WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Paya Lake - 2023 Fish Management Report

WBIC 425600

Photo Credit: WDNR

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2023

SUMMARY

Lake and location:
Paya Lake, Oconto County, T32N R16E Sec 10

Physical / chemical attributes (Wisconsin DNR, 1977):
Surface acres: 121
Maximum depth (ft): 40
Average depth (ft): 20
Shoreline length (mi): 1.8
Lake type: Seepage
Lake class: Simple, warm, clear
Basic water chemistry: Hard water, slightly alkaline, clear water with very high transparency, Secchi = 16 ft. (summer).
Littoral substrate: Sand (40%), gravel (40%), rubble (10%), muck (10%)
Aquatic vegetation: Sparse
Other features: This lake is highly developed with homes along the shoreline and is located within the Ceded Territory.
Fish regulations: Five smallmouth and largemouth bass may be kept. Smallmouth bass must be at least 14". Largemouth bass between 12-18" may not be kept and only one over 18" may be kept. Only 10 panfish may be kept.

Purpose of survey:
Evaluated abundance and size structure of bass and panfish populations.

Surveys:

Survey Sequence	Survey Begin	Survey End	Primary Survey Purpose
515099334	5/25/2023	5/25/2023	FISHERIES ASSESSMENTS LAKES LATE SPRING BASS PAN
515099412	6/12/2023	6/15/2023	FISHERIES ASSESSMENTS LAKES SUMMER PANFISH

Fishery:

The fishery of Paya Lake is comprised of panfish species (bluegill, green sunfish and rock bass) and gamefish species (smallmouth bass and largemouth bass).

TABLE OF CONTENTS

INTRODUCTION

Paya Lake is a 121-acre seepage lake in northern Oconto County and is considered a simple, warm, clear lake by classification. Paya Lake is very clear, relatively infertile and has only 1.8 miles of shoreline. The shoreline is highly developed with homes around the entire lake. A single, public boat landing is located on the southwest side of the lake, but parking is limited.

The Wisconsin Department of Natural Resources stocked a limited number of fish in the 1950's and 1960's. These stockings consisted of northern pike *Esox lucius* and walleye *Sander vitreus*. The most recent stocking in Paya Lake was initiated by the lake association and occurred in 2003 (1,000 fingerling walleye; 4.9-inch average).

Paya Lake has been surveyed numerous times since the early 1970's. The last survey was in 2015 and consisted of a June SE2 electrofishing for gamefish and panfish. A follow-up panfish netting survey was completed in June 2016. After presenting the survey results to the membership of the Paya Lake Association in August 2017, a fish sticks project was completed in February 2018 where 70 trees were placed at 17 locations around the lake (Figure 1). The consensus was to create a better panfish fishery. Therefore, fishing regulations for largemouth bass *Micropterus salmoides* (14 to 18-inch protected slot / 5 bag) and panfish (10 bag) were changed in 2020.

Figure 1. Fish stick placement in February 2018 on Paya Lake, Oconto County, WI.

The primary goal of the 2023 survey was to assess the status of bass and panfish populations since 2015. Specifically, we were interested in changes in abundance, size structure and growth of largemouth bass and bluegill *Lepomis macrochirus*. Paya Lake was not supposed to be sampled until 2025 however, the lake association requested WDNR survey the lake sooner to evaluate the need to supplementally stock panfish based on their observations.

METHODS

DATA COLLECTION

Standard fyke nets (3-foot hoop, $^{3}/_{4}$-bar, 1.5-inch stretch) and a standard WDNR electrofishing boat (summer/SE2) were used to collect fish. All fish collected were measured to the nearest 0.1-inch (in) total length (TL). A sub-sample of scales, dorsal spines, or anal fin rays was collected for age and growth analysis from all gamefish. Aging structures from target species were collected from 5 fish per half inch group in the stock, quality and preferred length groups. Ages were assigned to each fish using standard WDNR procedures.

DATA ANALYSIS

Catch per unit effort (CPUE) was calculated as catch by gear divided by sampling effort for each species collected. Length frequency distributions were tabulated from fish measured during the electrofishing and fyke net samples; not all panfish were measured. Proportional stock density (PSD) and relative stock density for preferred length fish (RSD^{P}) were calculated for dominant gamefish (Anderson and Neumann 1996). Preferred lengths of various gamefish have a minimum length between 45 and 55% of the world record length for that species (Anderson and Neumann 1996). Stock, quality, and preferred lengths were used as proposed by Gabelhouse (1984). Mean length at capture data was calculated for dominant gamefish and compared to the average of mean length at age for northern Wisconsin.

