Introduction: ***Fall 2020***

JadEco, LLC was contacted by Mike Ponder to collected data on the fishery for Antioch Lake. DC Electroshocking was conducted throughout most of the lake on October 6, 2020. Fish population data was collected for a total of 60 minutes utilizing DC electrofishing equipment. A total of 1,469 fish were collected with 11 species being represented. Data analysis consisted of catch per unit effort per species and total catch per unit effort. This provides information on the fish population density, and potential trends in the fishery. PSD's (proportional stock density) were also calculated on important game species to assist with understanding the size structure within the lake. The last metric analyzed was the relative weight (Wr). This metric provides information on length to weight relationships to better understand if your game fish are relatively fat, or relatively thin and potential changes in the predator / prey relationships and available forage.

There was concern for both bass and bluegill age and growth therefor, along with the parameters outlined above, we also collected age data on bluegill and largemouth bass to determine if they were stunting, or slow growing in Antioch Lake.

Summary of Fisheries Data:

Consistent with the 2015 collection, the survey indicated an excellent fishery at Antioch Lake for anglers. For game species collected, the relative weight and PSD's indicated a healthy population of largemouth bass and bluegill, and the fishery seems to be in balance. One concern is the high collection rate of bluegill observed again in 2020. Even though there is a dense bluegill fishery, the relative weights are still within our objective range at 92, even though at the lower spectrum. The bluegill size distribution is good and the fishery is in balance, but when reviewed the relative weighs for bluegill between 6" and 8", the fishery seems to be stunting. Age and growth work is being performed on bluegill and bass, and this information will be helpful to the issue of lower Wr at the 6" to 8" size range.

Crappie are represented by a strong adult class of 8" plus fish and another class of younger crappie. Small bodies of water can observe stunted fisheries, but the relative weight for the crappie collected were excellent at 101.

The overall CPUE for all fish collected was over FOUR times the objective of 6 fish per minute at 24.5 fish per minute. The majority of this was due to the bluegill collection (19.43 fish per minute).

A representative sample for both bass and bluegill from all size ranges were kept for age analysis using otolith removal, sectioning and polishing, and subsequent counting of annuli for aging. These ages were then compared to average growth

rates in Illinois lakes. Overall, each year class for bluegill were consistent with statewide averages for length at age. The four-year old age group average (6.42", range 5.63" to 7.05") was slightly lower than the statewide average (6.60"). Of those aged at 4 years, 57% were below the statewide average. The largemouth bass length at age averages were consistently slightly below the statewide averages, with the exception of two-year old bass which were substantially larger, on average.

Largemouth Bass:

When evaluating the fish population, we utilize a metric known as proportional stock density or "PSD". This metric analyzes the size structure within the population. The proportion of fish greater than quality size (12") divided by the number of fish greater than stock size (8") provides the PSD value. A desired PSD range for Largemouth bass is a value from 40 to 70. The PSD for largemouth bass collected at Antioch Lake is within the objective range at 64 (up from 56 in 2015). Along with this, the RSD14 value (the proportion of fish greater than 14 inches divided by the number of fish greater than 8 inches) was at 37 and above our objective range (up from 10 in 2015). A desired RSD14 range for Largemouth bass is 10 to 20. This indicates a good portion of the population of bass at the 14" or greater size, but on the lower side of our objective range.

While the average relative weights were good at 99, there was a good portion of bass over 11" that were under our objective range (nearly 30%).

We collected largemouth bass from 2.8" to over 16.7" during the survey, with an average size of 10.9". This is slightly higher than 2015 at 10.1". The average relative weights (Wr) for largemouth bass fell within the objective range at 99 and was slightly lower that 2015 at 101 (Range 90-110). The classes over 11" were exhibiting about 30% of the collection below our objective Wr and may indicte slower growth. We are working on age and growth of a sample of bass to determine if there is an issue. The sample size distribution also indicated solid year classes and no major gaps. Antioch Lake anglers can anticipate good bass fishing for the next few years.

Bluegill:

The CPUE for bluegill was at 19.43 fish per minute, which is much higher than the objective range. Bluegills ranging from 1.2" to 9.5" were collected with the average size at 4.5" (up from 3.8" in 2015). We observed a much better population distribution (size distribution) in 2020 than 2015 with more larger bluegill present. However, there is a large class of 7" bluegill that are not 'jumping the hump' into the larger 8" plus fish, and exhibiting lower relative weights. Overall average Wr was at 92 for bluegill with a range from 70 to 141.

The PSD for bluegill at Antioch Lake was at 44 (up from 5 in 2015), which is within the objective between 20 and 60. There is a dense population of 7" bluegill which increased the RSD7 values (the number of fish larger than 7" divided by the number of fish 3" and larger) from 5 in 2015 to 32 in 2020. While this is desirable by anglers (over larger bluegill), it is likely this population is stunting and needs corrective action.

The bluegill fishery, in all, appears to be doing well, but the high density as well as the stacking of bluegills in the 7" range with lower Wr provides for concern.

Black Crappie:

We collected a decent number of crappie during this survey, ranging in size from 3.5" to almost 13.6". The size breakdown of the crappie collected indicated multiple year classes of successful spawn and recruitment. While the upcoming crappie fishing at Antioch Lake should be very good, it is important to control the crappie fishery as a small lake such as Antioch Lake could easily become over populated and stunted by crappie. The harvesting of crappie should be allowed. For crappie collected, the average Wr was excellent at 101 (up from 97 in 2015) indicated a population of relatively fat crappie.

Other Species:

We collected 11 species in total. Carp (18), warmouth (48), yellow perch (6), yellow bass (1), golden shiners (3), walleye (1), green sunfish (2), and red ear sunfish (2) were all collected.

The higher density of carp collected in 2020 (0.3 fish per minute) was above our recommended objective of less than 0.25 fish per minute. Carp ranged from 14.8" to nearly 36" long and averaged 28.7". Carp should be classified as a catch and remove species. Older surveys (IDNR) show carp recruitment occurring, but with the dense bass fishery at Antioch Lake, I would anticipate these predators are controlling the majority of recruitment, but any effort to remove carp has a positive effect on the fishery.

Once again, warmouth were the next most abundant species, with 48 warmouth collected. They ranged from 2.6" to 7.5" and averaged 4".

Again in 2020, there was only one yellow bass collected and was just less than 5" in length. Any yellow bass caught should be removed from Antioch Lake. These fish can be very prolific and can over populate and stunt out easily. As with the carp, the large bass population is probably keeping this population of yellow bass under control for now.

Yellow perch were collected from 7.9" to 10.9" and averaged 9.6". Relative weights were low at 77, and is likely due to the competition for forage and space with the dense bluegill fishery.

