

# **ESTIMATING SEA LAMPREY-INDUCED MORTALITY ON LAKE TROUT WITH OBSERVED MARKING RATES**

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Presentation at Kellogg Center  
October 2, 2008

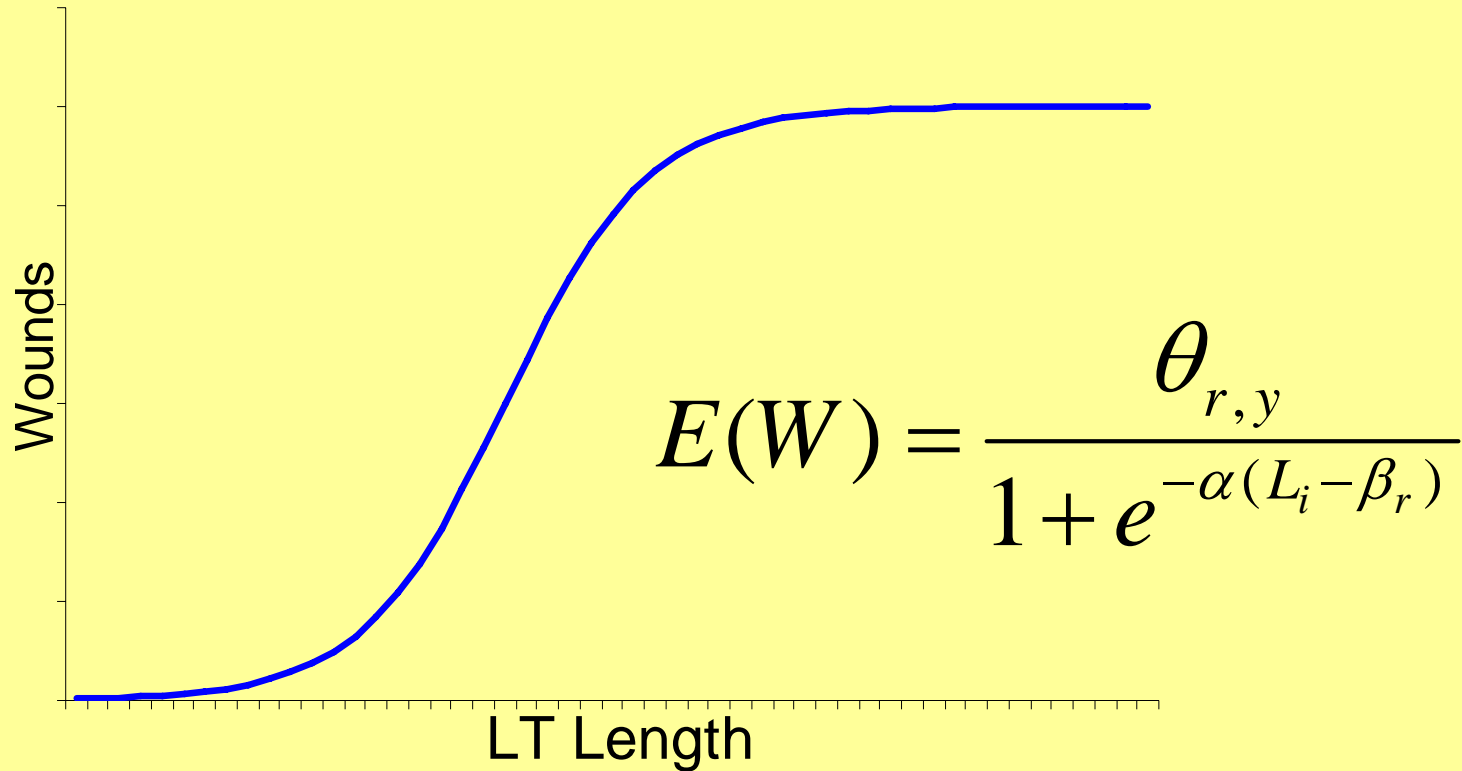
# Talk Objectives

- Briefly describe methods to estimate sea lamprey mortality
- Review status and trends across regions
- Compare to other sources of mortality

# Estimating Lamprey Induced Mortality

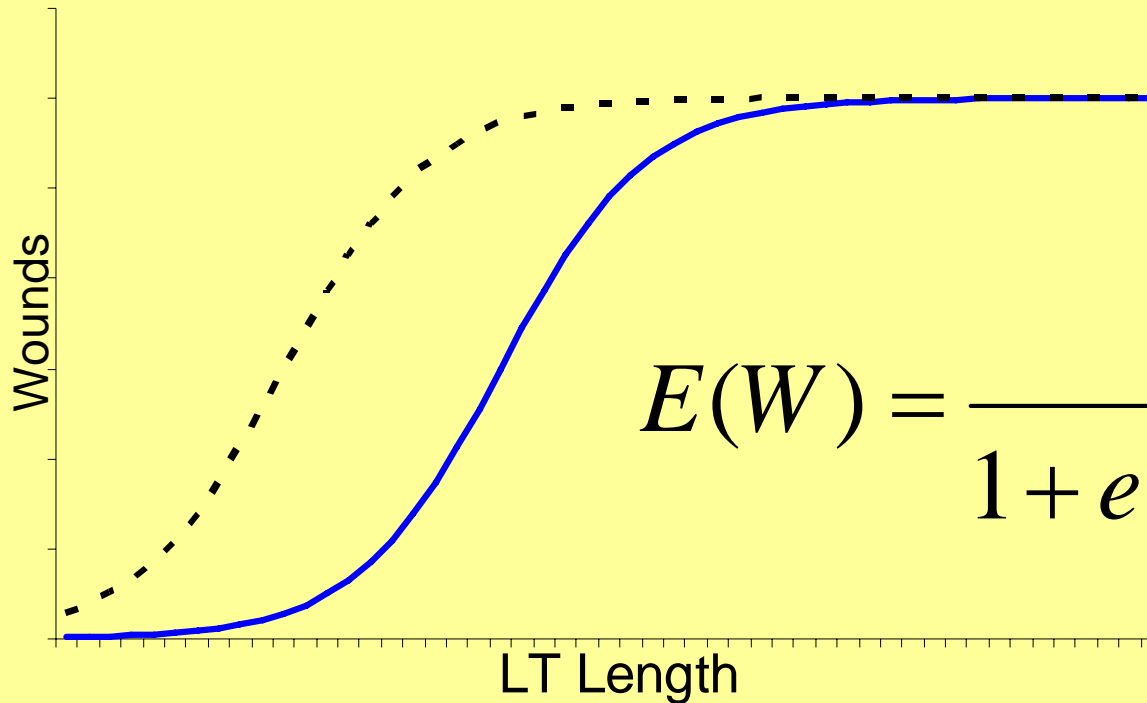
- Collect wounding data
  - Fishery monitoring and survey data
- Fit a wounding model to data
  - $\text{Wounds} = f(\text{length})$
- Calculate mortality at length
- Convert to mortality at age

