

Diet and heritage strain of wild young of year and yearling lake trout in the main basin of Lake Huron



Workshop on Mortality of Age -1 Lake Trout in the Great Lakes
October 2-3, 2008, Michigan State University

Objectives

- ♦ **Determine diet and genetics**
 - Are progeny of stocked lake trout filling traditional foodweb roles?
 - Diet preference may have genetic component
- ♦ **ELH wild fish/age-0 ecology**
 - Lack of fundamental understanding of early life history and ecology in Lake Huron
 - Traditional benthic foodweb changing at unprecedented pace (Nalepa et al., French et al.)

Overview

- ♦ Lake Huron lake trout samples
- ♦ Methods - Genetic analysis, diets
- ♦ Results - Genetic analysis, diets
- ♦ Implications for habitat use and management in Lake Huron
- ♦ Future research on young lake trout

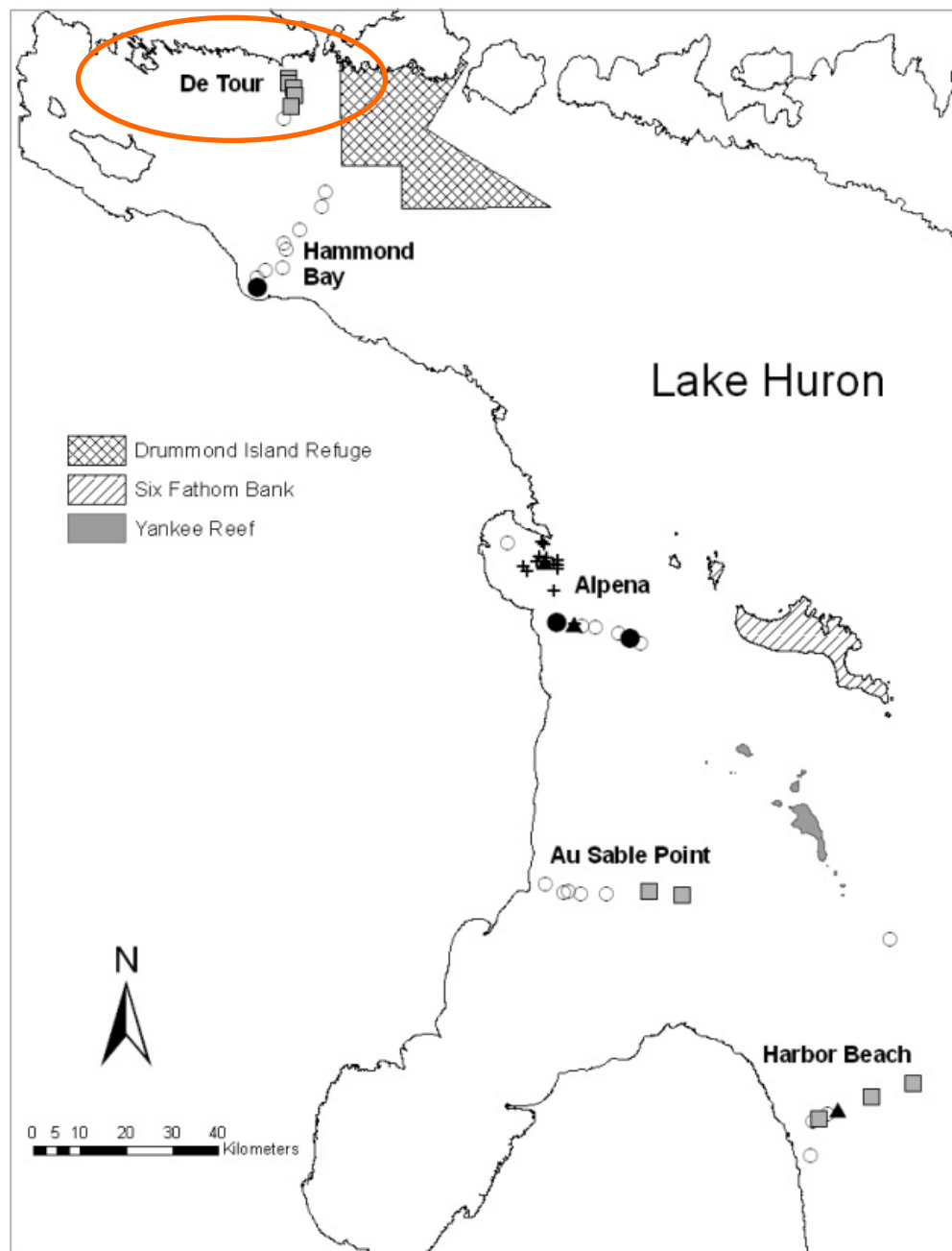


Lake Trout Collections

- ♦ Wild lake trout first collected in 2004
- ♦ All fish sampled with bottom trawls (depth 18-73m)
- ♦ YOY collected in fall 2004-2006 (46-86 mm)
- ♦ Yearling collected spring 2006 (74-120 mm)



