STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-80-R-16

Study No.: 230557 **Title:** Comprehensive analysis and improvement of Michigan statewide angler survey data

Period Covered: October 1, 2014 to September 30, 2015

Study Objectives: 1) Examine and define the objectives of angler surveys at a statewide scale; 2) evaluate and improve efficiency of angler survey design and estimation techniques; 3) develop methods to improve the spatial and temporal efficiency of estimates and data use; and 4) develop conceptual and quantitative models that describe fishery dynamics and aid in management decision-making.

Summary: During this year of the study, we developed a new catch estimator based on a hierarchical (or mixed effects) or small-area statistical model. We also developed Bayesian nonparametric Gaussian process models for describing the effort dynamics of Lake Michigan and Lake Huron.

Findings: Jobs 5, 6, and 7 were scheduled for 2014-15, and progress is reported below.

Job 5. Develop methods.−Developed a new catch estimator based on a hierarchical (or mixed effects) or small-area statistical model. This new catch estimator models the daily catch jointly rather than treat them separately and can use information from days with more interviews to improve estimates for days with a few or no interviews. The new catch estimator is expected to produce more stable and precise creel catch estimates for the Great Lakes and inland creel surveys.

Job 6. Develop quantitative models that describe fishery dynamics and aid in management decision-making.−We developed Bayesian nonparametric Gaussian process models for describing the effort dynamics of lakes Michigan and Lake Huron.

Job 7. Prepare progress report and publish findings.−This performance report was completed as scheduled. In addition, a project summary was prepared (Attachment 1).

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Date: September 30, 2015

Comprehensive Analysis and Improvement of Michigan Statewide Angler Survey Data

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Background

The Great Lakes and inland waters of Michigan support outstanding recreational fishing opportunities. Fisheries Division has been conducting creel surveys regularly for decades to monitor and manage our fisheries. Creel or angler surveys collect recreational angler fishing data. Creel surveys involve in making counts of anglers and conducting interviews of anglers about their fishing trips, catch, and release (Photo 1). A formal angler survey program has also been established to ensure that surveys are designed and implemented in a consistent and statistically appropriate manner, ensuring the quality and comparability of survey results. These data are used to estimate fishing effort and harvest, data essential for fisheries management.

Photo 1. Fisheries Division creel census clerk interviewing an angler.

Creel census surveys are costly to implement and time consuming to conduct. Creel surveys can be very complicated due to the complex and highly dispersed nature of the anglers they study and the nearly endless possible choices that need to be made in the design and data analysis. The design features and analysis procedures for creel results affect the overall costs and quality of the surveys so the methods need to be carefully examined and refined regularly to be cost-effective.

In the past, angler surveys were targeted to individual waters or sited and were poorly designed to examine statewide or regional fisheries. For example, Great Lake angler surveys have over 30 years of data with good spatial coverage. The survey design was consistent among years and across survey sites but the data were only reported for individual Great Lake ports, not a whole region or lake. Additionally, data from adjacent ports (or regions) that may show similar results and trends were not combined to improve the efficiency of the survey design or to make better fisheries management decisions.

The objectives of this study are to develop: 1) appropriate creel survey methods and ensure the highest quality, cost-effectiveness, and comparability of the surveys at a state-wide scale; 2) new angler survey methods that will improve the effectiveness of surveys and data use; and 3) techniques that better describe our fisheries and aid fisheries managers to improve fisheries management decisions.

Recent study results

- A new software packages for creel survey design and scheduling, estimation, and mobile device data entry have been developed and implemented. These software packages have greatly automated, streamlined, and improved the survey design and scheduling, and data analysis of the Statewide Angler Survey Program, and have also led to considerable cost and time savings along with improved efficiency in the program.

- We have completed examining our sample design and analysis methods for Great Lakes angler surveys. Knowing the total catch and amount of fishing effort from creel surveys are essential for fisheries management decisions. However, quality of angler survey estimates can be greatly affected by survey design and analyses used. We have completed evaluating the effects of potential sources of bias on our standard creel catch estimation methods and will be making adjustments to our methods at critical locations.
- Excessive numbers of zero angler catch can cause large problems for fish population analysis and management. We evaluated a range of methods for analyzing the angler catch data of Walleye, Chinook Salmon, and Lake Trout in Lake Huron. We have identified better ways to handle high zero and highly variable angler catch information and identified important factors affecting catch rate of these three species in Lake Huron.
- We conducted detailed statistical analyses Great Lakes creel data that will allow us to improve angler catch and effort estimates, make informed estimates for sites without surveys, and allow us to make future predictions of angler catch and effort.