Upper and Lower Clam Lake Fishery Survey, 2011

MWBIC (Upper Clam Lake – 2656200, Lower Clam Lake – 2655300)

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Executive Summary

A comprehensive fisheries survey of Clam Lake was conducted in 2010 and 2011 by the Wisconsin Department of Natural Resources. The primary objective of this survey was to assess the status of the sport fish populations in Clam Lake. Secondary objectives were to assess common carp populations and their impact on other fish species.

The Clam Lake fishery has undergone a dramatic change in recent years. A fishery that was once dominated by largemouth bass and bluegill has changed to one dominated by common carp. This shift has caused substantial impacts to the overall fish community and aquatic vegetation on Clam Lake. Aquatic vegetation that was historically dense throughout the lake is now sparse and confined to very shallow water near shore.

Catch rates of common carp in 2011 were much higher than previous surveys, with much of the increase attributed to a large 2005 year class. Walleye reproductive success increased beginning in 2006 and adult catch rates increased from negligible in previous surveys to 158 adults captured in the 2011 survey. Largemouth bass and bluegill have had very poor recruitment since 2005 and catch rates were much lower in 2011 than in previous surveys. Overall, northern pike catch rates declined slightly but catch rates of fish greater than 28 in were highest in the 2011 survey. Growth rates for all species analyzed met or exceeded statewide averages.

Management recommendations include: 1) Reduce carp populations on Clam Lake by removals through netting operations, 2) Assess and implement long term measures to limit carp reproductive success, 3) Monitor winter dissolved oxygen levels, 4) Evaluate possible changes to panfish regulations, 5) Assess fish passage at the dam below Clam Lake, 6) Increase habitat complexity, and 7) Continue exotic species monitoring and control programs.

Introduction

Upper and Lower Clam Lake (Clam Lake) are St. Croix basin drainage lakes located in south central Burnett County. The shoreline of both lakes is primarily privately owned and well developed. Upper Clam Lake is 1,253 acres with a maximum depth of 11 feet. Lower Clam Lake is 337 acres with a maximum depth of 14 feet. The two lakes are connected by a bridge on state highway 70 allowing fish passage. For this report, the two lakes will be considered one waterbody (Clam Lake).

The approximately 300 square mile Clam Lake watershed is primarily forest land with some agriculture occurring in upper portions. Most of the watershed is drained by the Clam River through Barron, Burnett, Polk, and Washburn counties. Minimum water levels on Clam Lake are maintained by a dam on the Clam River approximately two miles downstream of the lake.

Clam Lake is a shallow, eutrophic, polymictic lake. TSI is an index for evaluating trophic state or nutrient condition of lakes (Carlson 1977; Lillie et. al. 1993). TSI values can be computed for water clarity (secchi disk measurements), chlorophyll-a, and total phosphorus values. TSI values represent a continuum ranging from very clear, nutrient poor water (low TSIs) to extremely productive, nutrient rich water (high TSIs). The data on Clam Lake (WDNR (online) 2010) indicate the nutrient condition was eutrophic (high productivity) when considering secchi disk, total phosphorus and chlorophyll-a TSI indices.

Clam Lake has historically supported diverse, dense macrophytes communities (Cahow et al. 1997) including large stands of wild rice (Johnson and Havranek 2010). From the 1960s through early 2000s, numerous mechanical and chemical measures were used to reduce what was considered nuisance levels of aquatic vegetation. Since 2006, macrophyte densities have decreased dramatically. For example, wild rice beds declined from nearly 300 acres in 2001 to approximately 60 acres in 2010 (Johnson and Havranek 2010).

Clam Lake supports a very diverse fish community. Gamefish species include walleye Sander vitreus, largemouth bass Micropterus salmoides, smallmouth bass M. dolomieui, and northern pike Esox lucius. Channel catfish Ictalurus punctatus and lake sturgeon Acipenser fulvescens are also present in Clam Lake. Panfish species include bluegill Lepomis macrochirus, black crappie Pomoxis nigromaculatus, yellow perch Perca flavescens, pumpkinseed L. gibbosus, and rock bass Ambloplites rupestris. Other species common in Clam Lake include, bowfin Amia calva, redhorse species Moxostoma spp., bullhead species Ameiurus spp.,common carp Cyprinus carpio, and white sucker Catostomus commersoni. No fish have been stocked in Clam Lake since 1989.

Past comprehensive fisheries management surveys conducted by Wisconsin DNR on Clam Lake occurred in 1995 and 2004. An angler creel survey was also conducted in 1995-1996. Various other narrower scope surveys have been conducted on Clam Lake in recent years.

