Stock Assessment Review of Michigan's Lake Gogebic Walleye Fishery

QFC Technical Report T2016-03

Prepared for:
Michigan Department of Natural Resources Fisheries Division

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Introduction

In December 2015 the Michigan Department of Natural Resources (DNR) Fisheries Division invited Michigan State University's Quantitative Fisheries Center (QFC) to evaluate the current Lake Gogebic walleye fishery and provide future recommendations. A review was undertaken by Dr. Michael Jones and Alex Jensen between February and July 2016; this document provides a brief summary of the review and its findings. Dr. Jones and Mr. Jensen hosted an initial meeting with stakeholders, managers, and researchers on February 23, 2016, to hear concerns and perspectives regarding the status of the Lake Gogebic walleye fishery. Data collection, organization, and analysis were then conducted to evaluate trends in the walleye population, relative to similar lake systems, and identify recommendations. Harvest, abundance assessment, and mark-recapture data from the Michigan DNR and Great Lakes Indian Fish and Wildlife Commission (GLIFWC) were used to guide evaluation of the fishery. Final results were presented to stakeholders and researchers on July 7, 2016.

Broadly speaking, Lake Gogebic is a large, shallow water body, and is the largest lake in Michigan's Upper Peninsula. Although productivity is generally low, the lake is well mixed and contains sufficient dissolved oxygen levels throughout the water column. Lake Gogebic contains typical fish communities for the region, including walleye, northern pike, smallmouth bass, and yellow perch. Walleye represents a popular fishery in the lake, and has been historically managed using length-based fishing regulations along with bag limits and designated seasons. From 1995 to the winter of 2015, a maximum of five fish with a minimum length of 15 inches could be kept. More recently, these regulations were changed to allow up to two walleyes between 13 and 15 inches to be kept as part of an angler's daily possession limit.

Results and Discussion

The Lake Gogebic walleye population does not appear to show any pattern of low abundance relative to nearby lakes or decreasing abundance over time. The density of legal-sized fish, expressed as fish per acre, is approximately equal to or higher than three nearby lakes in the Upper Peninsula, and the adult abundance does not show any apparent decline since 1976 (Fig. 1; Hanchin 2011a; Hanchin 2011b). Variability in recruitment also has not shown any systematic trends, either positive or negative, over time, which suggests walleye production is relatively consistent on average but variable from year to year in the lake (Fig. 2), as is typical of natural walleye populations. Walleye were stocked in the 1970's and 1980's, and several stockings of forage fish occurred in the late 1980's and 1990's; however there was no evidence from assessments that these stocked walleye or forage fish had effects either on walleye growth or abundance, which is consistent with published findings for other natural lakes.

Although walleye overall mortality rates (including mortality due to fishing and to other natural causes) in the lake appear high, exploitation rates are not high. Separate studies found that anglers remove between 7.9% and 9.3% of legal-sized fish in any given year, and reported tribal spearing suggest the removal of another 3.3%. The

combined exploitation of approximately 12.6% is safely below average walleye exploitation rate by anglers alone among lakes surveyed in Michigan's Large Lake Program. However, separate analyses reported total walleye loss, as a function of both natural and exploitation morality, at 48%/year. Subtracting the estimated exploitation loss (12.6%) from this value yields 35.4% natural mortality; this represents a value higher than those observed in other walleye populations at similar latitudes. Annual natural mortality values of approximately 15% and 25% were observed for Lake Oneida and Lake Erie walleye populations, respectively, within the last decade (Jackson et al. 2010; Vandergoot 2014). It is possible that the high estimate for Lake Gogebic is a result of ageing errors from interpretation of scales.

