DNR TO HOST PUBLIC MEETINGS ON FISHERIES MANAGEMENT IN NORTHEAST WISCONSIN

Spotlight Series

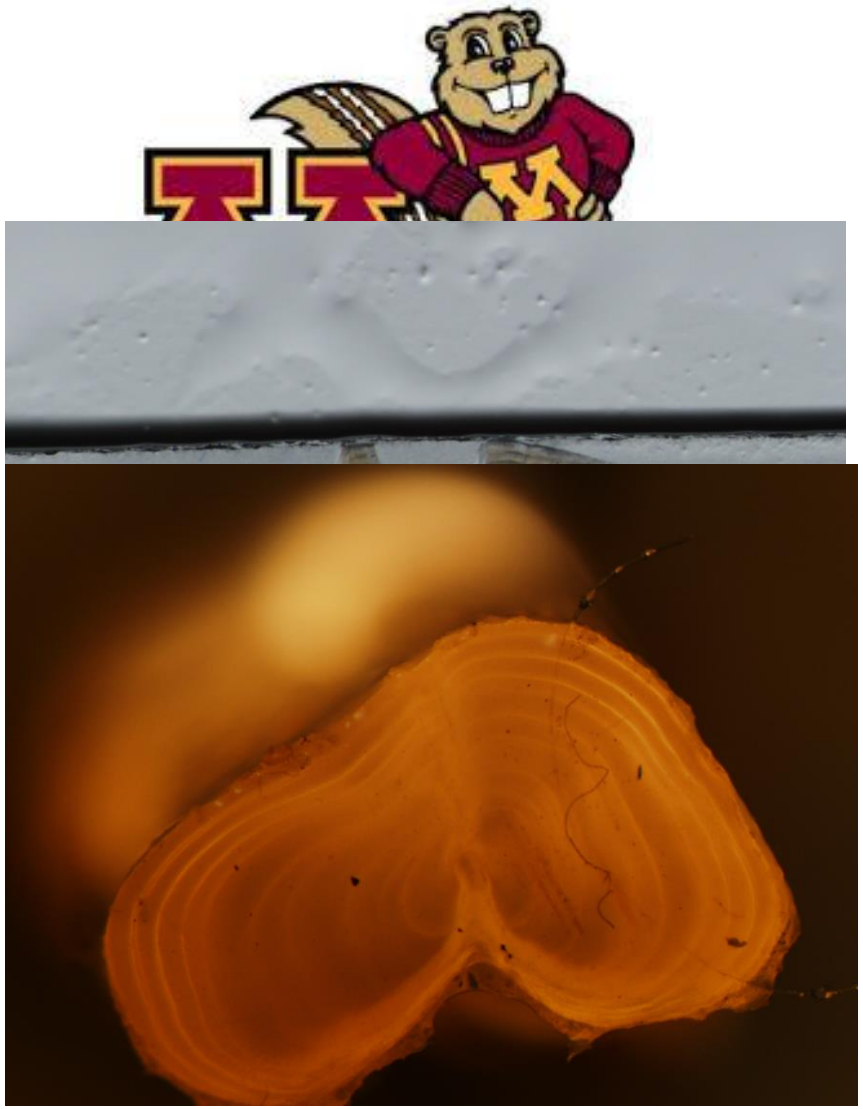
- Inland Trout And Lake Management In Florence And Forest Counties
  Presenter: Greg Matzke, DNR Fisheries Biologist
  When: Jan. 29, 2024
  Where: Wild Rivers Interpretive Center
- **Green Bay Walleye And Muskellunge Management**
  Presenter: Jason Breeggemann
  DNR Fisheries Biologist
  When: Fed. 7, 2024
  Where: Green Bay DNR Service Center
- Green Bay Northern Pike And Yellow Perch Management
  Presenter: Tammie Paoli, DNR Fisheries Biologist
  When: Feb. 12, 2024
  Where: Peshtigo DNR Field Office
- Inland Trout Management In Marinette And Oconto Counties
  Presenter: Chip Long
  DNR Fisheries Biologist
  When: Feb. 19, 2024
  Where: Peshtigo DNR Field Office
- Northeast Wisconsin Trout Habitat Management
  Presenter: Jonathan Pyatskowit
  DNR Fisheries Habitat Specialist
  When: Feb. 26, 2024
  Where: Green Bay DNR Service Center
- Green Bay And Fox River Area Of Concern Habitat Restoration Project Updates
  Presenter: Brie Kupsky
  DNR Green Bay Program Coordinator
  When: March 4, 2024
  Where: Green Bay DNR Service Center

Walleye and Musky Management on Green Bay

Jason Breeggemann
Fisheries Biologist – Wisconsin Department of Natural Resources
2/7/2024

My Background

- University of MN
  - Bachelor of Science in fisheries management
  - December 2007
- January 2008 – June 2009
  - Fisheries technician at U of M
  - Age and growth of fish
- July 2009 – May 2011
  - University of Wisconsin – Stevens Point
  - Master of Science in fisheries management
  - Compare age estimates and growth rates from different calcified structures from yellow perch in Green Bay



My Background

- May 2011 – May 2016
  - South Dakota State University
  - Ph.D. in fisheries management
  - Factors affecting growth potential of largemouth bass in a lake in TX
- May 2016 – August 2016
  - Columbia, MO
  - Biologist with USFWS
  - Different gears for capturing bighead and silver carp in Illinois River
- August 2016 – March 2017
  - Green Bay, WI
  - Biologist with USFWS
  - Native fish on Lake Michigan

My Background

- March 2017 – January 2022
  - Fisheries Biologist with WDNR
    - Shawano, WI
    - Shawano, Waupaca and Menominee counties
- January 2022
  - Fisheries Biologist with WDNR
    - Green Bay, WI
    - Brown and Manitowoc counties
    - Walleye and musky management on Green Bay

History of Walleyes and Muskies in Green Bay

Green Bay late 19th and early 20th Century

- Abundant walleye populations
  - Spawning populations in Oconto, Peshtigo, Menominee and Fox rivers
  - Intense harvest
    - One man could spear over 1,000 pounds of walleyes in 1 night!
- Muskellunge
  - Abundant predator
  - Part of near shore fish community
- Habitat degradation
  - Loss of near shore wetlands
    - Critical nursery habitat for many species
- Declines in water quality
  - Wastes discharged into rivers
  - Sediment deposition
    - Cover spawning habitat
- Invasive species
  - Sea lamprey
  - Rainbow smelt

