

Population characteristics of walleye, northern pike, and largemouth bass in Minong

Flowage, Washburn County, Wisconsin, 2005.

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Executive Summary

Walleyes Sanders vitreus were sampled in Minong Flowage in 2005 to determine population abundance, size distribution, and growth. A total of 1,876 walleyes were collected by electrofishing and fyke nets during the spring spawning period in the flowage and the Totagatic River. Adult population abundance was estimated to be 10,954 fish or 7.0 fish/acre. As in past surveys, the majority of the population measures between 12 and 19.9 in. However, there has been a decline in the number of walleyes greater than 20 in. Growth rates have also declined since past surveys and now are below northern region and statewide averages. It takes more than five seasons for an average walleye to reach 15 in. Natural reproduction of walleye remains good. The current 15 in minimum length limit may be inhibiting growth. A regulation change allowing the harvest of smaller walleyes would likely increase growth without a detrimental decrease in walleye density. Any regulation changes should be accompanied by future sampling to assess the effects of the changes. Northern pike Esox lucius were also collected during spring sampling to assess size distribution and growth. The majority of northern pike measured less than 20 in, but fish were collected up to 39 in. Northern pike PSD was below the regional mean. Largemouth bass Micropterus salmoides were also collected but were not directly targeted, resulting in a small sample size. Mean length at age was below the regional and statewide averages for largemouth bass older than age five. Mean length of the catch was 14.7 in.

Introduction

Minong Flowage is a 1,564 acre impoundment of the Totogatic River created by a dam constructed in 1936-37. The majority of the flowage lies in Washburn County, while a small part extends north into Douglas County. There is a Washburn County park and campground with a boat landing on the western side of the lake. There is also a state-owned boat landing on the eastern side of the flowage and a township-owned unimproved boat landing at the upstream end of the flowage. The shoreline is nearly entirely privately owned and is well developed. The water is stained brown and is moderately fertile. Most of the bottom substrate is sand. There are exposed tree stumps, especially in the upstream bays. Aquatic vegetation is common in the shallow bays. The maximum and mean depths of Minong Flowage are 21 feet and 9 feet, respectively. The fishery consists mainly of walleye, northern pike, largemouth bass, bluegill Lepomis macrochirus, black crappie Pomoxis nigromaculatus, and yellow perch Perca flavescens. Smallmouth bass M. dolomieu, rock bass Ambloplites rupestris, pumpkinseed L. gibbosus, black bullhead Ameiurus melas, yellow bullhead A. natalis, and carp Cyprinus carpio are also present. Common forage species include golden redhorse Moxostoma erythrurum, shorthead redhorse M. macrolepidotum, and white sucker Catostomus commersoni.

Minong Flowage is part of the ceded territory of northern Wisconsin and is subject to tribal harvest. Walleye daily bag limits have varied from two to five fish, depending on annual tribal harvest declarations. A daily bag limit of two walleyes was in effect for the 2005 angling year, although the bag limit has typically been five. A reduced daily bag limit has occurred in only seven seasons since inception of tribal harvest in 1985. There

is currently a 15-in minimum length limit on walleyes, which has been in effect since 1990. For the ten years preceding 1990 there was no length limit on walleyes in Minong Flowage.

Minong Flowage was stocked with fry and/or fingerling walleyes annually from 1942 to 1949. Fingerling muskellunge were also stocked annually from 1942 to 1947. No stockings have occurred since. Also, a minimal amount of northern pike and walleye eggs were taken as part of hatchery operations during the 1960s.

Numerous fisheries and aquatic habitat surveys have been conducted on the Minong Flowage with varying objectives. A general fish population survey with emphasis on gamefish populations and overabundant bullheads was conducted on Minong Flowage in June 1949 by the Wisconsin Conservation Department. Recommendations from this survey included encouraging panfish harvest and eradicating the overabundant bullhead population (Niemuth 1950). Wisconsin Department of Natural Resources (WDNR) conducted fall electrofishing surveys in 1980 and 1986, finding an abundant year class of walleyes both years. An estimate of adult walleye population abundance was attempted in 1988 by WDNR. Walleyes were marked in the flowage with fyke nets and recaptured with an electrofishing boat. Due to a very low number of fish recaptured an abundance estimate was not possible. Another attempt to estimate walleye abundance was conducted in 1989 using only an electrofishing boat in the Totagatic River. The vast majority of walleye spawning activity takes place in the river upstream of the flowage. The 1989 sampling and subsequent estimate (5.5 adult walleyes/acre) was thought to be a much more accurate representation of the adult spawning population (Johannes 1989).