One large walleye (20.6") was collected and had an excellent relative weight at 107.

Largemouth Bass and Bluegill Aging:

Due to concerns for bass and bluegill size structure and angler concern for stunting, both bass and bluegill ages were collected on a subsample of fish from the Fall 2020 sample. Largemouth bass and bluegill representing all size classes were collected, euthanized and aged. Standard methods for aging centrarchids was used by removing the otolith (inner ear bones), sectioning of the otolith, polishing of the bone, and then annuli were counted for aging of individual fish.

Largemouth bass ranged from young of the year at 3.98" to 5 year old bass up to 16.18". No bass were collected older than 5 years, or 16.18". The average length per year class was compared to the statewide average growth per age class. The growth at age was close to the average growth rates for Illinois, but all age classes were blow average, with the exception of the 2-year old bass age class. The 2-year old bass, on average were larger than statewide averages.

Of the bluegill aged, they ranged from 1-year old to 5-year old fish, and were from 2.76" to 8.66" in length. Bluegill length at age were above statewide averages, with the exception of the 4-year old age class. This was a bit surprising to me due to the high density of bluegill collected (over 19 fish per minute with our objective range being between 2 and 4.5 fish per minute) and the lower Wr at 92. I would have expected a slower growth rate at older age classes with the high competition for food and space.

Based on the data on proportional stock densities, both bass and bluegill appear to be in balance with the population distribution and growth rates appear to be average for both species when compared to statewide growth rates.

Recommendations:

Stocking Program:

With the prey biomass that is available in Antioch Lake, a diversification of predators would be beneficial. This diversity could have several impacts: 1) It would help control the over population of prey species (bluegills). 2) Provide an alternate predator in the event there is a problem with the bass fishery. 3) Provide additional angling opportunities for multiple species. Catching and transporting fish into your lake from other water bodies can be detrimental to your lake by introduction of disease and placing your fishery out of balance. It is not recommended any fish be stocked until discussing this with your biologist.

Fish that could be stocked would be the muskie and walleye. If stocking muskie, approximately 90 muskie (not to exceed 1 fish / acre) every three years, or about 30 every year would be recommended. These fish can be costly to purchase, but studies have shown that they target bluegill in lakes like Antioch Lake and those studies have also shown an increase in largemouth bass PSD's when muskie were stocked. The budget for 12"-14" muskie would be around $12/ fish.

If walleye are desired, I would recommend a supplemental stocking of 6"-8" walleye at about 10 per acre. The walleye fishery should be monitored over time (angling or spring netting) to determine the success of the stocking program. Walleye at this size can normally be purchased around $1.95 per fish.

Stocking is always subjective to budgetary constraints, and all recommendations may not be able to be met. Stocking recommendations should always be re-evaluated based on subsequent fish population sampling. If budgetary constraints are a problem, stocking every other year may be an option, keeping in mind limited year-class strength and size gaps in the fish that anglers are catching.

Creel Limits:

The dense biomass of bluegill in the 7" (just under 8") size class is concerning. The life history of bluegill is unique in that the big (bull) mall bluegill regulate the spawning. Absence of these big males (over 9") will cause bluegill males to become sexually mature at an earlier age, and can cause them to stunt out under 8". The current regulations in place do not protect the big bluegill. By changing the limit to allow ONLY 5 bluegill OVER 8" per day and the remaining limit of smaller fish, you can ported the big males while still removing the large biomass of bluegill stacked up under 8". Harvest the smaller bluegill, but protect the big males. This can be a difficult regulation for many anglers to understand and support. If you need educational literature, please let me know and we'll provide an article for distribution and education.

Currently, the population of crappie appears to be substantial, and relative weights are good at 101. However, continue to monitor this population though angling and if the fish begin to all be 'cookie cutter' fish under 8", corrective action needs to occur and harvest encouraged. This condition is difficult to reverse and needs to be addressed as soon as you see those trends occurring.

Habitat Enhancement:

Antioch Lake is working towards managing native aquatic plants in the lake. Your management plan should be tailored to control non-native invasive species while maintaining a healthy biomass of native plants. Allowing the growth of a quality native plant community would provide food and cover as well as water quality

benefits to the community. To the contrary, however, if the aquatic plant community is too dense, it can become more difficult for largemouth bass to forage. This could cause an increase in bluegill survival and a reduction in both bass and bluegill condition. Continue to manage (not eradicate) your native plant community for a healthy balance by treating in areas that are necessary (such as boat ramps and private docks for access) and leave areas that are out of the way (such as along highway 173 and the dam).

Table 1: Catch Per Unit Effort (CPUE) by species

Species:	***Number:***		***Fish / Minute***		***Obj. (fish/min)***
	20f	*15f*	***20f***	*15f*	
Largemouth Bass:	**183**	124	**3.05**	1.65	1.0-2.5
Bluegill:	**1165**	358	**19.43**	5.97	2.0-4.5
Black Crappie:	**40**	10	**0.67**	0.13	0.2-0.8
Walleye	**1**	- -	**0.02**	- -	- - - - -
Common Carp:	**18**	2	**0.3**	0.03	Less than 0.25
Pumpkinseed:	**- - - -**	4	**- -**	0.07	- - - - -
Redear Sunfish:	**2**	- -	**0.03**	- -	- - - - -
Warmouth:	**48**	18	**0.8**	0.3	- - - - -
Green Sunfish:	**2**	- -	**0.03**	- -	- - - - -
Yellow Perch:	**6**	1	**0.1**	0.02	- - - - -
Yellow Bass:	**1**	1	**0.02**	0.02	- - - - -
Golden Shiner	**3**	4	**0.05**	0.01	- - - - -
Total CPUE	**1,469**	522	**24.5**	8.2	6.00 plus

Table 2: Proportional Stock Density (PSD)

