STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-16

Study No.: 230484 **Title**: Yellow Perch and nearshore fish community dynamics in Michigan waters of Lake Michigan.

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

Study Objectives: (1) To summarize pertinent existing nearshore Lake Michigan fish population data from state, federal, commercial, sport, university, and private sources; (2) To conduct assessment netting to establish baseline data and evaluate population dynamic parameters for Yellow Perch and other recreationally, commercially, and ecologically important fish populations in Michigan waters; (3) To oversee a program of biological data collection for sport-caught Yellow Perch, Smallmouth Bass, and Walleye; and (4) To develop information and mathematical models from these data that will allow managers to predict, with some predetermined level of certainty, the outcome of various management strategies related to Lake Michigan nearshore fish populations.

Summary: Gill-net assessments were conducted at eight eastern Lake Michigan ports (Charlevoix, Elk Rapids, Leland, Arcadia/Frankfort, Grand Haven, Saugatuck, South Haven, and St. Joseph) in April–June, 2015, and trawling was conducted in August–September 2015 at Petoskey, Pentwater, Grand Haven, and South Haven. Smallmouth Bass assessment work (trap-netting and tagging operations) was completed in the Beaver Island Archipelago, near Waugoshance Point, and in Grand Traverse Bay, and recreational catch information was collected and summarized in coordination with Study 230499. Assessment results were summarized for various Michigan Department of Natural Resources (MDNR) and external committee reports and publications. Additional analysis of these data is ongoing.

Findings: Jobs 1–6 were scheduled for 2014-15, and progress is reported below.

Job 1. Survey design and coordination.–Gill-net and trawl assessments were conducted according to established multi-agency lakewide assessment protocols (Schneeberger et al. 1998; see also Makauskas and Clapp 2015, Job 6). Coordination activities included attendance at Lake Michigan Yellow Perch Task Group (YPTG) meetings, communication with task group members, and communication with other MDNR research stations and management unit offices.

Additional targeted Smallmouth Bass assessment was conducted in coordination with Central Michigan University (CMU) and the MDNR Central Lake Michigan Management Unit. Survey design was consistent with long-term and historical collections at Waugoshance Point and in the Beaver Island Archipelago. In 2014 and 2015, additional sampling sites were added in Grand Traverse Bay, following similar protocols.

Job 2. Conduct surveys and process samples.–

Spring Assessment Netting—Gill-net assessments were conducted at eight eastern Lake Michigan ports (Charlevoix, Elk Rapids, Leland, Arcadia/Frankfort, Grand Haven, Saugatuck, South Haven, and St. Joseph) in April–June, 2015. Sixteen nets (each net 1,000 feet long, 1.5 to 6.0" stretched nylon mesh or monofilament mesh, 0.5" intervals) were fished overnight at each port. Nets were fished across the 30-, 50-, 100-, and 150-foot depth contours. Subsamples of fish from

spring assessments were returned to the Charlevoix Fisheries Research Station (CFRS) for analysis of age and growth, fecundity, body composition (percent water, gonadosomatic index), and diet. Processing of samples and data analysis is ongoing. The 2015 assessment marked the second season for evaluation of monofilament mesh as a potential replacement for traditional multifilament nylon mesh nets. Comparison of species-specific catch rates between net types is ongoing.

Summer Trawl Assessments—Trawling was conducted in August–September, 2015 at Petoskey, Pentwater, Grand Haven, and South Haven. Nearshore (0–7 m depth) samples consisted of 12, 10-minute trawls at each port, on each of two successive nights. Six trawls were conducted prior to sunset and six were conducted after dark on each sampling date. Trawling in depths from 10 to 35 m was conducted from the S/V *Steelhead*. Additional experimental assessments of nearshore young-of-year (YOY) fish abundance, initiated in 2007, were continued in 2015. Micromesh gill nets (12.5-16.0 mm stretched mesh, N=2 sets per site) were set at sites where bottom trawling occurred. Analysis of data describing Yellow Perch recruitment from summer assessments is ongoing; this and additional data analyses will be presented in future reports.

Smallmouth Bass assessments—Smallmouth Bass assessments were completed in the Beaver Island Archipelago (8 sites), near Waugoshance Point (6 sites), and in Grand Traverse Bay (5 sites). Trap nets (1.5m wide x 2.5m long x 0.5m deep; 4cm mesh) were set at each site 1–4 m deep; 30 m leads were set perpendicular to shore starting in 0.25–0.5 m deep near shore water. Nets were checked every 1–2 days. All fish caught in the net were identified, counted, and measured (TL, mm). Total length (TL, mm) and weight (g) of all Smallmouth Bass was collected. All Smallmouth Bass larger than 300 mm were given a jaw tag with a unique identifier to track movement and growth. Scale samples and anal spine clips used for aging were also taken from the tagged Smallmouth Bass, and scale samples were taken from Smallmouth Bass that were too small to tag. The clipped anal spine also serves to identify recaptures in the case of lost tags. When possible, young-of-year Smallmouth Bass were sampled with fyke nets. During 2015, habitat data were also collected following protocols described in Nevorski (2015).