RESULTS & DISCUSSION

Overall, 704 fish representing 9 species and were collected during the 2023 sampling season (Table 1). The five most abundant species collected by number were rock bass *Ambloplites rupestris* (28%), yellow bullhead *Ameiurus natalis* (16%), largemouth bass (16%), smallmouth bass *Micropterus dolomieu* (11%) and bluegill (10%).

Table 1. Species composition of fishes collected during the 2023 survey of Paya Lake, Oconto County, WI.

2023					
SPECIES COMPOSITION OF FISHES COLLECTED					
***COMMON NAME**	**TOTAL NUMBER COLLECTED**	**PERCENT**	**NUMBER COLLECTED (SE2 - EF)**	**NUMBER COLLECTED (FN)**	**AVERAGE LENGTH (inches)**
Rock Bass	196	28%	20	176	6.4
Yellow Bullhead	114	16%		114	-
Largemouth Bass	114	16%	105	9	12.7
Smallmouth Bass	79	11%	79		12.2
Bluegill	71	10%	8	63	6.3
Hybrid Sunfish	61	9%	2	59	5.7
Green Sunfish	52	7%	6	46	4.7
Northern Pike	10	1.4%		10	27.6
Yellow Perch	4	0.6%	4		4.9
Black Crappie	3	0.4%		3	13.3
TOTALS	**704**		**224**	**480**	

* Common names of fishes recognized by the American Fisheries Society.

Rock bass and yellow bullhead were the most abundant species collected. Rock bass accounted for 28% of the total number of fish collected and 16% were yellow bullhead (Table 1). However, most of these fish were not measured since they were not the primary targets of the survey.

A total of 105 largemouth bass were collected during the SE2 electrofishing survey (Table 1). Largemouth bass ranged in length from 5.6 to 20.5 inches and averaged 12.7 inches (Figure 2). Electrofishing CPUE decreased between 2015 and 2023 from 119/mile to 88/mile. PSD (the ratio of fish >12" to fish >8") was 66 in 2015 and 62 in 2023. But the number of big largemouth increased substantially between 2015 and 2023. In 2015 RSD^P (the ratio of fish >15") increased from 7 to 50 between 2015 and 2023. The improvement in size structure can be attributed to the regulation change (14-inch minimum to 14 to 18-inch protected slot), habitat improvements, or both.