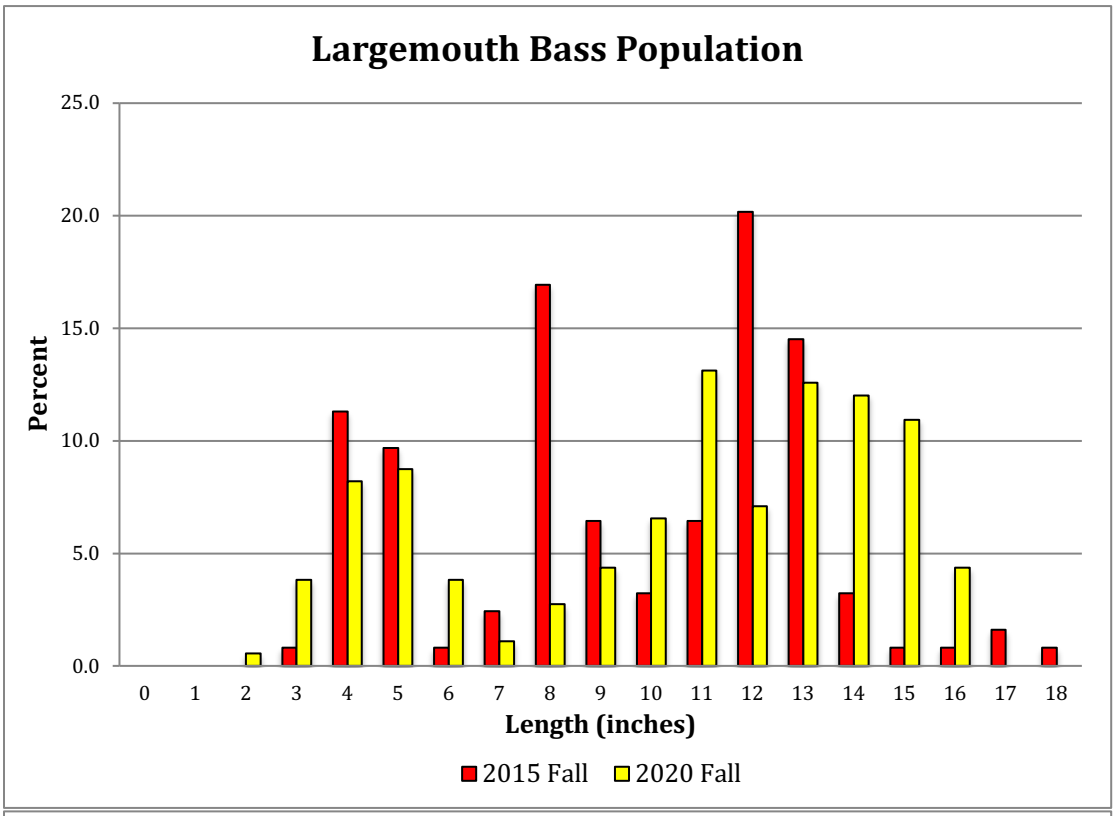
Species:	***2020f***	***2015f***	***Objective***
Largemouth Bass:	64	56	40-70
Bluegill:	44	5	20-60

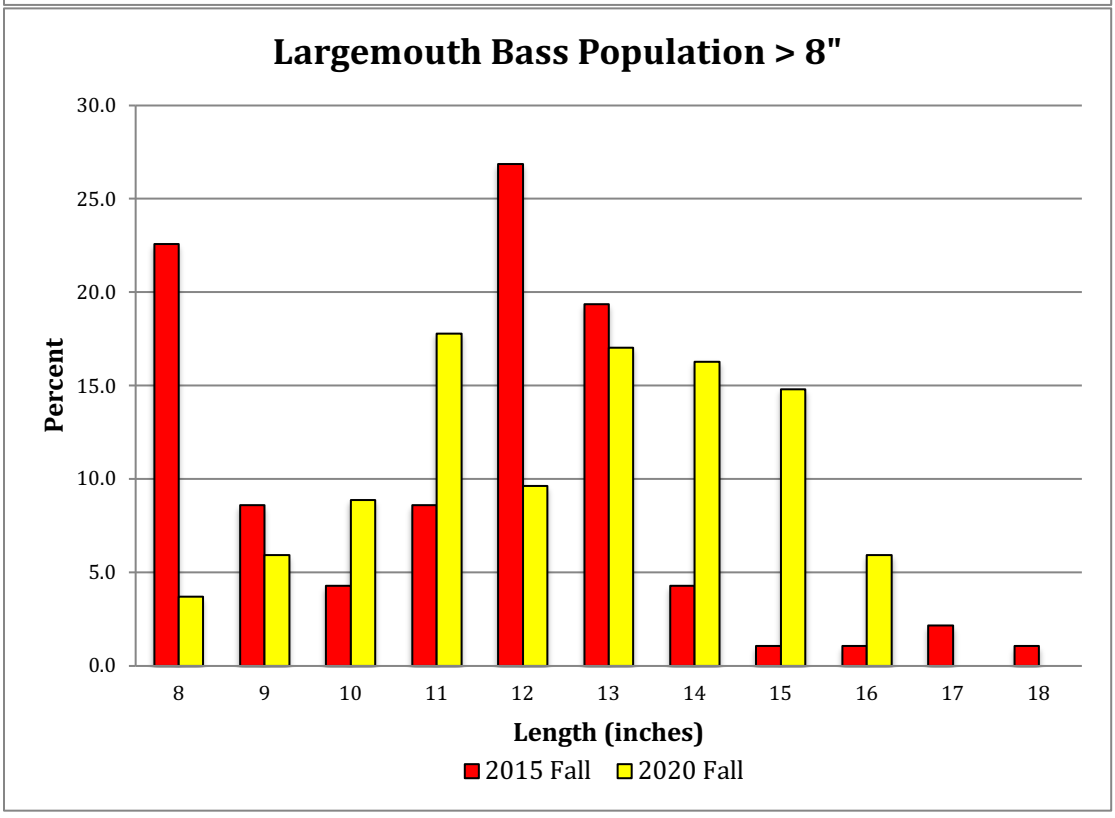
Table 3: Relative Weight (Wr)