Collection and analysis of biological data from sport-caught Yellow Perch, Smallmouth Bass, and Walleye—Yellow Perch length and age data were collected in 1985–1992 as part of the Lake Michigan creel survey program (previously Study 230427, current Study 230499). No data were collected from 1993–1995. From 1996–2009, length data were collected from the recreational creel surveys at sites between New Buffalo and Grand Traverse Bay. At a given site, length data were collected from up to 100 angler-caught Yellow Perch per month. In 2010, biodata collection protocols for recreationally-harvested Lake Michigan Yellow Perch were modified to match those in other areas of the Great Lakes; both length and scale samples (for later age determination) were collected from a subsample of harvested Yellow Perch. These protocols were continued for Lake Michigan sites in 2015. Processing of Yellow Perch biological samples from the creel survey is ongoing.

Aging samples have not typically been collected from creel-sampled Smallmouth Bass or Walleye on Lake Michigan, outside of the bays de Noc. We are currently in the process of evaluating sample collection protocols for these species at Lake Michigan ports outside of bays de Noc.

Job 3. <u>Manage data and maintain database</u>.–A relational database was developed and refined for handling vessel survey data from CFRS assessment activities. Data from 2015 nearshore assessments have been, or are in the process of being, entered into the standard database. Data from Smallmouth Bass assessment activities is being housed at CMU with CFRS staff are providing consultation, assistance, and oversight in management of these data.

Job 4. Analyze data, modeling.–Analysis of survey data is ongoing; analyses from spring gill-net surveys include determination of adult Yellow Perch catch-per-unit-effort (CPE), sex ratios, age structure, and size-at-age. Annual YOY Yellow Perch CPE in trawl surveys is also calculated, as an index of year class strength. These analyses will be presented in the annual report of the YPTG to the Lake Michigan Committee (see Makauskas and Clapp 2015). Smallmouth Bass data are summarized as adult CPE, young-of-year CPE, population size, and individual growth and condition, and are presented in progress reports (see Galarowicz 2014, Nevorski 2014) and in management briefings (e.g., Double Crested Cormorant management; USDA 2011)

Job 5. Write annual performance report.–This annual progress report was completed as scheduled. In addition, a project summary was prepared (Attachment 1).

Job 6. Write other reports.–Yellow Perch data from CFRS assessments were summarized and presented at the Lake Michigan Committee meeting in Ypsilanti, Michigan, and in the following report:

Makauskas, D., and D. Clapp. 2015. Status of Yellow Perch in Lake Michigan, 2012-14. Report to the Lake Michigan Committee, Ypsilanti, Michigan.

Results of Smallmouth Bass assessments (through 2013) reported in 2014-15 include the following reports:

Galarowicz, T. 2014. Smallmouth Bass population dynamics in the Beaver Archipelago and at Waugoshance Point. Final report to the Michigan Department of Natural Resources, Lansing.

Nevorski, K. 2014. Smallmouth Bass movement and mark-recapture study in the Beaver Island Archipelago and at Waugoshance Point. Progress report to the Michigan Department of Natural Resources, Charlevoix.

Data were also provided for a multi-lake analysis of Great Lakes nearshore fish communities (Fetzer et al. *In review.* "Spatial and temporal dynamics of coastal fish communities in the Great Lakes"), to be submitted for publication in 2016.

Literature Cited:

Nevorski, K. C. 2015. Relationships between Smallmouth Bass (*Micropterus dolomieu*) distribution and habitat in Lake Michigan using multi-scale modeling. Master's thesis. Central Michigan University, Mt. Pleasant.

Schneeberger, P., M. Toneys, R. Elliott, J. Jonas, D. Clapp, R. Hess, and D. Passino-Reader. 1998. Lakewide assessment plan for Lake Michigan fish communities. Lake Michigan Technical Committee Report. Great Lakes Fishery Commission, Ann Arbor, Michigan. Available: http://www.glfc.org/pubs/SpecialPubs/lwasses01.pdf (September 2014).

United States Department of Agriculture. 2011. Final environmental assessment: Double-Crested Cormorant damage management in Michigan.