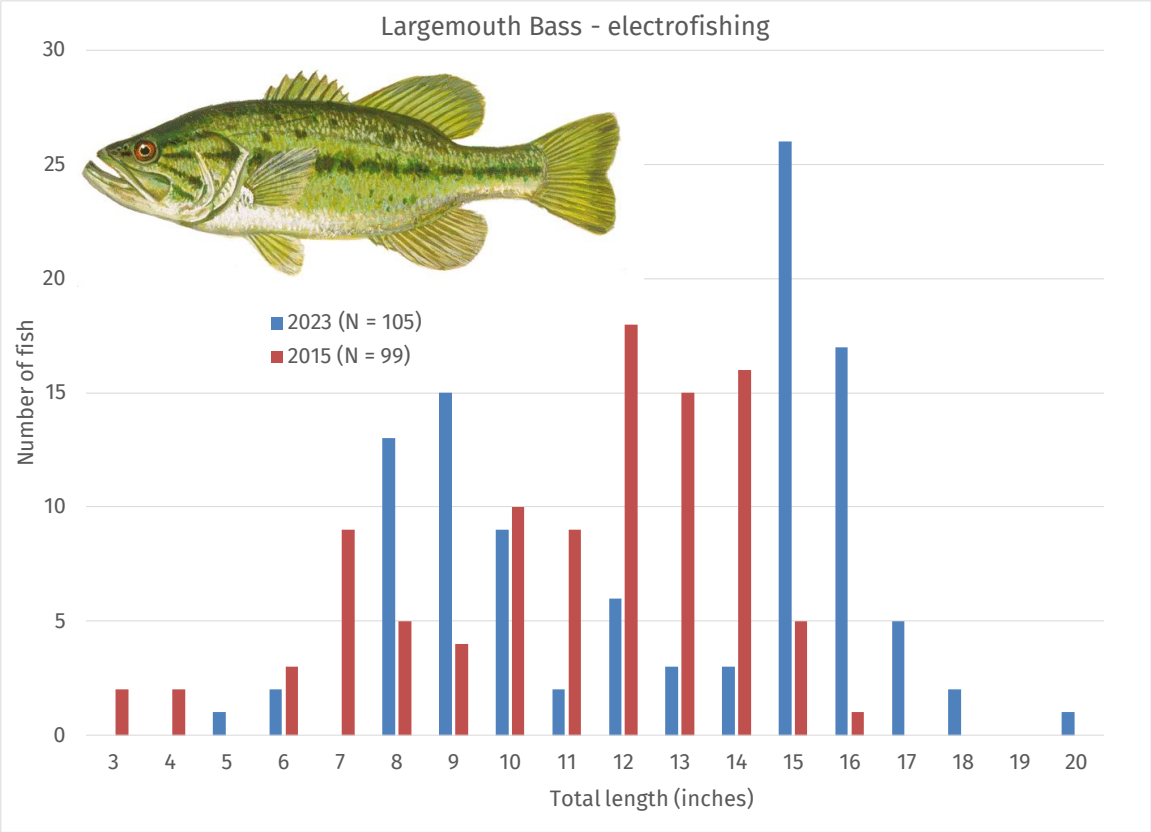

Figure 2. Length frequency of largemouth bass collected during 2015 and 2023 SE2 electrofishing surveys from Paya Lake, Oconto County, WI.

A subsample of 27 largemouth bass was aged using scales (<12”) and dorsal spines (>12”). Ages ranged from 3 to 10 years old (Figure 3). Largemouth bass growth was average at all ages and were reaching 14 inches between age 5 and 6. Good year classes of smaller/younger largemouth bass were present indicating successful reproduction and recruitment.

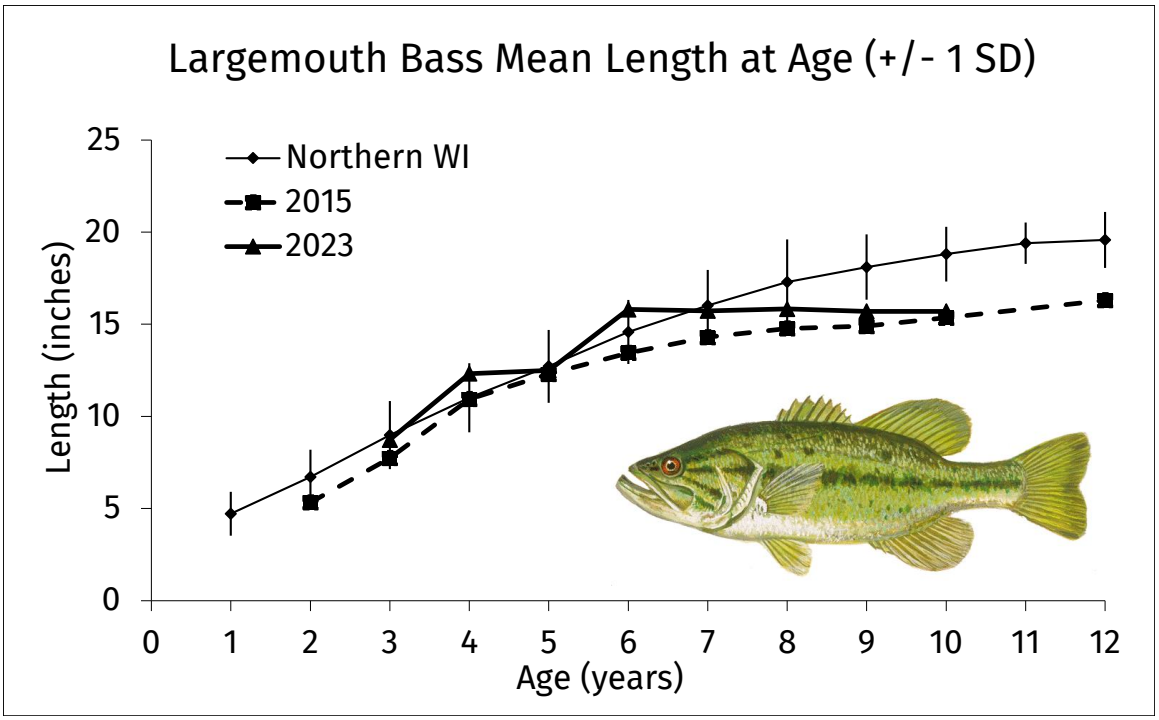

Figure 3. Mean length at age of largemouth bass from 2015 and 2023 surveys from Paya Lake, Oconto County, WI.