1938

Fox River Habitat Loss

1938

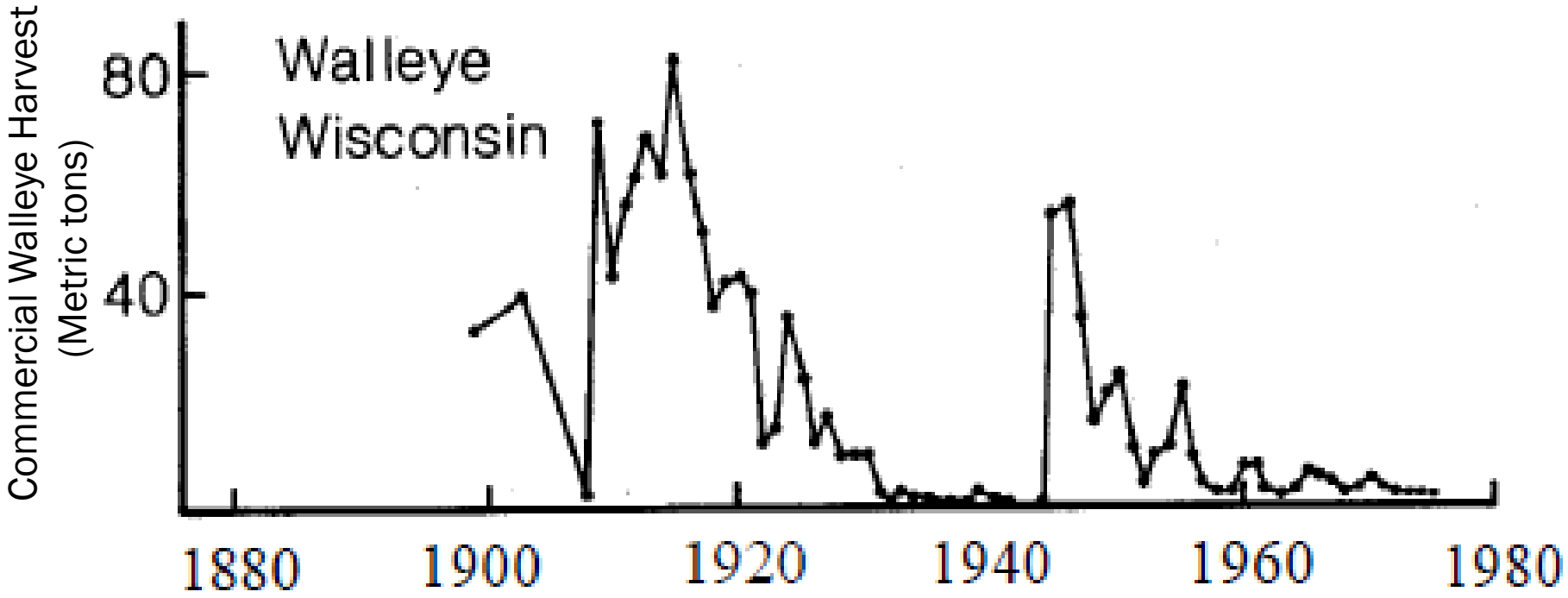
1978

Green Bay Habitat Loss

1938

1978

Commercial Walleye Harvest – Green Bay

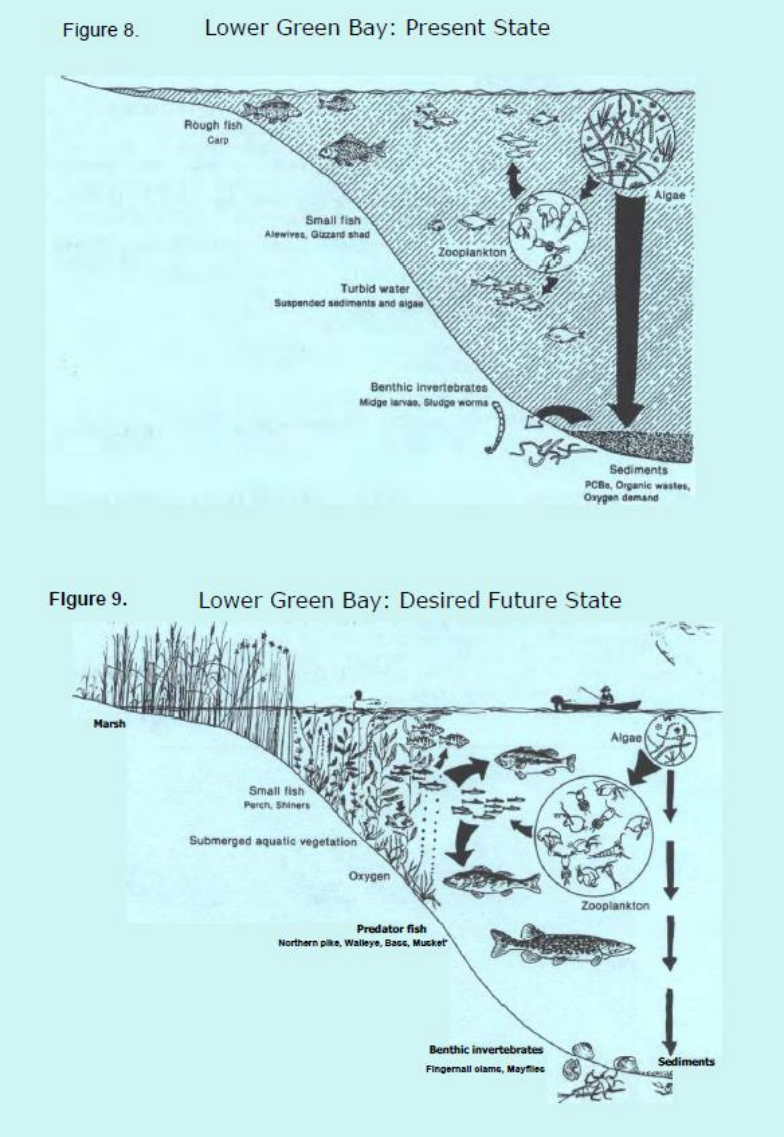


Schneider and Leach 1979

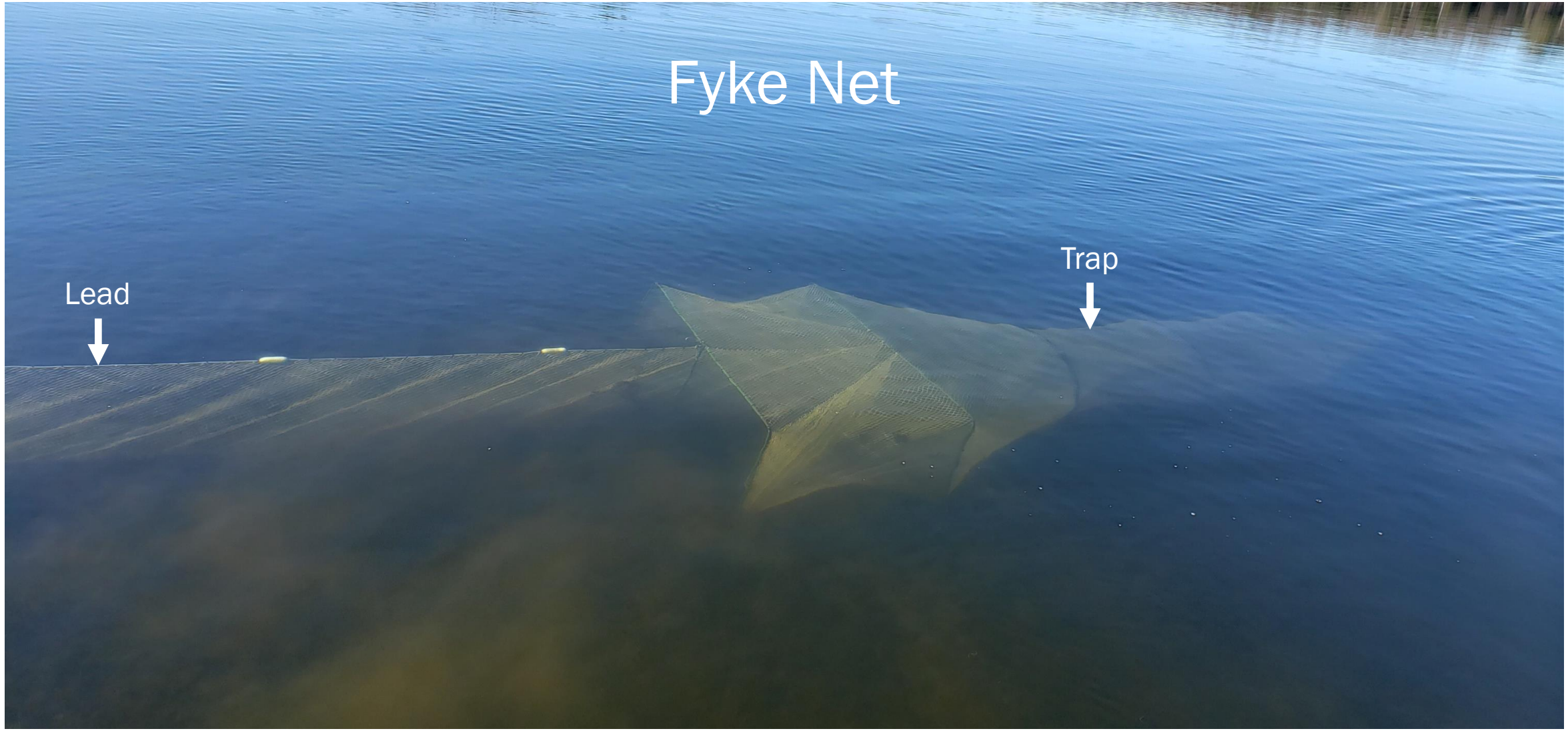
- 1970s
  - Only Menominee River supported natural reproduction of walleyes
  - Muskies extirpated from Green Bay

Regulations and Environmental Restoration

- Clean Water Act
  - 1972
  - Federal regulation of discharging pollutants into waters
  - Improved water quality
- Area of Concern (AOC)
  - 1980s
  - International Joint Commission of Canada and United States
    - Contaminated sediment
    - Poor water quality
    - Lost or altered habitat
  - Remedial Action Plan
- Environmental Protection Agency
  - 1998
    - Responsible parties must clean up pollutants in Fox River
- Improving water quality, restoring habitat and aiding in restoration



Fisheries Gears



Fisheries Gears

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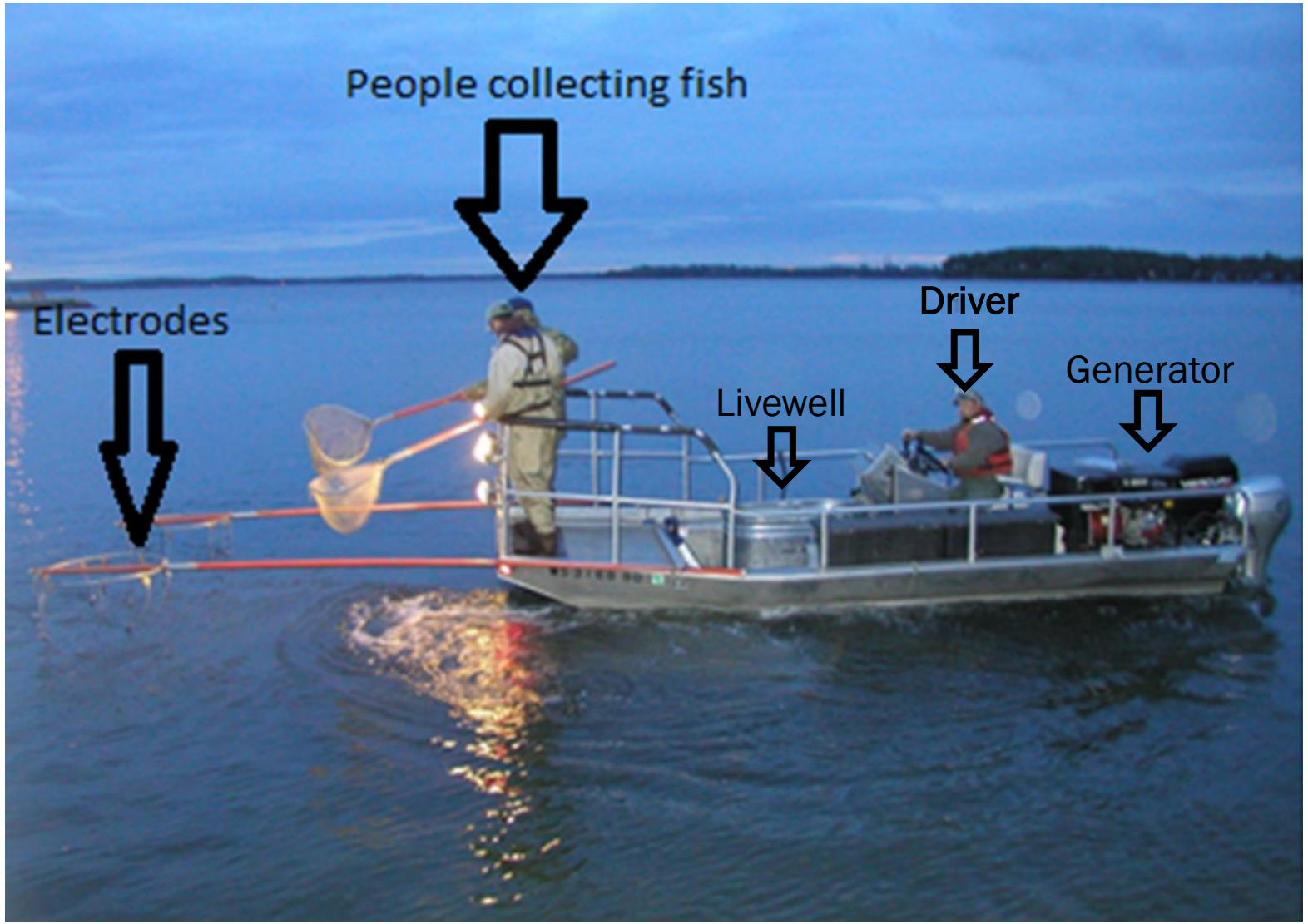
Electrofishing



Walleyes in Green Bay

Walleye Life History

- Spawn on clean gravel and rocks
  - 40 – 50 degrees
- No parental guarding
- Prefer cool water with low light
  - Tapetum lucidum
- Habitats
  - Vegetation
  - Rocks
  - Reefs
  - Points
  - Open water
- Predatory
- Mature at ages - 3 to 5
  - 14 – 15 inches
- Live to be 20+ years old
- Reach 30+ inches

Walleye Restoration

- Stocking:
  - 1973 – 1984
  - 73 million fry
  - 3.12 million fingerlings
- Spawning reefs
- Natural reproduction makes stocking unnecessary!

Walleye Restoration – Spawning Refuge

- Fox River below De Pere Dam
  - Creel data in early 1990's showed heavy exploitation on first year classes produce by natural reproduction
  - Created refuge to protect these spawning fish
    - Closed to fishing March 1 – May 31
  - Dates recently extended to end of May to protect spawning sturgeon

Walleye Restoration = Success!