# Wounding Model



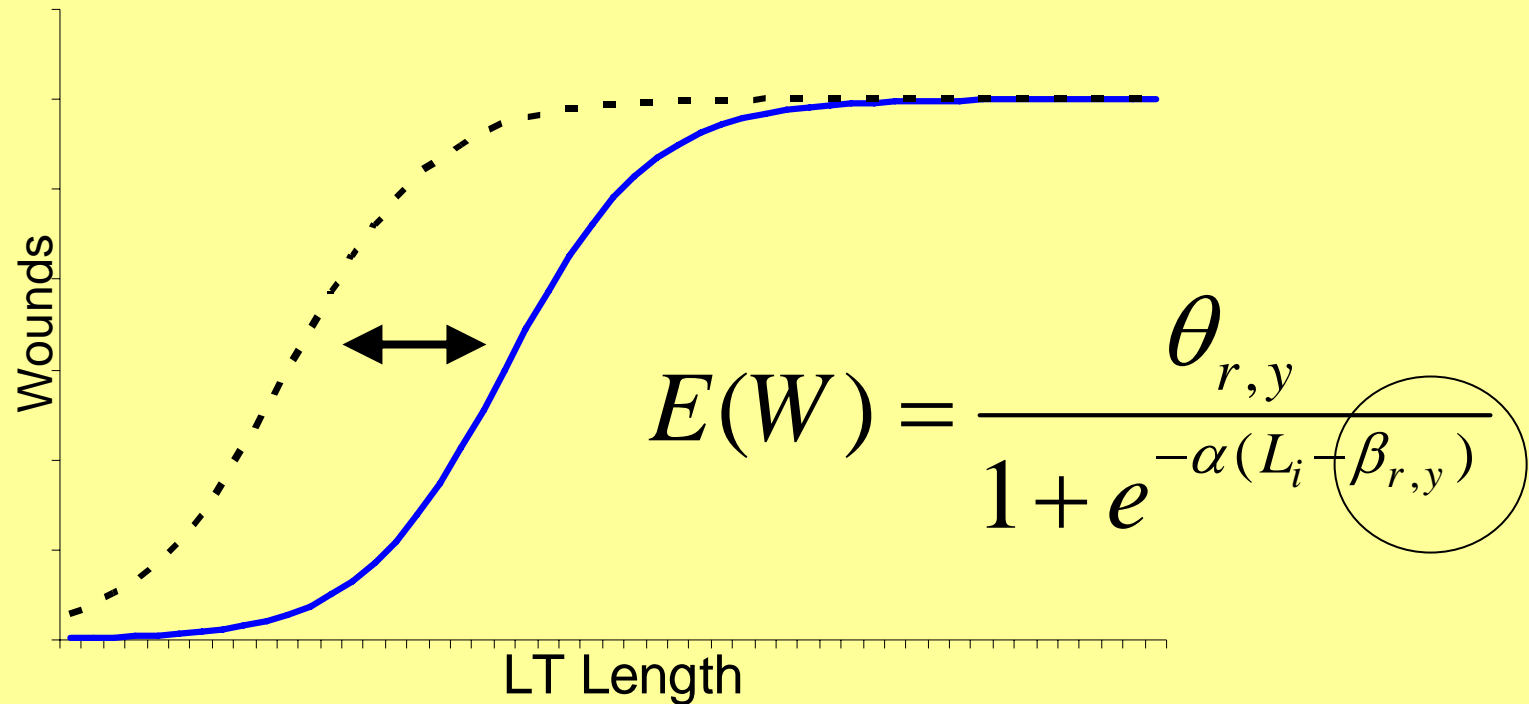
# Wounding Model

Time varying adjustment



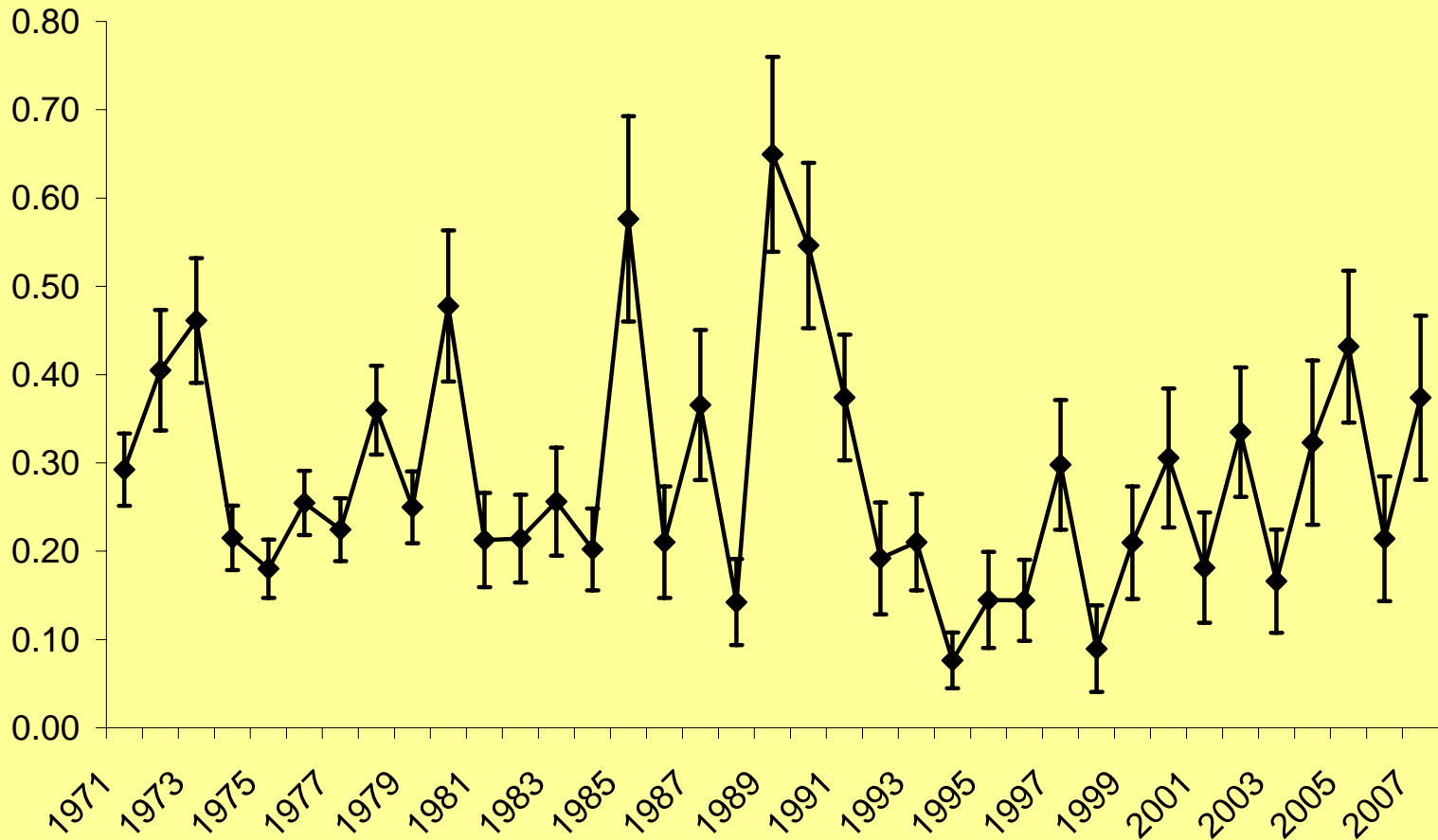
# Wounding Model

Time varying adjustment



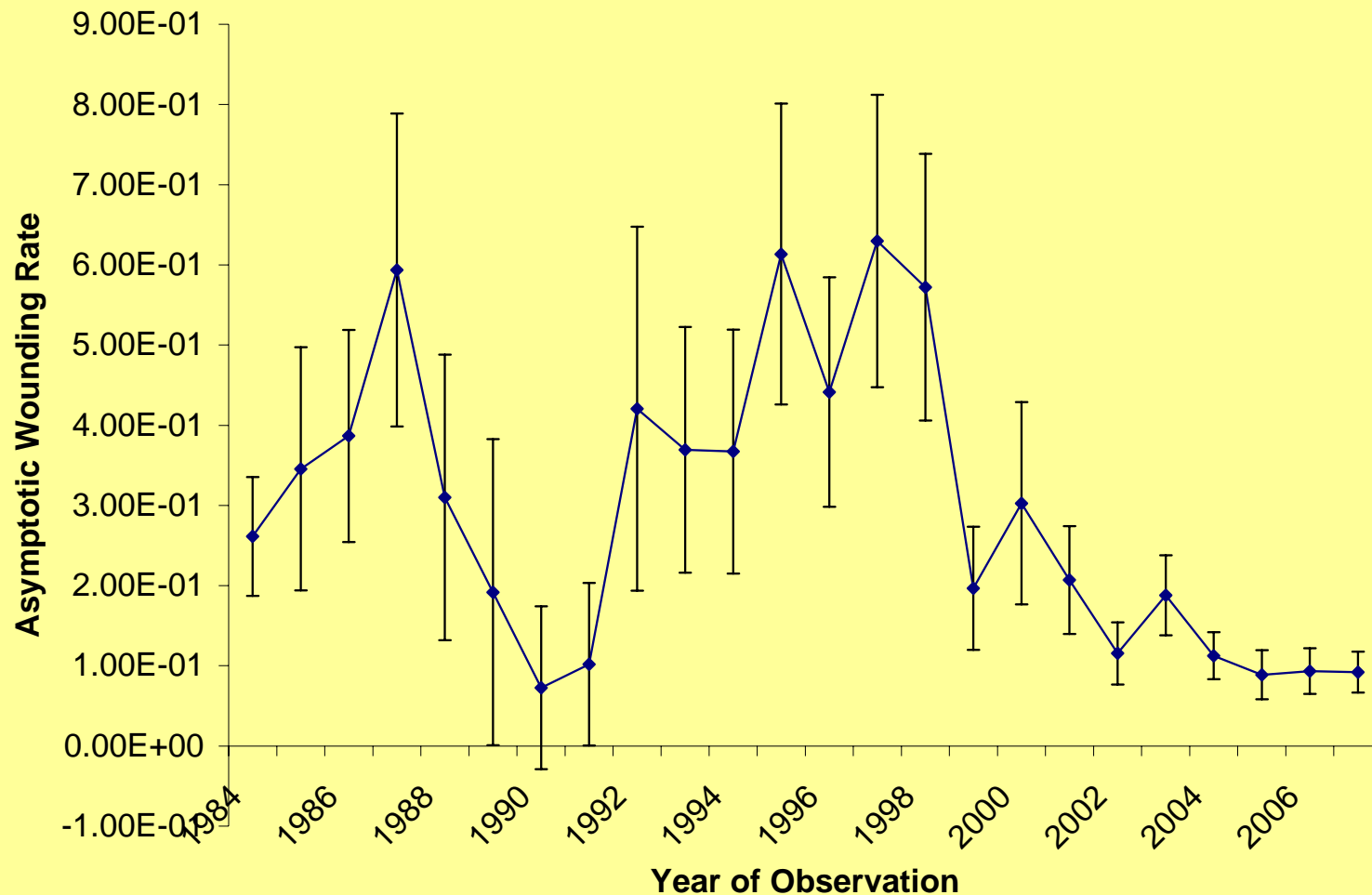
# Asymptotic Wounding Rate

## Eastern Lake Superior



# Asymptotic Wounding Rate

## Eastern Lake Superior





# Advantages to Modeling Wounding Rates?

- Continuous function
- Allows use of varied data
- Robust to differences in selectivity

# Estimating Lamprey Induced Mortality

- Data request and consolidation
  - Fishery monitoring and survey data
- Fit wounding model to data
  - $\text{Wounds} = f(\text{length})$
- Calculate mortality at length
- Convert to mortality at age

