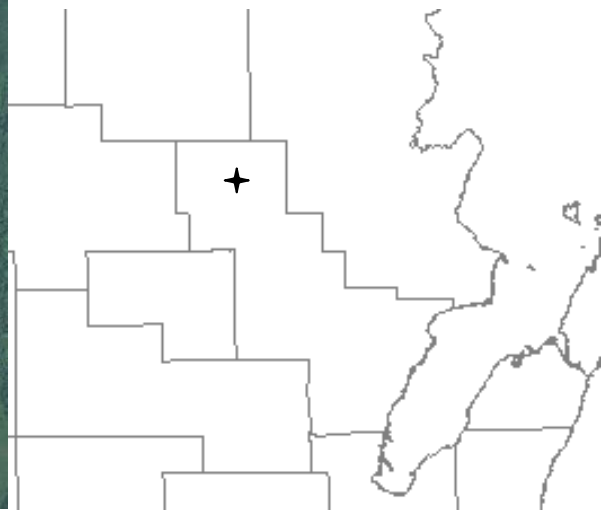
PAYA LAKE

Oconto County

2015 Fish Management Report

Christopher C. Long – Senior Fisheries Biologist



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Paya Lake - Oconto County, Wisconsin
2015 Fish Management Report

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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
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.

Purpose of survey:
Determine the current status of fishery.

Surveys:
WDNR Survey ID: 515077896 – Gamefish/Panfish electrofishing (SEII) - 6/3/2015

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).

EXECUTIVE SUMMARY

- Paya Lake is a 121-acre seepage lake located in northern Oconto County. Paya Lake is very clear, relatively infertile and has only 1.8 miles of shoreline. A single, public boat landing is located on the southwest side of the lake but parking is limited.
- Overall, 274 fish representing 6 species and 1 hybrid were collected during the 2015 survey (Table 2). The five most abundant species collected by number were largemouth bass (36%), bluegill (34%), green sunfish (13%), smallmouth bass (8%) and rock bass (6%).
- A total of 99 largemouth bass was collected and accounted for 36% of the fish collected (Table 2). Bass ranged in length from 3.7 to 16.3 in and averaged 11.6 in (Figure 1). Twenty-two percent of largemouth bass collected were over the 14-in minimum length limit. A subsample of 69 largemouth bass was aged from 2 to 12 years old. Largemouth bass growth was average until age 6 but below average at older ages compared to the average mean length at age for bass in northern Wisconsin (Figure 2).
- Bluegill accounted for 34% of the fish collected and ranged in length from 3.2 to 7.9 in and averaged 6.1 in (Figure 3). Sixty-five percent of the bluegill collected were 6.0 in or greater and considered harvestable. A subsample of 37 bluegill was aged from 3 to 5 years old. Growth was average compared to the mean length at age of bluegill in northern Wisconsin (Figure 4).
- During the survey, 21 smallmouth bass were collected (Table 2). Electrofishing yielded a CPUE of 14.0/h (Table 3). Smallmouth ranged in length from 4.3 to 14.3 in and averaged 9.0 in (Figure 5). Five percent (1 fish) of smallmouth bass measured were over the 14-in minimum length limit. A subsample of 20 smallmouth bass was aged from 2 to 4 years old. Smallmouth bass growth was average compared to other lakes in northern Wisconsin (Figure 6).
- Rock bass made up 6% of the fish collected totaling 16 fish (Table 2). Rock bass ranged in length from 4.5 to 8.9 in and averaged 7.6 in. Electrofishing CPUE was 10.7/h (Table 3). Overall the length distribution suggests that the rock bass population is well balanced in terms of age and size structure. Rock bass have never been collected in Paya Lake. The 2015 electrofishing survey was the first documented and recorded occurrence of rock bass.
- The current fishing regulations (Table 4) are adequate and should continue to provide quality fishing opportunities. While the overall abundance of panfish appears to be improving, summer panfish netting, including mini-fyke netting, should be included with the next survey in order to better evaluate panfish growth, abundance, size structure and recruitment.
- Changes to the fishing regulations for both largemouth and smallmouth bass should be considered. I propose changing the minimum length limit of smallmouth bass to 18 inches and implementing a protected slot limit from 14 to 18 inches for largemouth bass. Changing the fishing regulation for largemouth would be ineffective if substantial harvest of small, largemouth bass does not occur.
- Paya Lake may be a good candidate for reducing the bag limit of panfish from 25/angler/day to 10/angler/day. However, summer panfish netting, including mini-fyke netting, is recommended before the next survey and/or a regulation change in order to better evaluate panfish abundance and size structure.
- The fishing regulation changes proposed in this report will not be implemented unless a fish sticks project is initiated. Improving fish habitat in conjunction with these changes is essential for the fishery to improve.
- The next fisheries survey (panfish netting, mini-fyke netting and summer gamefish/panfish electrofishing) of Paya Lake is scheduled for 2025 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish.