Current Walleye Management

- Spring electrofishing:
  - Fox River
  - Size and age distribution of adult spawning walleye population
    - 500 adult walleyes
    - Measure lengths
    - Spine for age estimates
  - Oconto, Peshtigo, Menominee rivers

Spring 2022 Walleye Survey – Fox River

- March 25, April 5, April 6 and April 11
  - 5.23 hours of electrofishing
  - 494 walleyes
  - 94.5 walleyes per hour of electrofishing

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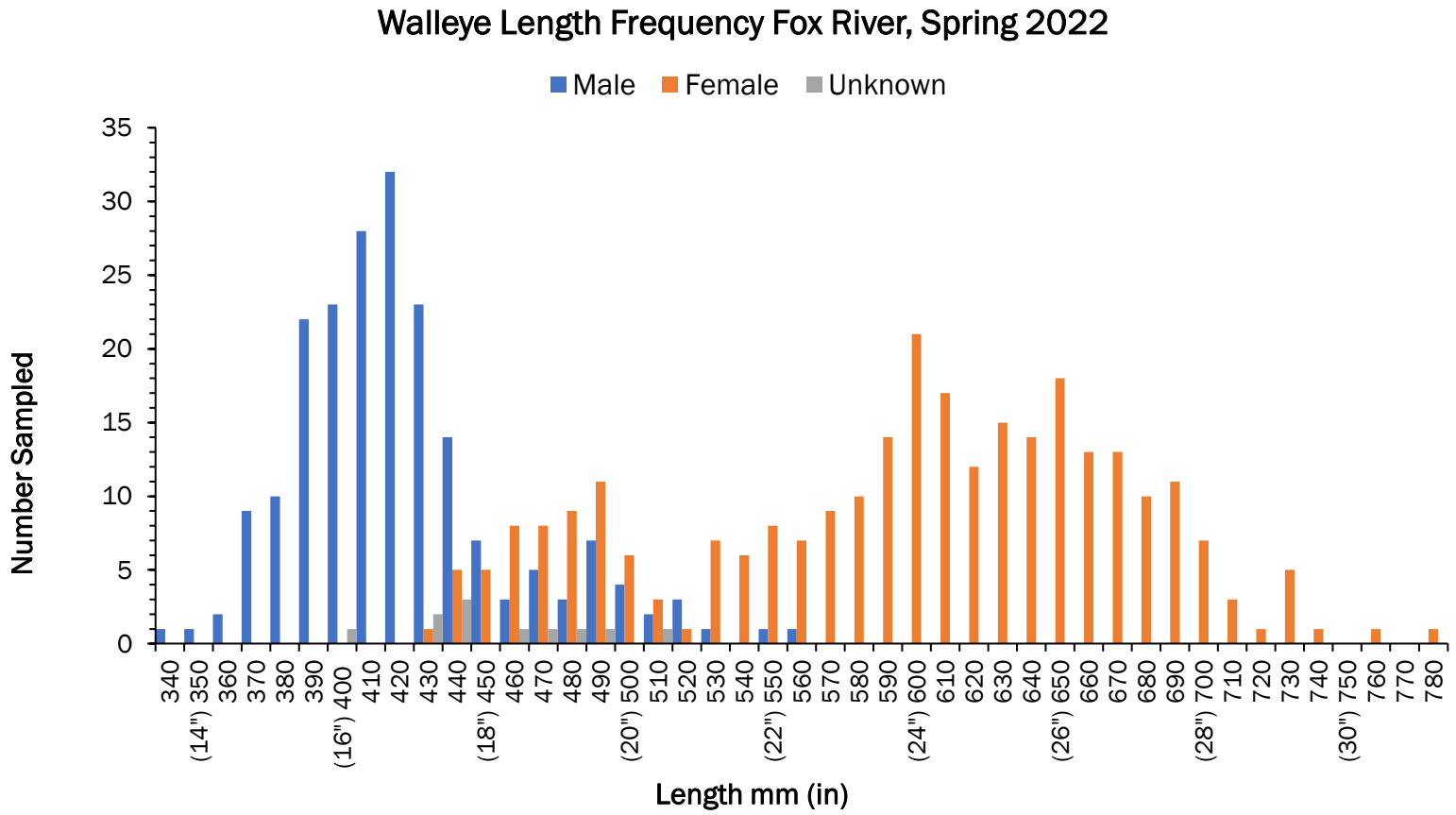

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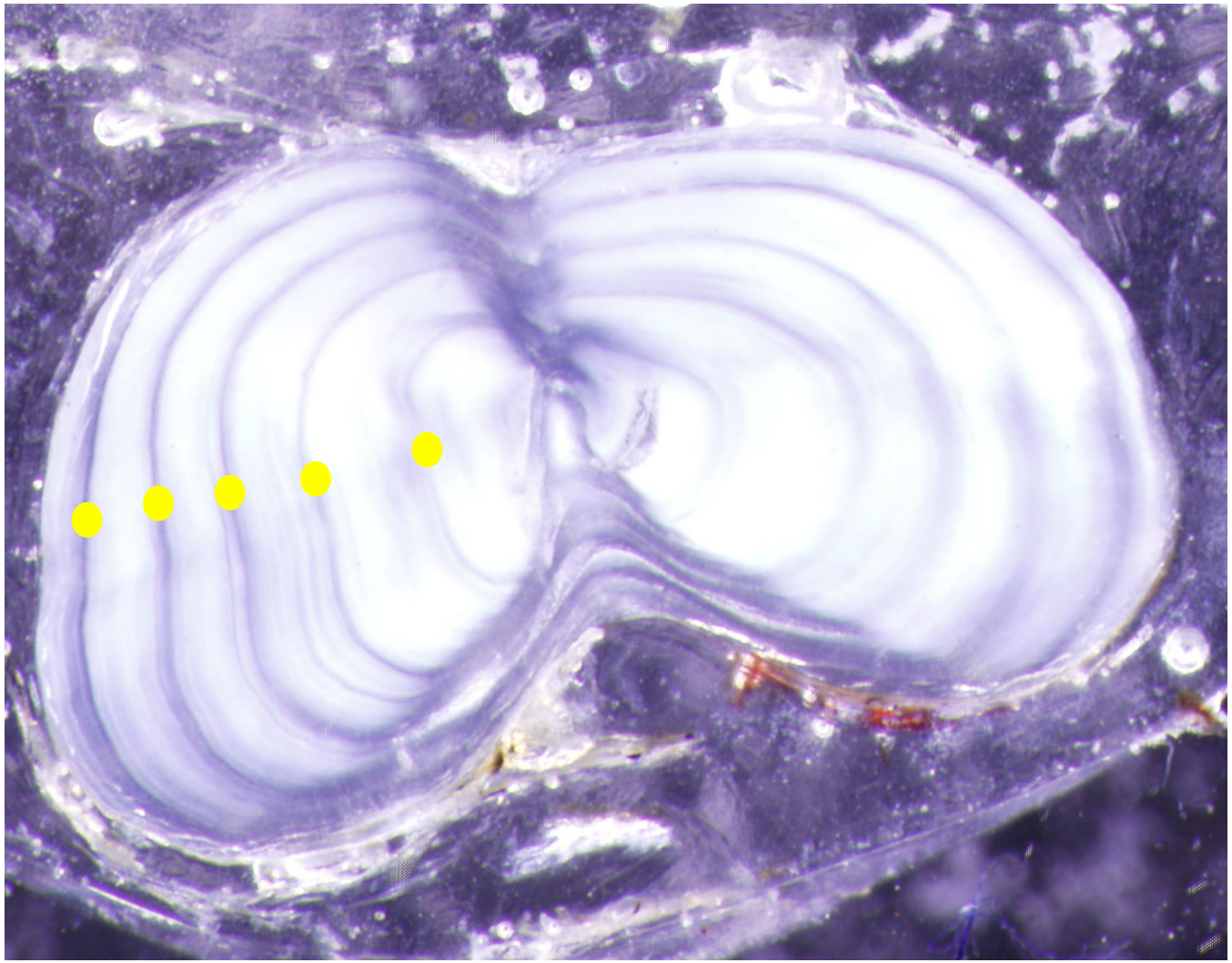

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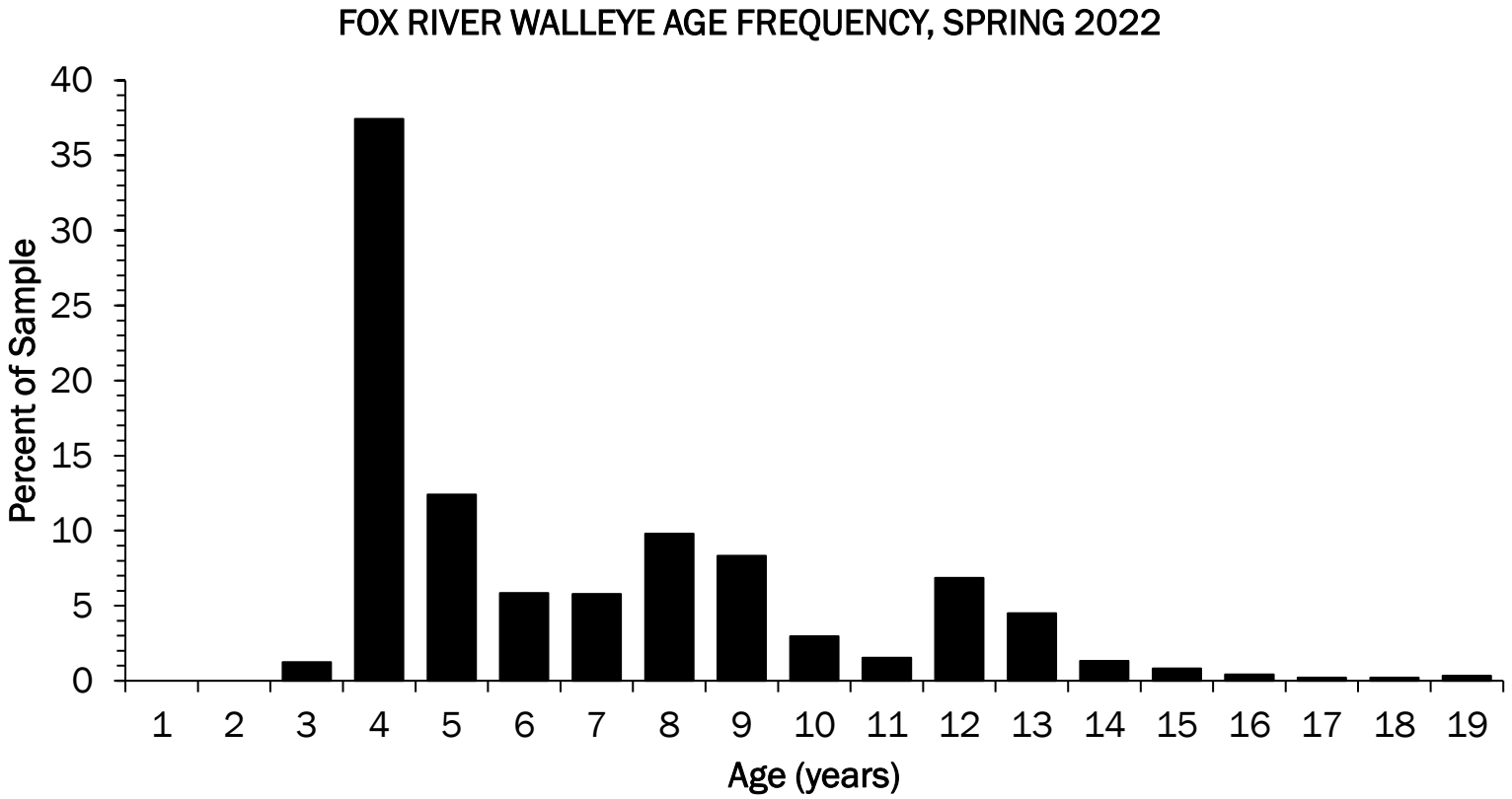

Current Walleye Management

- Fall electrofishing survey
  - Targeting young of year (YOY) walleyes
    - Hatched the previous spring
    - Indicator of year class strength
    - Lower Green Bay and Fox River
    - Measure all walleyes captured
    - Annually since 1993