# Estimating Lamprey Induced Mortality

- Calculate mortality at length

$$ML_{l,y} = W \frac{(1 - p_1)}{p_1}$$

- Convert to mortality at age

$$ML_{a,y} = ML_{l,y} * A @ L_y$$

# Estimating Lamprey Induced Mortality

- Calculate mortality at length

$$ML_{l,y} = W \frac{(1 - p_1)}{p_1}$$

$p$  = probability of surviving a sea lamprey attack

$p$  increases with lake trout size

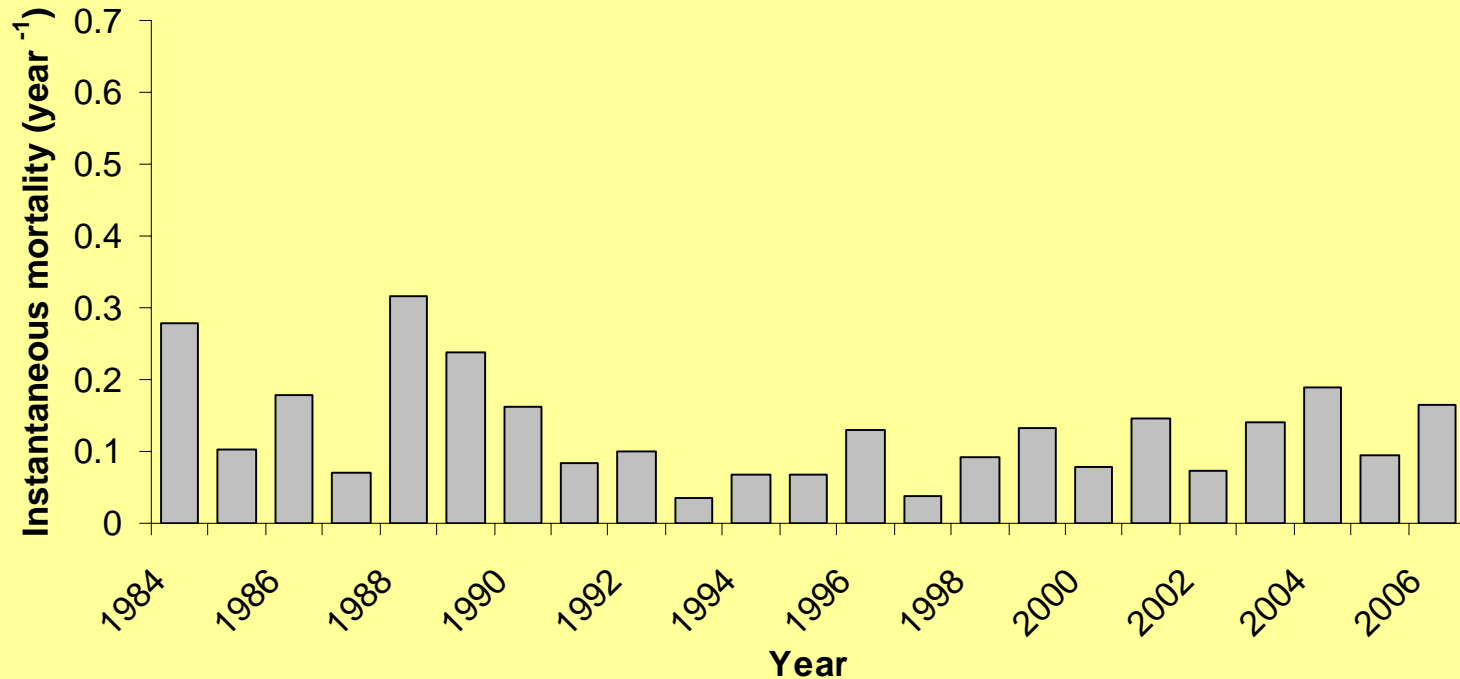
- Convert to mortality at age

$$ML_{a,y} = ML_{l,y} * A @ L_y$$

# Sea Lamprey Induced Mortality

## Eastern Lake Superior

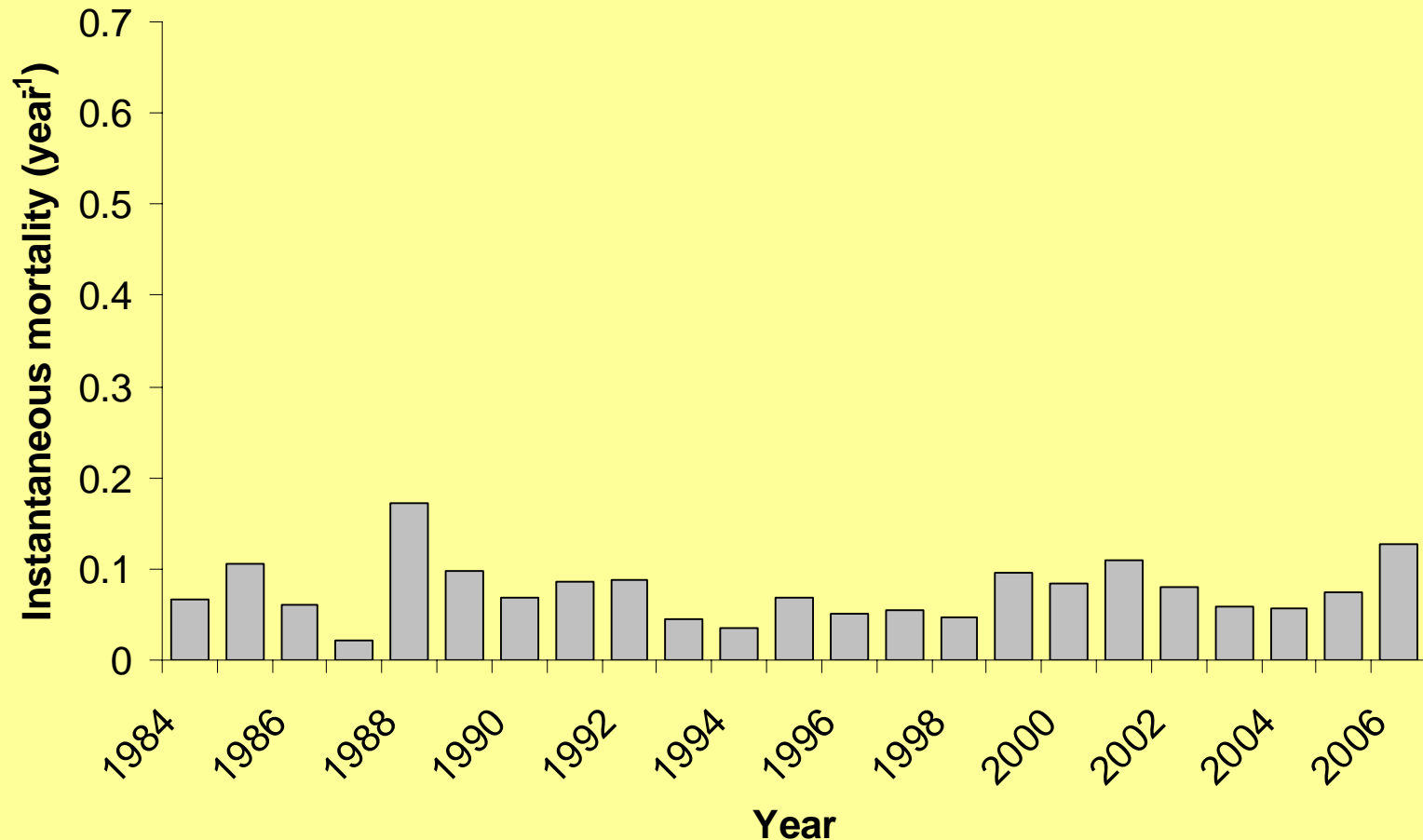
Instantaneous sea lamprey induced mortality rates for lake trout  
> age 6



# Sea Lamprey Induced Mortality

## Western Michigan Waters of Lake Superior

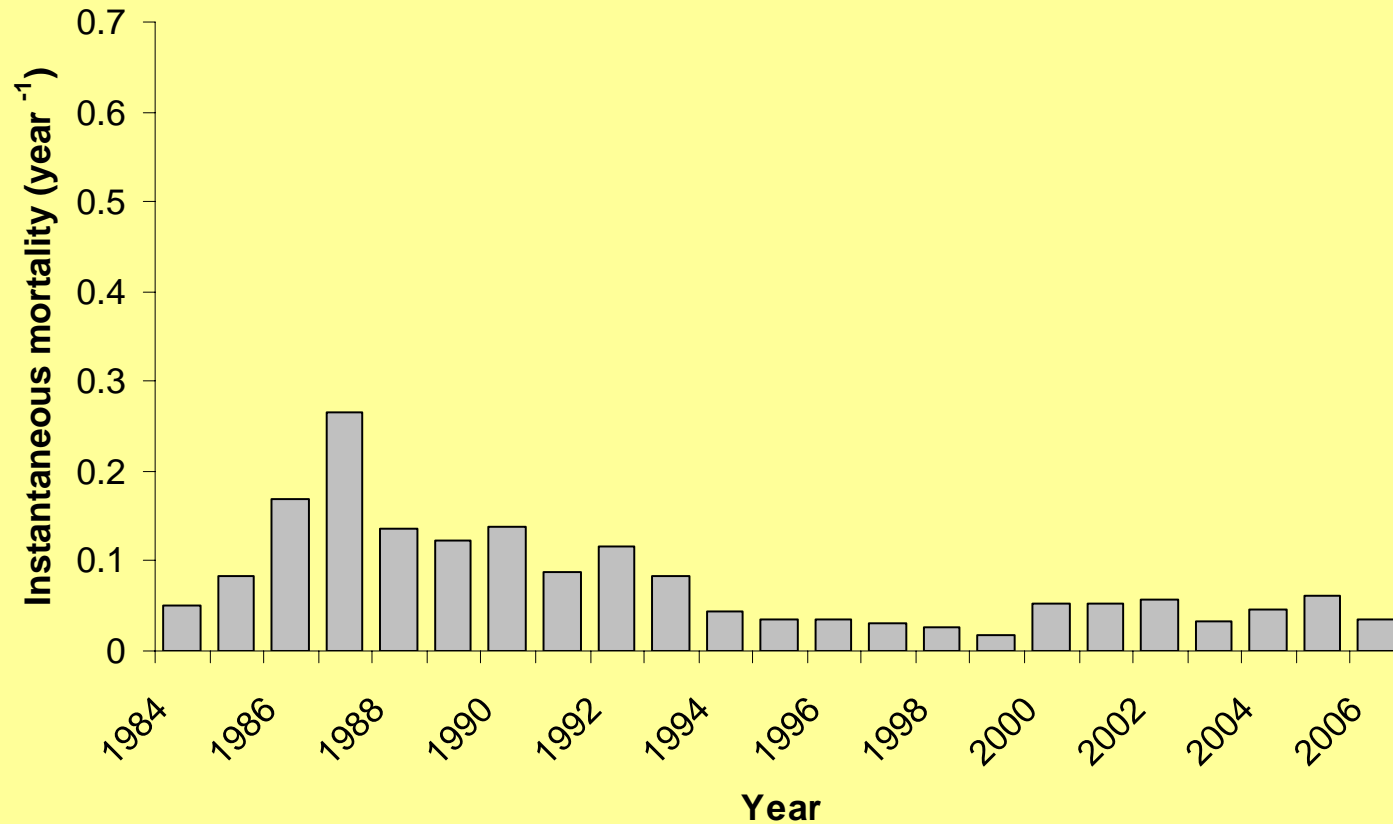
Instantaneous sea lamprey induced mortality rates for lake trout > age 6