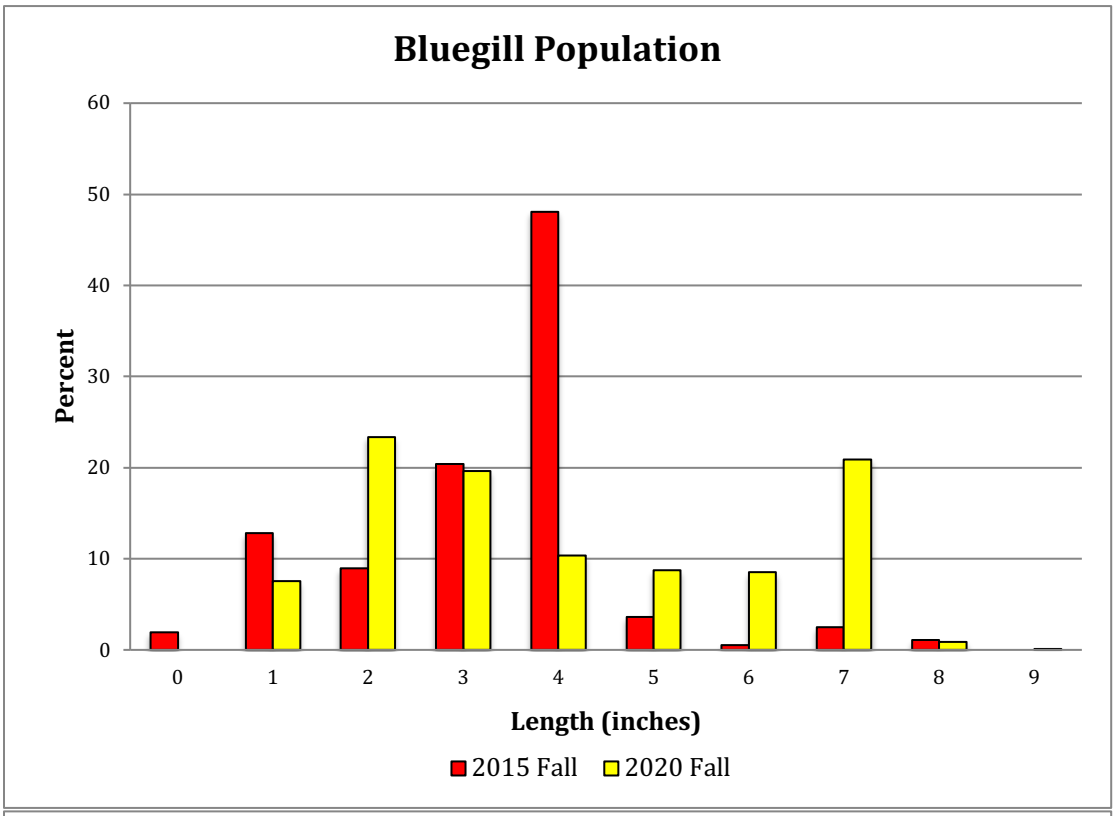
Species:	***Wr (Ave)***		***Range:***		***Objective***
	20f	*15f*	***20f***	*15f*	
Largemouth Bass:	***99***	101	**66-153**	81-118	90-110
Bluegill:	***92***	93	**70-141**	75-149	90-110
Black Crappie:	***101***	97	**74-115**	81-112	90-110
Yellow Perch	***77***	- -	**68-82**	- - - - -	90-110
Walleye:	***107***	- -	**107**	- - - - -	- - - - -