- 2022
  - Shocked 8.65 miles on lower Green Bay
  - Shocked 9.13 miles on Fox River

- Captured 257 YOY walleyes
  - 234 Fox River
  - 23 lower Green Bay

- Caught 307 age 1+ walleyes

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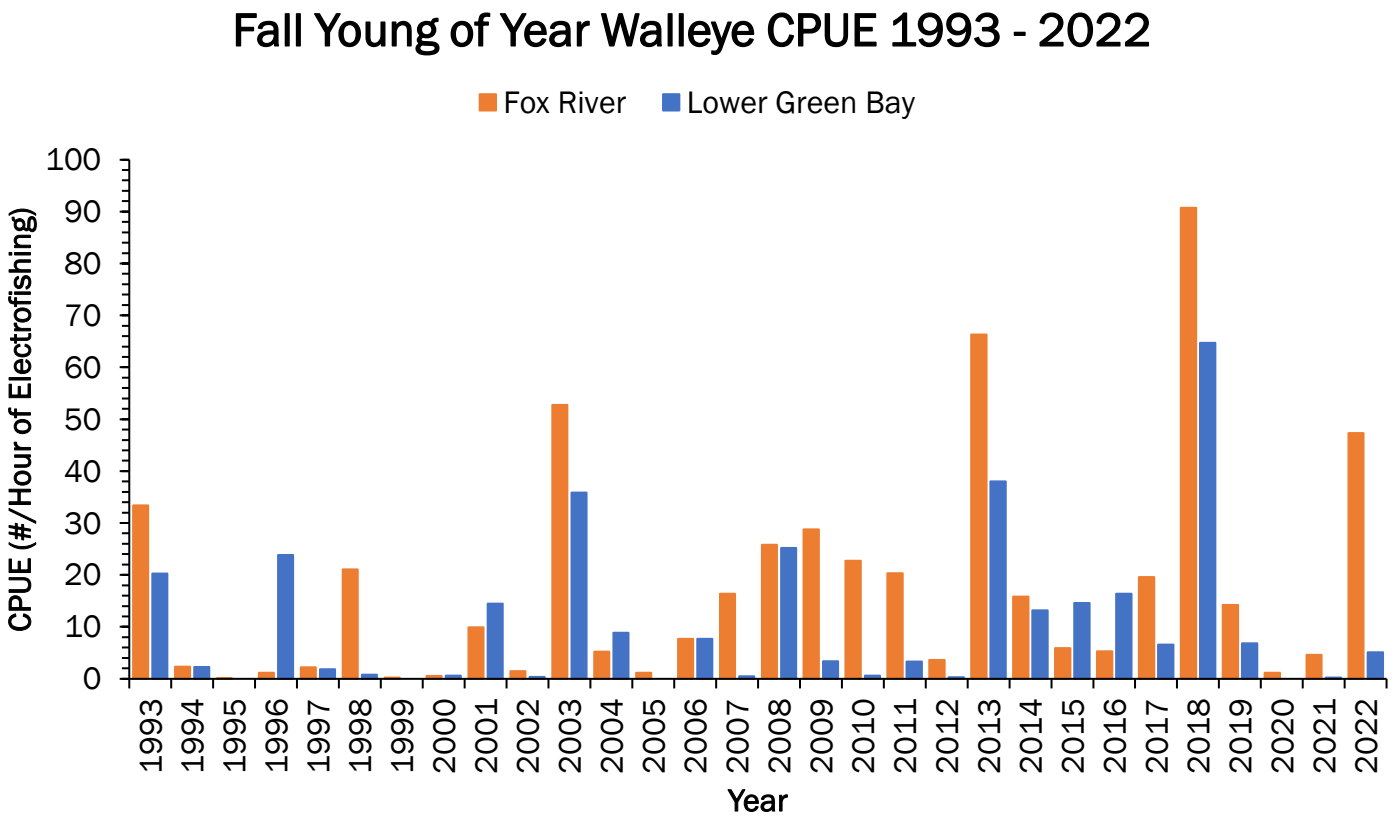
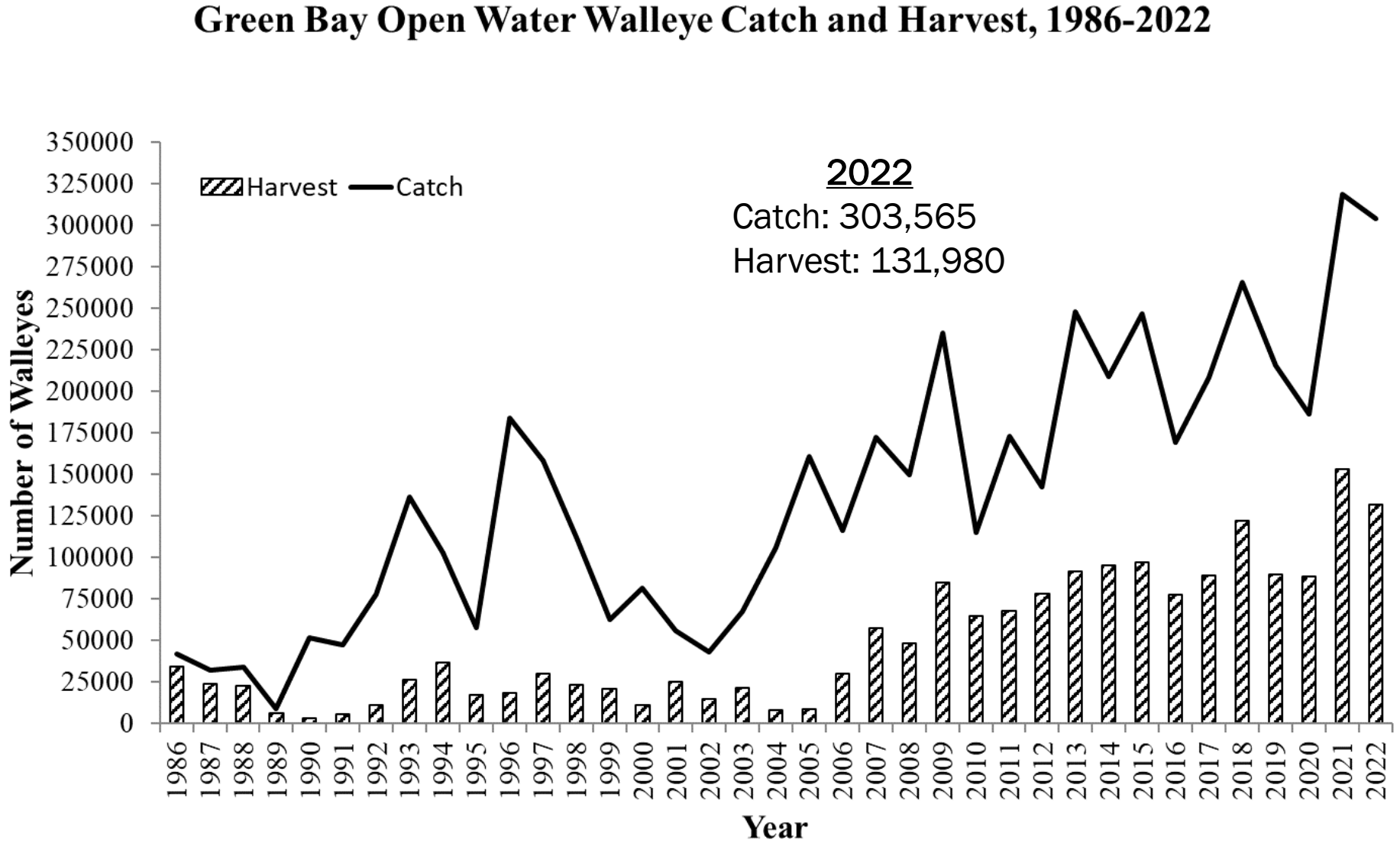


Walleye Harvest

Creel Survey

Walleye Catch and Harvest



Future Walleye Management

- Fishery is doing well!

- Exploitation rate?
  - Percent of population harvested by anglers
  - Declines in quality?

- Reward tag study:
  - 2024 – 2026 or longer?
  - Tag 5,000 walleyes
    - Fox River, Oconto River, Peshtigo River, Menominee River and Sturgeon Bay
    - Collect data on size and age structure of spawning population
  - 200 will have a red reward tag
    - Receive $100.00 for reporting valid reward tag with proper verification
  - Exploitation rate and correction factor for future non-reporting

- Recruitment
  - Continue annual fall electrofishing
  - UWSP
    - 31 years of YOY walleye data
    - Factors correlated with successful recruitment
    - De Pere research project

Muskies in Green Bay

Musky Life History

- Spawn near decaying leaves, branches, or other organic matter, wood, gravel, or in marshy habitat
  - 50 – 60 degrees
  - Deposit eggs over several hundred yards of shoreline
- No parental guarding
- Prefer cool water
- Habitats
  - Wood
  - Vegetation
  - Reefs
  - Offshore
- Predatory
- Mature at age – 5
- Live to be 20+ years old
- Reach 55+ inches

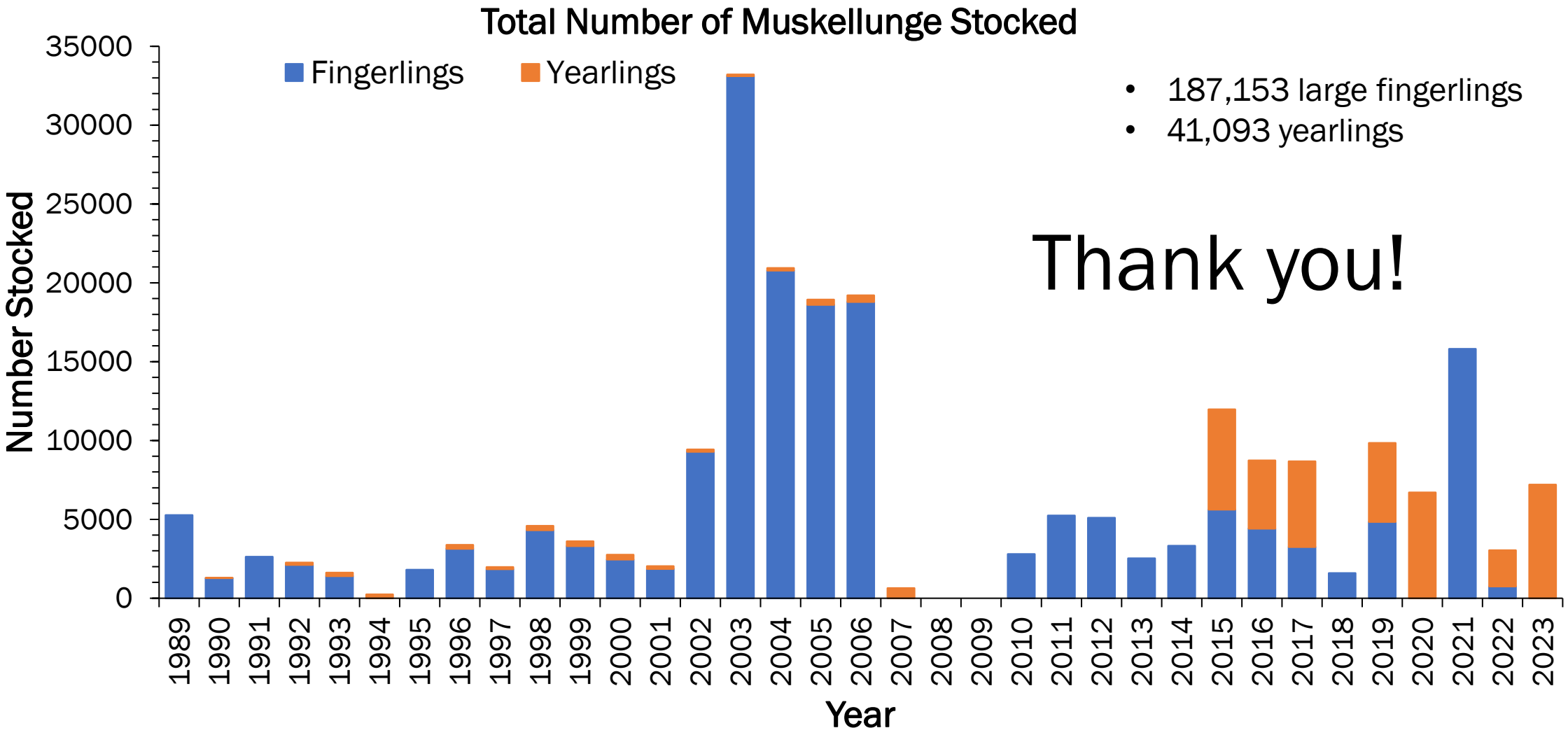
Musky Restoration

- 1989 - 3 incremental phase reintroduction plan
  - 1.) Identify an appropriate egg source and begin to stock fish
  - 2.) Establish an inland lake broodstock population
    - Future source of eggs
  - 3.) Develop a self-sustaining musky population in Green Bay