In summer 1994 WDNR conducted a species-presence survey using mini fyke nets, seines, and an electrofishing boat, finding 33 species of fish (WDNR, unpublished data).

Electrofishing surveys were conducted in September 2000 by WDNR to assess walleye young-of-the-year (YOY) recruitment and gather ageing data on gamefish, and in May 2002 by the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) to determine walleye length frequency. A comprehensive aquatic plant survey was conducted in August 2003 in response to the discovery of Eurasian water milfoil (EWM) in the fall of 2002. More than 50 species of aquatic plants were found (Roesler 2004). YOY walleye fall recruitment surveys have been conducted in five of the last six years by DNR and GLIFWC, showing varied, but good reproduction. YOY counts averaged 76/mile and ranged from 15 to 135/mile. In 2004 Minong Flowage was sampled as part of the WDNR baseline monitoring program. Mini-fyke nets were set for one night in August and one night of electrofishing was conducted in October. The Minong Flowage Association has monitored water quality with volunteers as part of the Self Help Lake Monitoring Program since 1989.

An extensive fisheries survey was conducted on the Minong Flowage in 2005. The 2005 survey was intended to monitor the status of gamefish populations, specifically walleye population abundance, growth, and size distribution. Additional population information was collected on northern pike and largemouth bass.

Methods

Adult walleyes were collected in the Totagatic River upstream of the flowage during the spring spawning period with a pulsed DC electroshocking boat. Adult walleyes were defined as all fish for which sex could be determined and all fish 15 in or longer (Hennessey 2002). River sampling began on 5 April when water temperatures reached

40 F. Electrofishing was not conducted on 6 April but began again on 7 April and continued until 12 April. Daily shocking runs began approximately 1.75 miles upstream of the flowage and continued downstream to where the river widens into the flowage (Figure 1). Six (4x5 ft frame) fyke nets were also set in the upstream end of the flowage to sample adult walleye, northern pike, and largemouth bass. Two nets were set on 4 April, and two more nets were set on each 5 and 6 April. Some nets were occasionally moved. All six nets were removed on 10 April for a total of 30 net lifts.

All walleyes, northern pike, and largemouth bass were measured to the nearest 0.1 inch (total length). Walleyes and northern pike were sexed by the presence of gametes. Walleyes were given a unique fin clip each day to eliminate within-day confusion between fyke netted and electroshocked fish. Marked and unmarked walleyes were recorded daily. Adult walleye population abundance was estimated using the Chapman modification of the Petersen method (Ricker 1975). Fish collected from fyke nets and all electrofishing runs (with the exception of the last run) made up the marking sample. The final electrofishing run was used as the recapture sample. Walleyes were grouped by length to estimate abundance. These numbers were then combined for an estimate of total adult population abundance. Changes in length frequency distribution of the sample between 1989 and 2005 were tested using a Kolmogorov-Smirnov test.

All northern pike and largemouth bass were given a left pelvic fin clip. For age analysis, scale samples were removed from walleyes less than 15 in, while dorsal spines were removed from larger walleyes. Scale samples were removed from northern pike. An attempt was made at interpreting the age of northern pike scales. Casselman (1990) found that this can be difficult due to irregular growth and resorption or erosion on the midlateral region. Minong Flowage northern pike scales also showed many irregularities. Results were questionable and were not used for analysis. Scale samples were removed from largemouth bass less than 13 in, while

spines were removed from larger fish. Mean length-at-age comparisons for walleye and largemouth bass were made to regional and statewide data using the WDNR Fish and Habitat statewide database. An index of proportional stock density (PSD) was used to describe and compare population size structure of northern pike and largemouth bass to regional means (Anderson and Neumann 1996). PSD values for northern pike and largemouth bass represent the percent of fish larger than stock length (14.0 and 8.0 in, respectively) that are larger than 21.0 and 12.0 in, respectively.

Results and Discussion

Walleye. A total of 1,876 walleyes were captured using fyke nets (N = 376) and electrofishing (N = 1,500), including the final electrofishing run, which captured 338 unmarked and 64 marked walleyes. The average length of all captured walleyes was 16.1 in (SD=2.2), and ranged in length from 11.0 to 26.5 in (Figure 2).

The size structure of walleyes shifted significantly to smaller fish from 1989 to 2005 (D = 0.10, P < 0.001). Sixty eight percent of both the 1989 and 2005 sample measured greater or equal to 15 in (Figures 2 and 3). In both 1989 (59%) and 2005 (53%), more than half of the catch measured between 14.0 and 16.9 in. However, the percentage of the sample measuring greater or equal to 20 in decreased from 10% in 1989 to 5% in 2005.

