STUDY PERFORMANCE REPORT

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

Study No.: 230747 **Title:** Assessment of nearshore fish communities in northern Lake Michigan and southern Lake Superior

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

Study Objectives: 1) To provide higher resolution data on trends in Bays de Noc (BDN) fish populations; 2) To provide indices of adult abundance, year class strength, sex, and age structure of Walleye *Zander vitreus* and Yellow Perch *Perca flavescens* in BDN (and other areas of northern Lake Michigan when possible), as well as samples of juvenile walleye to examine for oxytetracycline (hatchery) marks; and; 3) To provide periodic data on fish community composition for under-sampled nearshore areas of northern Lake Michigan and southern Lake Superior.

Summary: The survey design for gill-net and trawl sampling for fall 2015 was the same used in previous years. In fall 2015, we set experimental-mesh nets at 52 sites in northern Lake Michigan, 16 of which were in Little Bay de Noc (LBDN), 24 in Big Bay de Noc (BBDN), six near Menominee, and six near Cedar River. We also set the same gill nets at six sites in two Lake Superior bays (Keweenaw and Huron bays). We trawled in previously established sampling areas in BDN and near Menominee and Cedar River. Gill-net catch-per-unit-effort (CPE) values for game fishes were summarized and compared to values for prior years at Lake Michigan locations. Trawl samples at all locations were dominated by Round Goby *Neogobius melanostomus*. Population abundance and age and growth data on Yellow Perch, Walleye, Smallmouth Bass *Micropterus dolomieu*, Northern Pike *Esox lucius*, and Lake Sturgeon *Acipenser fulvescens* were summarized and provided to various agencies, universities, and individuals.

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

Job 1. Survey design and coordination.–The survey design for gill-net and trawl sampling was the same as the one described in a previous progress report (e.g., Zorn 2013). We continued to incorporate micromesh (fine mesh) gill nets into our gill-net sampling effort to provide broader coverage and a more effective means of sampling young-of-year Yellow Perch than our existing trawl surveys. We accomplished this by attaching 10-foot by 6-foot panels of 0.5-in and 0.625-in stretch monofilament mesh to each gang of experimental mesh gill nets that were fished on the entire survey. Micromesh gill nets are used in other jurisdictions of Lake Michigan to provide an index of Yellow Perch reproductive success, and our survey data will provide comparable data for nearshore waters of northern Lake Michigan.

To provide continuity and aid in the transition from MDNR Fisheries Division gill-net and trawl surveys in BDN that began in 1988, Marquette Fisheries Research Station personnel sampled fish in August and September 2012 in BDN using overnight sets (four per bay per month) of gill nets whose dimensions and configurations were identical to those described by Schneeberger (2000). Data collected will be used for comparisons between previous BDN assessment studies (Schneeberger 2000; Zorn and Schneeberger 2011) and the current fish community assessment.

Job 2. Conduct surveys and process samples.–In August and September 2015, personnel from the Marquette Fisheries Station and the Northern Lake Michigan Management Unit surveyed nearshore waters of Lake Michigan. We sampled eight sets of two sites (16 sites total) using experimental mesh gill nets in LBDN, eight sets of three sites (24 total) in BBDN, six sites at

Menominee, and six sites at Cedar River. The survey is ongoing at the time of this writing, and all locations have not yet been sampled. Prior to the Lake Michigan gill netting, we set the same gill nets at six sites in two Lake Superior bays (Keweenaw and Huron bays). At each site, we set a gang of two 320-foot long experimental-mesh gill nets composed of 40-foot by 6-foot panels of experimental monofilament mesh having 1-, 1.5-, 2-, 2.5-, 3-, 3.5-, 4-, and 5-inch stretch mesh. Attached to each gang was 20-foot micromesh gill net as mentioned under Job 1.