# Sea Lamprey Induced Mortality

## WI / MN Waters of Lake Superior

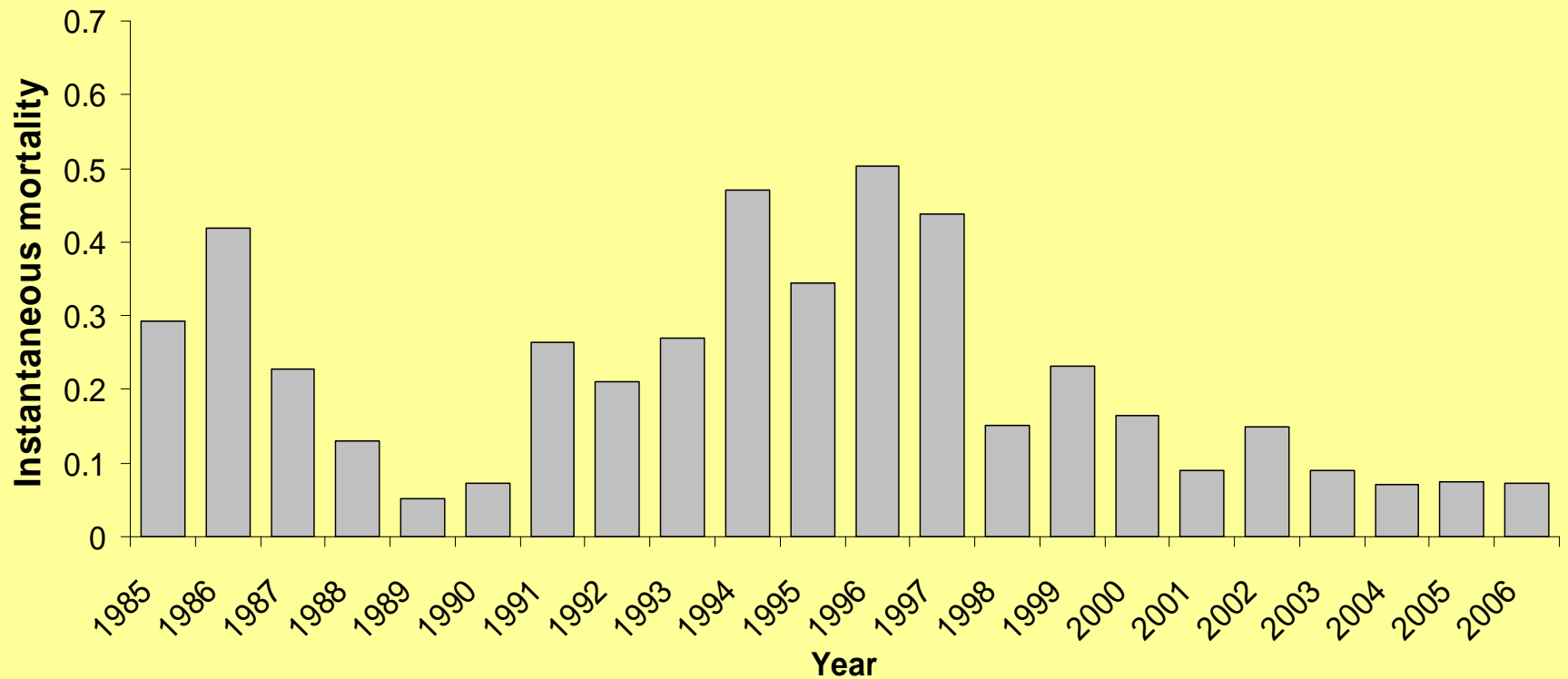
Instantaneous sea lamprey induced mortality rates for lake trout > age 6



# Sea Lamprey Induced Mortality

## Northern Lake Huron

Instantaneous sea lamprey induced mortality rates for lake trout ages 6-11 in MH-1