Smallmouth bass accounted for 11% of the sample with 79 fish collected (Table 1). Smallmouth ranged in length from 5.6 to 17.5 inches and averaged 12.2 inches (Figure 4). Electrofishing CPUE increased between 2015 and 2023 from 25/mile to 66/mile. PSD (the ratio of fish >11" to fish >7") was 24 in 2015 and 64 in 2023. The number of big smallmouth also increased substantially between 2015 and 2023. In 2015 RSD^{P} (the ratio of fish >14" to fish >7") increased from 6 to 47 between 2015 and 2023. The mechanism for improved abundance and size structure is unclear. Fishing regulations for smallmouth bass were not changed like they were for largemouth bass. Therefore, habitat enhancement or improved reproduction and recruitment could have contributed to better smallmouth abundance and size structure.

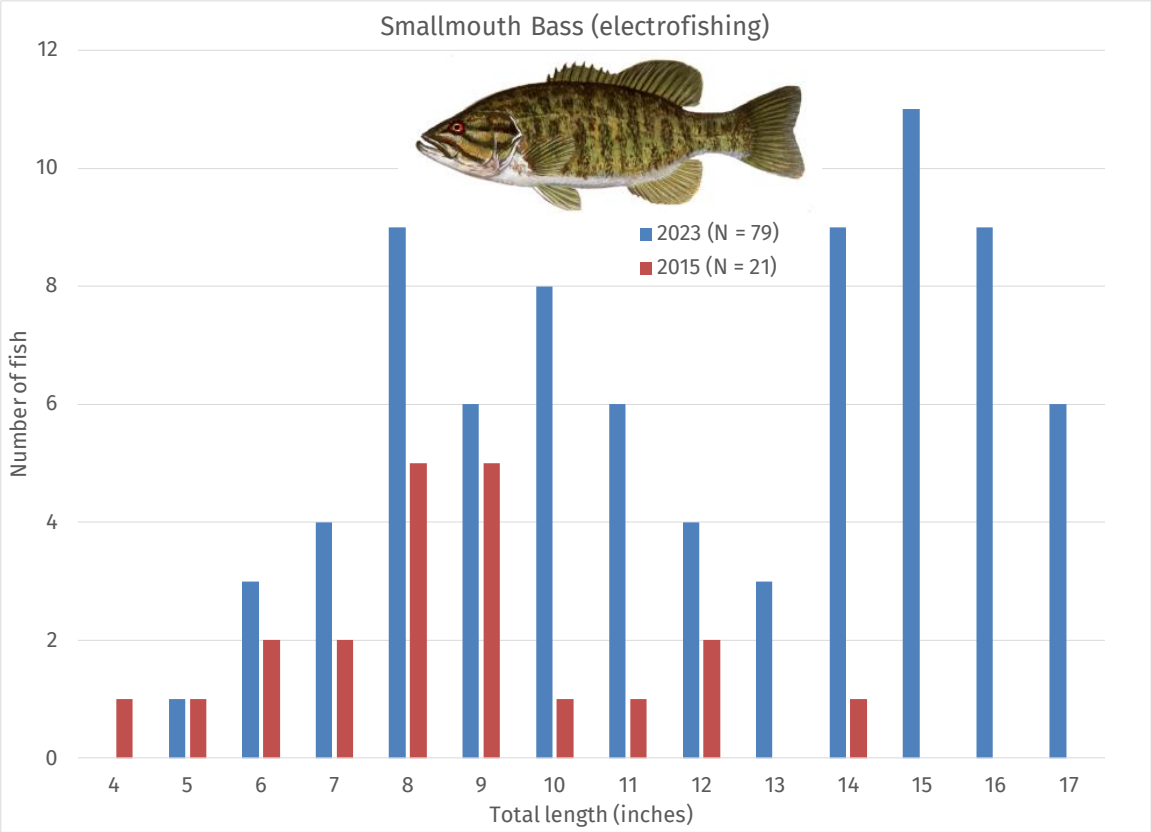

Figure 4. Length frequency of smallmouth bass collected during 2015 and 2023 SE2 electrofishing surveys from Paya Lake, Oconto County, WI.

