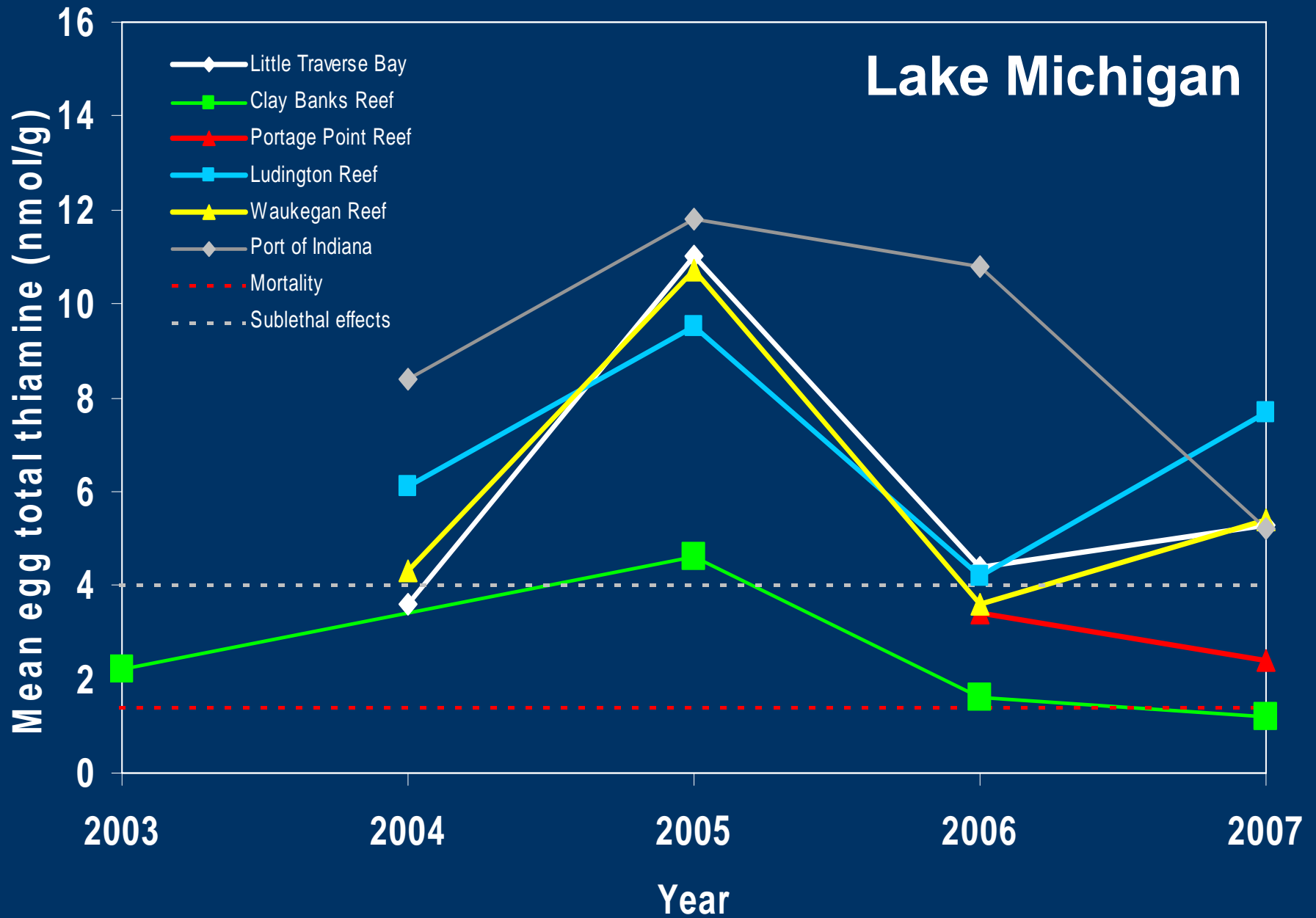
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