USGS Bottom Trawl locations



Methods - Genetic analysis

- ♦ Caudal fin clips from all lake trout sampled
- ♦ DNA extraction - all fish and from 3 strains comprising >80% of stocked fish in sample area (Lewis Lake, Seneca, Marquette)
- ♦ 20 microsatellite loci genotyped
- ♦ Individual assignments using Bayesian methodology (STRUCTURE software)



Methods – Diet analysis

- ♦ Numerical composition
- ♦ % frequency of occurrence
- ♦ % composition by dry weight

YOY lake trout gut

Mysis relicta →



Results - Genetic analysis

- ♦ 177 hatchery, 50 wild lake trout genotyped
- ♦ Majority (92%) were classified as Seneca Lake or Seneca Lake hybrids

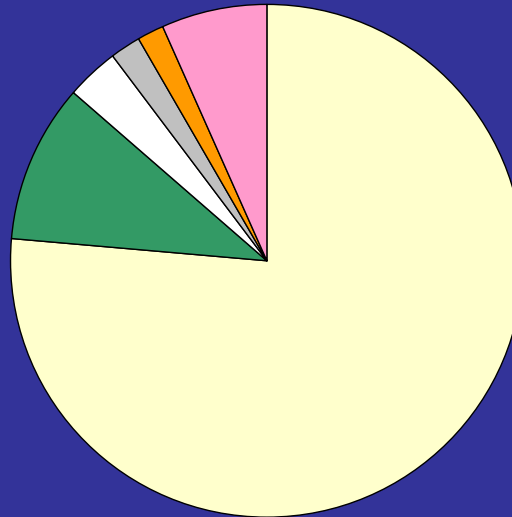
Results – Diet analysis

- ♦ 57 lake trout examined - 18 spring yearling, 39 fall YOY
- ♦ *Mysis* occurred in 82% of stomachs across seasons and years
- ♦ *Mysis* 45-96% dw biomass
- ♦ Chironomidae, *Bythotrephes*, *Daphnia*, calanoid copepods, fish eggs

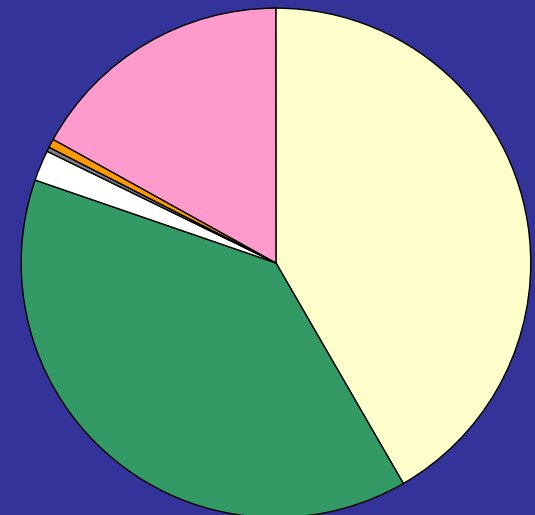


Diet results

- *Mysis*
- Chironomid
- *Bythotrephes*
- calanoid copepod
- Fish eggs
- *Daphnia*

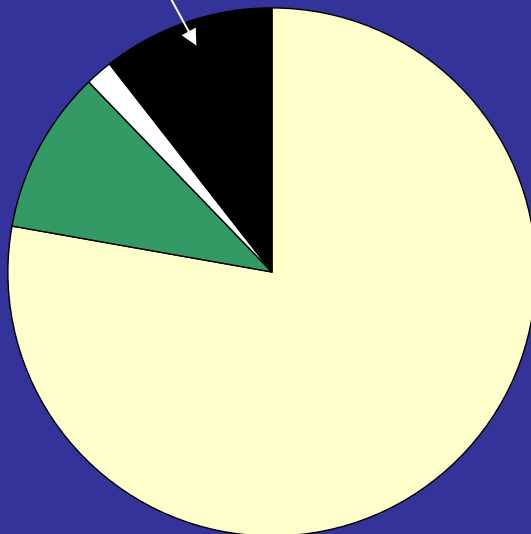


% Frequency



Prey Counts

Unidentified



% Dry Weight

Implications

- ♦ **Habitat use - linked to *Mysis* ecology**
- ♦ **Emphasizes soft substrate utilization by young lake trout**
- ♦ **Similar diet and habitat use as in Lake Superior studies**

(Eschmeyer 1956, Anderson and Smith 1971, Bronte 1995, Hudson et al. 1995)