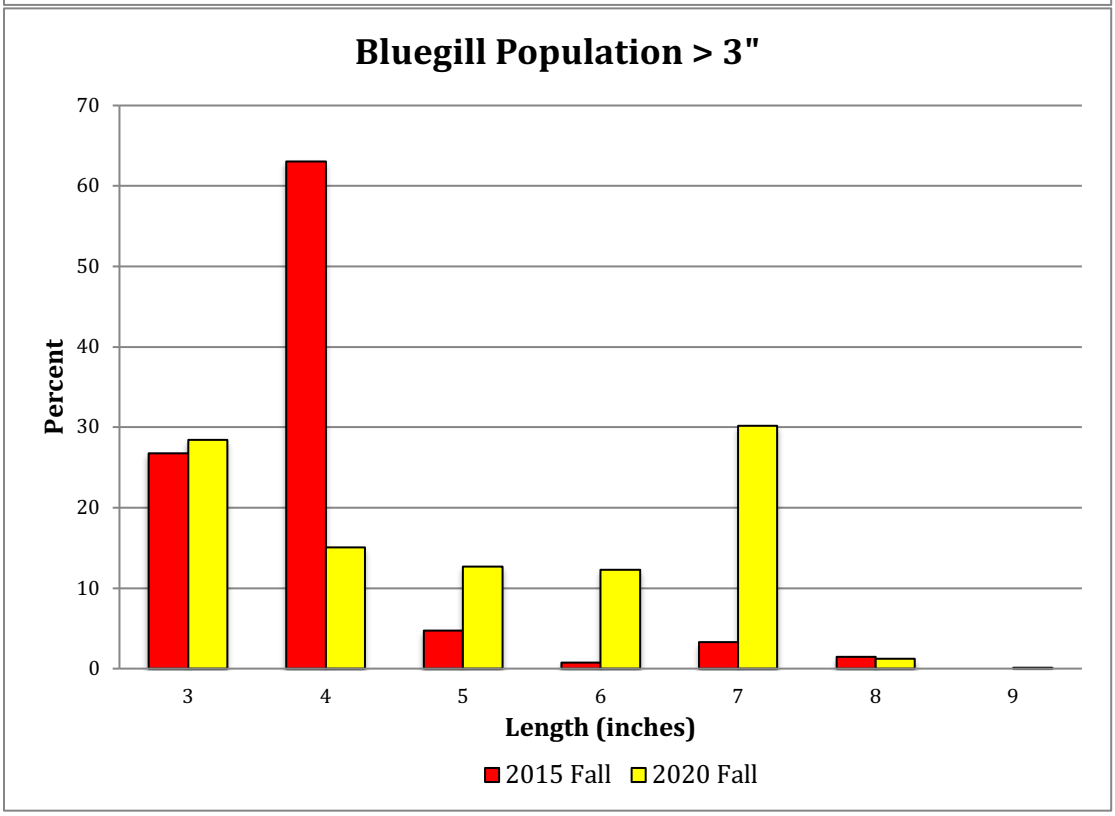
Table 4: Length Ranges by Species

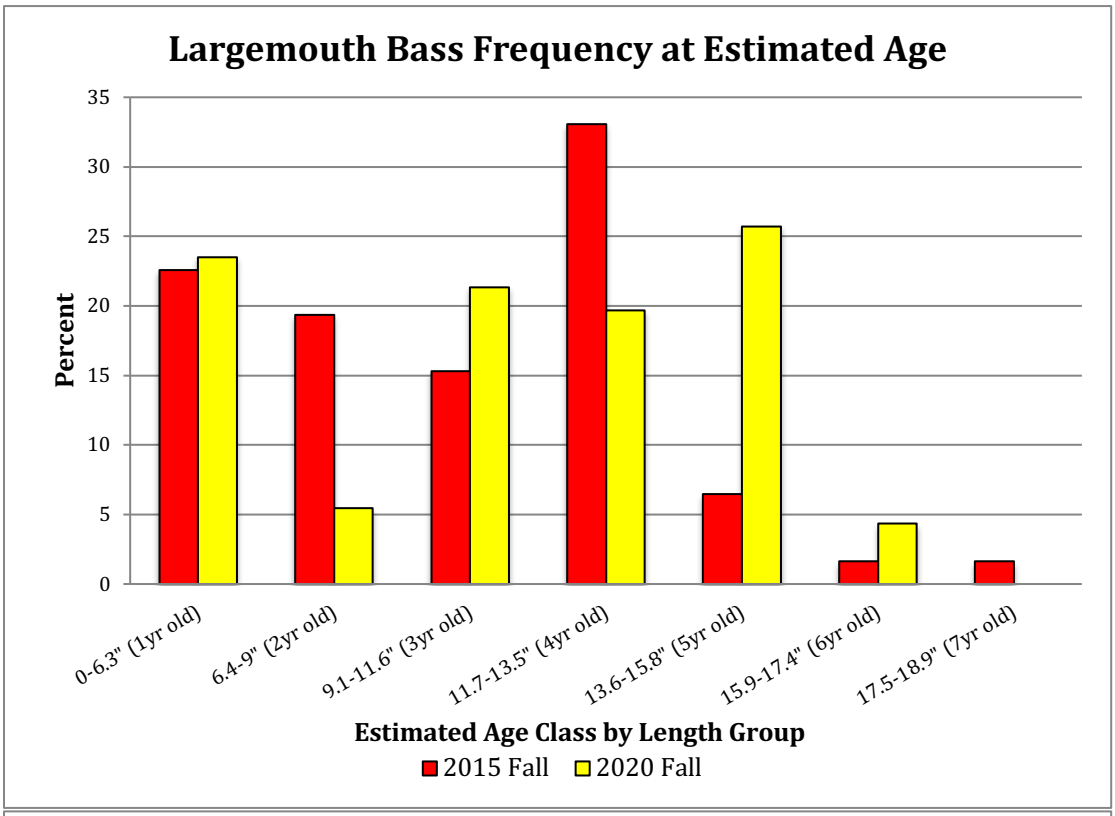
Species:	***Length:***		***Average:***	
	20f	*15f*	***20f***	*15f*
Largemouth Bass:	***2.8"-16.7"***	3.7"-18.7"	***10.9"***	10.1"
Bluegill:	***1.2"-9.5"***	0.9"-8.6"	***4.5"***	3.8"
Black Crappie:	***3.5"-13.6"***	3.2"-10.9"	***7.5"***	8.3"
Walleye	***20.6"***	- - - -	***20.6"***	- -
Common Carp:	***14.8"-35.8"***	- - - -	***28.7"***	- -
Pumpkinseed:	- - - -	5.2"-7.8"	- -	7"
Redear Sunfish:	***2.6"***	- - - -	***2.6"***	- -
Warmouth:	***2.6"-7.5"***	1.8"-8.8"	***4.0"***	4.3"
Green Sunfish:	***2.9"-3.1"***	- - - -	***3.0"***	- -
Yellow Perch:	***7.9"-10.9"***	9.8"	***9.6"***	9.8"
Yellow Bass:	***4.7"***	4.8"	***4.7"***	4.8"
Golden Shiner	***4.9"-9.5"***	5.8"-9.1"	***4.9"***	6.8"

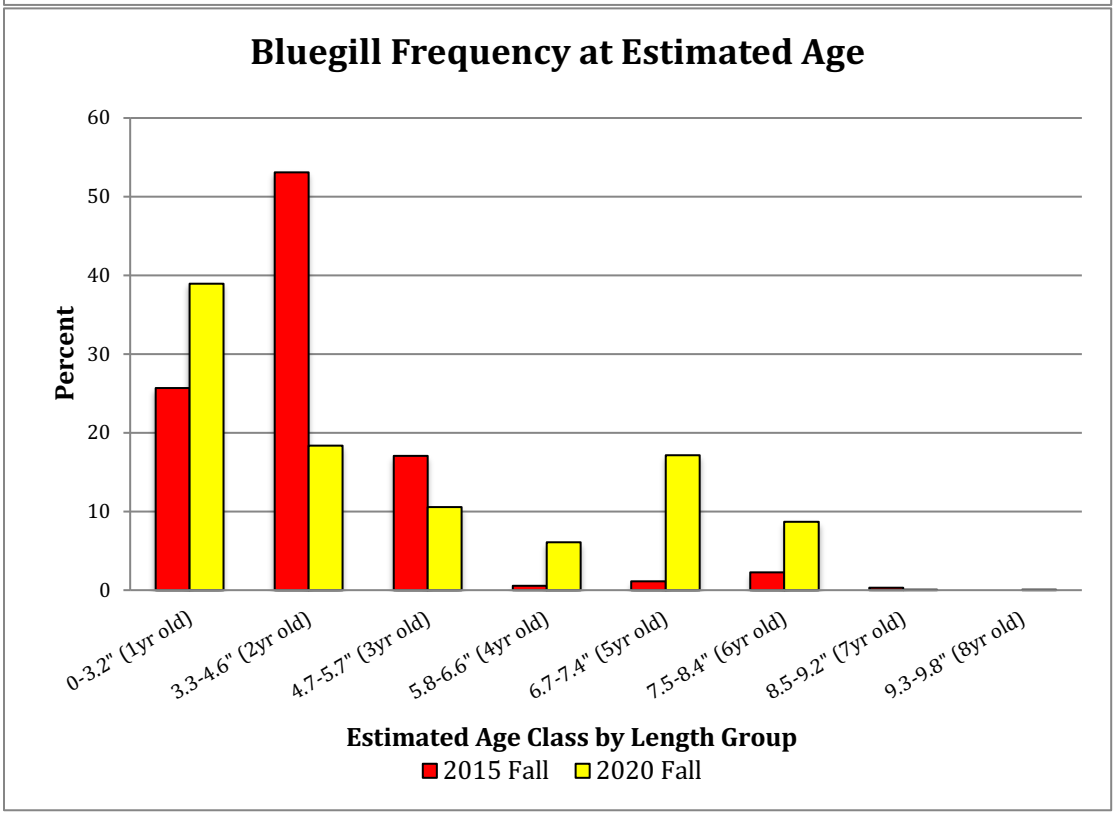

Largemouth Bass Population
25.0
20.0
15.0
10.0
5.0
0.0
Percent
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Length (inches)
2015 Fall
2020 Fall