The male:female ratio in the catch decreased from 5.3:1 in 1989 to 1.9:1 in 2005. Male walleyes accounted for 66% of the total catch in 2005 and averaged 15.1 in (SD=1.5; Figure 4), while female walleyes averaged 18.0 in (SD=2.1; Figure 5). In 1989 males accounted for 84% of the catch and averaged 15.8 in, while females averaged 21.9 in. Numbers of large (≥ 20 in) female walleye were considerably less in 2005. In 1989 more than 60% of the female sample

measured at least 20 in. In contrast, only 14% of the 2005 female sample measured 20 in or greater.

Adult walleye abundance in the Minong Flowage during 2005 was estimated at 10,954 fish (95% C.I. 7,654-14,253) or 7.0 fish/acre. Abundance estimates by length groups generally reflected the sampled length distribution, with most walleyes being 12 – 19.9 in and few larger than 20 in (Figure 6). Adult walleye abundance in 1989 was estimated at 8,546 fish (5.5/acre). The estimated number of walleyes in each length group has increased since 1989, with the exception of fish greater than 20 in. Seven percent of the 1989 adult population was estimated at greater than 20 in, which is nearly three times the number estimated in 2005. In 2005 less than half (47%) of the adult walleye population estimate measured at least 15 in. In 1989, with no minimum size limit, 57% of the adult population estimate measured 15 in or greater.

While the number of walleyes in Minong Flowage has increased since 1989, growth has decreased. Age interpretations showed above average growth in 1988 when compared to both statewide and northern Wisconsin means (Figure 7). Growth in 2005 was below both state and regional means, and the disparity increases with age. In 2005 it took more than five complete growing seasons for an average walleye to reach 15 in and 10 seasons to reach 20 in. In 1988 the average walleye was larger than 15 in after four years and measured nearly 20 in after seven years. Growth of male walleyes no longer meets the minimum growth standard established by WDNR (at least 13.0 in at 4 years). From 1988 to 2005 the mean age of sampled walleyes increased from 4.9 to 6.7 years for males and from 5.3 to 8.3 years for females (Johannes 1989). In 2005 28% of the aged female sample was at least 10 years old. This is in contrast to 1988 when none of the female sample was aged at 10 years. The 2005 population was substantially older than the previously surveyed population, indicating that the large decrease in the number of walleyes greater than 20 in is due to reduced growth rates.

At the current density, walleye growth rates are unlikely to improve. A regulation change allowing the harvest of smaller walleyes could improve growth without reducing walleye density to an unacceptable level. There has been some angler dissatisfaction with the large percentage of sub-legal walleyes in their catch. In addition, the increasing prevalence of EWM may reduce angler harvest as fish behavior and movement patterns change. EWM was found at 65 sampling sites throughout the flowage in 2003 (Roesler 2004).

Northern pike. A total of 266 northern pike (8.9 fish/ net lift) were captured with fyke nets in 2005. Lengths of sampled fish ranged from 6.3-39.0 in and averaged 18.3 in (SD=5.0; Table 1). Northern pike PSD was 23, which was below the mean (30) for 19 northern Wisconsin lakes reported by Margenau et al. (1998). However, in spite of the poor size structure, some (4%) of the northern pike reached quality length (≥ 30 in).

Largemouth bass. Although not targeted, 36 largemouth bass (1.2 fish/net lift) were captured with fyke nets in 2005. Lengths of sampled fish ranged from 7.5-18.2 in and averaged 14.7 in (SD=2.2; Table 1). Twenty three (64%) fish measured at least 14 in. Largemouth bass PSD was 92. Although the 2005 sample size was small, age interpretations showed below average growth for fish greater than five years old when compared to regional and statewide means (Figure 8).

Summary and Management Recommendations

1. Minong Flowage continues to have an abundant walleye population. The 2005 adult population estimate was more than 25% higher than in 1989. Although there is still an abundance of small and mid-sized fish, the number of fish ≥ 20 in has decreased.

