Lake Trout

Indicator #93

Overall Assessment

Status: **Mixed**

Trend: **Unchanging**

Rationale: **Factors used to determine status were the levels of natural reproduction observed, the survival of hatchery-reared fish after stocking, the level of mortality on adults from sea-lamprey and fishing, and the over all population trajectory. This limits harvest objectives in most lakes.**

Lake-by-Lake Assessment

Lake Superior

Status: Good

Trend: Improving

Rationale: Natural reproduction of both near shore (lean) and offshore (siscowet) populations is widespread and supports all populations. Most stocking has been discontinued and fisheries are well managed. Sea lamprey mortality has been increasing.

Lake Michigan

Status: Poor

Trend: Unchanging/Deteriorating

Rationale: Survival of adult fish is declining in some areas from increased sea lamprey mortality. There is no evidence of significant natural reproduction. Fishing mortality is low.

Lake Huron

Status: Mixed

Trend: Improving

Rationale: Levels of natural reproduction continue to increase, adult abundance is stable to declining, and survival of stocked fish is low and declining. Fishing and sea lamprey mortality have declined since 2001 but have increased slightly during the last few years.

Lake Erie

Status: Mixed

Trend: Unchanging

Rationale: Sea lamprey mortality is high. A shift to a deepwater Lake Superior strain for stocking has appeared to improved post-release survival and overall population is increasing. Natural reproduction has not been observed.

Lake Ontario

Status: Mixed

Trend: Deteriorating

Rationale: Post-release survival of stocked fish is declining and the level of natural reproduction remains low.

Purpose

- To track the status and trends in lake trout populations

- To infer the basic structure of the cold water predator community and the general health of the ecosystem

Ecosystem Objective

Self-sustaining, naturally reproducing populations that support target yields to fisheries are the goal of the lake trout restoration program. Target yields approximate historical levels of lake trout harvest or levels adjusted to accommodate stocked non-native predators such as Pacific salmon. These targets are 1.8 million kg (4 million pounds) from Lake Superior, 1.1 million kg (2.5 million pounds) from Lake Michigan, 0.9 million kg (2.0 million pounds) from Lake Huron and 50 thousand kg (0.1 million pounds) from Lake Erie. Lake Ontario has no specific yield objective but has a population objective of 0.5 to 1.0 million adult fish that produce 100,000 yearling recruits annually through natural reproduction.

State of the Ecosystem

Background

Lake trout were historically the principal salmonine predator in the coldwater communities of the Great Lakes. By the late 1950s, lake trout were extirpated throughout most of the Great Lakes, mostly from the combined effects of sea lamprey predation and over fishing. Restoration efforts began in the early 1960s with chemical control of sea lamprey, controls on exploitation, and stocking of hatchery-reared fish to rebuild populations. Full restoration will not be achieved until natural reproduction is established and maintained to sustain lakewide populations. To date, only Lake Superior has that distinction.

Status of Lake Trout

Trends in the relative abundance of lake trout in each of the Great Lakes are displayed in Figure 1. Targets are set for most populations as these are perceived to be biologically important to increase the probability of natural reproduction. Lake trout abundance dramatically increased in all the Great Lakes after initiation of sea lamprey control, stocking, and harvest control. Natural reproduction, from large parental stocks of wild fish, is occurring throughout Lake Superior, and supports both onshore and offshore populations. Populations may be approaching historical levels, and stocking there has been largely discontinued. Trends of wild adult and large juvenile populations appear to be relatively stable (Figure 1A). In Lake Huron, substantial and widespread natural reproduction was seen starting in 2004 following near collapse of the alewife population. Overall abundance of hatchery-reared fish has been declining since the 1990s due to declining survival of young hatchery fish (Figure 1B). Populations of wild adult spawners are at or approaching target levels at selected sites in refuges (Figure 1C). In Lake Michigan (Figure 1D), lakewide populations are below target levels in most areas, with no sustained natural reproduction. In Lake Erie, target abundances of all age groups and age 5+ fish are below target levels (Figure 1E). Abundance of hatchery-reared adults was relatively high in Lake Ontario from 1986 to 1998, but declined by more than 30% in 1999 due to reduced stocking and poor survival of stocked yearlings since the early 1990s (Figure 1F). Adult abundance again declined by 54% in 2005 likely due to ongoing poor recruitment and mortality from sea lamprey predation. Sustained natural reproduction, albeit at low levels, has also been occurring in Lake Ontario since the early 1990s.