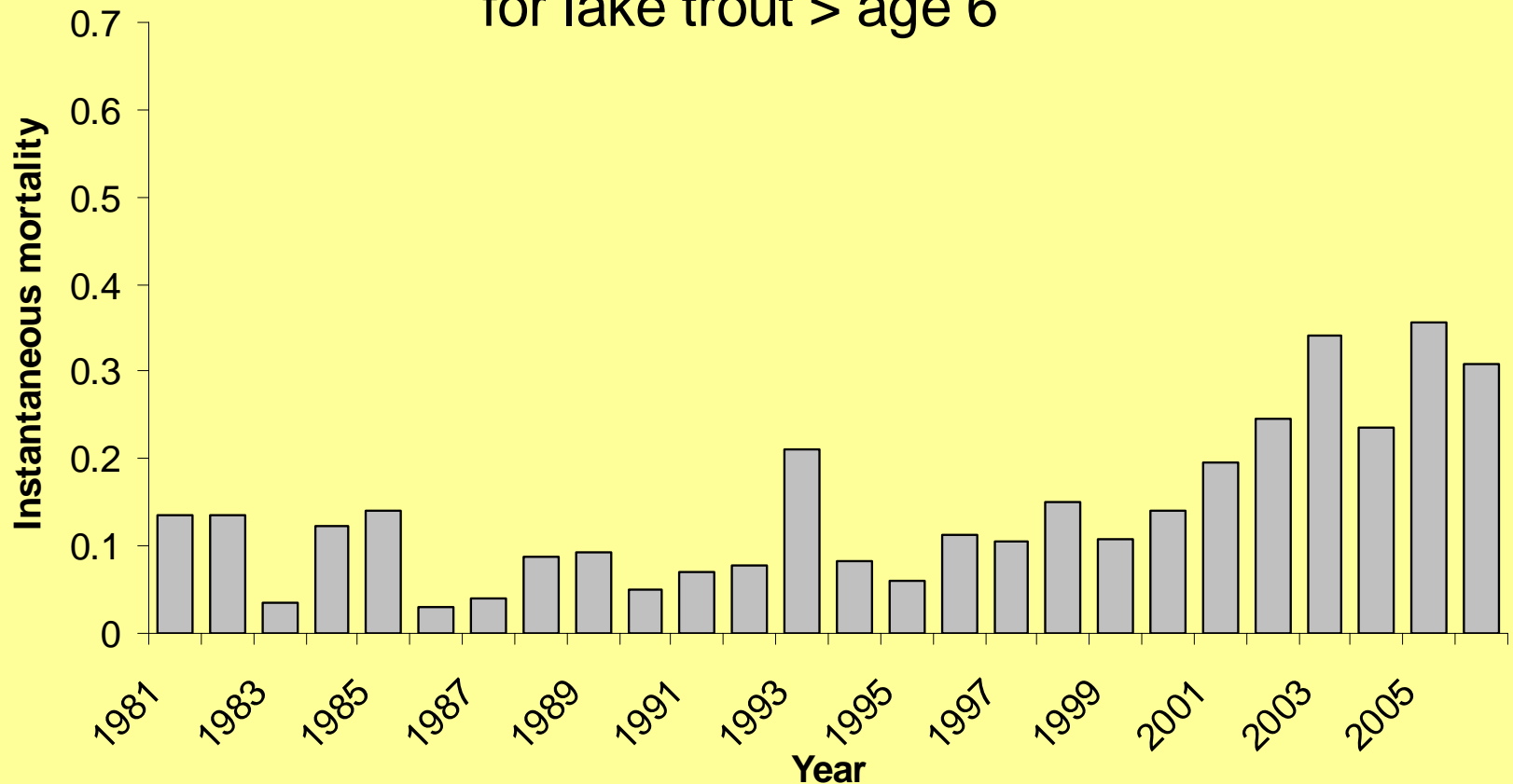




# Sea Lamprey Induced Mortality

## Northern Lake Michigan

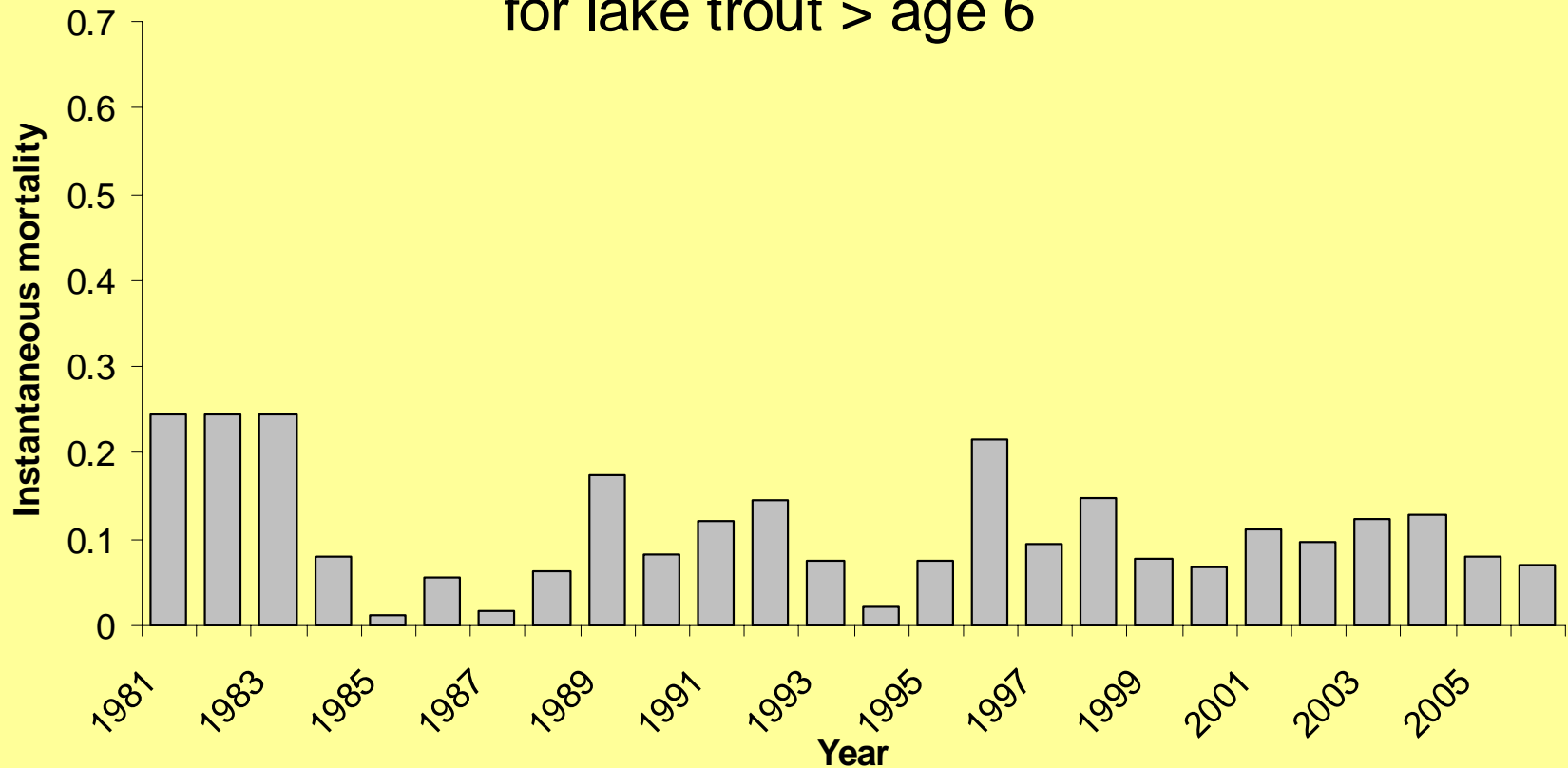
Instantaneous sea lamprey induced mortality rates  
for lake trout > age 6



# Sea Lamprey Induced Mortality

## Southern Lake Michigan

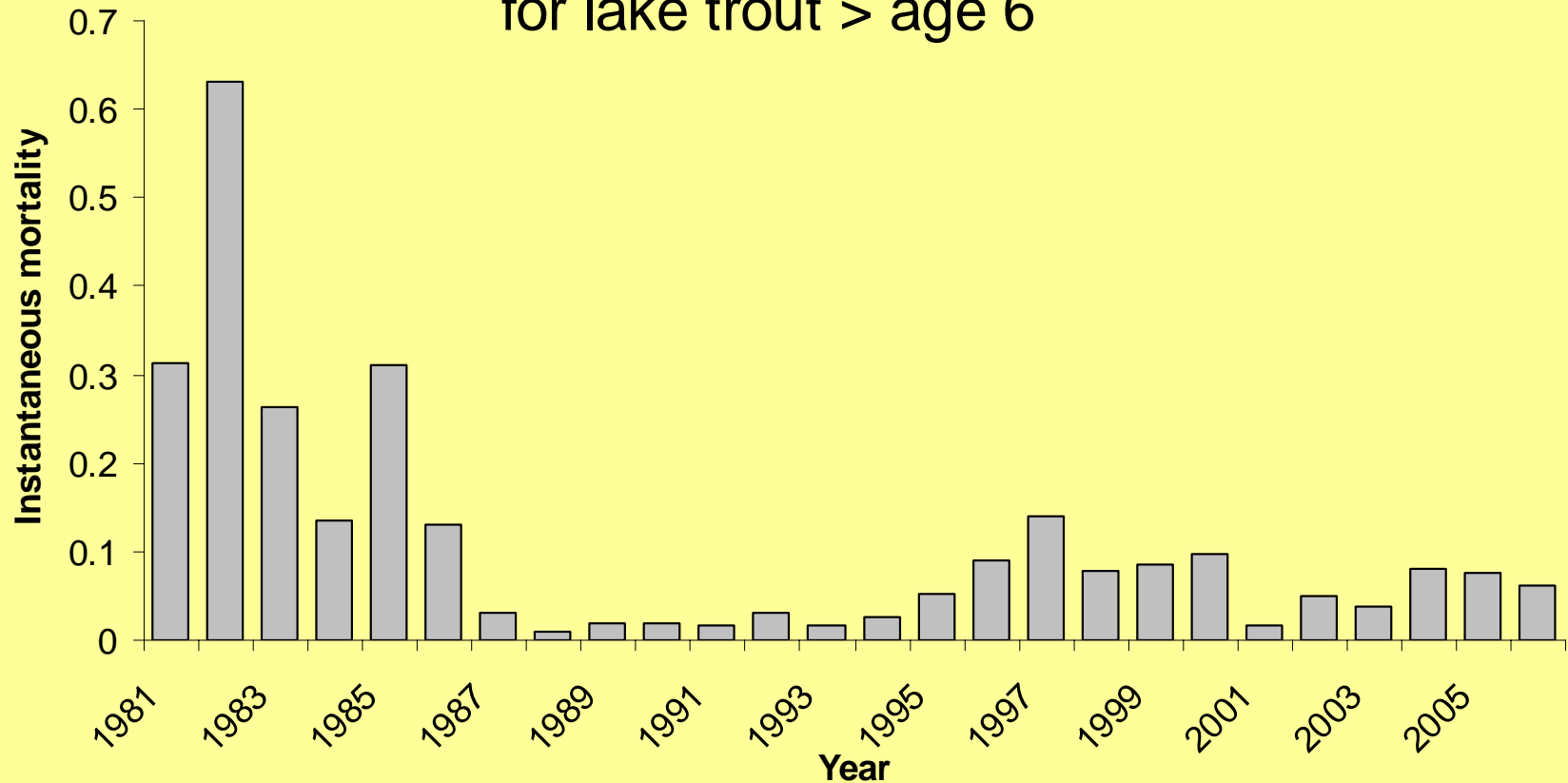
Instantaneous sea lamprey induced mortality rates  
for lake trout > age 6