Musky Restoration

- Phase 1:
  - Obtain eggs, rear, and stock fish

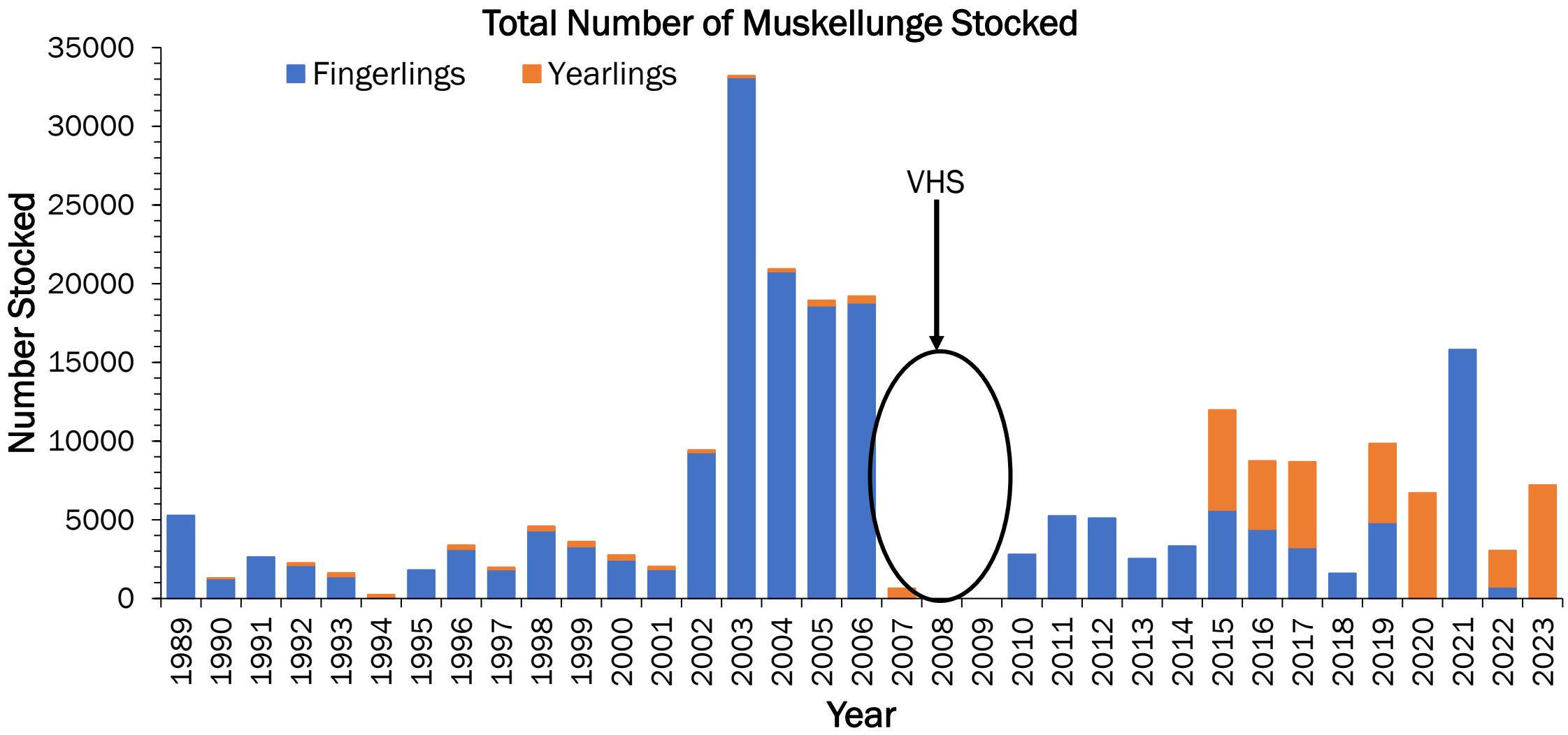
Musky Stocking



- 187,153 large fingerlings
- 41,093 yearlings

Thank you!

Musky Stocking Opportunities and Challenges



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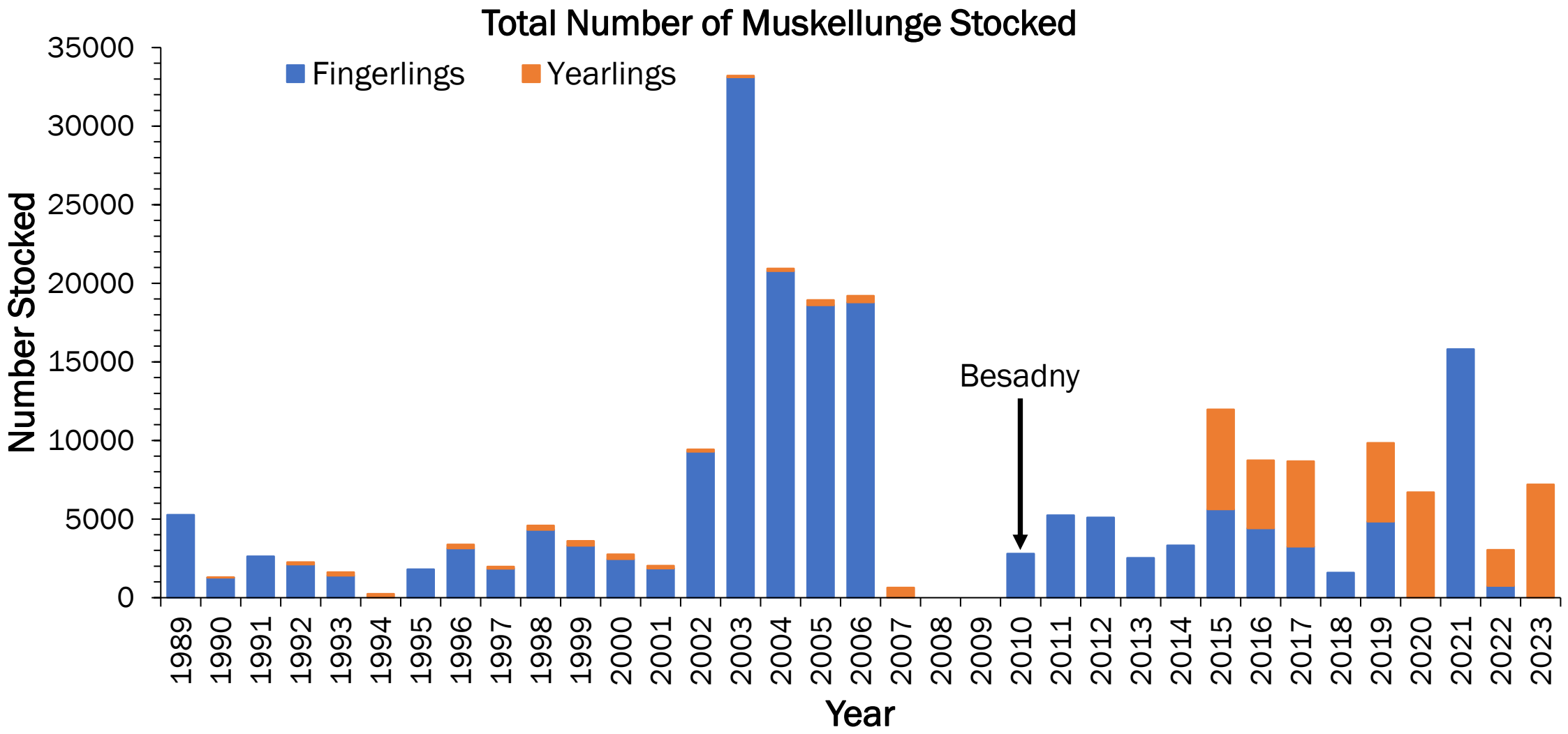

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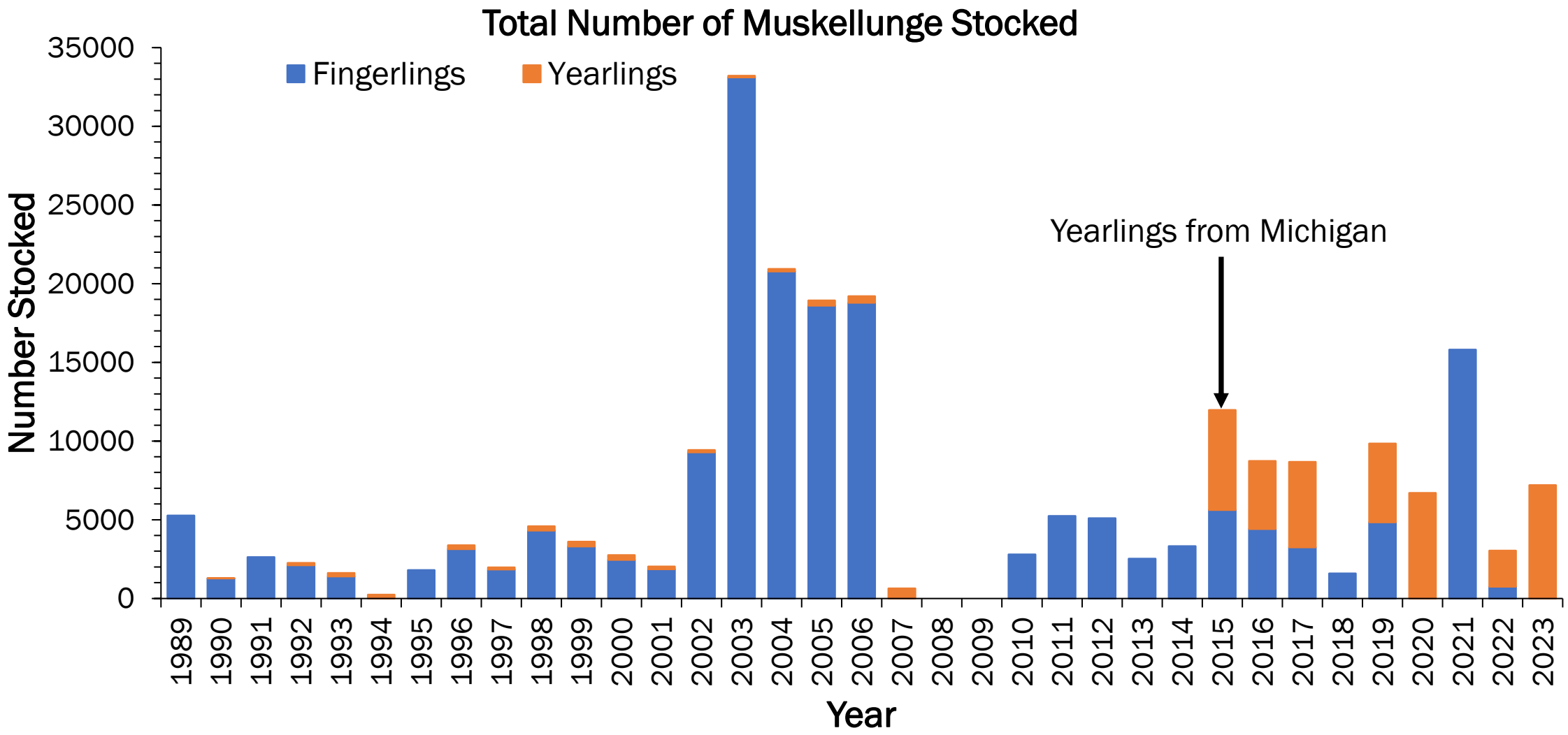