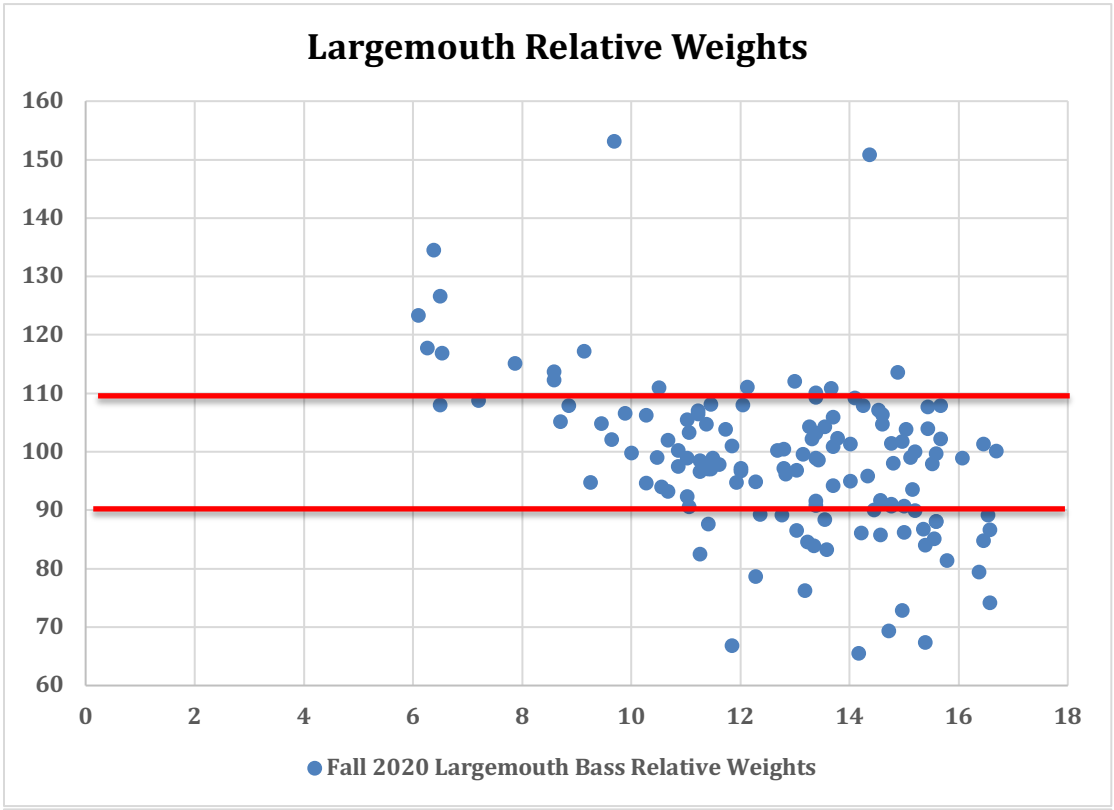

Largemouth Bass Population > 8"
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Percent
8 9 10 11 12 13 14 15 16 17 18
Length (inches)
2015 Fall
2020 Fall

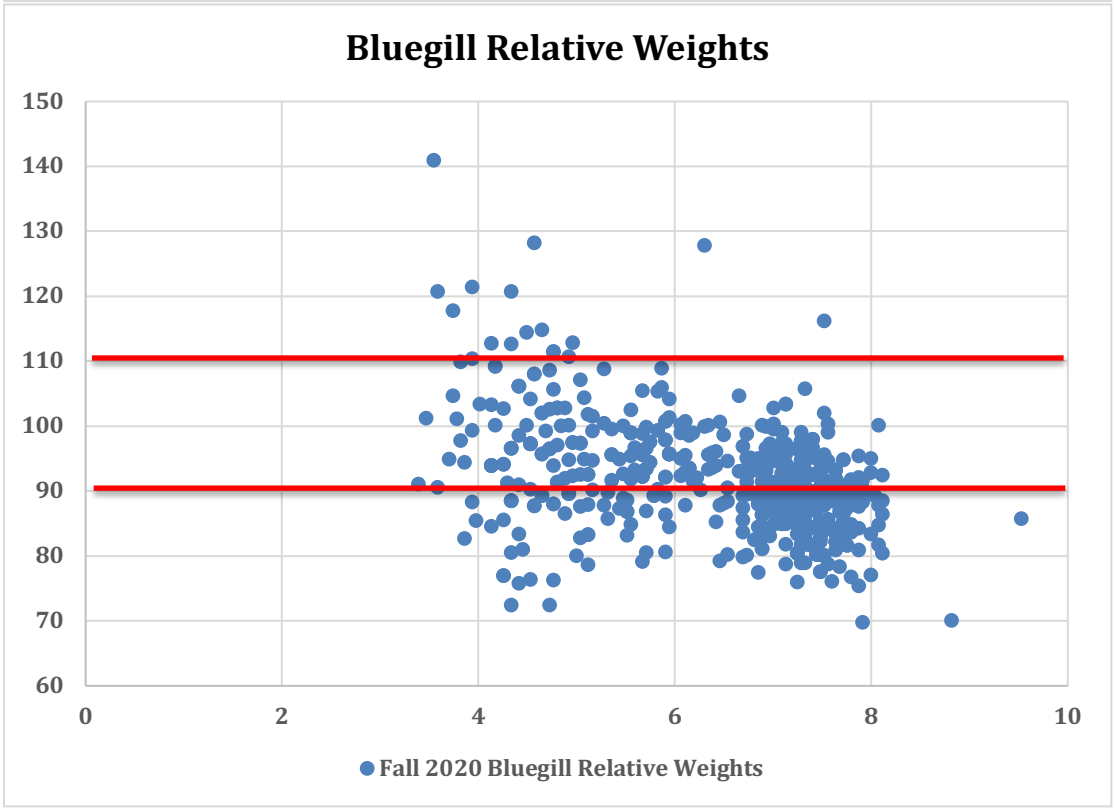

Bluegill Population
Percent
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
Length (inches)
2015 Fall
2020 Fall