2. Walleye growth rates have decreased dramatically since 1988. It now takes more than five full seasons for walleyes to reach 15 in, and 10 seasons to reach 20 in. Despite a large increase in the number of old (\geq age 10) walleyes, there is a substantial decrease in the number of large (\geq 20 in) walleyes. Reduced growth is responsible for the decrease in numbers of larger fish.
3. Consideration should be given to changing the current walleye harvest regulations to allow for the harvest of smaller fish. Modeling population responses to more liberalized regulation options (e.g. no length limit, 1 fish over 14 in, five fish bag) should occur before any change is proposed. Future population assessments should be planned if a regulation change is implemented.
4. Northern pike and largemouth bass populations appear stable. Northern pike PSD values are below the regional mean, but fish measuring up to 39 in were captured. The small sample of largemouth bass showed good size distribution but slower than average growth for fish $>$ age 5.

Literature Cited

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-481 *in* B. R. Murphy and D. W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

- Casselman, J.M. 1990. Growth and relative size of calcified structures of fish. Transactions of the American Fisheries Society 119:673-688.
- Johannes, S. 1989. DNR Treaty Assessment Lake Survey Report, Minong Flowage, Washburn County. Wisconsin Department of Natural Resources, Spooner.
- Hennessy, J.M. 2002. Wisconsin Department of Natural Resources 2001-2002 Ceded Territory Fishery Assessment Report. Administrative Report No. 55. Wisconsin Department of Natural Resources, Madison.
- Margenau, T.M., P.W. Rasmussen, and J.M. Kampa. 1998. Factors Affecting Growth of Northern Pike in Small Northern Wisconsin Lakes. North American Journal of Fisheries Management 18:625-639.
- Niemuth, W. 1950. Lake Survey Report No. 621. Wisconsin Conservation Department, Spooner.
- Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada Bulletin 191.
- Roesler, C. 2004. Minong Flowage Aquatic Plant Survey. Wisconsin Department of Natural Resources, Hayward.

Table 1. Length frequency of northern pike and largemouth bass captured in Minong Flowage, 2005.

Length group (in)	Largemouth bass	Northern pike
6- 6.9	0	1
7- 7.9	1	5
8- 8.9	0	3
9- 9.9	0	2
10- 10.9	0	3
11- 11.9	2	4
12- 12.9	4	7
13- 13.9	6	6
14- 14.9	4	20
15- 15.9	9	28
16- 16.9	5	18
17- 17.9	2	39
18- 18.9	3	39
19- 19.9	0	25
20- 20.9	0	13
21- 21.9	0	10
22- 22.9	0	7
23- 23.9	0	8
24- 24.9	0	8
25- 25.9	0	1
26- 26.9	0	3
27- 27.9	0	2
28- 28.9	0	2
29- 29.9	0	1
30- 30.9	0	3
31- 31.9	0	1
32- 32.9	0	2
33- 33.9	0	0
34- 34.9	0	1
35- 35.9	0	1
36- 36.9	0	2
37- 37.9	0	0
38- 38.9	0	0
39- 39.9	0	1
	36	266



Figure 1. Fyke net locations and electrofishing station, Minong Flowage, 2005.

