STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-7

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

Period Covered: October 1, 2005 to September 30, 2006

Study Objective: To estimate stock parameters for lake trout in Lake Huron based on surveys.

Summary: All job requirements for 2006 were met. This was the third year we implemented a new design for the spring gillnetting survey. The result continued to confirm changes in the lake trout *Salvelinus namaycush* depth distribution which, until now, have not been considered in developing fishery independent abundance indices for lake trout in Lake Huron. We reported our findings to the Lake Huron Technical Committee and started to modify the current modeling estimates of lake trout abundance. Survey and stocking data were also used to suggest modification of model estimates of hatchery lake trout recruitment. From the spring survey in 2006, sea lamprey wounding rates became higher in southern Lake Huron than north-central and northern Lake Huron. We started to implement a fall survey design for developing a comparable time series of spawning lake trout abundance, age composition, and wild lake trout contribution to the spawning stock. In October 2005, two primary reefs and three inventory reefs were sampled using gill nets set at the bottom over night. Catch rate was 38 fish per 1,000 ft, with average age of 8.2 years. We estimated that the percentage of naturally reproduced lake trout was 8.7%. This was also the third year we implemented a new design for the summer bottom trawl survey. Unlike the last two years, however, we did not catch any age-0 lake trout from Thunder Bay area in 2006. We started to use a new "SBE 39" bathythermograph to record temperature profiles during the survey to better implement the survey design and allow analysis of our findings with respect to temperature regimes.

Findings: Jobs 1 through 5 were scheduled for 2005-06, and progress is reported below.

Job 1. Title: Spring assessment using gillnets.–The survey in 2006 maintained the same design that was implemented in 2005. There were 12 fixed stations in U.S. water 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. Until now, lake trout abundance indices have not considered changes in depth over time. We reported the new design and our findings in the past three years to the Lake Huron Technical Committee, and will cooperate with the Quantitative Fisheries Center at Michigan State University in modifying current models for lake trout abundance indices.

The survey continued to face three major challenges. The first was that weather conditions became more variable. In 2006, undesirable weather conditions and algae slime substantially influenced catch rates in the area of MH3. We discussed these changes in climate conditions over the past years, and decided to start future surveys in late April as is done in Lakes Michigan and Superior when weather conditions are favorable. Starting the survey one or two weeks earlier will give a wider window of opportunity to conduct the survey, at the best weather conditions, for each of the 12 survey stations. The second challenge was the near zero catch rate at the Spectacle Reef station during the past years. We conducted experimental gill netting at nearby Reynolds

Reef in 2006. Catch rates were higher and we believe they are more representative of the area. We decided to continue to set gillnets at Reynolds Reef in future surveys. The third challenge 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 conducted experimental summer gill netting in 2006, aimed at finding young lake trout in much deeper water (300—400 ft). We caught adult lean lake trout in these deeper waters, which altered our understanding of the normal depth distribution of adult lake trout, but we still did not improve catch rates of young lake trout. We reported our efforts and results to the Lake Huron Technical Committee. Declines in catchability for young lake trout and declines in survival of young lake trout were both likely to occur under prevailing conditions of high adult lake trout stock biomass. This will demand close attention in our future survey and assessment modeling.

Job 2. Title: Fall assessment gill netting.–A major effort was taken to develop a protocol for assessing spawning lake trout, with the aim of implementing a long term index survey of spawning lake trout, measuring abundance, age composition, and proportion of the spawning stock composed of wild fish. The secondary objective of the fall assessment is to monitor thiamine concentration of lake trout eggs, and contaminants concentrations in lake trout tissues.

In October 2005, two primary reefs and three inventory reefs were sampled using bottom set gill nets. The two primary reefs were Cement Plant South, and Cement Plant North. The inventory reefs were Partridge Point, Sulfur Island, and Sulfur Island Northeast Point. The gillnetting effort at each reef was 300 ft. The nets were 6 ft deep, and included mesh sizes of 4.5-5.5 inch with graded increment of 0.5 inch. All nets were set over night on the bottom across depth contours. Total catch was 57 lake trout, and catch rate was 38 fish per 1000 ft. These spawning lake trout were 5-12 years old, and the average age was 8.16 years. There were five unclipped fish, so the likely percentage of wild lake trout was 8.7%. Egg samples were collected and sent to the USGS Science Center to determine thiamine concentrations.

Job 3. Title: Analysis of data and coordination of interagency research, management, and planning.–Stock assessment synthesis including statistical catch-at-age modeling, inter-annual growth of multiple cohorts, size-specific body condition, and diet composition were reported in the annual report for Study 230522. We led the lake trout subsection for "The State of Lake Huron 2004", and presented the major findings in the State of the Lake Symposium, Great Lakes Fisheries Commission. Our survey data and lake trout stocking data were used by the Technical Fishery Committee, Modeling Subcommittee, in discussing recruitment of hatchery-origin lake trout in Lake Huron. The discussion may lead to substantial modification of modeled lake trout number at ages and recommended total available catch.

A total of 451 lake trout were caught during the 2006 spring gillnetting survey, and the catch rate was 9.6 per 305 m of net. There were 13 non-clipped lake trout, so the likely percentage of wild lake trout (2.8%) was still negligible. A total of 50 lake trout carried coded-wire tags (CWT). These CWT samples and related catch and effort information will be sent to the USGS Great Lakes Science Center for a cooperative study on lake trout movement. Sea lamprey wounding rates for lake trout larger than 533 mm were 7.4%. In northern, north-central, and southern Lake Huron, the wounding rates were 6.7%, 3.9%, and 10.4% respectively. The wounding rate (1.6%) for lake trout smaller than 533 mm was negligible. We reported to the Great Lakes Fisheries Commission that wounding rates in southern Lake Huron were much higher than the previous year and higher than other areas of Lake Huron.

Job 4. Title: Conduct annual trawl surveys for age-0 lake trout.–The summer bottom trawl survey in 2006 maintained the same design as implemented in 2004 and 2005. Basically, rather than focus on the "best" depth of 18.3, 21.3, and 24.4 m in the month of August or early September,

the survey in the recent three years covered much wider depth strata from 12.2 to 36.6 m in late July and early August. Unlike in the two previous years when age-0 wild lake trout were caught (mostly from July and deeper water), the survey in 2006 failed to catch any age-0 lake trout.

This year, we started to use a new "SBE 39" bathythermograph to record temperature profiles during the survey. We reported our new design and findings to Lake Huron Technical Committee. Various hypotheses about changes in survival and seasonal distribution of age-0 lake trout were discussed. The discussion and more analyses of available data will be used to direct further improvements of the survey design, aiming at the development of a comparable time series for wild lake trout recruitments.

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

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