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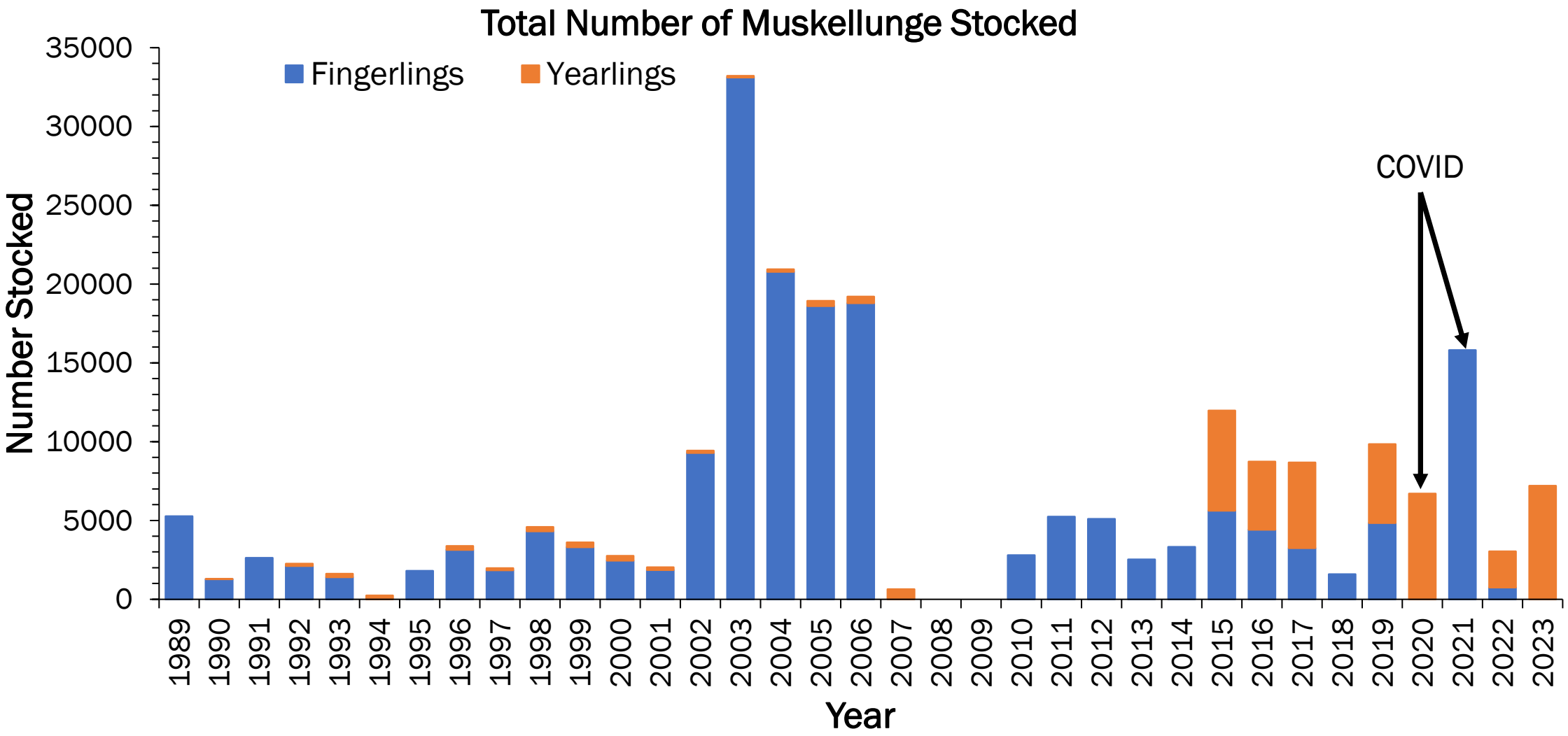

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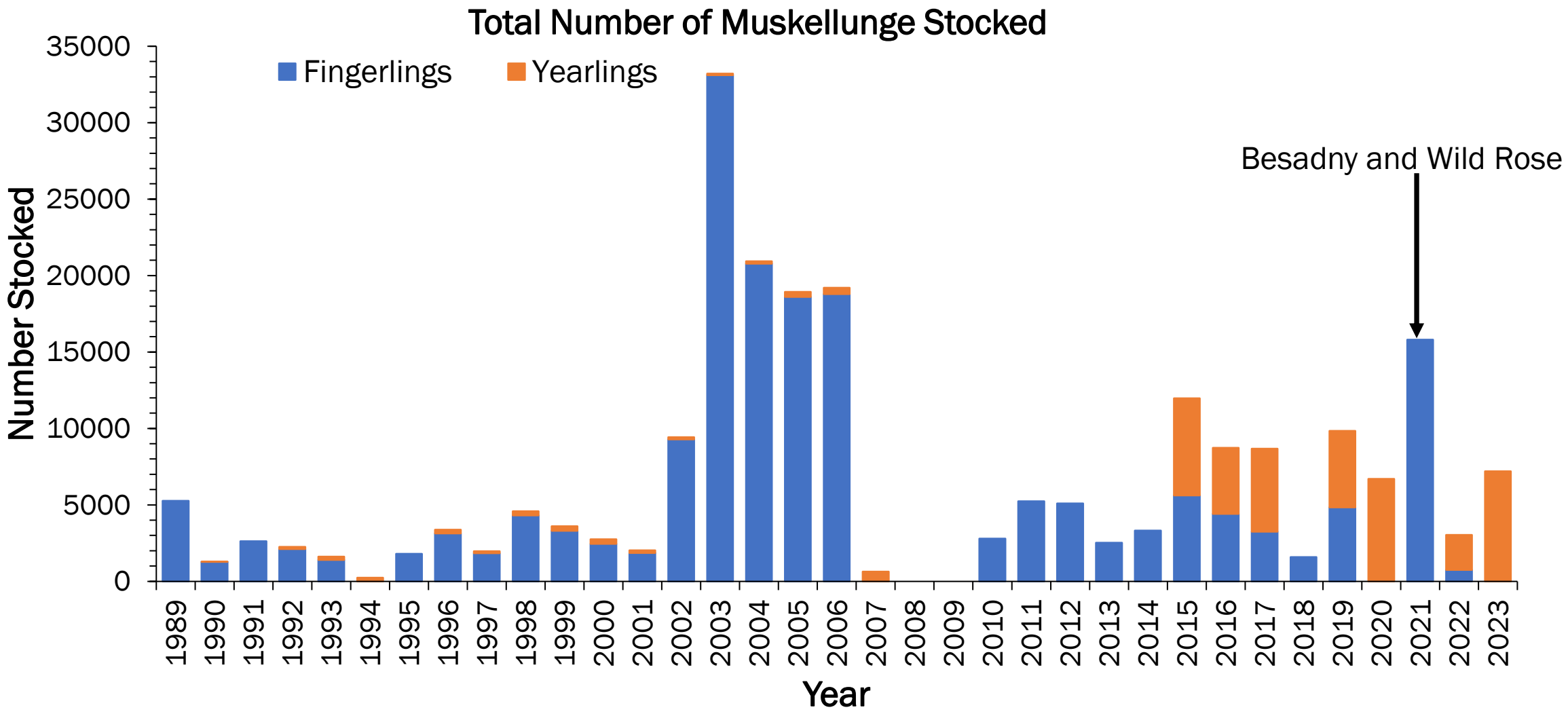

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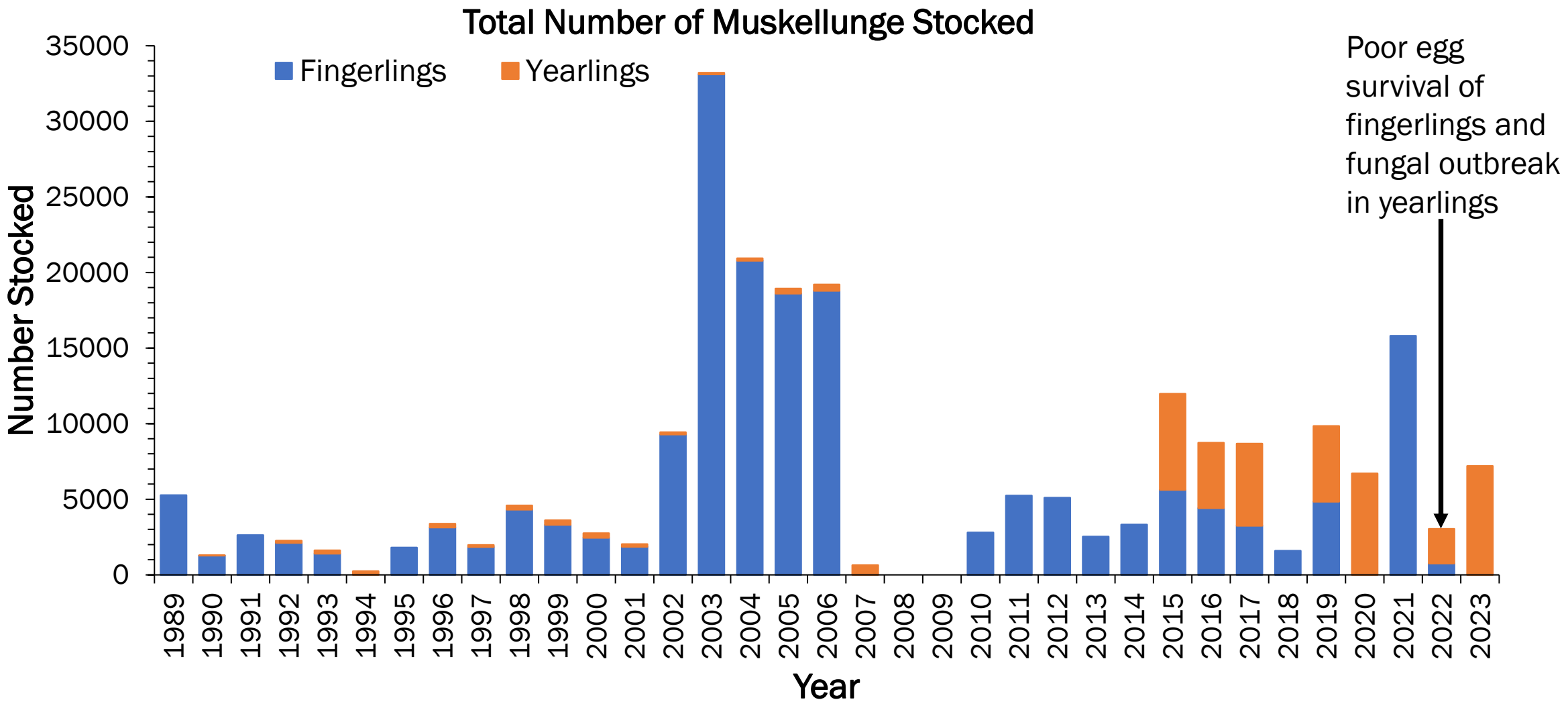

