STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-8

Study No.: 230451 **Title:** Assessment of lake trout stocks in Lake Huron

Period Covered: October 1, 2006 to September 30, 2007

Study Objective: To determine such stock parameters as: diet; maturity; condition and growth indices; mortality rates from fishing, lamprey, and natural causes; natural recruitment rates, movement between management units, and to compare performance of different strains and sizes of stocked lake trout. To use the parameters to help measure progress toward the lake trout rehabilitation goal and to help evaluate management options.

Summary: All job requirements for 2007 were met. This was the fourth year since we implemented a new design for the spring gillnetting survey. The results continued to confirm changes in lake trout depth distribution which, until now, have not been considered in developing fishery independent abundance indices for lake trout in Lake Huron. This was also the fourth year since we implemented a modified design for the summer bottom-trawl survey. The results continued to confirm seasonal and bathymetric changes in Thunder Bay residency of age-0 wild lake trout. We started in 2006 to supply 50 whole-body lake trout samples collected during our fall gillnetting survey of spawning lake trout to the EPA for contaminants analyses. The ongoing challenge in assessing Lake Huron lake trout stocks is to improve the statistics of lake trout annual abundance indices based on findings from the recent new survey designs, and to improve empirical evidence of the status of juvenile lake trout growth and survival. Age-1 mortality of hatchery origin lake trout has become a central focus in the assessment modeling and fishery management in 1836 treaty waters and Lake Huron main basin as a whole,

Findings: Jobs 1 through 5 were scheduled for 2006-07, and progress is reported below.

Job 1. Title: Fish assessment gill nets during spring.–The survey in 2007 maintained the same design we implemented in 2004, and further refined in 2005. There were 12 fixed stations in U.S. waters of Lake Huron, and four depth strata within each station. The exact start depth (where we began setting each gillnet) within each stratum was determined using a random number generator. The new design allowed us to adequately cover the depth range of lake trout distribution and will allow for better determination of lake trout abundance.

In 2007, we began netting in the first week of May, one week earlier than previous years. This change gave us a wider window of opportunity to conduct the survey during the best weather conditions for each of the 12 survey stations. Catch rate is apparently improved in comparison with 2006, and we believe the 2007 catch rates more closely represented status of lake trout stocks in all management units than the catch rates in 2006. We will continue to start the annual survey in late April or first week of May whenever the weather permits, as is done in Lakes Michigan and Superior in our future surveys. In 2007, we also continued to use Reynolds Reef to represent the station that had been represented by Spectacle Reef in 2005 and all earlier years. Catch rates at Reynolds Reef this year were similar as in 2006, and the results further supported our decision to maintain a gillnet station at Reynolds Reef in future surveys.

Job 2. Title: Fish fall assessment gill nets as called for to evaluate spawning developments.–Our recent refinement of the objectives for conducting a long-term index survey of spawning lake

trout was reported in 2006. The primary objectives include measuring abundance, age composition, and the proportion of the spawning stock composed of wild fish. The secondary objective includes monitoring thiamine concentration of lake trout eggs. Starting in 2006, we also had an obligation to supply 50 whole-body lake trout each year for EPA to analyze contaminant concentrations in lake trout tissues. From the results of 2005 and 2006, Grass Island Reef can be added in our list of primary spawning reefs. Catch rate was 57 per 1000 ft in that reef and most of the spawning lake trout were 8 years old. Sulfur Island is also a hopeful primary reef where catch rates were 33–46 per 1000 ft. Previously, our list of primary reefs (those regularly occupied by significant numbers of lake trout in spawning condition) only included Cement Plant North, Cement Plant South, Kiln Pile, and Mischley Reef. However, to date only these latter four reefs appear to host significant numbers of wild lake trout (lacking fin clips).

Job 3. Title: Analysis of data and coordination of interagency research, management, and planning.–Coded-wire tag returns and sea lamprey wounding rates were reported to the Lake Huron Technical Committee members and other relevant agencies.

The survey continued to face two major challenges. The first was the decline in catch rates for fish of ages 2 through 4 during the recent years, and catch rate for fish of age 5-6 also started to decline. We did not conduct a summer gill netting survey in 2007. We reported our 2006 efforts and results to the Lake Huron Technical Committee. Various experiences from other agencies and from Lake Superior in particular, suggested that monitoring indices of juvenile lake trout should be conducted in middle or late summer. The second challenge was that the current design of the spring survey has yet to be fully considered with respect to the estimation of annual abundance statistics for lake trout. We have reported on the new design to Lake Huron Technical Committee. The results from the past four years suggested that the new design, while better representing lake trout distribution and abundance, may also help to address issues such as changes in depth range covered and changes in fishing power (gillnet length) in the previous years' survey. Modification of the statistical model for annual abundance indices will be a high priority task over the next year.

The two challenges outlined here have close connection with each other. Improvement of the statistics of annual abundance indices will directly influence the performance of statistical catch at age (SCAA) models that synthesize all fishery and survey data in assessment of lake trout stocks in Lake Huron. Among many other agencies, we have led ongoing SCAA modeling efforts aimed at better estimating age-1 mortality of hatchery-origin lake trout stocked in Lake Huron. This issue has become the central focus of fishery management in 1836 treaty waters and Lake Huron main basin as a whole.

Job 4. Title: Conduct annual trawl surveys for age-0 lake trout.–The summer bottom-trawl survey in 2007 further expanded the design implemented in 2004 through 2006. We started the survey and caught age-0 lake trout in middle of July. The 2007 results further demonstrated that the highest catches of age-0 lake trout were in late July and in water deeper than 80 ft. After early August, the catch decreases to near zero. We have generated a detailed hypothesis that habitat use of age-0 lake trout is a function of temperature, dissolved oxygen, and the structure of the benthic fish community.

Job 5. Title: Write annual performance report.–This progress report was completed as scheduled.

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