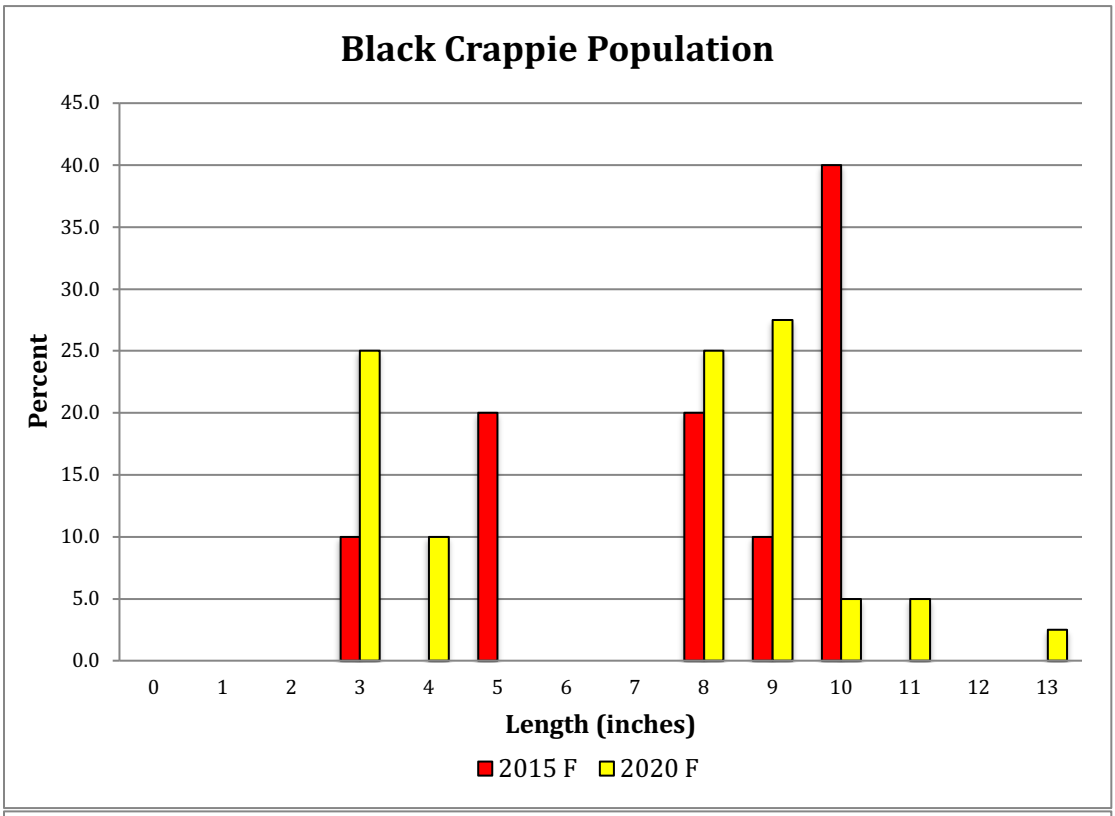

Bluegill Population > 3"
Percent
70
60
50
40
30
20
10
0
3
4
5
6
7
8
9
Length (inches)
2015 Fall
2020 Fall

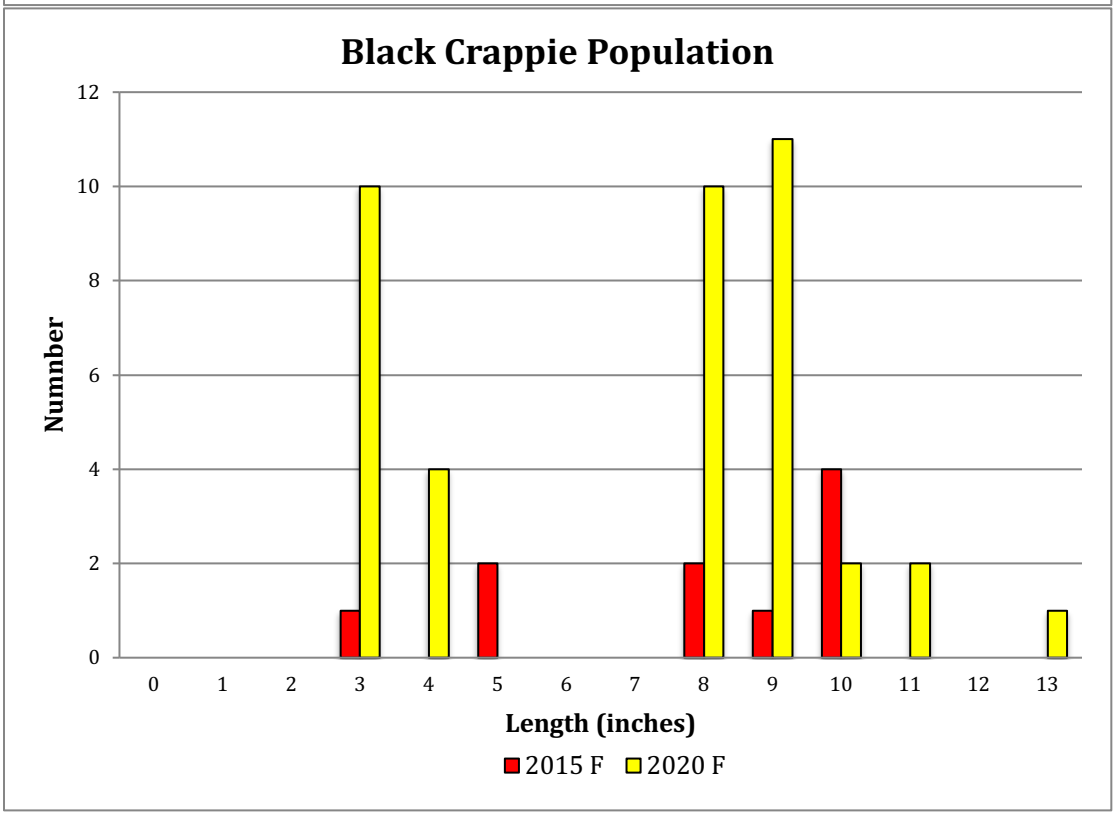

Largemouth Bass Frequency at Estimated Age
Percent
35
30
25
20
15
10
5
0
0-6.3" (1yr old)
6.4-9" (2yr old)
9.1-11.6" (3yr old)
11.7-13.5" (4yr old)
13.6-15.8" (5yr old)
15.9-17.4" (6yr old)
17.5-18.9" (7yr old)
Estimated Age Class by Length Group
2015 Fall
2020 Fall