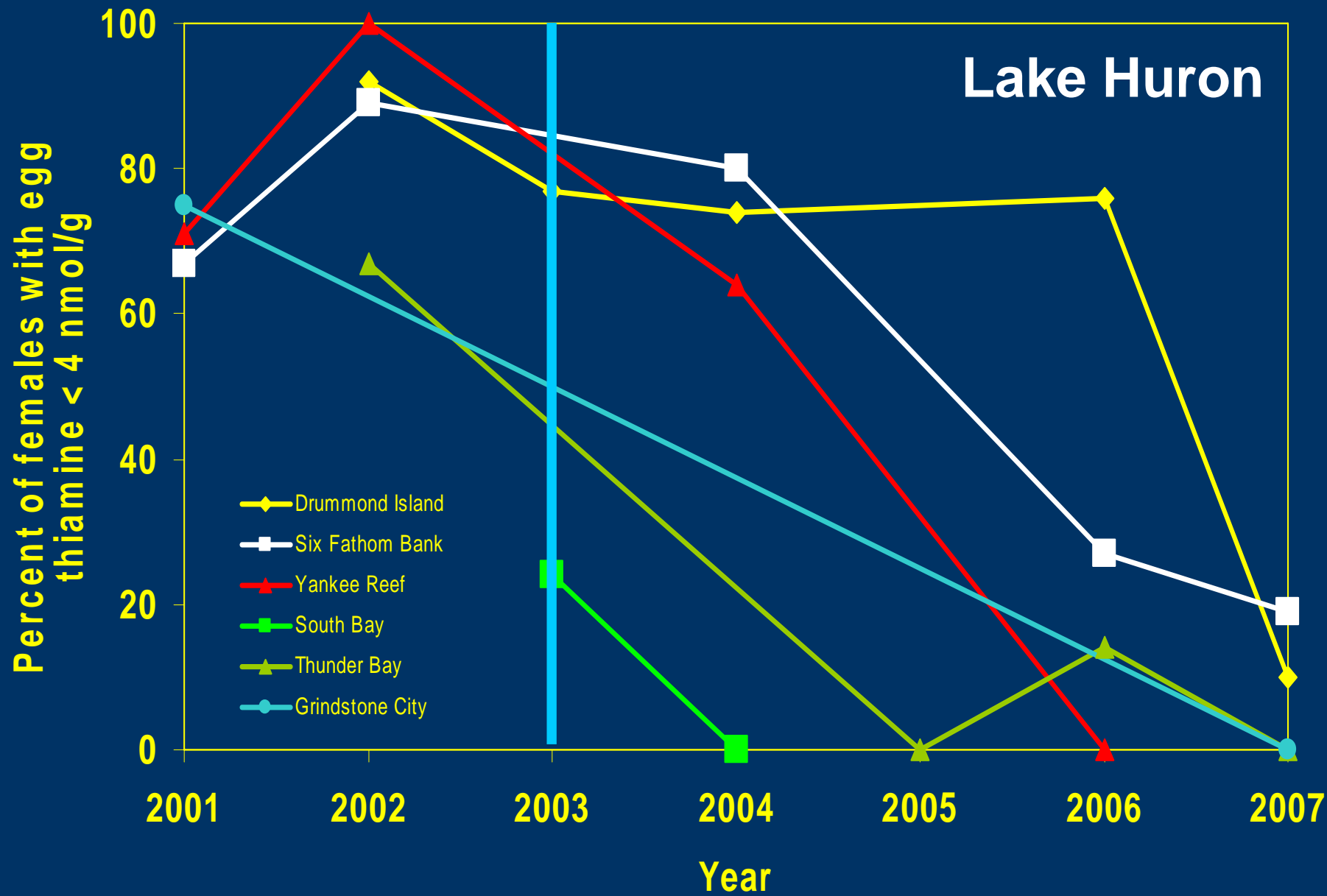