We obtained aging structures from all Walleyes, Smallmouth Bass, and Northern Pike collected and a sub-sample of Yellow Perch. We examined Walleye diets in the field. We saved otoliths from all Lake Michigan Walleyes that died in gill nets, as part of a collaborative project with the UWSP to compare dorsal spines and otoliths as aging structures for walleyes. We are also providing samples of Eurasian Ruffe *Gymnocephalus cernua* to the University of Toledo, Lake Sturgeon to the USFWS, and Walleye to the U.S. EPA.

We completed 10, 10-minute trawl tows in Lake Michigan at Cedar River, 10 in LBDN near Kipling, and 10 in Ogontz Bay of BBDN in August 2015. Ten tows are also scheduled for Lake Michigan near Menominee.

Job 3. Manage data and maintain database.–All data from the 2014 fall assessment survey were entered into a relational database. Entry of data from the 2015 fall survey is ongoing.

Job 4. Analyze data.–Data from the 2014 survey were summarized and compared to that of prior years, with a brief summary being developed for public distribution. Data specific to the Walleye in LBDN were not used to update the Little Bay de Noc Walleye stocking barometer (Michigan DNR 2012) due to concerns about effects of potential illegal Walleye harvest on survey catch data.

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

Job 6. Write other reports.–Data from the 2014 fall assessment were summarized and contributed to Michigan DNR's cormorant control evaluation, and other Lake Michigan Technical Committee products. Data on Eurasian Ruffe, Yellow Perch, Walleye, Smallmouth Bass, and Lake Sturgeon were provided to projects and evaluations associated with these species. In addition, the following summaries of study data were developed for public distribution (Attachment 2):

- Zorn, T., and D. Kramer. Fish community status in Little and Big bays de Noc—2015 update.

Literature cited:

Michigan DNR. 2012. Marquette Fisheries Research Station (T. G. Zorn) and Northern Lake Michigan Management Unit. Walleye management strategy for Little Bay de Noc, Lake Michigan. Michigan DNR Fisheries Division report at: http://www.michigan.gov/documents/dnr/LBDN_walleye_management_strategy-_Jul2012_FINAL_391363_7.pdf

Schneeberger, P. J. 2000. Population dynamics of contemporary yellow perch and walleye stocks in Michigan waters of Green Bay, Lake Michigan, 1988-96. Michigan Department of Natural Resources, Fisheries Research Report 2055, Ann Arbor.

Zorn, T. G. 2013. Assessment of nearshore fish communities in northern Lake Michigan. Annual progress report for study 230747, Project F-81-R-14, October 1, 2012 to September 30, 2013, Sport Fish Restoration Program. Michigan Department of Natural Resources, Fisheries Division, Lansing.

Zorn, T. G., and P. J. Schneeberger. 2011. Habitat and fish community changes in the Michigan waters of Green Bay 1988-2005. Michigan Department of Natural Resources, Fisheries Research Report 2096, Ann Arbor.

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Assessment of Nearshore Fish Communities in Northern Lake Michigan and Southern Lake Superior

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Background

Northern Green Bay (Michigan's portion of Green Bay) supports the largest recreational fishery in Michigan's Upper Peninsula (UP). In recognition of the importance of their fisheries, fish community sampling was initiated in Big and Little Bays de Noc by Fisheries Division in 1988.

Understanding and management of fish populations in the Bays de Noc (BDN) is complicated by many natural and man-made changes to this system. These include water quality changes, climatic variation/change, establishment of new invasive species, and fishery management activities (e.g., stocking). Over time, the fisheries data have been used to address these and other management questions, including several which require information on trends in game species abundance, reproduction of game species, and fish community composition.