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INTRODUCTION

Paya Lake is a 121-acre seepage lake located in northern Oconto County. 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 and walleye. 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 2004 and consisted of mini-fyke netting (July) and gamefish/panfish electrofishing which took place in October (Kornely, 2009). Bluegill and green sunfish were collected in large numbers in the mini-fyke nets. The October electrofishing sample revealed an abundant largemouth bass population and a smaller population of smallmouth bass (Kornely, 2009). Very few bass were greater than the 14-inch minimum length limit.

Since the last survey in 2004, WDNR fish sampling protocols were evaluated and changed; specifically the timing of gamefish/panfish electrofishing (SEII). In 2004, this sampling was conducted in the fall (i.e. October) where as in current survey protocol, SEII electrofishing was conducted in June. Therefore, it will be difficult to detect changes in bass and panfish populations between surveys.

The goal of the 2015 gamefish/panfish survey was to assess the status of the based on relative abundance, proportional stock density (PSD), relative stock density (RSD), catch per unit effort (CPUE) and mean length at capture (age and growth). Comparisons to the 2004 fisheries survey were made where applicable.

METHODS

Data collection:

A standard WDNR electrofishing boat was used to collect fish on Paya Lake. All fish collected were measured to the nearest 0.1 inch total length (TL) and separated into half-inch groups (X.0-X.4 for inch group and X.5-X.9 for half-inch group). A sub-sample of scales or dorsal spines was collected for age and growth analysis from all gamefish. Aging structures (scales or

spines) were collected from 5 non young-of-the-year (YOY) fish per half inch group. Ages were assigned to each fish using standard WDNR procedures.

Data analysis:

Relative abundance was calculated as the percentage each species represented from the total sample (i.e. 22 fish of a single species from a sample of 100 total fish = 22% relative abundance). Catch per unit effort (CPUE) was calculated as catch by gear divided by sampling effort for each species collected. Length frequency distributions were tabulated for dominant gamefish and consisted of electrofishing samples. Proportional stock density (PSD) and relative stock density for **p**referred 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) (Table 1). 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 northeast Wisconsin.

RESULTS

Overall, 274 fish representing 6 species and 1 hybrid were collected during the 2015 survey (Table 2). The five most abundant species collected by number were largemouth bass (36%), bluegill (34%), green sunfish (13%), smallmouth bass (8%) and rock bass (6%).

A total of 99 largemouth bass was collected and accounted for 36% of the fish collected (Table 2). Electrofishing yielded a CPUE of 66.0/h (Table 3). Bass ranged in length from 3.7 to 16.3 in and averaged 11.6 in (Figure 1). Largemouth bass PSD was 66 and RSD^{P} was 7. While PSD was within the desirable range (40-70), RSD^{P} was not (10-40) (Table 1). Twenty-two percent of largemouth bass collected were over the 14-in minimum length limit. A subsample of 69 largemouth bass was aged from 2 to 12 years old. Largemouth bass growth was average until age 6 but below average at older ages compared to the average mean length at age for bass in northern Wisconsin (Figure 2). Bass are reaching legal size (14 in) around age 7 or 8. Successful reproduction and recruitment of largemouth bass was evident.

Bluegill accounted for 34% of the fish collected and ranged in length from 3.2 to 7.9 in and averaged 6.1 in (Figure 3). Sixty-five percent of the bluegill collected were 6.0 in or greater and considered harvestable. Bluegill PSD was 65 and RSD^{P} was 0. Neither PSD nor RSD^{P} were

within the desirable range for a balanced population (Table 1). Electrofishing CPUE was 62.0/h (Table 3). A subsample of 37 bluegill was aged from 3 to 5 years old. Age-4 bluegill averaged 5.7 in and age-5 fish averaged 7.0 in. Growth was average at all ages compared to the mean length at age of bluegill in northern Wisconsin (Figure 4). Successful reproduction and recruitment of bluegill was evident.

Green sunfish were the third most abundant species collected representing 13% of the sample (Table 2). Green sunfish ranged in length from 3.2 to 7.2 in and averaged 5.3 in. Electrofishing yielded a CPUE of 24.0/h (Table 3). No green sunfish were aged however, based on the length distribution, consistent reproduction and recruitment was evident.

During the survey, 21 smallmouth bass were collected (Table 2). Electrofishing yielded a CPUE of 14.0/h (Table 3). Smallmouth ranged in length from 4.3 to 14.3 in and averaged 9.0 in (Figure 5). Smallmouth bass PSD was 24 and RSD^P was 6. Smallmouth bass PSD was not within the desirable range for a balanced population (Table 1). Five percent (1 fish) of smallmouth bass measured were over the 14-in minimum length limit. A subsample of 20 smallmouth bass was aged from 2 to 4 years old. Smallmouth bass growth was average compared to the average mean length at age for smallmouth bass in other northern Wisconsin lakes (Figure 6). Successful reproduction and recruitment of smallmouth bass was evident.

Rock bass made up 6% of the fish collected totaling 16 fish (Table 2). Rock bass ranged in length from 4.5 to 8.9 in and averaged 7.6 in. Electrofishing CPUE was 10.7/h (Table 3). Overall the length distribution suggests that the rock bass population is well balanced in terms of age and size structure.