Implications

- ♦ **Community interactions (sculpin spp., stickleback spp., trout perch, burbot, round goby)**
- ♦ **Underscores importance of Seneca strain for continued rehabilitation efforts in Lake Huron**

Progress towards lake trout rehabilitation – GLFC

- ♦ Evaluating stocking strategies
 - *Lake trout genotype*
- ♦ Community Interactions
 - *Diet of lake trout and their potential competitors*
- ♦ Examining critical life-history stages
 - *ELH from spawned egg through age 1*
 - *Growth and diet of juvenile fish*



Image: J. Allen, USGS

Future Research

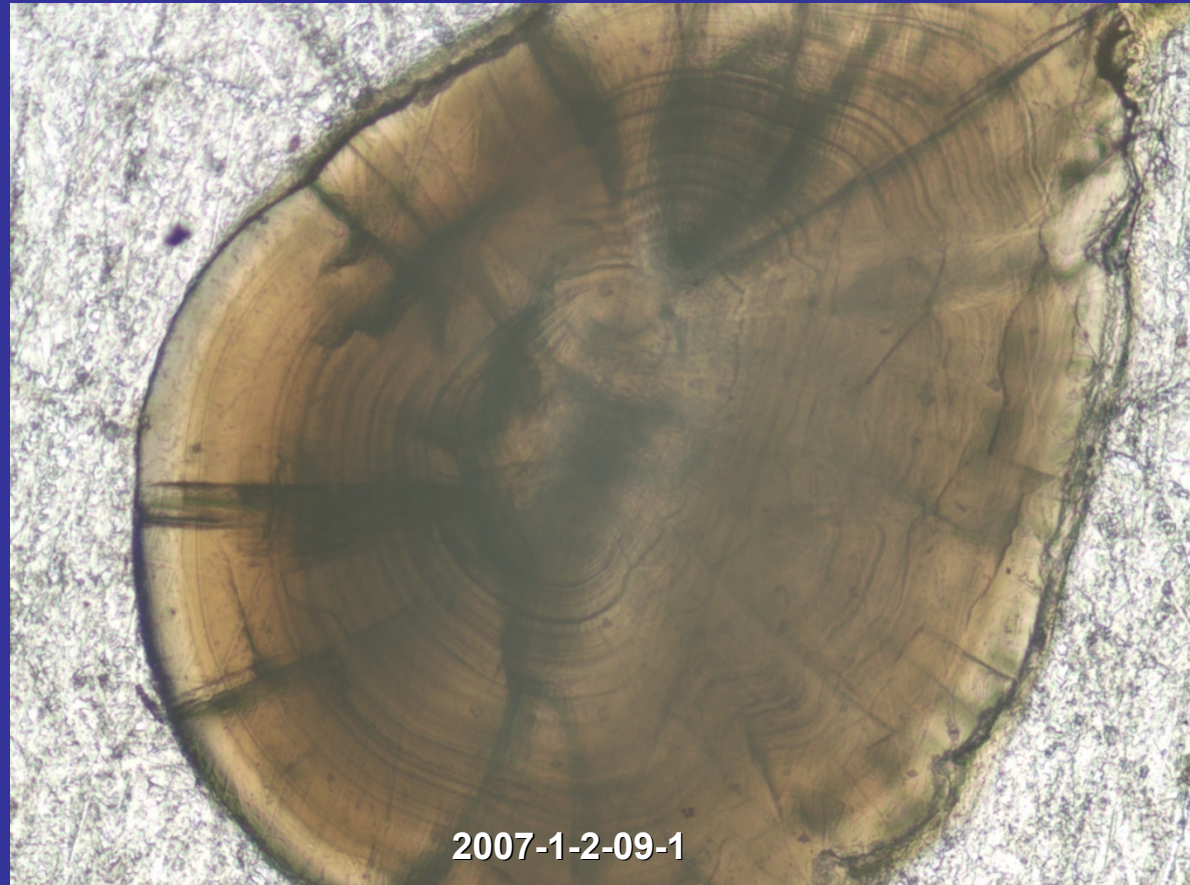
- ♦ Compare diet across lakes with different stocks - Isle Royale, Apostle Islands
- ♦ Yankee Reef lake trout sampled in early June 2007-08 (spatial and ontogenetic differences in diet, genetics)
- ♦ MDNR Thunder Bay samples
- ♦ Age and growth estimation



Image: J. Allen, USGS

Estimation of Daily Age

- ♦ Hatch date?
- ♦ Ontogenetic events?
- ♦ Growth rates?
- ♦ Validation?





Sources: NASA Geospatial Interoperability Office, Jet Propulsion Laboratory, California Institute of Technology, U.S. Geological Survey. Imaging by Pete Giencke.