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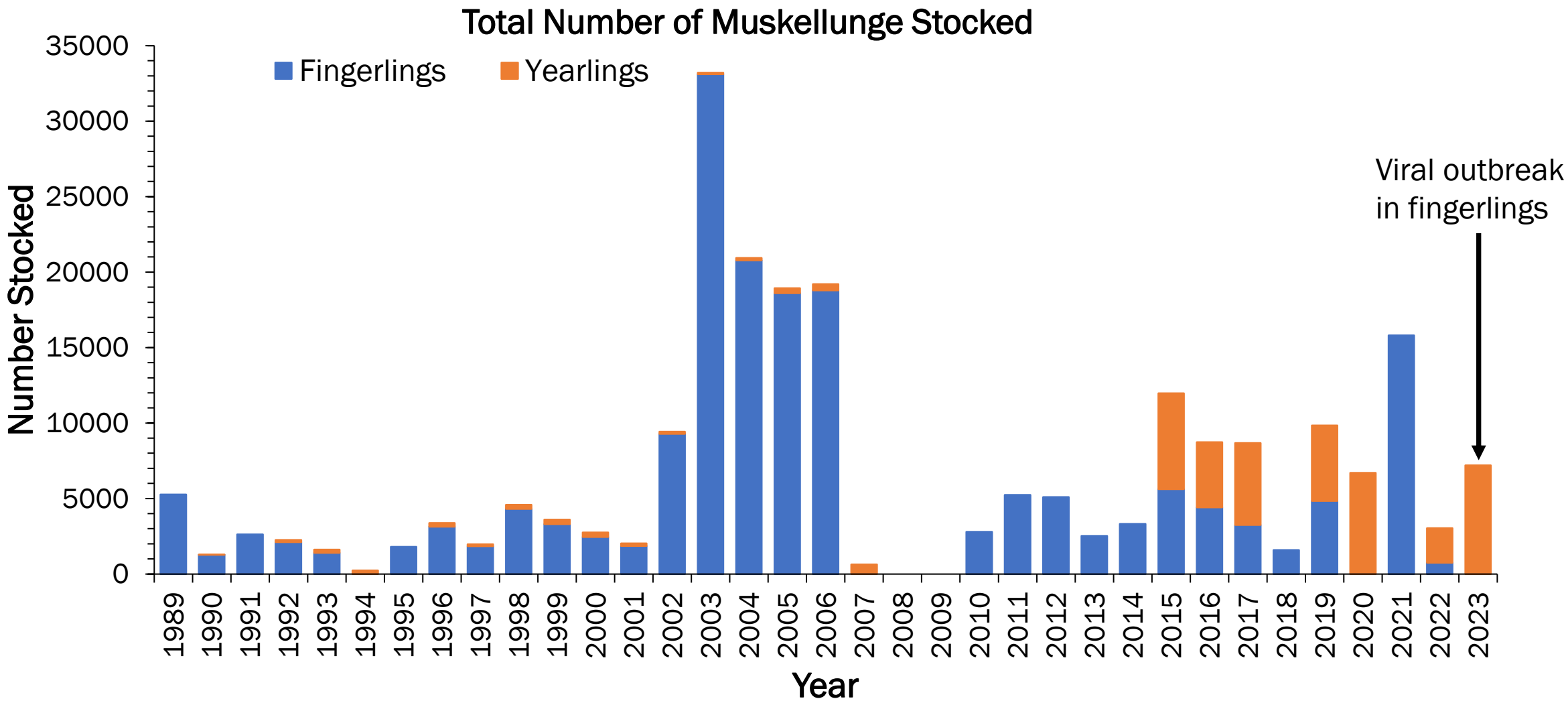

Musky Stocking Locations

Musky Restoration

- Phase 2:
  - Establish inland broodstock lakes
    - Stock young fish
    - Use sources of eggs when enough adults are mature
  - Long Lake – Waushara County
    - 1989 – 1992
  - Anderson, Archibald, and Elkhart Lake
    - 2009
    - Not enough adults to spawn
  - Use Fox River as adult broodstock source

Musky Restoration

- Phase 3:
  - Create self-sustaining musky population
    - Stocked fish receive fin clips
      - 20% yearlings get PIT tags
  - Evaluate contributions of stocked versus naturally reproduced muskies in surveys

PIT Tags

- PIT tags
  - Passive Integrated Transponder
  - Microchip in pets
  - Injected just under skin with hollow needle
  - 20% stocked yearlings
  - All captured adults
  - Growth, movement, spawning site fidelity

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  - Passive Integrated Transponder
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Stationary PIT Tag Arrays

Peshtigo River

Musky Surveys

- Annual spring netting on Fox River
  - Size structure of adult musky population
  - Recaptures via fin clips and PIT tags
  - Gametes for future stockings
- 2022
  - May 11
  - 5 nets for 24 hours
  - Captured 81 muskies!
  - 16.2 muskies per 24 hours soak!

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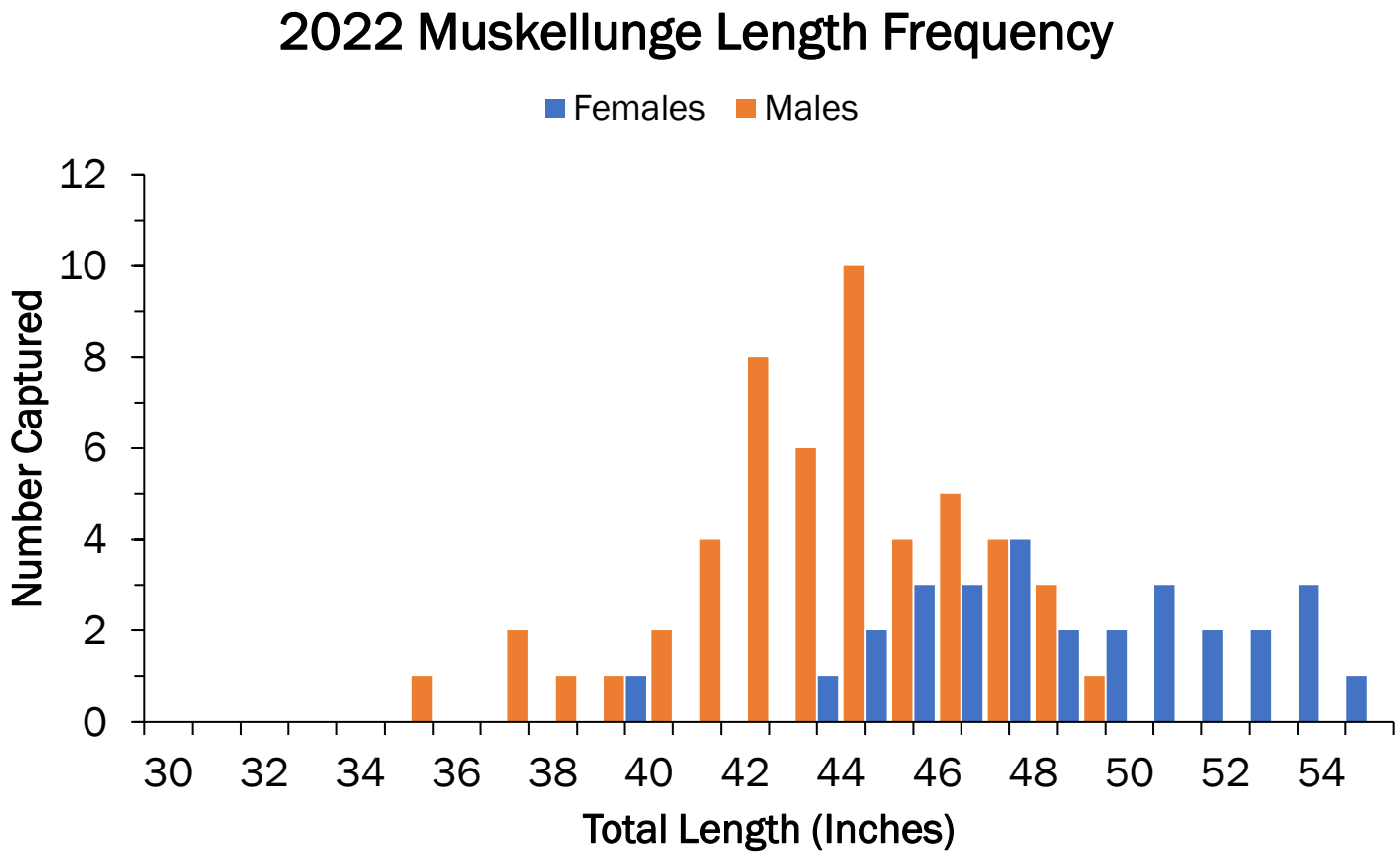