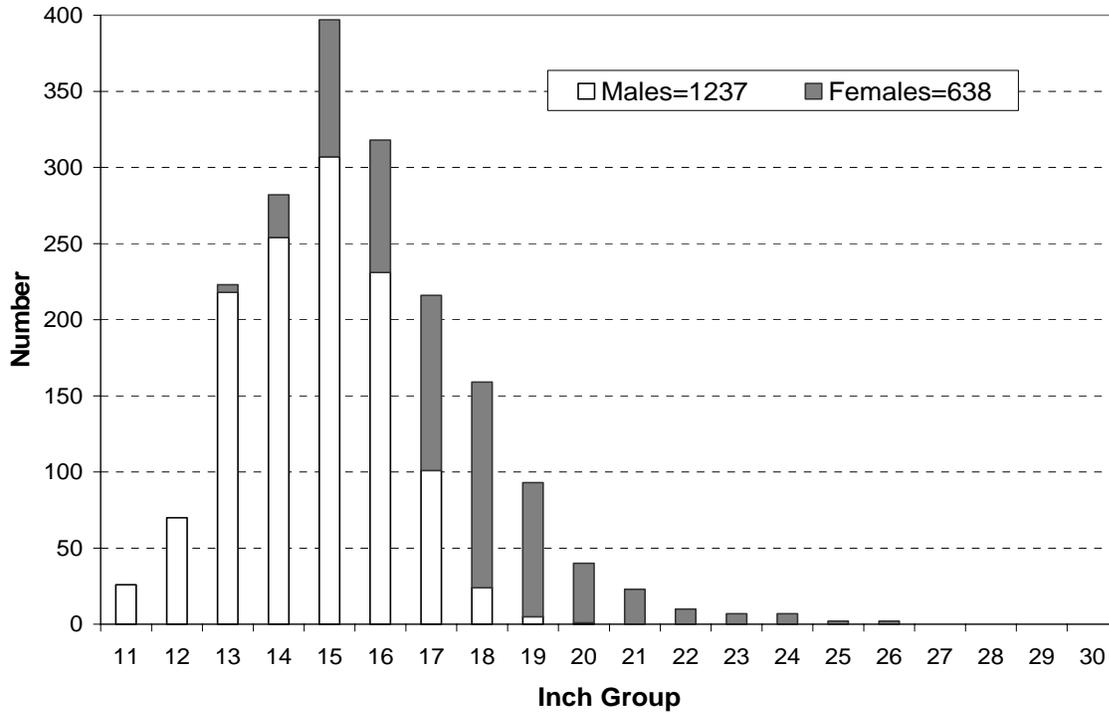


Figure 2. Length frequency by sex of walleyes captured in Minong Flowage, 2005.

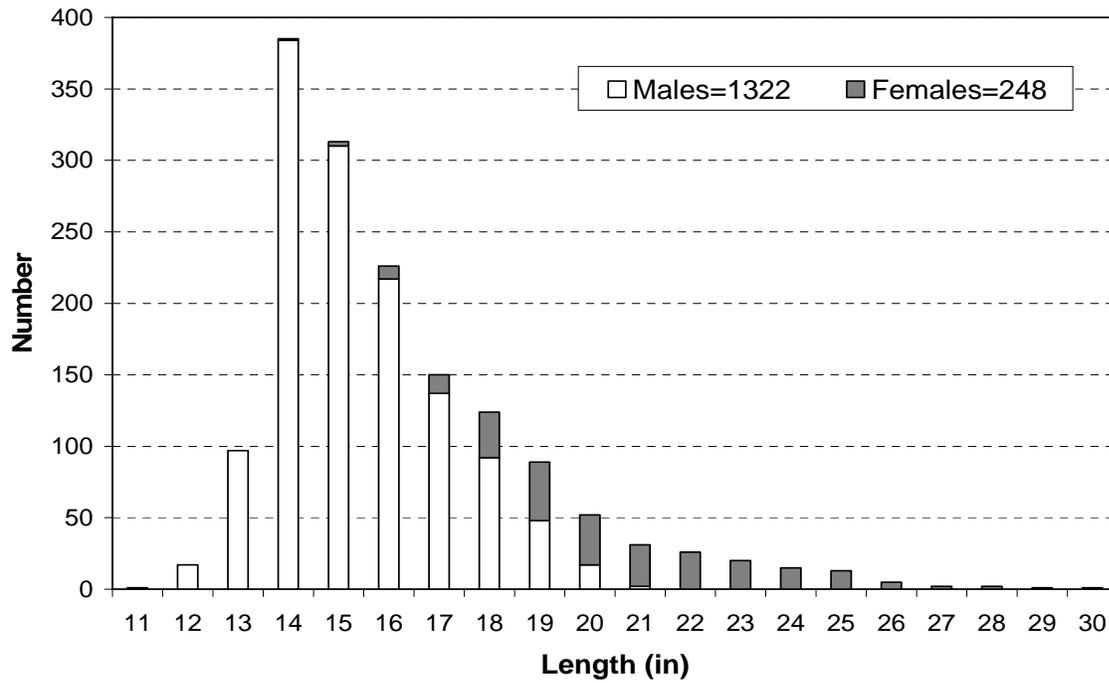


Figure 3. Length frequency by sex of walleyes captured in Minong Flowage, 1989.