Additionally, hybrid sunfish and yellow bullhead were also collected during the 2015 survey and accounted for approximately 3.3% of all fish collected (Table 2).

DISCUSSION

Paya Lake is relatively infertile because it is a deep, headwater seepage lake that has a small upland, forested watershed. Primary production, which forms the base of all aquatic food chains, is lacking which is evident from a summer Secchi disc reading of 16 ft. However, populations of panfish (bluegill and rock bass) and gamefish (largemouth bass and smallmouth bass) are present and offer anglers a respectable fishing opportunity.

Since the previous fisheries survey in 2004, fish sampling protocols were evaluated and changed; specifically the timing of gamefish/panfish electrofishing (SEII). In 2004 this sampling was conducted in the fall (i.e. October) where as in current survey, SEII electrofishing was conducted in June. Therefore, changes in bass and panfish populations between surveys will be difficult to ascertain.

Largemouth bass are abundant in Paya Lake, but not as abundant as in 2004 (Figure 1). Proportionally, more bass over the 14-inch minimum length limit were collected in 2015 than in 2004 but the overall number of legal-sized largemouth bass was about the same between years. There were definitely not as many sub-legal largemouth bass present in 2015 (Figure 1). PSD and RSD^P both improved between 2004 and 2015. Largemouth bass PSD increased from 19 to 66 and RSD^P from 1 to 7. Largemouth bass PSD was within the desirable range for a balanced population while RSD^P fell slightly short of the desirable range (Table 1). However, largemouth bass growth is below average beginning at age 7 and older (Figure 2). This could also be attributed to our ability to accurately assess ages of older fish using dorsal spines.

Bluegill abundance appears to have improved between 2004 and 2015 but this increase is most likely associated with the sampling bias between electrofishing in June versus October (Figure 3 & Table 3). For example, in June most bluegill will be in shallow water to spawn. Bluegill will also be in shallow water in October but not to the degree they would be in early summer. This change, more than anything, explains the difference in abundance and size structure we observed in bluegill between the 2004 and 2015 surveys.

Smallmouth bass are the only other substantial predator species present in Paya Lake besides largemouth bass. While the overall abundance appears to have declined somewhat, size structure has changed little between 2004 and 2015; the population is comprised of mostly sub-legal fish (Figure 5). PSD and RSD^P remained stable between 2004 and 2015. Smallmouth bass PSD decreased slightly from 28 to 24 but RSD^P increased from 3 to 6 between 2004 and 2015, respectively. Both PSD and RSD^P were within the desirable range for a balanced population (Table 1). Smallmouth bass growth was average compared to other lakes in northern Wisconsin however, only a few age groups were represented in the 2015 sample (Figure 6). The largest fish (14.3 in) in our sample was not aged.

Rock bass have never been collected in Paya Lake. The 2015 electrofishing survey was the first documented and recorded occurrence of rock bass. Even though no rock bass were aged, several year classes are obviously present based on the length frequency of the fish in the sample.

CONCLUSIONS & RECOMMENDATIONS

The current fishing regulations (Table 4) are adequate and should continue to provide quality fishing opportunities. While the overall abundance of panfish appears to be improving, summer panfish netting, including mini-fyke netting, should be included with the next survey in order to better evaluate panfish growth, abundance, size structure and recruitment.

Fishing regulations for black bass (largemouth & smallmouth) were changed in 2014. The most notable change is that largemouth bass are no longer protected under the early catch-and-release season from the first Saturday in May to the second Saturday in June. Smallmouth bass are still protected under the early catch-and-release rule during this time frame. It's uncertain if harvest of largemouth bass in Paya Lake is occurring. Harvest could impact reproduction and recruitment of largemouth bass if fish are removed before spawning occurs. This may not have a negative effect on the population since largemouth bass abundance has historically been high.

Changes to the fishing regulations for both largemouth and smallmouth bass should be considered. Increasing the minimum length limit to 18 inches on smallmouth bass (daily limit of 3) would simply improve the size structure of the population allow their numbers to increase over time if reproduction and recruitment remain constant. A protected slot limit from 14 to 18 inches for largemouth bass (daily limit of 5) may improve the size structure of the population but abundance could also increase. If harvest below the slot is minimal, abundance would increase and growth would likely decline essentially allowing the slot to function like an 18-inch minimum length limit. Largemouth bass harvest is generally negligible even when catch rates are high. For example, the 1999/2000 creel survey on Maiden Lake revealed a catch of 778 largemouth bass but only 37 were harvested. Similarly, a creel survey on Wheeler Lake in 2008/2009 estimated 3,391 largemouth bass were caught by anglers but only 133 were harvested (Tobias, 2009). Both of these lakes are similar to Paya Lake and are also located in northern Oconto County. Therefore, changing the fishing regulation for largemouth bass would be ineffective ***if*** substantial harvest of small largemouth bass does not occur.