A subsample of 24 smallmouth bass was aged using scales (<12”) and dorsal spines (>12”). Ages ranged from 3 to 9 years old (Figure 5). Smallmouth bass growth was slightly above average compared to other lakes in northern Wisconsin (Figure 5). Smallmouth were reaching 14 inches between age 4 and 5. Strong year classes of smallmouth bass were present indicating successful reproduction and recruitment.

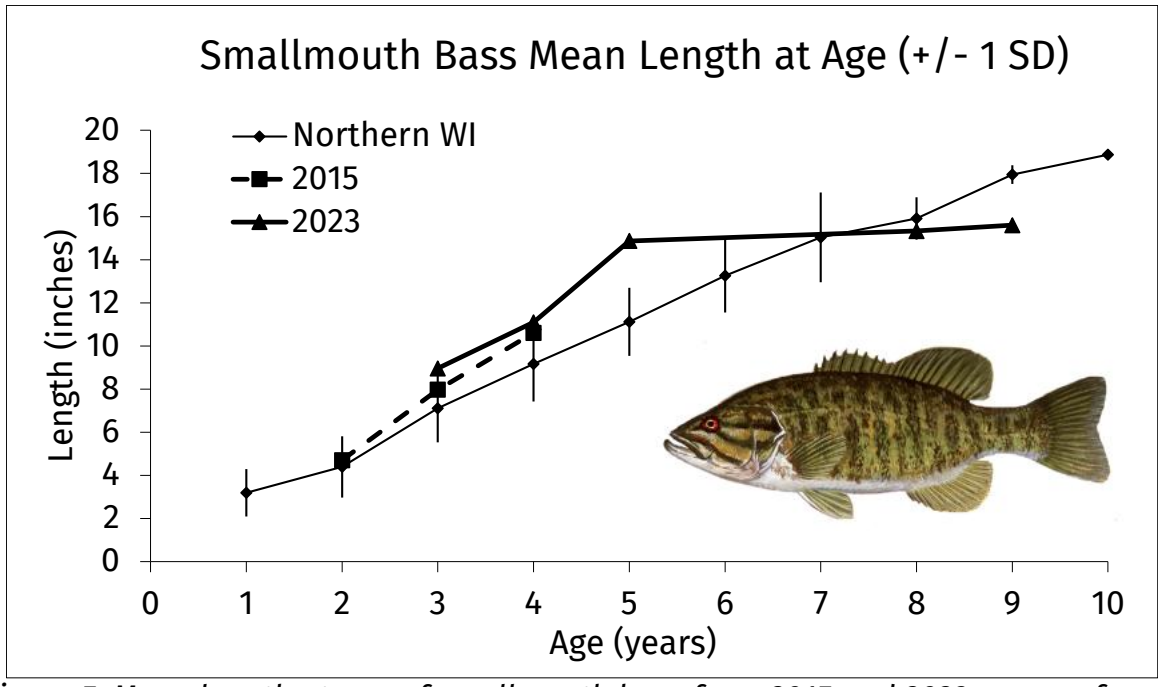

Figure 5. Mean length at age of smallmouth bass from 2015 and 2023 surveys from Paya Lake, Oconto County, WI.

Only 8 bluegill were collected during the SE2 electrofishing survey (Table 1). Electrofishing CPUE declined from 112/mile in 2015 to 7/mile in 2023. Summer panfish netting produced a better sample with the collection of 63 bluegill. However, netting CPUE also declined substantially between 2016 and 2023 from 38 bluegill/NN to 4 bluegill/NN.

Bluegill ranged in length from 4.0 to 7.9 inches and averaged 6.3 inches from both the electrofishing and netting samples. Due to the small sample size from the SE2 electrofishing sample, PSD could not be accurately estimated (Gustafson, 1988). Estimating PSD from the netting survey would not accurately describe size structure since fyke nets are not effective at catching smaller bluegill.