Lake Gogebic walleye growth does not appear to change over time, is similar to other lakes in the region, and is lower than average growth rates observed across Michigan. Six separate growth analyses, conducted between 1976 and 2005, indicate no systematic change in growth rates over time (Fig. 3). Furthermore, walleye growth in Lake Gogebic was equal or greater than average growth across other Upper Peninsula lakes, specifically Michigamme Reservoir, the South Cisco Lake Chain, Bond Falls Flowage, Lake Michigamme, and Peavy Pond, but was lower than the average growth rate observed across Michigan (Fig. 4; Schneider et al. 2000). The lower growth rate for Upper Peninsula walleye in general and the Lake Gogebic population in particular is not unexpected, because fish growth is dependent on temperature conditions. Analysis of walleye growth rates relative to heat accumulation (growing degree-days), in which walleye were expected to grow when temperatures exceeded 42°F (5°C; Chezik et al. 2014), showed that walleye grow as expected in Michigan's western Upper Peninsula given this region's temperature regime.

Based on these findings, the following conclusions and recommendations were provided to stakeholders and the Michigan DNR. 1) There is no evidence that either fish stocking or habitat enhancements will have a major impact on the Lake Gogebic walleye population, but it's important to emphasize that past habitat enhancement efforts here and elsewhere have lacked adequate follow-up monitoring, so it is difficult to say much about the likely effects of future habitat work. 2) Given current low exploitation levels, there is no immediate need to reduce exploitation risk. 3) Further modeling exercises should be considered to inform decisions on possible changes to size limits, with special consideration for angler satisfaction and density-dependent growth. 4) Finally, the Michigan DNR should consider more regular assessment efforts in Lake Gogebic, given the size of the lake and regional importance of the fishery, to better inform future management decisions. One option would be to implement a program similar to the Fall Walleye Index Netting (available at https://www.ontario.ca/document/fall-walleye-index-netting-instructions) conducted on numerous Ontario lakes by the Ontario Ministry of Natural Resources and Forestry.

Acknowledgments

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Figures

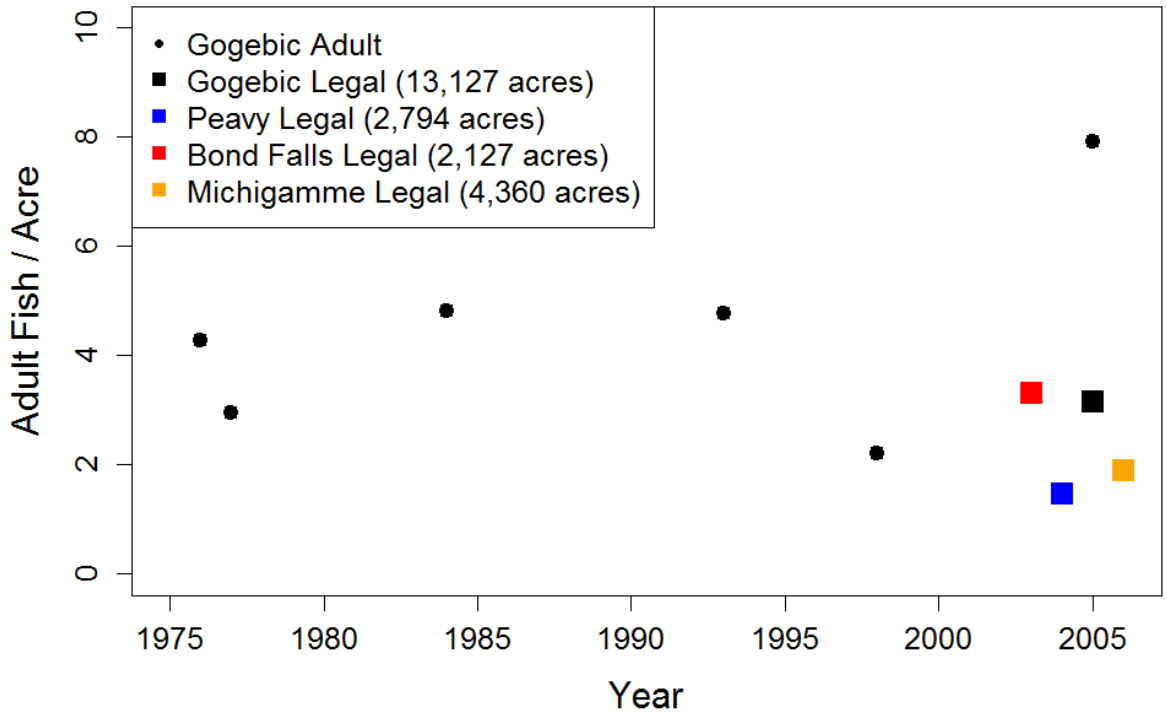

Figure 1. Abundance of Upper Peninsula walleye populations over time for Lake Gogebic, Peavy Pond, Bond Falls Flowage, and Lake Michigamme. The terms “adult” and “legal” represent spawning age fish and fish greater than 15” in length, respectively. Data were collected by the Michigan DNR through mark-recapture studies.