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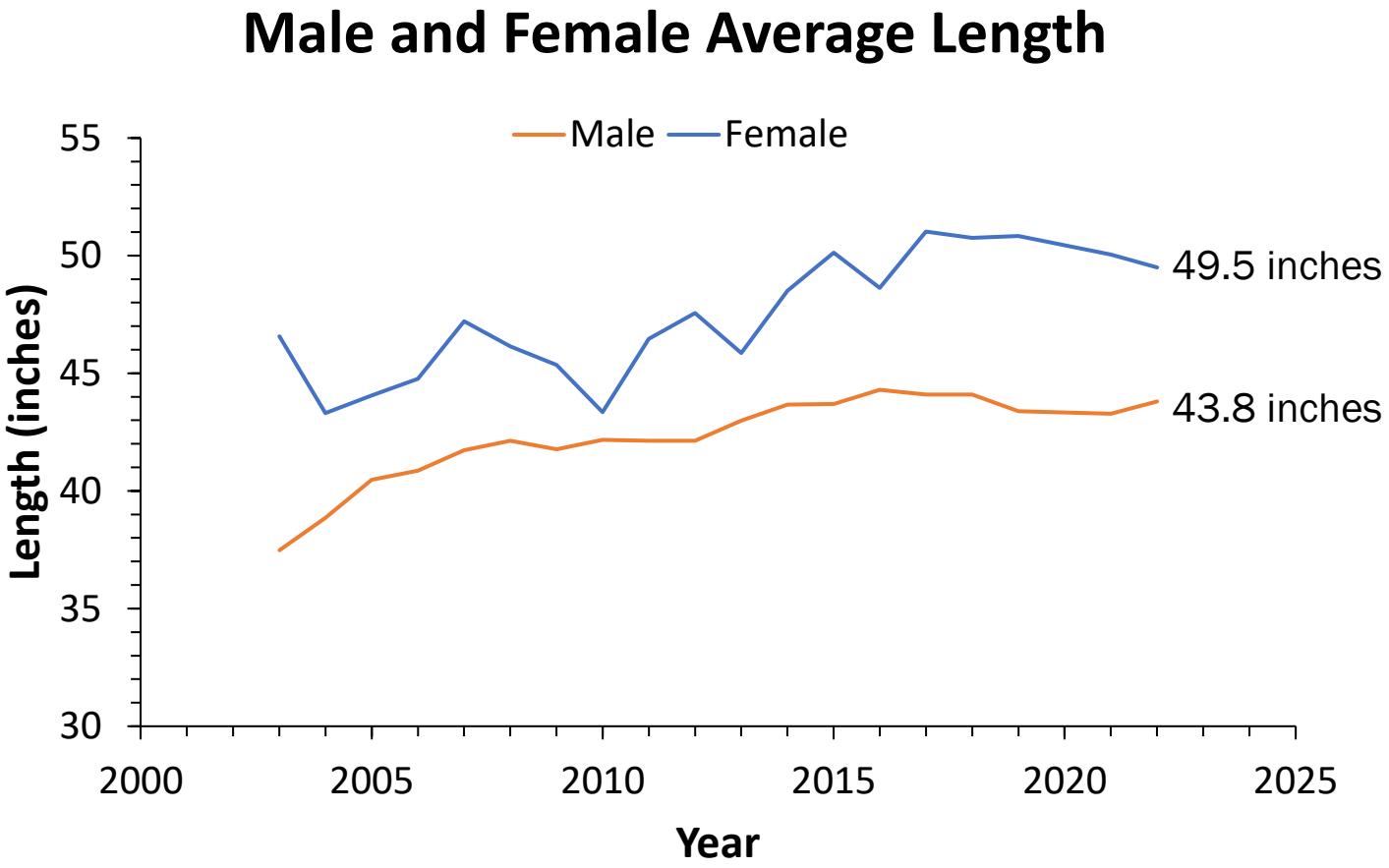


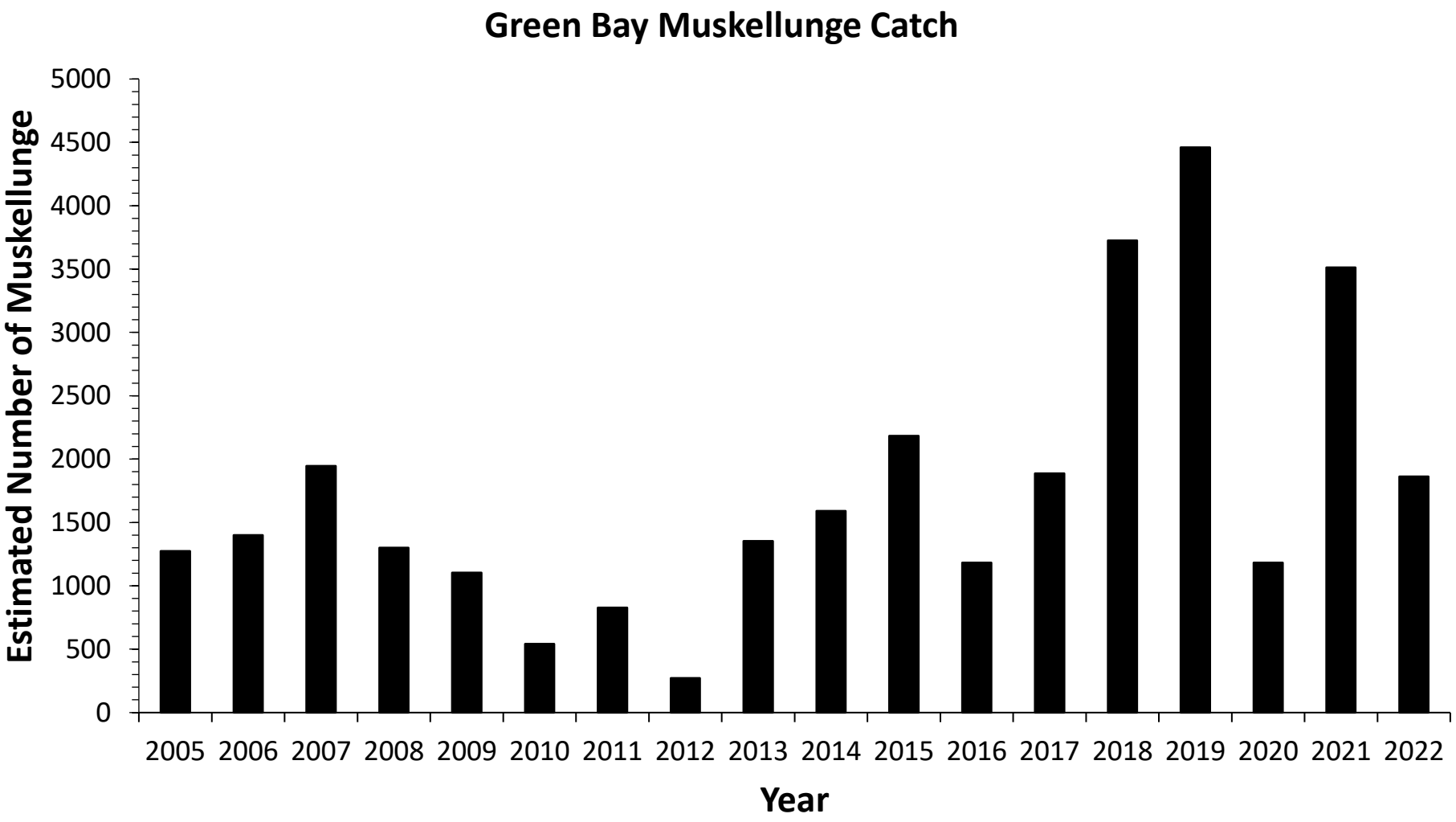
Musky Surveys

- Fall electrofishing
  - Naturally reproduced young of year muskies
    - Hatched previous spring
  - Capture all muskies encountered
    - Fin clips and PIT tags

Musky Catch and Harvest

Creel Survey

Musky Catch


Green Bay Muskellunge Catch
Estimated Number of Muskellunge
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year

Musky Restoration

- Phase 3:
  - Create self-sustaining musky population
    - Stocked fish receive fin clips
      - 20% yearlings get PIT tags
  - Limited amounts of documented natural reproduction
    - Menominee River
    - Sturgeon Bay area
    - Why?

UWSP Research

- Two graduate students:
  - Jared Krebs and Robert Sheffer
  - 2017 - 2019
- Adults surgically implanted radio and acoustic transmitters
  - Identify movements and spawning locations
- Egg and larval sampling at potential spawning sites
  - Fox River, Menominee River, and lower Green Bay
- Habitat variables associated with musky egg deposition
  - Bottom depth
  - Slope
  - Dissolved oxygen
  - Distance from shore
  - Percent gravel substrate
  - Percent organic matter as substrate
- Mapped all available habitat on Fox River and Menominee River
  - 1.3% of Fox River and 8.3% of Menominee River suitable for musky spawning!
  - Very little spawning habitat on Fox River
- Only captured 2 larval muskies
  - Could not evaluate factors associated with successful reproduction

Photo Credit: Jared Krebs - UWSP

UWSP Research

- Spawning in both Green Bay and tributaries
- All but one musky returned to stocking location to spawn
  - 6 fish with known stocking locations
- Moderate levels of spawning site fidelity across years

WDNR Spring Netting Surveys – Spawning Site Fidelity

- Annual spring netting on Fox River
- 2021 and 2022
  - 29 PIT tag recaptures
  - 27 (93%) stocked or tagged as adults in Fox River
  - 1 stocked in Lake Butte De Mortes
  - 1 tagged in Dead Horse Bay
  - Site fidelity

Peshtigo River PIT Tag Array – Spawning Site Fidelity

- Peshtigo River PIT tag array
  - 2021 - 2022 - Recorded tags of 55 muskies
  - Date and time entered and exiting location
    - Spawning runs
  - Original tagging date and location
    - 49 of 55 (89%) originally tagged and stocked in Peshtigo River
    - Strong site fidelity

Musky Stocking

- Historical stocking locations
  - Fox River and Menominee River
  - 71.5% large fingerlings
  - 58.4% yearlings

- Fox River
  - Very little spawning habitat!
    - 1.3% river
    - Very little nursery habitat
    - 53.5% large fingerlings
    - 34% yearlings

Musky Stocking

- Historical stocking locations
  - Fox River and Menominee River
  - 71.5% large fingerlings
  - 58.4% yearlings

- Fox River
  - Very little spawning habitat!
    - 1.3% river
    - Very little nursery habitat
    - 53.5% large fingerlings
    - 34% yearlings

Future Musky Stocking

- New stocking locations:
  - Deadhorse Bay
  - Point Sable
  - Seagull Bar
  - Egg Harbor

Future Musky Stocking

- Increased stocking numbers
  - Sturgeon Bay
  - Little Sturgeon Bay

Future Musky Management

- Survey additional locations
  - Spring adult surveys
    - Fox River
    - Little Sturgeon Bay
    - Sturgeon Bay
    - Menominee River
    - Peshtigo River
  - Fall YOY and juvenile surveys
    - Sturgeon Bay
    - Little Sturgeon Bay
    - Menominee River
    - Peshtigo River

Muskellunge Habitat Restoration - AOC

- 12 designated areas for habitat restoration projects
  - 6 have musky as target species
  - Results from UWSP research to add musky spawning habitat near wetlands
  - Establishment of nursery habitat through wetland restoration
  - Brie Kupsky – March 4

Future Musky Research - UWSP

- Additional egg and larval sampling
  - Locations throughout Green Bay
    - Coastal marsh habitat
    - Tributaries
    - Sturgeon Bay and Little Sturgeon Bay

Photo credit: Jared Krebs - UWSP

Future Musky Research - UWSP

- Additional egg and larval sampling
  - Locations throughout Green Bay
    - Coastal marsh habitat
    - Tributaries
    - Sturgeon Bay and Little Sturgeon Bay
- Acoustic tag adult muskies from Sturgeon Bay
  - Contributions to fishery and movement

Future Musky Research - UWSP

- Additional egg and larval sampling
  - Locations throughout Green Bay
    - Coastal marsh habitat
    - Tributaries
    - Sturgeon Bay and Little Sturgeon Bay
- Acoustic tag adult muskies from Sturgeon Bay
  - Contributions to fishery and movement
- PIT tag more stocked fish
  - Survival
  - Contributions of stocked fish to adult population

CONNECT WITH US

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/WIDNRTV

"WILD WISCONSIN:
OFF THE RECORD"