Pressures

The numbers of sea lamprey continue to limit population recovery, particularly in Lake Michigan and Lake Superior, and parasitic adults are increasing basin-wide. Fishing pressures also continue to limit recovery. More stringent controls on fisheries are required to increase survival of stocked fish. In northern Lake Michigan, parental stock sizes are low and young in age due to low stocking densities, and substantial sea lamprey mortality. Hence, egg deposition is low in most historically important spawning areas. Fishing mortality has been reduced in recent years, but it has been replaced by sea lamprey mortality. High biomass of alewives and other predators on lake trout

spawning reefs are thought to inhibit restoration through egg and fry predation, although the magnitude of this pressure is unclear. Recent trends in Lake Huron suggest that alewife may need to reach very low abundances to allow substantial natural reproduction of lake trout. A diet dominated by alewives may be limiting fry survival (early mortality syndrome) through thiamine deficiencies. The loss of *Diporeia* and dramatic reductions in the abundance of slimy sculpins is reducing prey for young lake trout and may be affecting survival. Current strains of lake trout stocked may not be appropriate for offshore habitats, therefore limiting colonization potential.

Management Implications

Continued and enhanced sea lamprey control is required basin-wide to increase survival of lake trout to adulthood. New sea lamprey control options, which include pheromone systems that increase trapping efficiency and disrupt reproduction, are being researched and hold promise for improved control. Continued and enhanced control on exploitation is being improved through population modeling in the upper Great Lakes, and is now being applied on Lake Ontario. Stocking densities need to be increased in some areas, especially in Lake Michigan and possibly Lake Ontario. The use of alternate strains of lake trout from Lake Superior could be candidates for deep, offshore areas not colonized by traditional strains used for restoration. Introduction of such strains has been initiated in Lake Erie, will start soon in Lake Ontario and are being considered for Lake Michigan. Direct stocking of eggs, fry, and yearling on or near traditional spawning sites should be used where possible to enhance colonization. The need to restore native forage fish, such as cisco and bloater, is gaining momentum and seen as an important requirement to add in bringing lake trout back to self sustainability. This activity will require careful consideration of the transfer of diseases among lakes.

Comments from the author(s)

Reporting frequency should be every 5 years. Monitoring systems are in place, but in most lakes measures do not directly relate to stated harvest objectives. Population objectives may need to be redefined as endpoints in units measured by the monitoring activities, and are being incorporated into restoration guides and plans. The data time series we present are based on important population targets that can be measured with current assessment activities.

Assessing Data Quality

Insert “x” under the statement that best corresponds with each data characteristic

Data Characteristics	Strongly Agree	Agree	Neutral or Unknown	Disagree	Strongly Disagree	Not Applicable
1. Data are documented, validated, or quality-assured by a recognized agency or organization		X				
2. Data are traceable to original sources				X		
3. The source of the data is a known, reliable and respected generator of data		X				
4. Geographic coverage and scale of data are appropriate to the Great Lakes basin			X			
5. Data obtained from sources within the U.S. are comparable to those from Canada			X			
6. Uncertainty and variability in the data are documented and within acceptable limits for this indicator report				X		
Clarifying Notes: Data sources are from biological assessments conducted cooperatively by state, federal, tribal and provincial						

agencies, and are largely contained in non-peered reviewed reports to the Great Lakes Fishery Commission, Lake Committees.