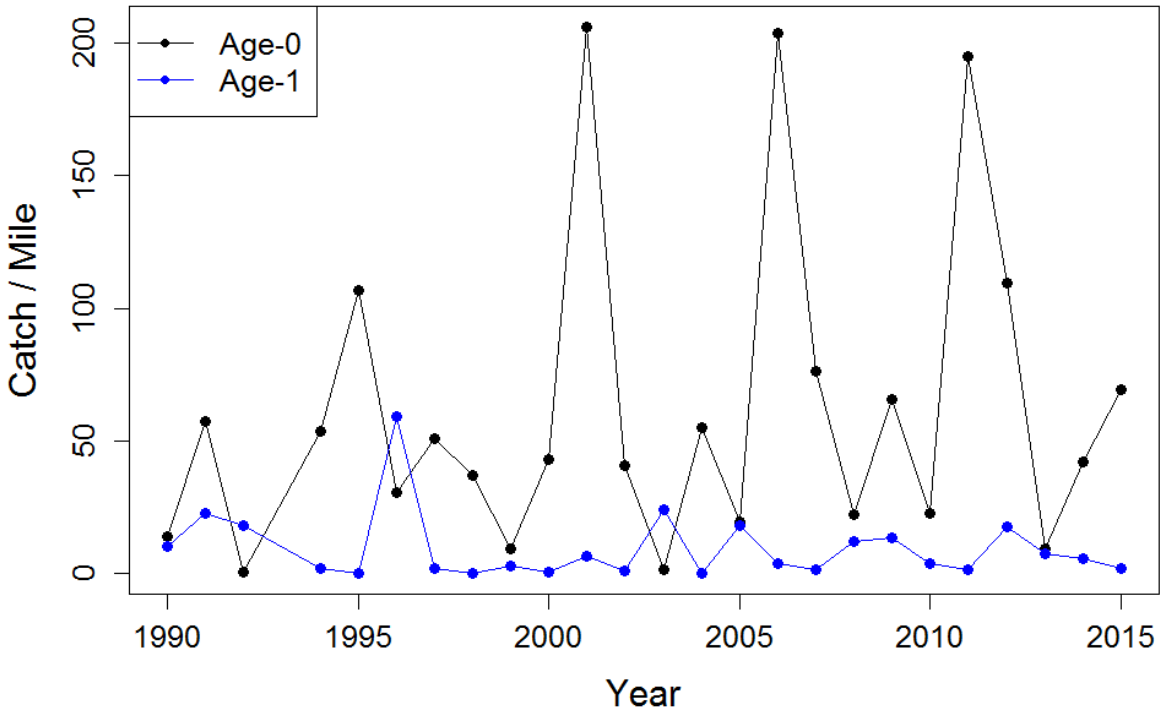

Figure 2. Plot of Lake Gogebic walleye recruitment over time. Data are based on fall electrofishing surveys conducted by GLIFWC.