Bluegill showed an improvement in both size structure and abundance between 2004 and 2015 (again, this is taking into account the difference between the time of year sampling occurred). Therefore, Paya Lake may be a good candidate for reducing the bag limit of panfish from 25/angler/day to 10/angler/day. However, summer panfish netting, including mini-fyke netting, is recommended before the next survey in order to better evaluate panfish abundance and size structure. Depending on the results of a panfish survey, I may recommend reducing the bag limit of panfish from 25/angler/day to 10/angler/day. This will be necessary in order to maintain a quality fishing opportunity for bluegill and stabilize the forage base if regulation changes to largemouth and smallmouth bass are also implemented.

The fishing regulation changes proposed in this report may not be implemented unless a fish sticks project is initiated. Improving fish habitat in conjunction with these changes is essential for the fishery to improve. Additionally, a "sunset clause" may be included with the changes to the bass fishing regulations. This will be done as a precaution in the event the bass populations do not respond as projected to the change in fishing regulations.

The next fisheries survey (panfish netting, mini-fyke netting and summer gamefish/panfish electrofishing) of Paya Lake is scheduled for 2025 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish. Boat access to Paya Lake is adequate. One public boat landing is available to anglers however, parking is limited. Shore fishing opportunities are extremely limited for the public. Boaters are reminded to remove all vegetation from their boat and trailer before leaving to limit the spread of invasive species. A map of Paya Lake can be found at the following internet address; http://dnr.wi.gov/lakes/maps/DNR/0425600a.pdf

ACKNOWLEDGEMENTS

WDNR would like to thank members of the Paya Lake Association for their invitation to discuss the logistics of coordinating and partnering on a "fish sticks" project. WDNR staff and association members met on June 29th, 2015 at the home of Wayne Everson.

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APPENDIX I – TABLES

Table 1. Proposed length categories for various fish species. Measurements are total lengths for each category in inches. Updated from Anderson and Neumann (1996), Bister et al. (2000), Hyatt and Hubert (2001).

Species	PSD	RSD-P	Stock	Quality	Preferred	Memorable	Trophy
Black crappie			5	8	10	12	15
Bluegill	20 - 40	5 - 20*	3	6	8	10	12
Brown bullhead			5	8	11	14	17
Largemouth bass	40 - 70	10 - 40*	8	12	15	20	25
Muskellunge	30 - 60		20	30	38	42	50
Northern pike	30 - 60		14	21	28	34	44
Pumpkinseed	20 - 40		3	6	8	10	12
Rock bass	20 - 60		4	7	9	11	13
Smallmouth bass	30 - 60		7	11	14	17	20
Walleye	30 - 60		10	15	20	25	30
Yellow perch	30 - 50		5	8	10	12	15
Yellow bullhead			4	7	9	11	14

*Range based on management strategy for balanced populations.

Table 2. Number, relative abundance (%), and length range (in) of fishes collected in 2015 from Paya Lake; Oconto County, WI.

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER			
*Common Name of Fish	Number	Percent	Length Range (inches)
Largemouth bass	99	36.1%	3.7 - 16.3
Bluegill	93	33.9%	3.2 - 7.9
Green sunfish	36	13.1%	3.2 - 7.2
Smallmouth bass	21	7.7%	4.3 - 14.3
Rock bass	16	5.8%	4.5 - 8.9
Hybrid sunfish	7	2.6%	3.6 - 7.1
Yellow bullhead	2	0.7%	8.4 - 9.6
TOTAL	274		

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

Table 3. Comparison of electrofishing data between 2004 and 2015 collected from Paya Lake; Oconto County, WI.

	Gamefish/Panfish electrofishing (SEII)					
	2015 June			2004 October		
	Total	**CPUE**	**CPUE**	Total	CPUE	CPUE
Species	**Catch**	**/hour**	**/mile**	Catch	/hour	/mile
Largemouth bass	**99**	**66.0**	**118.8**	433	240.6	324.8
Bluegill	**93**	**62.0**	**111.6**	10	5.6	7.5
Green sunfish	**36**	**24.0**	**43.2**	25	13.9	18.8
Smallmouth bass	**21**	**14.0**	**25.2**	136	75.6	102.0
Rock bass	**16**	**10.7**	**19.2**			

Table 4. Current fishing regulations (2015 - 2016) for Paya Lake; Oconto County, WI.

Species	Fishing Season	Daily Limit	Minimum Length
Largemouth bass	May 2- March 6	5	14 inches
Smallmouth bass	May 2- June 19	Catch and release	
	June 20- March 6	5 in total with LMB	14 inches
Panfish (bluegill, pumpkinseed, crappie, and yellow perch)	Open all year	25 in total	None
Bullheads	Open all year	None	None
Rock bass	Open all year	None	None