A subsample of 30 bluegill was aged from 2 to 6 years old. Bluegill growth was average at most ages. Bluegill were reaching 6 inches long by age 4 (Figure 7).

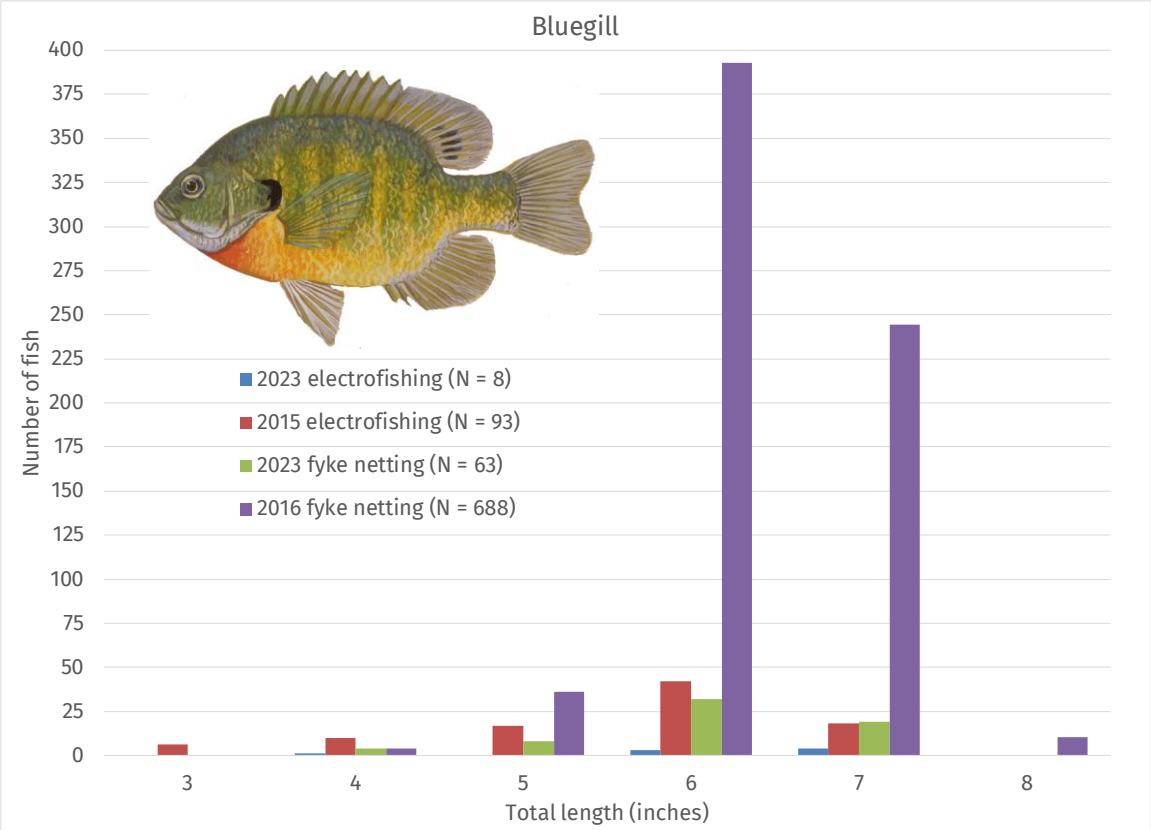

Figure 6. Length frequency of bluegill collected from Paya Lake, Oconto County, WI.