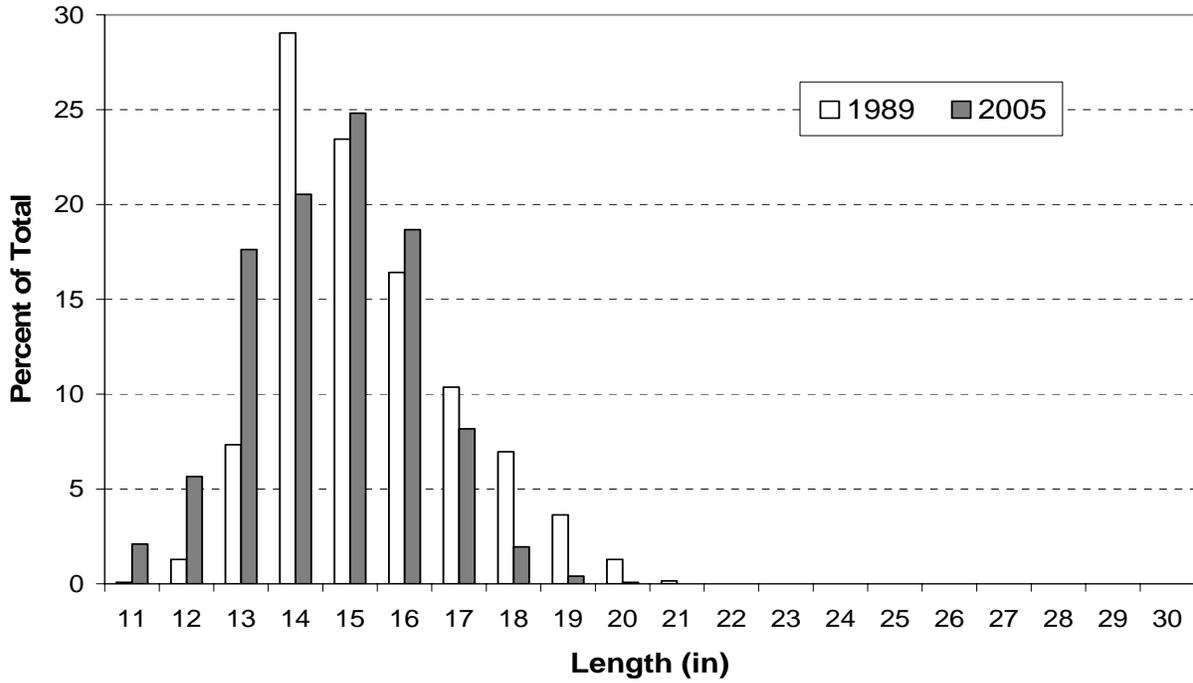


Figure 4. Percentage of catch by length for male walleyes captured in Minong Flowage, 1989 and 2005.

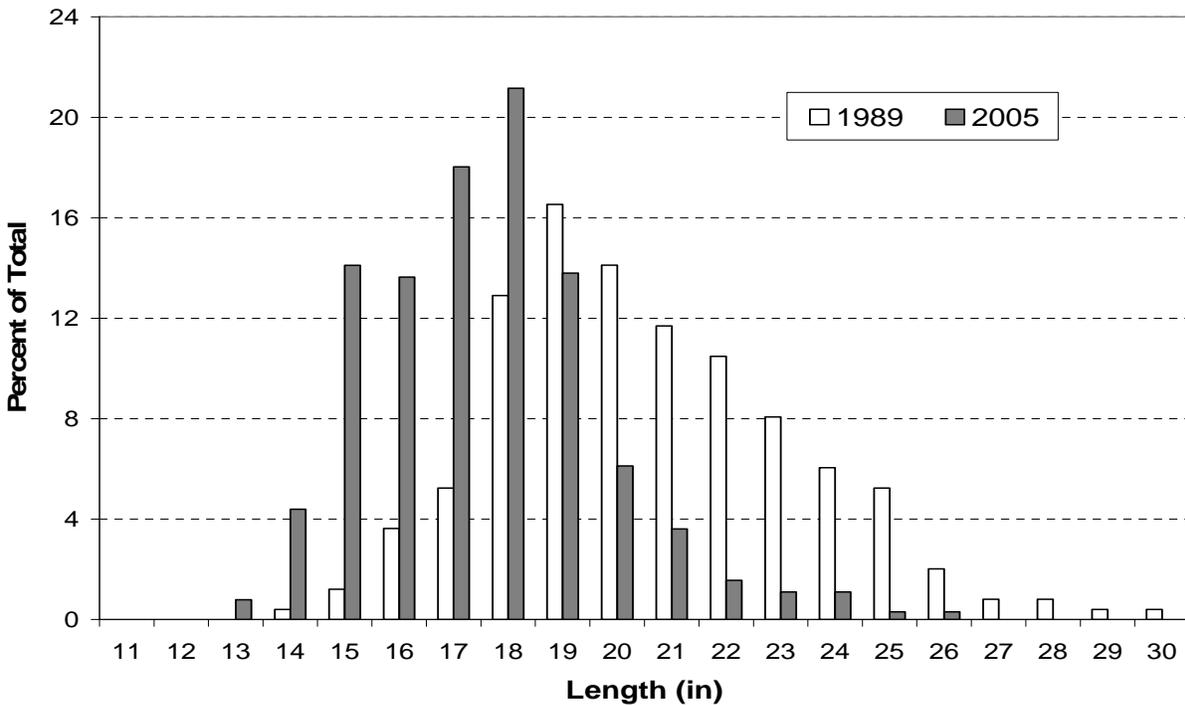


Figure 5. Percentage of catch by length for female walleyes captured in Minong Flowage, 1989 and 2005