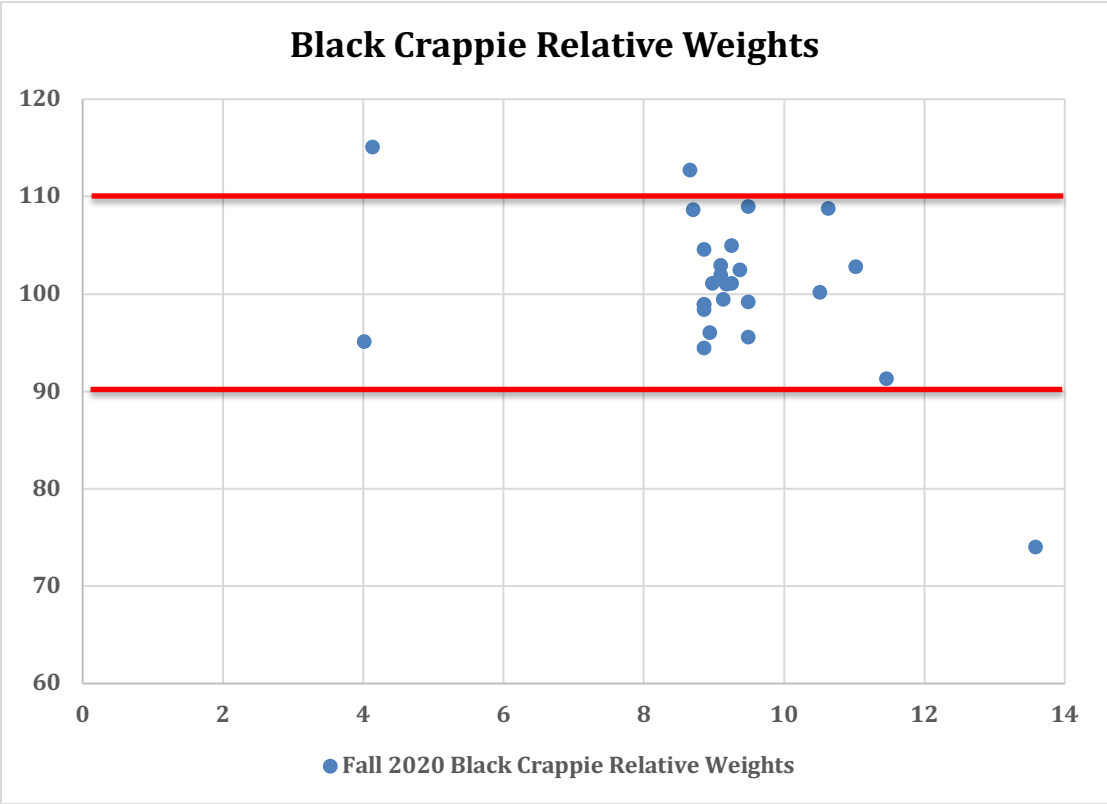

Bluegill Frequency at Estimated Age
Percent
60
50
40
30
20
10
0
0-3.2" (1yr old)
3.3-4.6" (2yr old)
4.7-5.7" (3yr old)
5.8-6.6" (4yr old)
6.7-7.4" (5yr old)
7.5-8.4" (6yr old)
8.5-9.2" (7yr old)
9.3-9.8" (8yr old)
Estimated Age Class by Length Group
2015 Fall
2020 Fall


Largemouth Relative Weights
160
150
140
130
120
110
100
90
80
70
60
0
2
4
6
8
10
12
14
16
18
Fall 2020 Largemouth Bass Relative Weights


Bluegill Relative Weights
150
140
130
120
110
100
90
80
70
60
0
2
4
6
8
10
Fall 2020 Bluegill Relative Weights


Black Crappie Population
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Percent
0 1 2 3 4 5 6 7 8 9 10 11 12 13
Length (inches)
2015 F
2020 F


Black Crappie Population
12
10
8
6
4
2
0
Numnber
0 1 2 3 4 5 6 7 8 9 10 11 12 13
Length (inches)
2015 F
2020 F

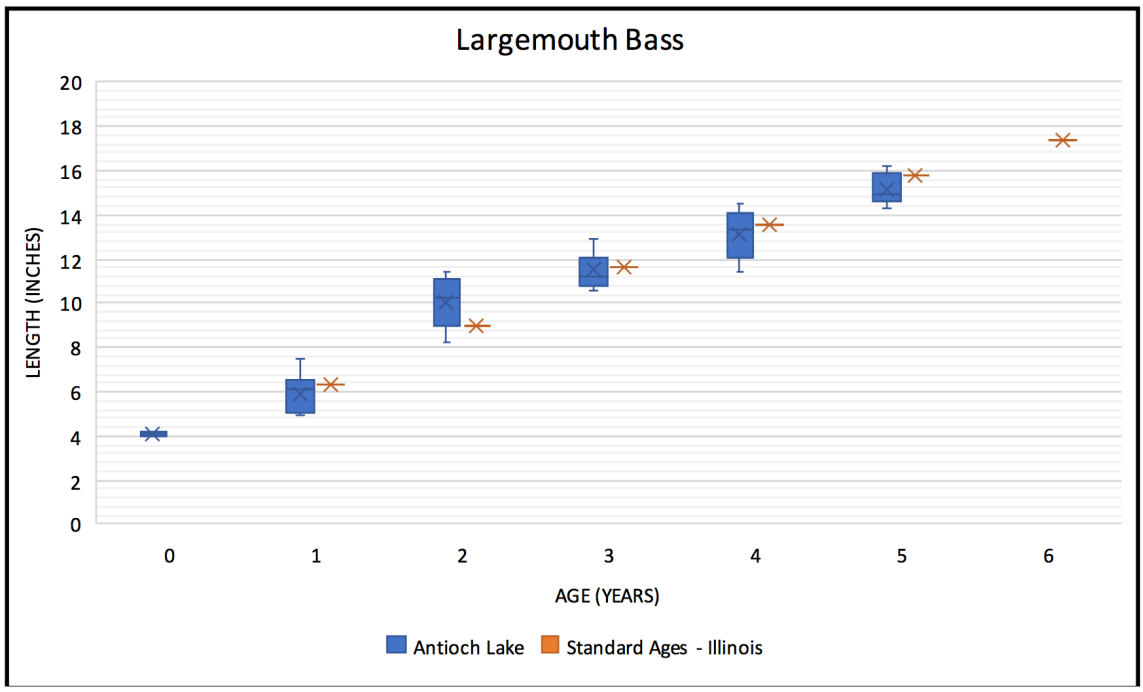


JadEco, LLC
PO BOX 445 Shannon, IL 61078
Phone: 815-543-5695
Email: jrush@jadecoconsulting.com

Bluegill and Largemouth Bass Length at Age

Largemouth Bass length at age: Antioch Lake vs Statewide Averages

Age	Antioch (Ave)	Statewide (Ave)	Antioch (range)	% over / under State Average
0	4.09"	- -	3.98"-4.21"	- -
1	5.94"	6.30"	4.92"-7.48"	94%
2	10.06"	9.00"	8.19"-11.38"	112%
3	11.49"	11.60"	10.55"-12.91"	99%
4	13.15"	13.50"	11.46"-14.53"	97%
5	15.18"	15.80"	14.29"-16.18"	96%
6	- -	17.40"	- -	- -



Bluegill length at age: Antioch Lake vs Statewide Averages

Age	Antioch (Ave)	Statewide (Ave)	Antioch (range)	% over / under State Average
0	- -	- -	- -	- -
1	3.46"	3.40"	2.76" - 4.57"	102%
2	4.95"	4.60"	4.13" - 5.87"	108%
3	6.71"	5.70"	5.98" - 7.52"	118%
4	6.42"	6.60"	5.63" - 7.05"	97%
5	8.12"	7.40"	7.80" - 8.66"	110%
6	- -	8.00"	- -	- -