# Sea Lamprey Induced Mortality

## Lake Erie

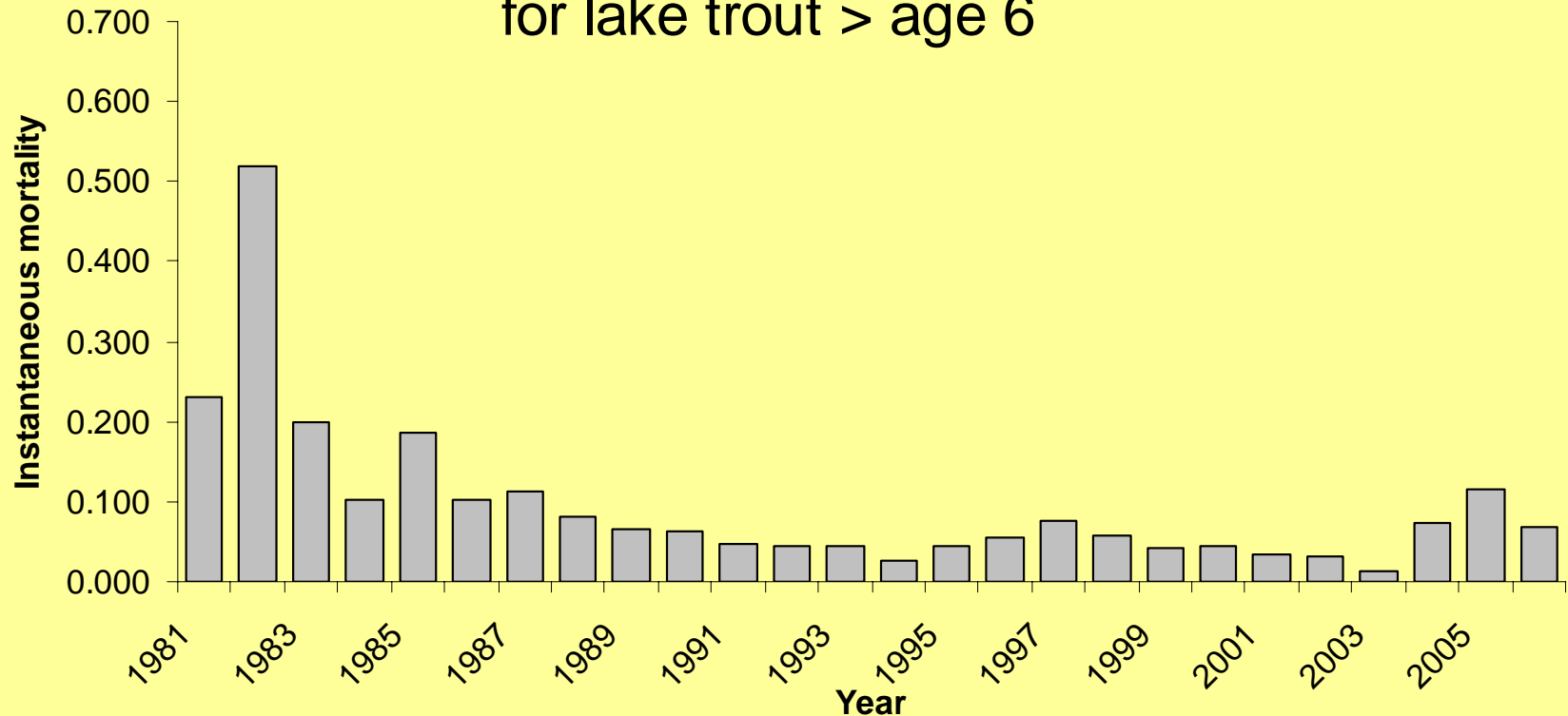
Instantaneous sea lamprey induced mortality rates  
for lake trout > age 6