Prepared by: David F. Clapp.
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Yellow Perch and Nearshore Fish Community Dynamics in Michigan Waters of Lake Michigan

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Background

Yellow Perch are an important component of Michigan's sport fishery in Lake Michigan, and play an equally important role in the Lake Michigan biological community. They are a native species that play an important role in energy cycling and transfer, acting as both prey and predators, especially in nearshore waters. Between 1985 and 2014, from approximately 300,000 to 3,000,000 Yellow Perch were caught by Michigan anglers annually, more than any of the other species tabulated by the Fisheries Division's creel census program. While yellow perch are an important component of the Lake Michigan sport fishery, numerous other recreationally, commercially, and ecologically important nearshore species require evaluation and assessment. These include Walleye, Smallmouth Bass, and increasingly numerous exotic invasive species that can have significant effects on sport fisheries in Michigan waters (e.g., Round Gobies).

The objectives of this study are: 1) to assess yellow perch and other recreationally, commercially, and ecologically important fish populations in Michigan waters; 2) to collect and analyze biological data for sport-caught yellow perch, smallmouth bass, and walleye; and 3) to develop decision support tools that will allow managers to forecast the outcome of various management strategies on Lake Michigan nearshore fish populations.

Fisheries Division takes a multi-pronged approach to addressing the study objectives. The R/V (Research Vessel) *Steelhead* sets gill nets to collect yearling and older Yellow Perch at three southern Lake Michigan ports (Grand Haven, Saugatuck, South Haven) and three northern Lake Michigan ports (Arcadia, Leland, Charlevoix) in April-May. Trawling for young-of-year (fingerling) yellow perch is conducted by Charlevoix Fisheries Research Station personnel in August and September from the R/V *Steelhead* and from smaller boats. Ten-minute trawl tows are made at depths from 3 to 100 feet at each of the ports sampled in spring. Trawl sampling gives us our best early indication of year-class strength (successful reproduction in a given year) and provides us with important information on the overall fish community including the presence of exotic species (Photo 1). Smallmouth Bass are sampled near Beaver Island, around Waugoshance Point, and in Grand Traverse Bay using trap nets and tagged for further analysis (Photo 2). Returns of tagged Smallmouth Bass allow us to measure mortality and movement rates for these populations. Finally, collections of Yellow Perch, Smallmouth Bass, and Walleye from the Lake Michigan creel census provide information on how management actions are influencing Lake Michigan nearshore fisheries.

Photo 1. Trawl collections provide an early indication of annual yellow perch reproductive success.

Key study results

- Yellow Perch adult assessment (spring gill nets): Lake Michigan Yellow Perch numbers peaked in the mid- 1980s to early 1990s, followed by significant declines. In recent years, increases in assessment catches of adult Yellow Perch have resulted from recruitment of the 1998, 2002, 2005, and 2010 year classes, with 4-year old (9") yellow perch most common in the recreational catch.
- Yellow Perch Young-of-the-Year (YOY) assessment: Data collected in trawl surveys indicate that the last excellent production of young-of-year Yellow Perch occurred in many areas of Lake Michigan in 2010. Recent observations consistently show reduced levels of young-of-year Yellow Perch and indices of young Yellow Perch production have been at low levels in nearly all Lake Michigan jurisdictions since 2011. However, early results from 2015 surveys indicate that reproduction this year may be more similar to 2010 than the period from 2011 to 14.

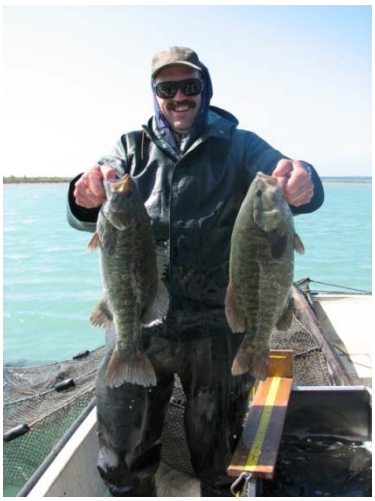

Photo 2. Two tagged smallmouth bass ready to be released.

- Yellow Perch harvest: Recreational harvest of Yellow Perch in 2014 was approximately 150,000 fish in Michigan waters and approximately 475,000 fish lakewide. In both cases, these numbers are about half the average annual harvest for the period 2005-2014. Commercial Yellow Perch fishing remains closed on Lake Michigan, except for Green Bay waters.
- Smallmouth Bass results: Assessment catches of Smallmouth Bass at Beaver Island Archipelago sites remains similar to 1970's levels before the establishment of large populations of Double Crested Cormorants in this area. Average population size of adult Smallmouth Bass at the Garden Harbor index site has fluctuated between 700 and 300 fish, and has exceeded the target goal of 600 adult Smallmouth Bass in most recent years. Analysis of collections from Waugoshance Point and Grand Traverse Bay sites is currently in process.

Detailed Study Information

Additional detailed study information is available at http://www.michigan.gov/dnr/0,4570,7-153-10364_52259_19056-333302--,00.html.