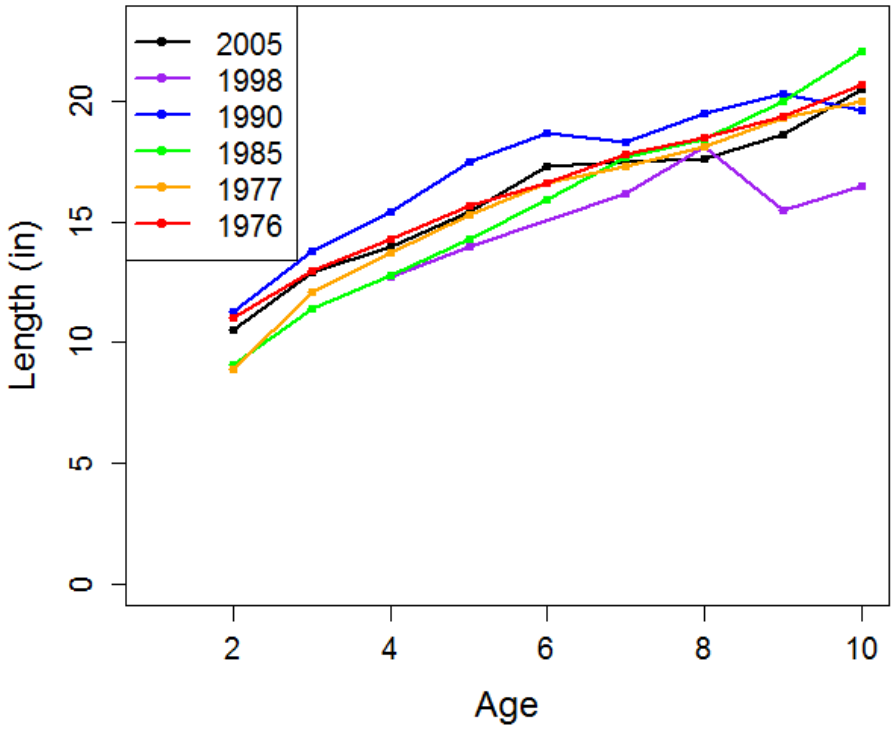

Figure 3. Plot of walleye growth over time in Lake Gogebic. Each point represents the mean length-at-age for a given study year. Data were collected by the Michigan DNR.

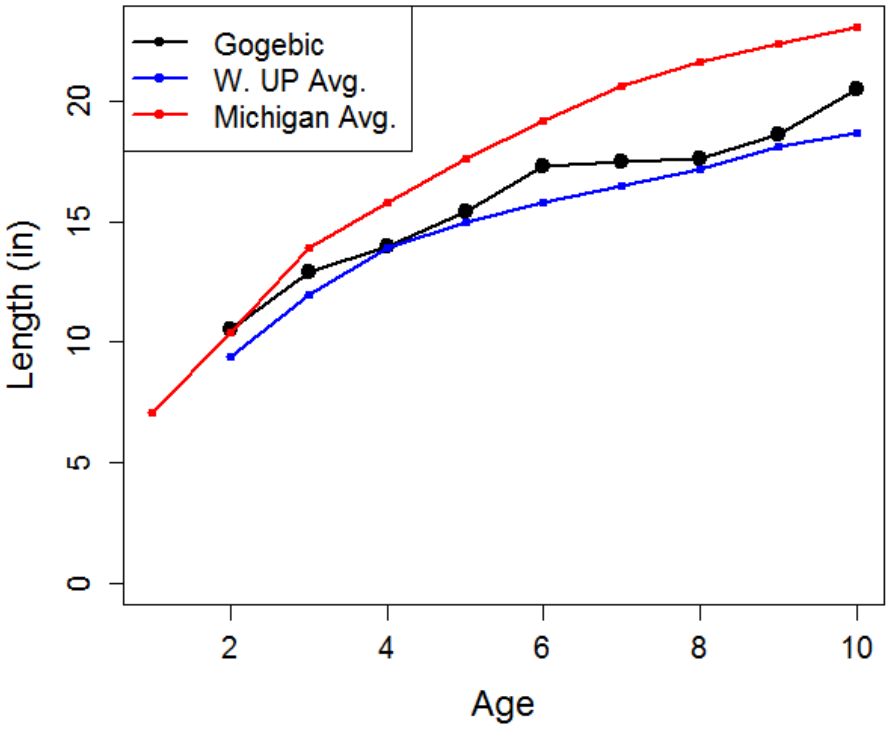

Figure 4. Plot of walleye growth across Lake Gogebic, four other aquatic systems in the western Upper Peninsula, and the state of Michigan. Each point represents the mean length-at-age for a given dataset. Data were collected by the Michigan DNR.