In 2009, the survey was redesigned to provide fish abundance indices that were more accurate, precise, and robust across Michigan's nearshore waters of Green Bay. The survey continues to use multiple mesh sizes of gillnets and daytime trawling, but the amount of survey gear used and spatial coverage were increased (Photo 1). This survey provides accurate population indices, which are needed to address various fishery management issues which include the following: 1) setting harvest regulations for Yellow Perch and Walleye; 2) assessing abundance and natural reproduction of important game fishes including Walleye, Yellow Perch, Smallmouth Bass, Northern Pike, Lake Sturgeon, and others (Photo 2); 3) assessing changes in survival of key species (Yellow Perch) following cormorant control; 4) assessing abundance levels of invasive species (Eurasian Ruffe and Round Goby) and abundances of native species potentially affected these invaders; and 5) describing fish community changes in response to changing physical environment (water clarity and temperature along with other chemical factors). These data will also be used to address larger-scale Green Bay and Lake Michigan management issues. In 2015, the survey was extended to Lake Superior embayments and nearshore waters (<50 ft deep) as these areas are primary fishing areas of many sport anglers and no fish community information is available on them. The study also includes jaw tagging and monitoring of tagged Walleyes in Little Bay de Noc, which will enable ongoing monitoring of exploitation, survival, and movement of this important fish population at minimal cost.

Photo 1. Setting assessment gill nets.

Photo 2. Yellow Perch collected during Fisheries Division's survey efforts.

The objectives of this study are: 1) To provide data on trends in Bays de Noc fish populations; 2) To provide information on adult abundance, year class strength, sex, and age structure of Walleye and Yellow Perch in BDN (and other areas of northern Lake Michigan when possible), as well as samples of juvenile Walleye to examine for oxytetracycline (hatchery) marks; and 3) To provide periodic data on fish community composition for under-sampled nearshore areas of northern Lake Michigan and southern Lake Superior. Lake Michigan ports sampled include Naubinway, Manistique, Cedar River, and Menominee, and Lake Superior bays include Keweenaw and Huron Bays. This study provides sound biological data to support for fisheries decisions regarding fish stocking, sport fish regulations, fishery resource protection, and invasive species management, etc. in northern Lake Michigan and southern Lake Superior.

Recent key study results

Data from both surveys have shown major changes in the bays, particularly after colonization by zebra mussels and quagga mussels in the 1990s. For example, water clarity in BBDN has increased 65% between the early 1990s and 2010s. During this time in LBDN, abundance of forage fishes most commonly eaten by walleyes declined by 62%. Angler catches of walleyes in LBDN declined in summer, and angler reports of tagged fish showed the average distance of the catch location from the tagging site (Rapid River access site- northern LBDN) increased from less than 5 miles to more than 25 miles. In other words, where the average summer-caught walleye used to come from around Saunders Point (central LBDN), now it comes from waters outside of LBDN (about 10 miles south of Escanaba). Clearly, the bay ecosystems have changed and continue to change.

A total of 2,615 fish representing 30 species were captured in the 2014 gillnet survey (Photo 3). Catch rates of Walleye and Smallmouth Bass in assessment nets were down considerably from prior years, at or approaching the lowest levels since surveys began in 2009. Catch rates of Yellow Perch and Northern Pike were relatively high in LBDN and about average in BBDN. Temperatures at sampling locations along the bottom of the bay were generally colder than prior years, and may have affected catch rates for some game species, such as Walleye and Smallmouth Bass. The extent to which colder temperatures or other factors contributed to the low catches for these species is unclear. Catch rates of game fish in nearshore waters of Lake Michigan at Manistique and Naubinway were generally lower than those in the bay environments. Rates were similar between years, except that 2014 catch rate values at Manistique and Naubinway were lower for most species.

Photo 3. Fisheries assessment gear used for the 2014 gill-net survey.

A total of 177 fish representing four species were captured in the 2014 trawling survey. The forage fish community of Northern Green Bay has changed notably since 1989, when trawl surveys began. Round Goby began dominating the catch in 2001, and lower catches of several formerly common species (such as Trout-Perch, Johnny Darter, Spottail Shiner, and Yellow Perch) have been the norm since then. These changes likely reflect a combination of factors including competition among species, and changes in water clarity and quality; also the trawl's ability to catch each species as water conditions have changed.