APPENDIX II – FIGURES

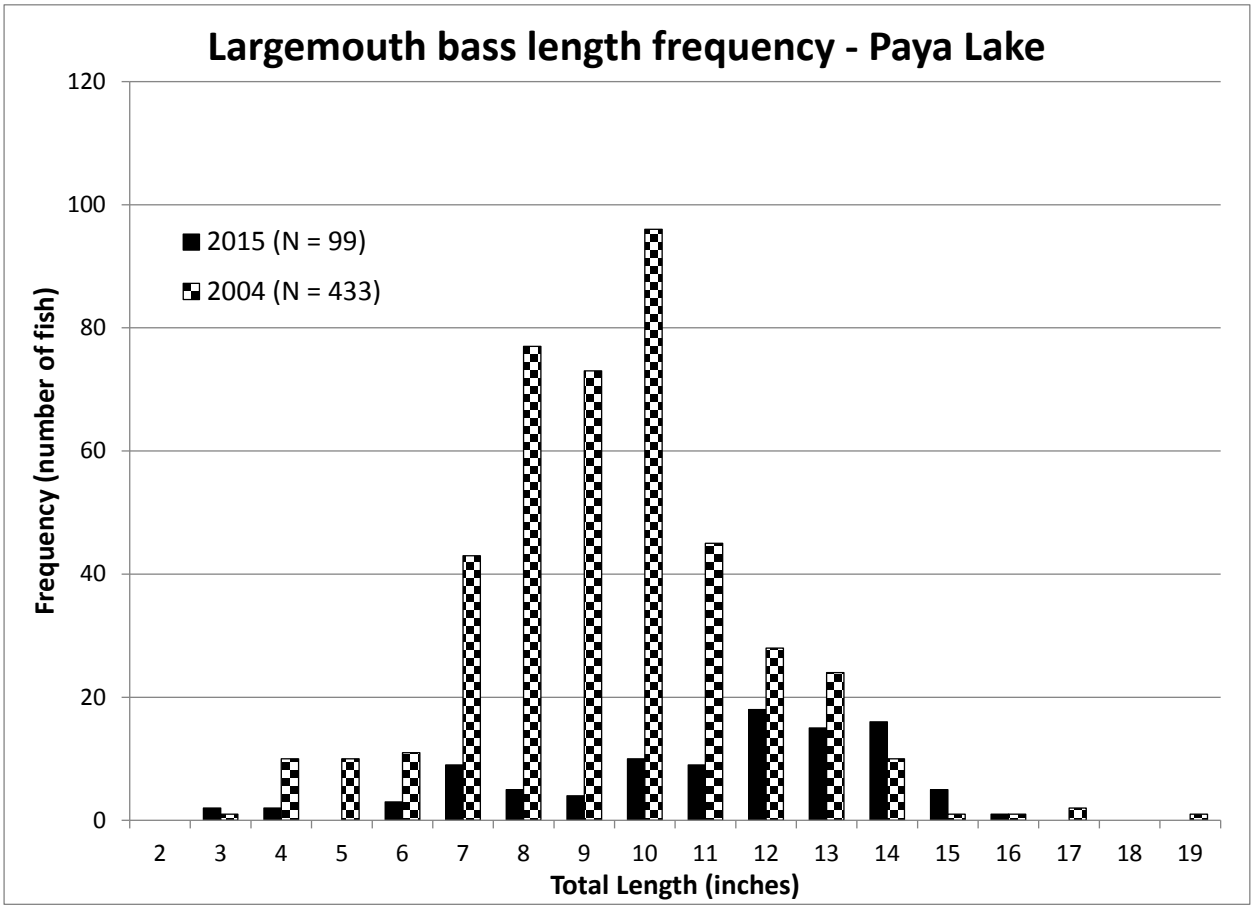

Figure 1. Largemouth bass length frequency from 2004 and 2015 fisheries surveys at Paya Lake; Oconto County, WI.