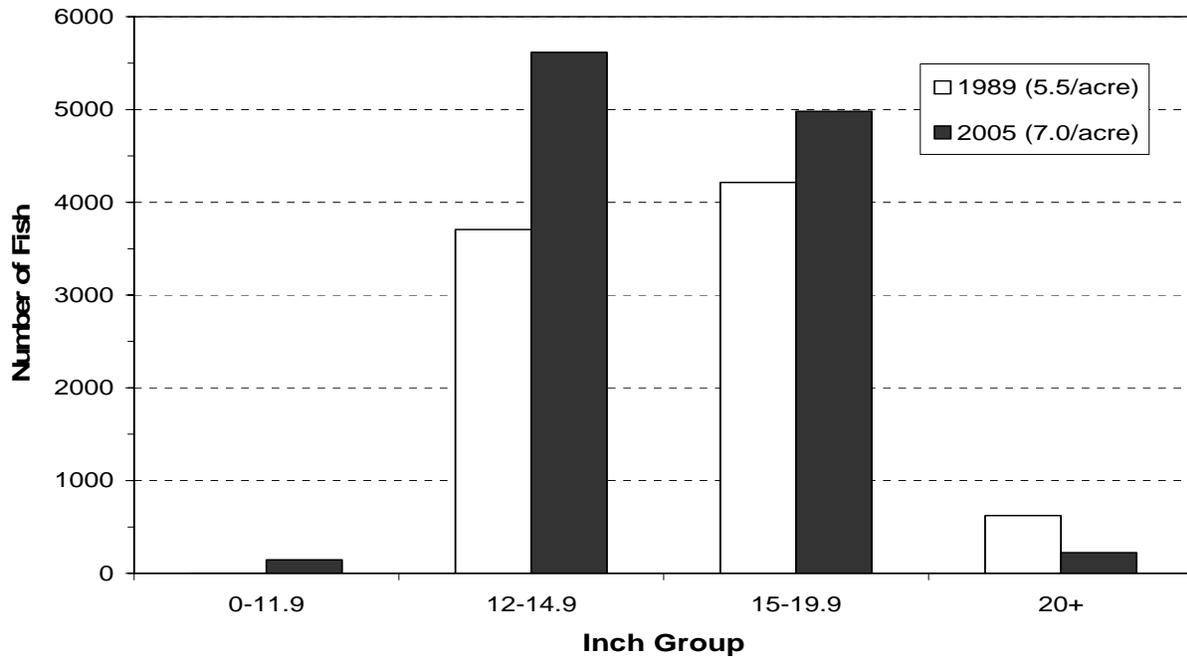


Figure 6. Adult walleye population abundance estimates by length group in Minong Flowage, 1989 and 2005.