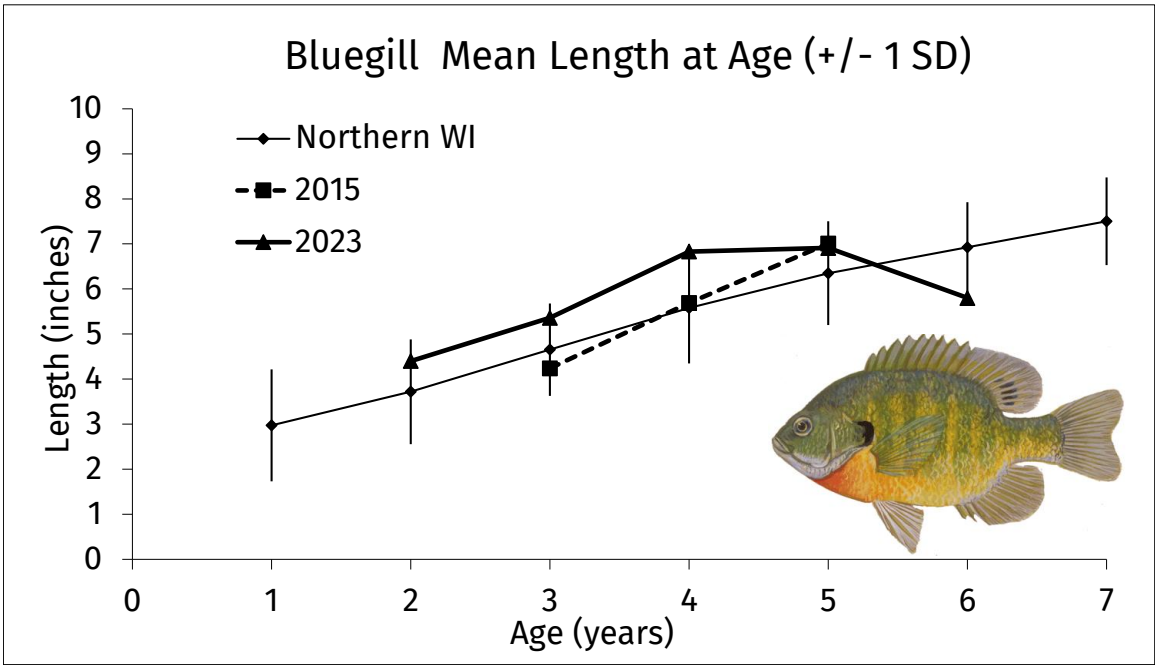

Figure 7. Mean length at age of bluegill from Paya Lake, Oconto County, WI.

CONCLUSIONS & RECOMMENDATIONS

Paya Lake continues to support a quality fishing opportunity for both largemouth and smallmouth bass. Between 2015 and 2023 largemouth abundance declined slightly but size structure improved, especially for fish greater than 15 inches (Table 2). On the other hand, both smallmouth abundance and size structure improved significantly between 2015 and 2023. This is somewhat puzzling because there was no regulation change for smallmouth bass; the 14 to 18-inch protected slot limit was only implemented for largemouth bass. Regardless, the largemouth ad smallmouth bass populations are both doing extremely well.

Table 2. CPUE, PSD and RSD^P comparison for largemouth bass and smallmouth bass collected from Paya Lake, Oconto County, WI.

				
	2015	2023	2015	2023
EF CPUE (Bass/mile)	119	88	25	66
PSD	66	62	24	64
RSD^P	7	50	6	47

Panfish abundance, namely bluegill, declined between 2015 and 2023 (Table 3). Initially we thought the low electrofishing CPUE observed in 2023 was because we surveyed too early; the 2015 survey was conducted in June whereas the 2023 survey was conducted in late May. However, the low CPUE observed during summer panfish netting confirmed abundance was much lower in 2023.

Table 3. CPUE comparison for bluegill collected from Paya Lake, Oconto County, WI.

		
	2015	2023
EF CPUE (Bluegill/mile)	112	7
FN CPUE (Bluegill/NN)	38	4

Panfish abundance has likely not been influenced by harvest since the bag limit was reduced from 25 fish/day to 10 fish/day in 2020. Unfortunately, our sample was too small to adequately characterize bluegill size structure using PSD and

RSD^{P}. The increase in bass size structure has probably contributed to the decline in panfish abundance due to increased predation.

A follow up survey (SE2 electrofishing and summer panfish netting) should be completed in 4 or 5 years to assess panfish abundance and size structure. If bluegill abundance (electrofishing CPUE of 80 to 100/mile) and size structure do not improve, a regulation change for largemouth bass may be considered. This could include removing the 14 to 18-inch protected slot and revert to the statewide regulation of 14 inches.

Access to Paya Lake is adequate. Boaters are reminded to remove all vegetation from their boat and trailer before leaving to limit the spread of this and other invasive species. A map of Paya Lake can be found at the following internet address: https://apps.dnr.wi.gov/doclink/lakes_maps/0425600a.pdf

LITERATURE CITED

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