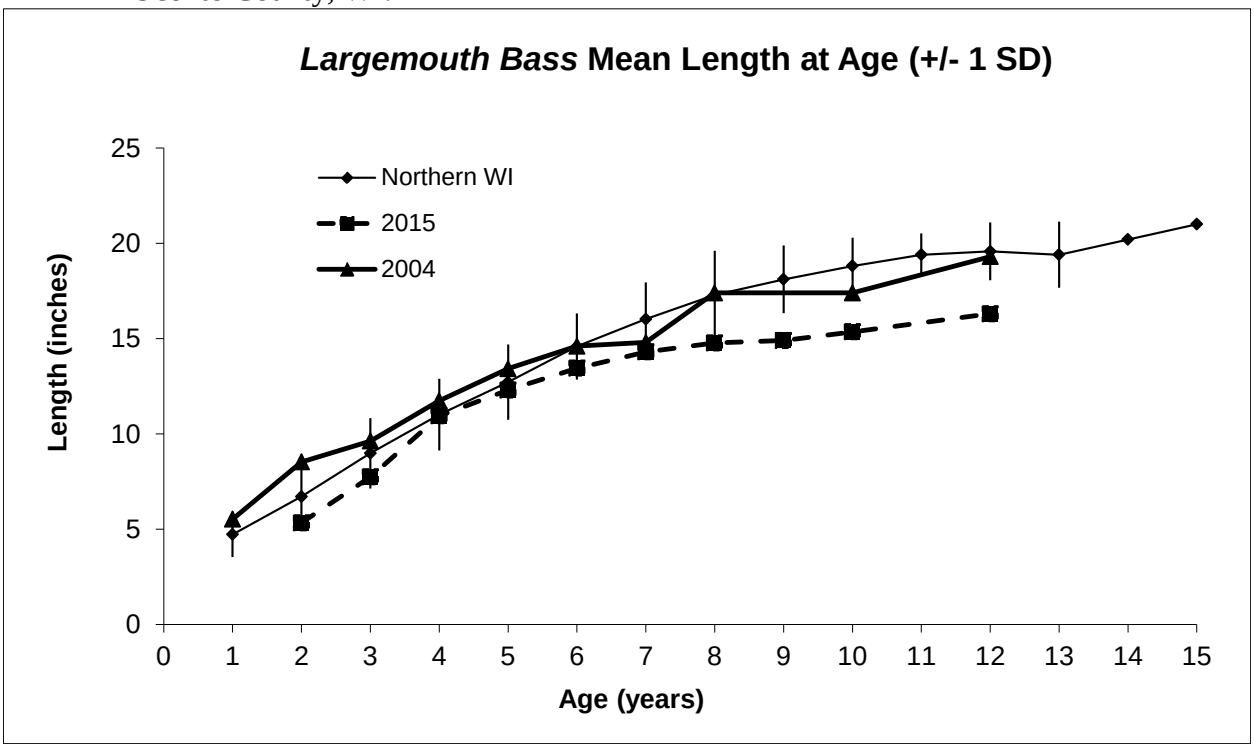

Figure 2. Largemouth bass mean length at age comparison from Paya Lake; Oconto County, WI.

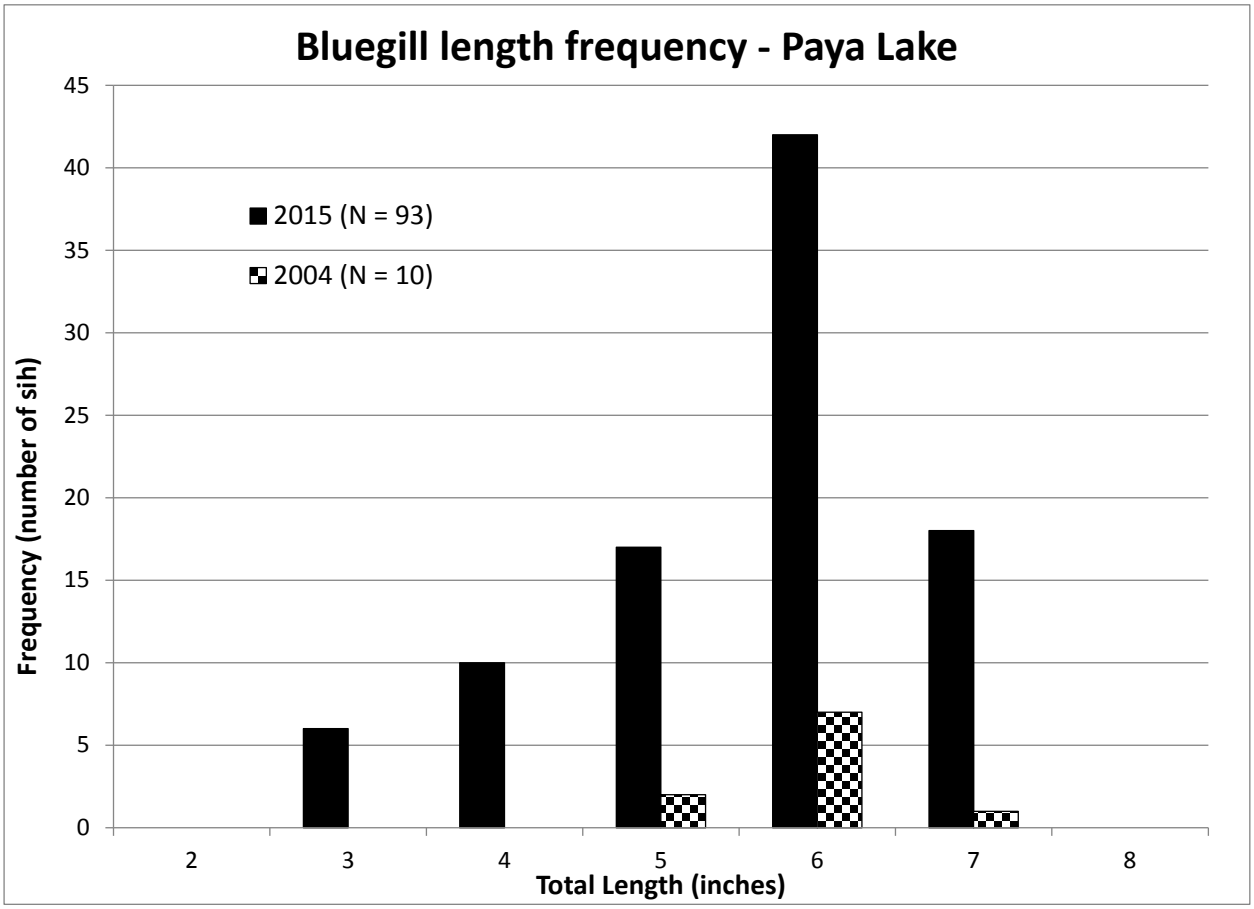

Figure 3. Bluegill length frequency from 2004 and 2015 fisheries surveys at Paya Lake; Oconto County, WI.