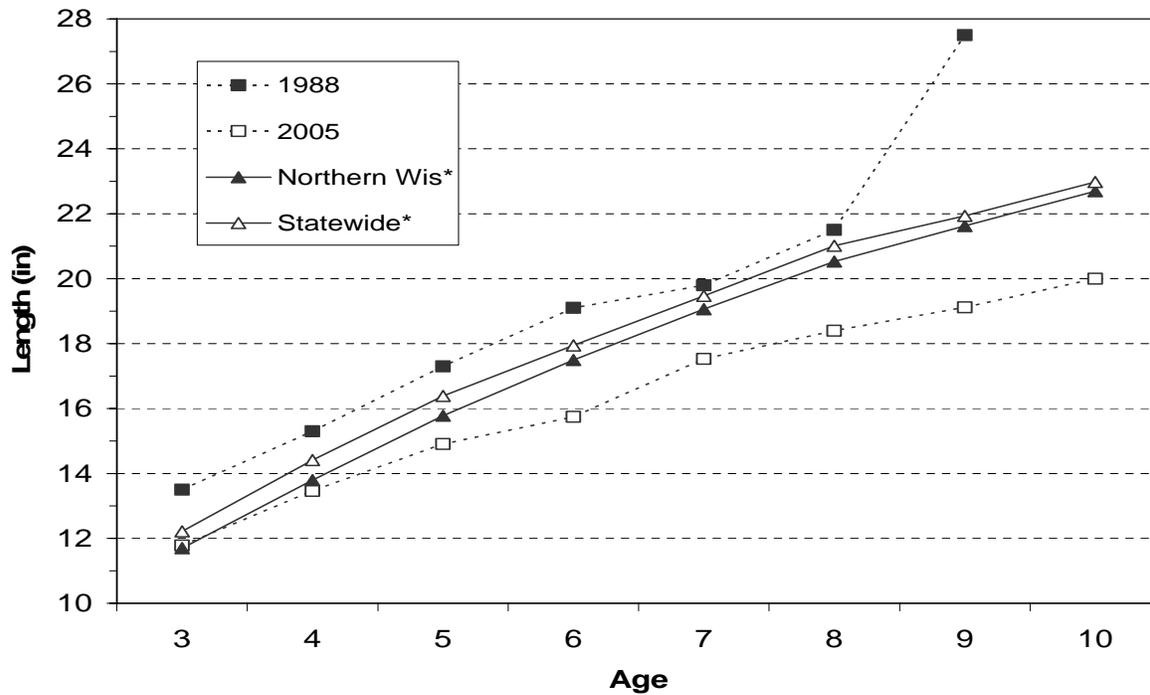


Figure 7. Mean lengths at age of walleye from Minong Flowage, 1988 and 2005, with comparisons to regional and statewide means.

*from WDNR Fish and Habitat Database

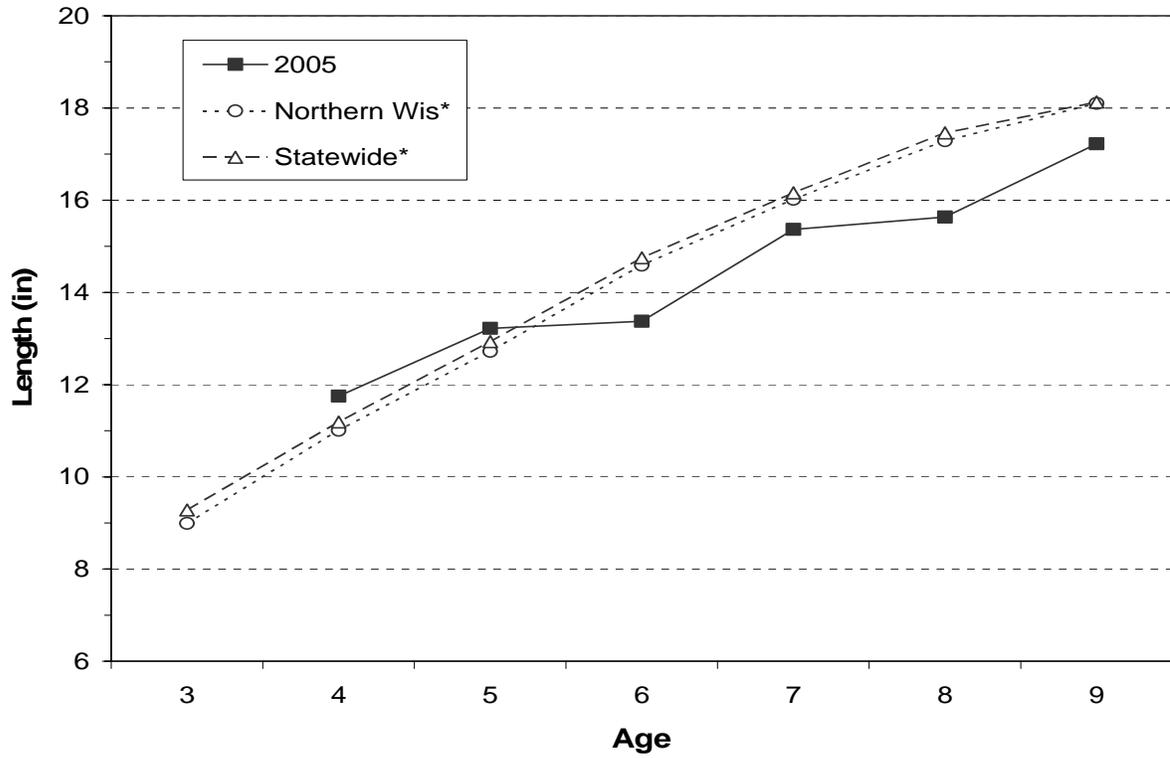


Figure 6. Mean lengths at age of largemouth bass from Minong Flowage, 2005, with comparisons to regional and statewide means.

*from WDNR Fish and Habitat Database