Lake Huron

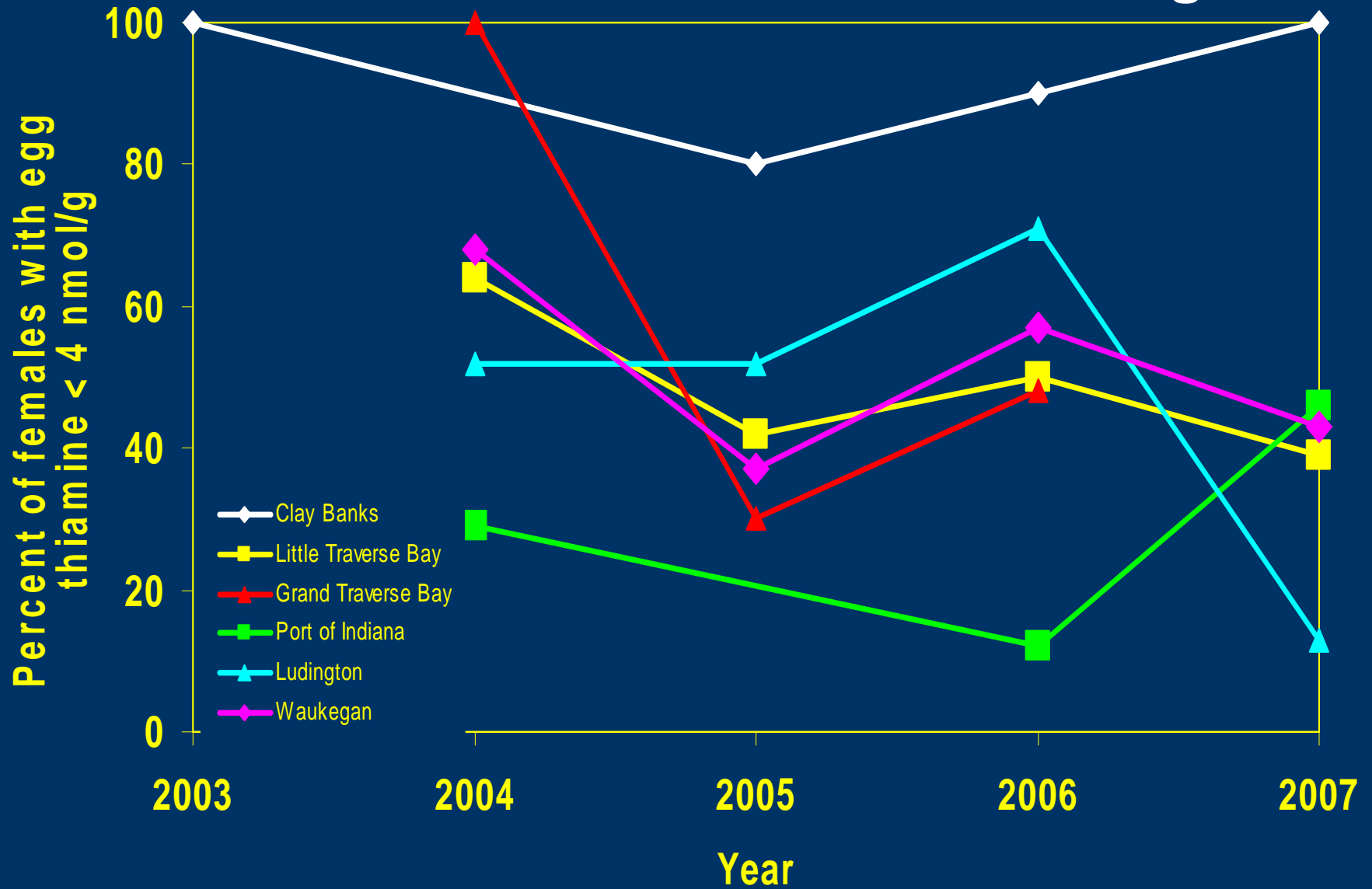


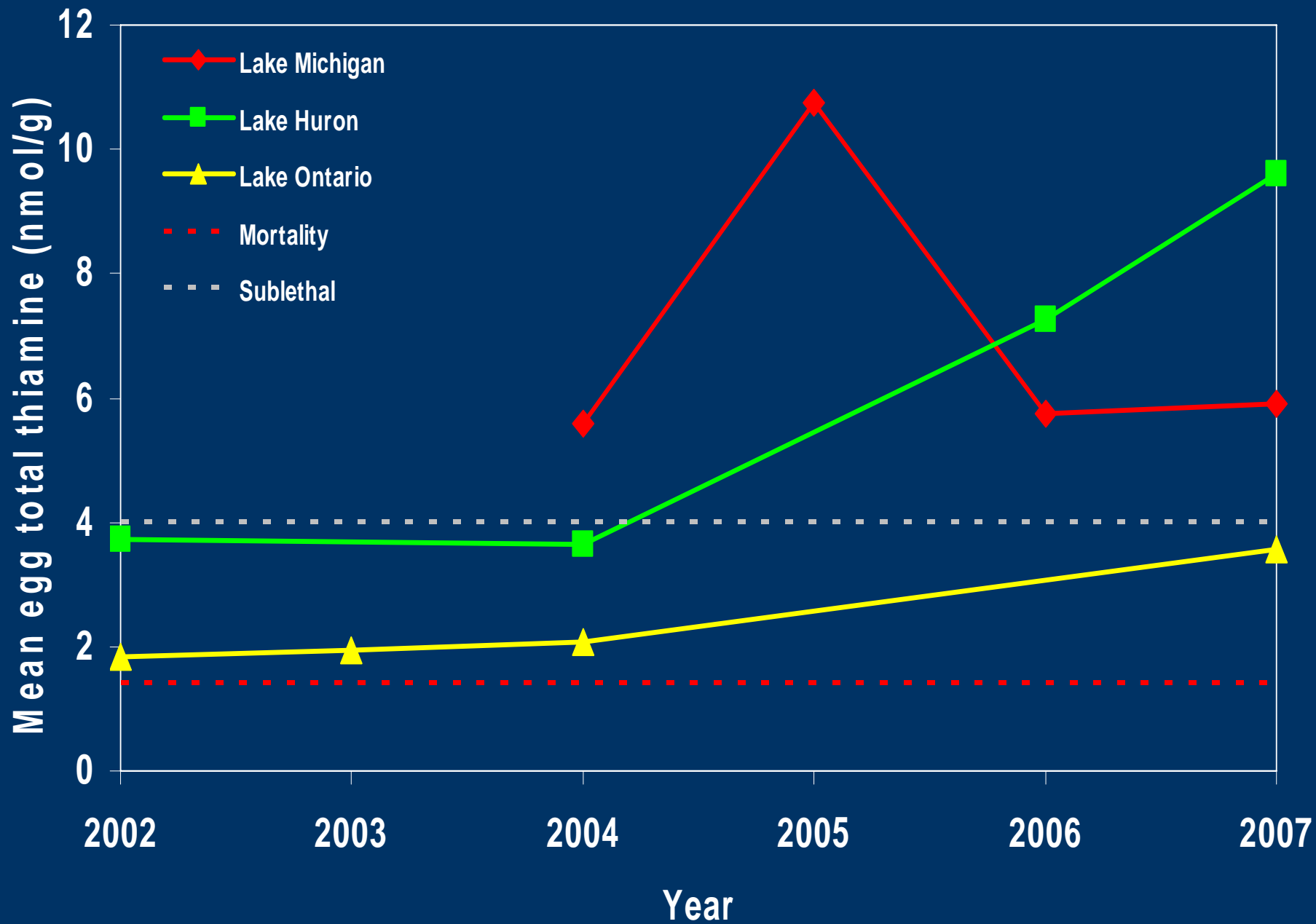
Lake Michigan





Lake Michigan





Lake Ontario data courtesy of J. Fitzsimons, DFO

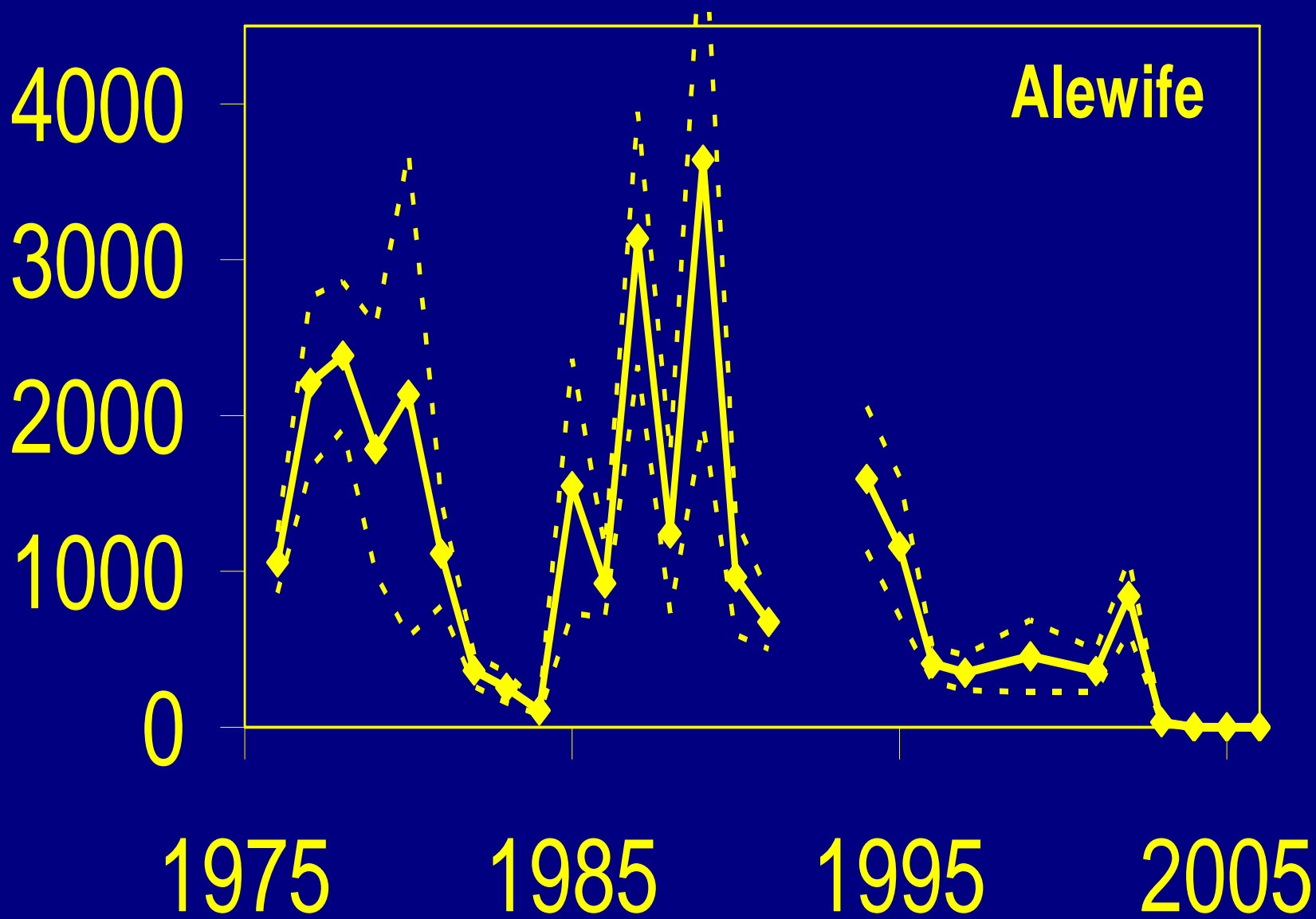
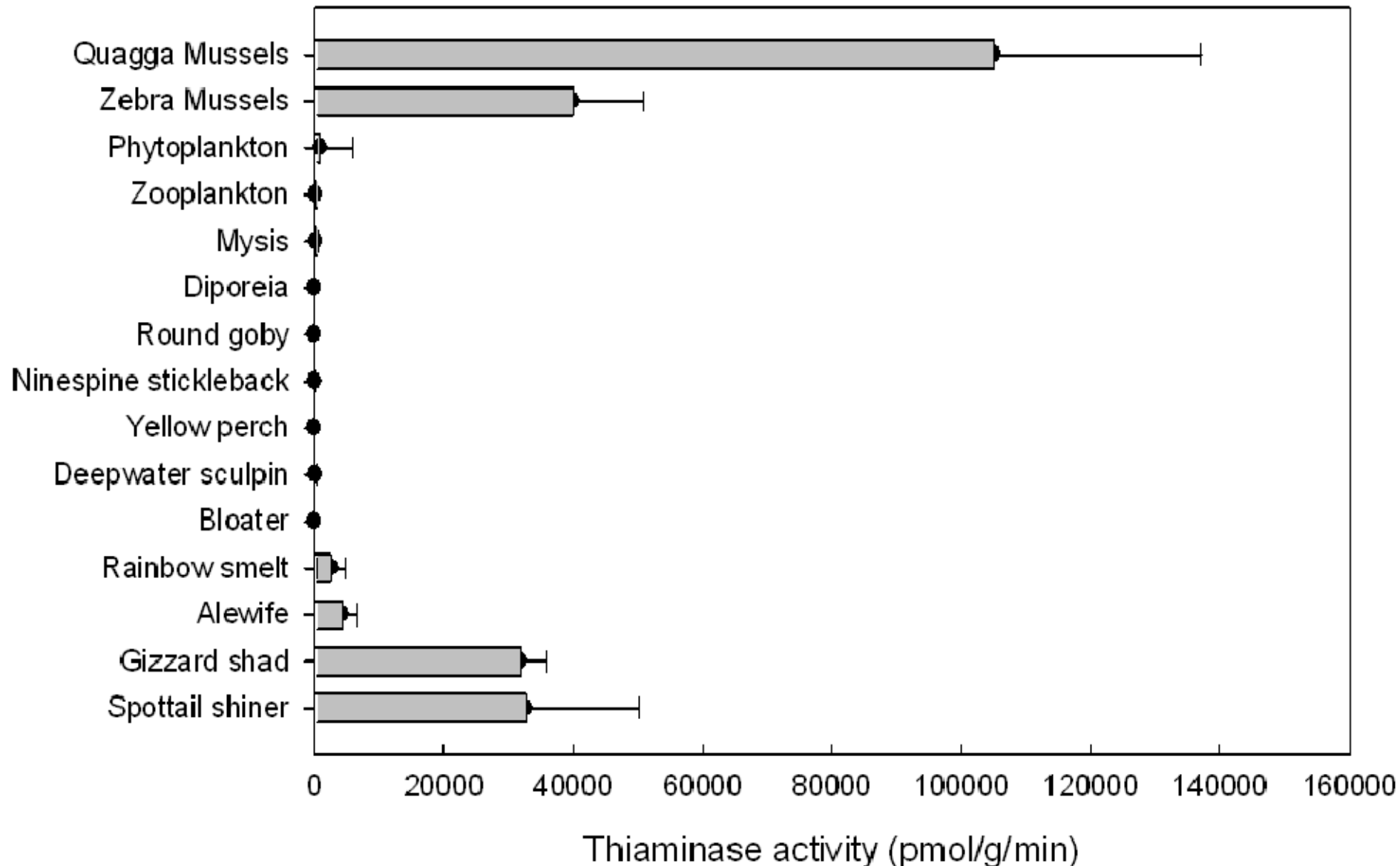


Fig. 1 Relative thiaminase activities (pmol/g/min.) in fish and invertebrate species collected in the Great Lakes.



Conclusions

1. Lake trout egg thiamine levels are highly variable in Lake Michigan and Lake Huron
2. Thiamine levels still low at some locations, mostly in Lake Michigan
3. Thiamine levels appear to be increasing at most locations in Lake Huron
4. Dreissenids a new source of thiaminase – implications for other species?

**Results will be available on USGS website at
<http://www.glsc.usgs.gov/>**

**TDC/thiaminase workshop
GLFC Fishery Research Program
7 November 2008
Ann Arbor, MI**

GLSC preproposals due 15 January

**Continue lake trout egg sampling.
We need your help !!!**

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