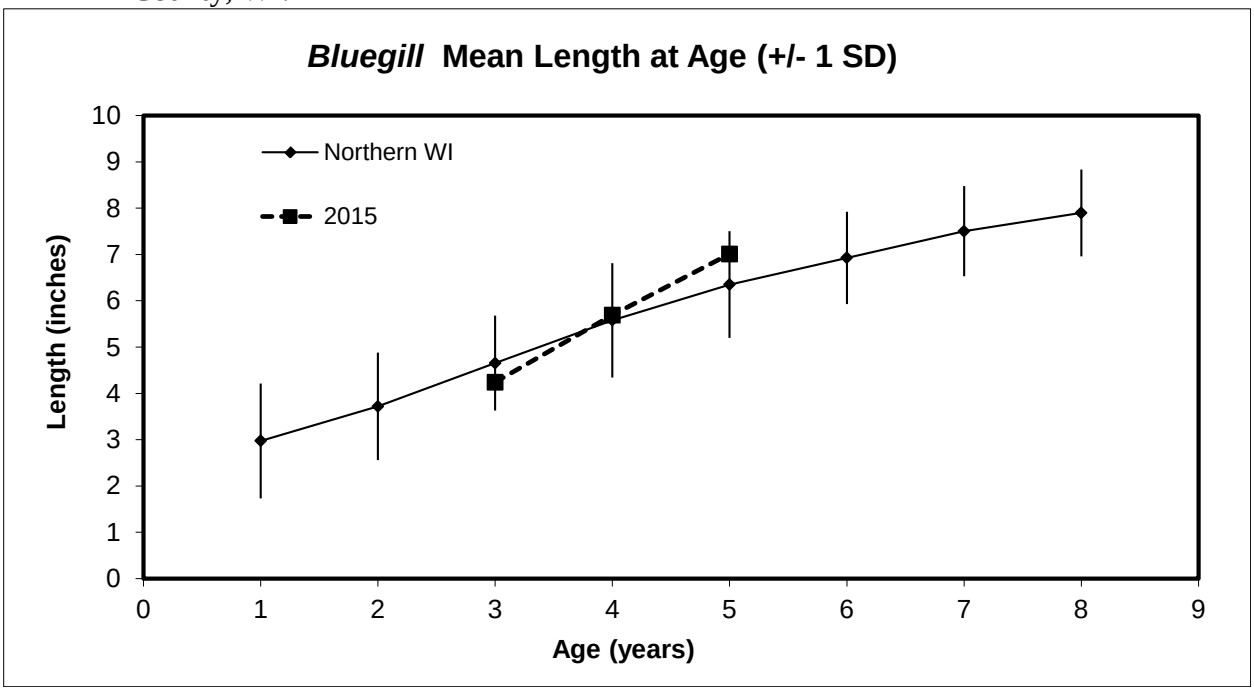

Figure 4. Bluegill mean length at age comparison from Paya Lake; Oconto County, WI.