# Sea Lamprey Induced Mortality

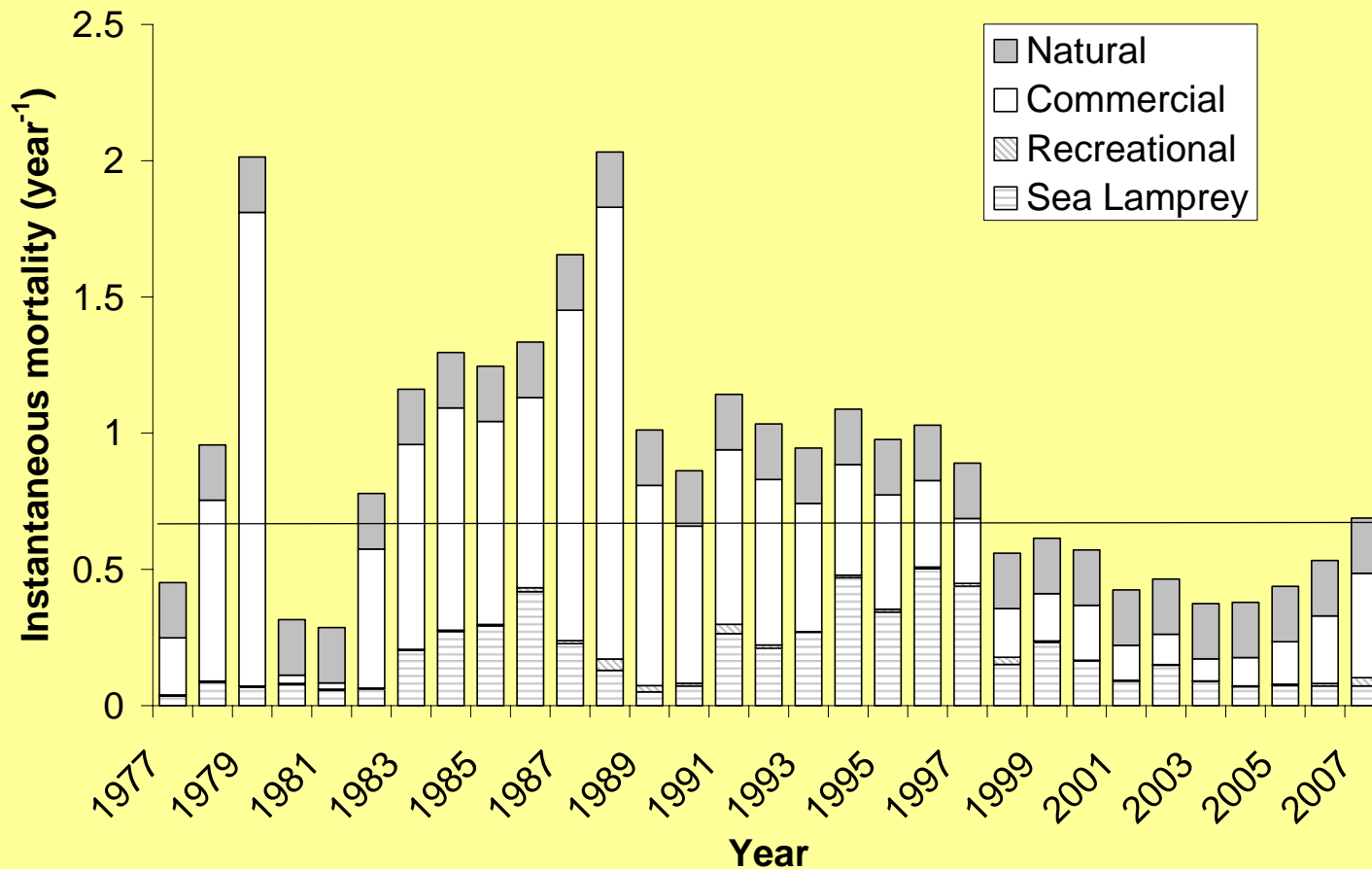
## Lake Ontario

Instantaneous sea lamprey induced mortality rates  
for lake trout > age 6



# Lake Trout Mortality in MH-1 Lake Huron

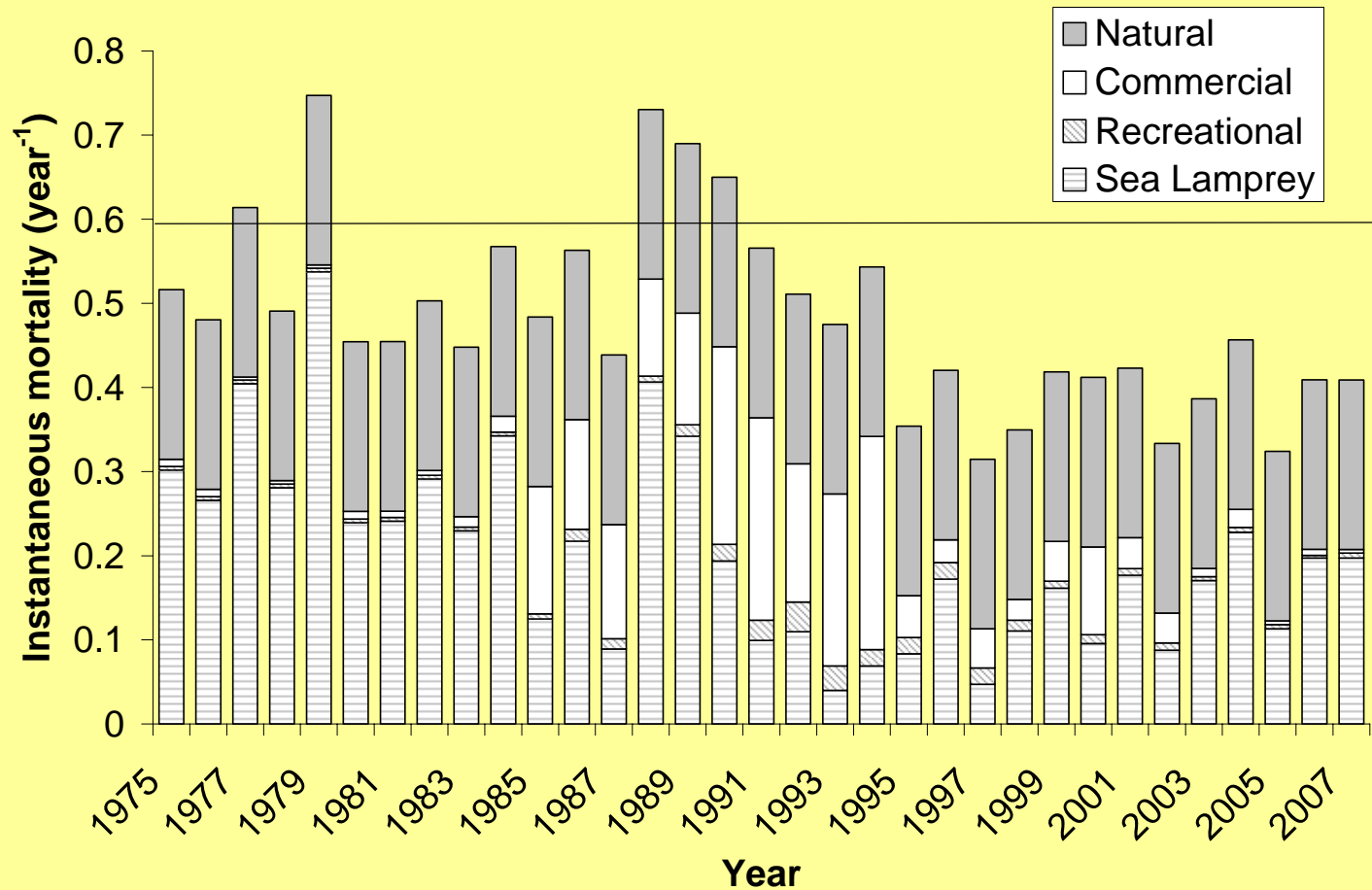
Instantaneous mortality rates for lake trout ages 6-11 in MH-1



# Lake Trout Mortality MI-7

## Eastern Lake Superior

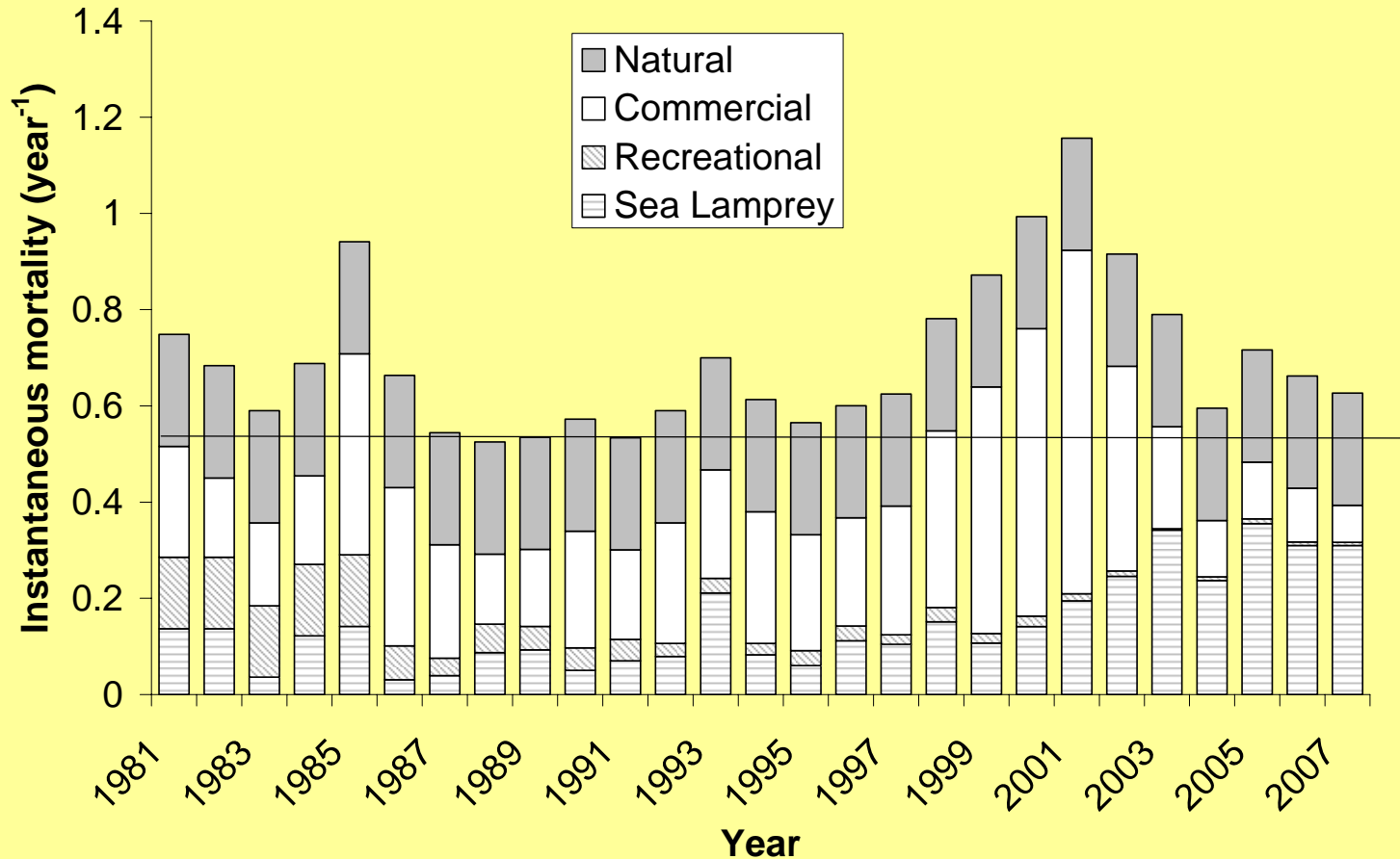
Instantaneous mortality rates for lake trout ages 6-11 in MI-7



# Lake Trout Mortality in MM-123

## Lake Michigan

Instantaneous mortality rates for lake trout ages 6-11 in MM-123



# General Conclusions

- Sea lamprey mortality varies spatially and temporally
  - Between lakes
  - Regionally Within a lake
- SL mortality currently exceeds fishing mortality in most areas