Acknowledgments

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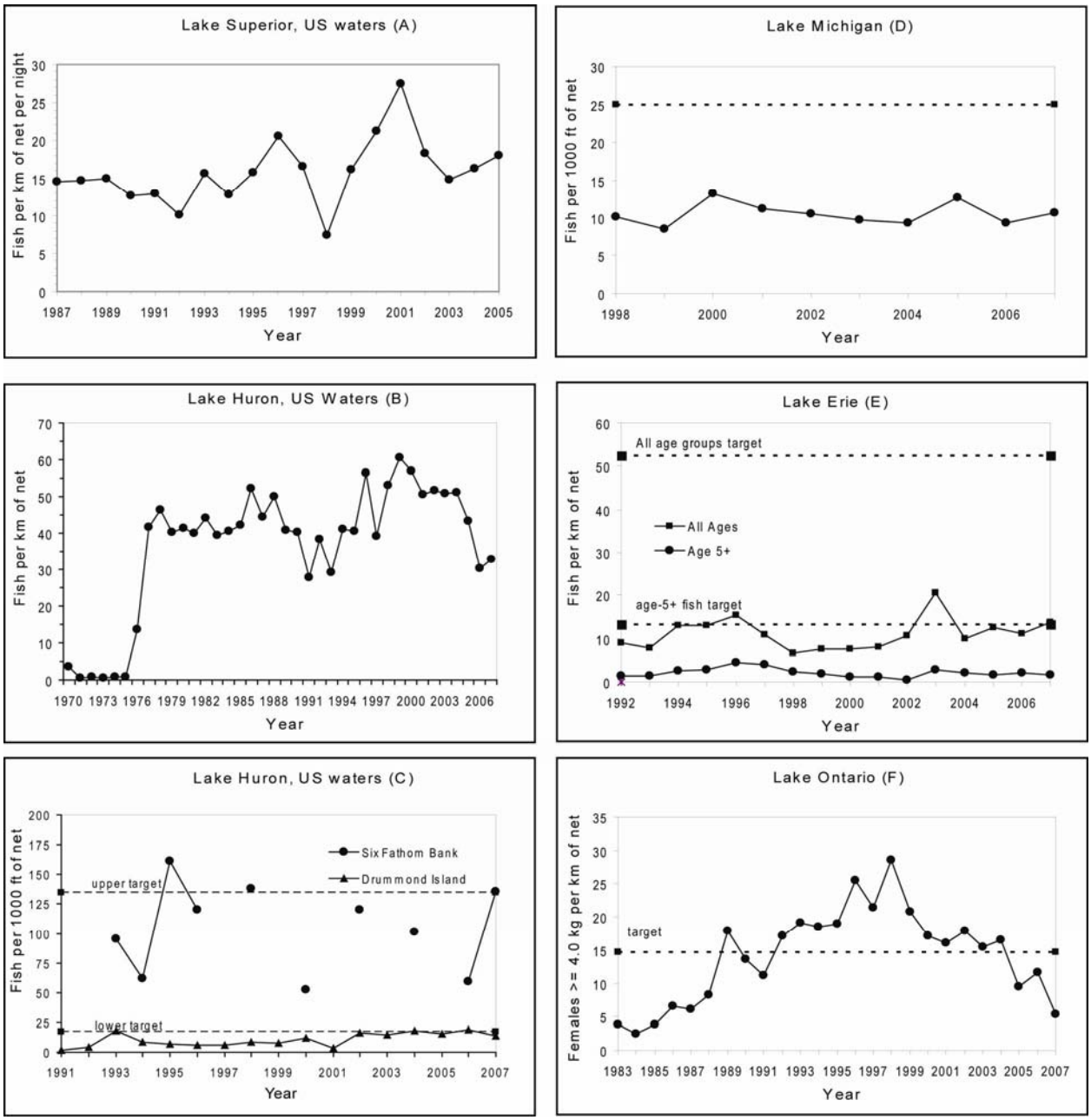
List of Figures

Figure 1. Relative abundance of lake trout in the Great Lakes.
The measurements reported vary from lake to lake, as shown on the vertical scale, and comparisons among lakes may be misleading. Overall trends over time provide information on relative abundances.
Source: Data sources are from biological assessments conducted cooperatively by state, federal, tribal and provincial agencies, and are largely contained in non-peered reviewed reports to the Great Lakes Fishery Commission, Lake Committees.

Last Updated

State of the Lakes Ecosystem Conference (SOLEC) 2008



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