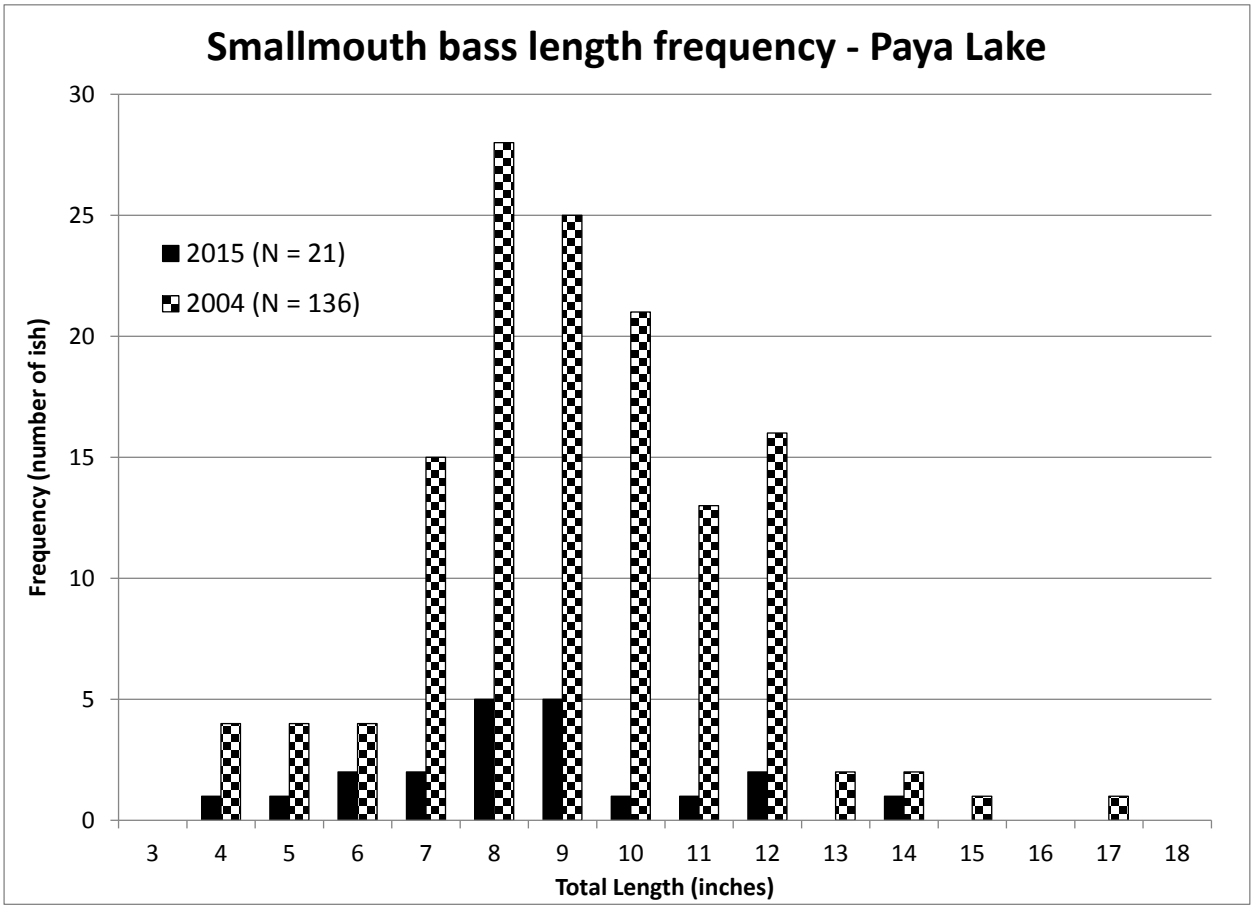

Figure 5. Smallmouth bass length frequency from 2004 and 2015 fisheries surveys at Paya Lake; Oconto County, WI.

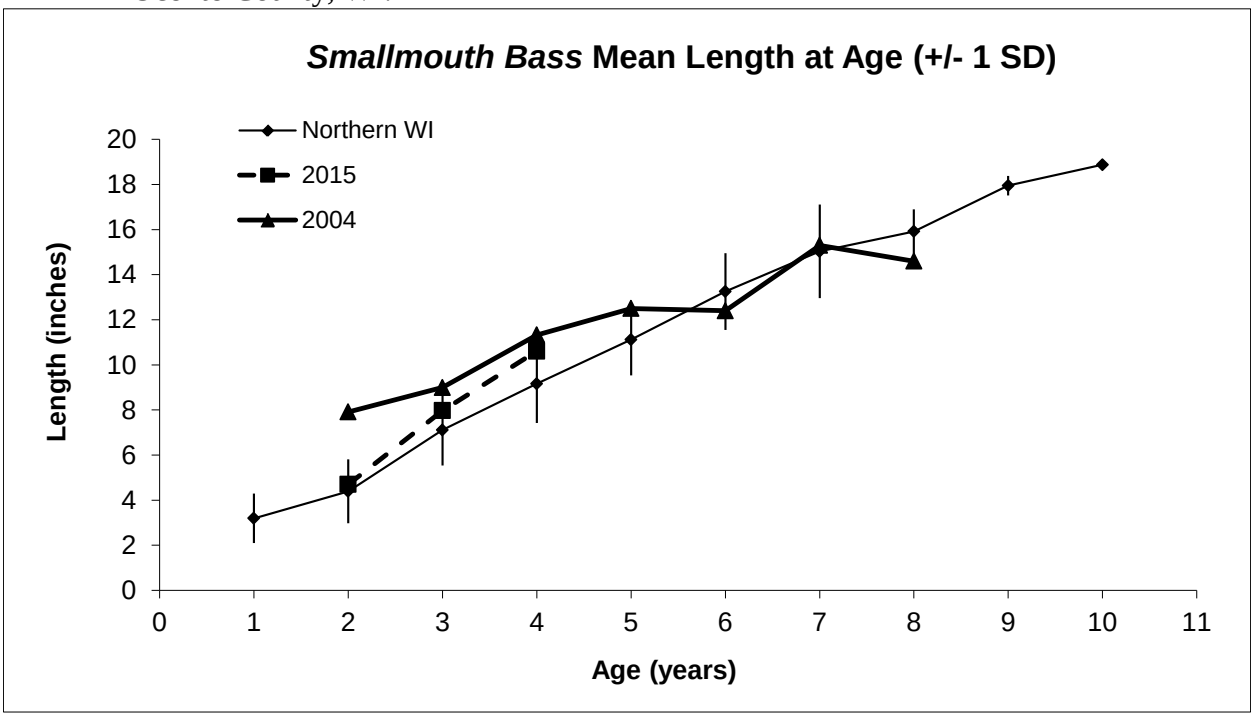

Figure 6. Smallmouth bass mean length at age comparison from Paya Lake; Oconto County, WI.