During this survey, all of the standard statewide fishing regulations applied to Clam Lake, except for a county wide 40 in minimum size limit on muskellunge (Appendix Table 1). Though lake sturgeon were present in the lake, densities have been too low to support an open season. Clam Lake has historically received a high amount of angling effort, with total effort in 1995-1996 nearly double the ceded territory average (Appendix Table 2).

The primary objective of this study was to assess the status of the sport fish populations on Clam Lake. Secondary objectives were to assess carp populations and their impact on other fish species.

Methods

Clam Lake and adjacent upstream portions of the Clam River were surveyed during 2010 and 2011 following Wisconsin Department of Natural Resources lake monitoring protocol. Spring sampling utilized fyke nets and electrofishing to assess gamefish and panfish populations. Summer mini-fyke netting was used to sample juvenile and nongame fish species. Fall electrofishing targeted young of year (YOY) walleye.

The first phase of the survey was initiated soon after ice out with fyke nets (4 x 5 ft frame) set on 7 April. Nets were checked daily and set at areas expected to contain high concentrations of spawning northern pike. Nets were removed on 13 April, with a total effort of 32 net nights. A portion of the Clam River immediately upstream of Clam Lake (Figure 1) was surveyed with a pulsed DC electrofishing boat on 13 April targeting spawning walleye.

Sampling targeting largemouth bass, smallmouth bass, and panfish was conducted on 23 May. Both bass species were sampled over three, two-mile index stations. A 1/2 mile index station was embedded in each station where panfish were collected in addition to bass. Because of low numbers of both species sampled, fish collected during fall and spring electrofishing were combined for length frequency analysis. However, only largemouth bass collected during spring sampling surveys with documented shoreline mile surveyed were included in CPE, PSD, and RSD analyses. Due to a temporary change in statewide sampling protocol, spring electrofishing data for panfish were only available for 1995 and 2011.

All walleyes, northern pike, largemouth bass, and smallmouth bass captured during the spring portion of the survey were measured to the nearest 0.5 in and given the appropriate fin clip (Appendix Table 3). Sex was determined for walleyes and northern pike by the presence of gametes.

Six mini-fyke nets (3 x 3 ft frame) were set on 03 August and run for one night. Juvenile and nongame fish species were targeted during this survey. Exclusion panels on the front frame of the nets were used to exclude larger fish and turtles. Minifyke netting surveys were conducted in 1995, 2003, and 2011.

Fall electrofishing surveys targeting juvenile walleye were conducted in 2010 and 2011. On 10 October 2010, two, two-mile index stations were sampled where walleye and all bass were collected. A 1/2 mile index station was embedded in each station where panfish were collected in addition to bass and walleye. On 28 September 2011, two, two-mile index stations were sampled where only walleye < 12 in were targeted and collected. These results were compared with a similar survey conducted in 2003.

For age analysis, scale samples were removed from walleyes and largemouth bass less than 12 in, while dorsal spines were removed from larger walleyes and largemouth bass. Age interpretations on northern pike were not conducted due to the unreliability and difficulty of determining annuli. Casselman (1990) found this to be due to irregular growth and resorption or erosion on the midlateral region. Dorsal spines were used to determine age from a sample of common carp collected by St. Croix Natural Resources Department in 2009.

Mean length-at-age comparisons were made to regional (18 county Northern Region) and statewide data using the WDNR Fish and Habitat statewide database. Mean length at age was used to assess growth for walleye and largemouth bass using the following von Bertalanffy equation:

$$l_t = L_\infty(1-e^{-K(t+t_o)})$$

Where l_t is length at time t, L_∞ is asymptotic length, K is a growth parameter, t is age in years, and t_0 is the age at which l_t is zero (Van den Avyle and Hayward 1999). L_∞ predicts the average ultimate length attained for fish in that population. Assuming dimorphic separation of length at age, growth equations were calculated separately for male and female walleye.

The descending limb of a catch curve regression was used to estimate total annual mortality (Ricker 1975). As aging materials were not taken for all fish, an age-length key was used to assign a sample age distribution.

Size structure quality of species sampled was determined using the indices proportional (PSD) and relative (RSD) stock densities (Anderson and Gutreuter 1983). The PSD and RSD value for a species is the number of fish of a specified length and longer divided by the number of fish of stock length or longer, the result multiplied by 100 (Appendix Table 4).

Catch per Unit Effort (CPE) was calculated as the number of fish captured above stock, preferred, and quality sizes divided by the appropriate unit of sampling effort for that species. That value is then compared to surveys of similar waterbodies throughout Wisconsin using the Fisheries Assessment Classification Tool (FACT) to determine how that value compares to other fisheries. For example, in Table 4, CPE8 is calculated by dividing the number of largemouth greater than 8 in captured during late spring electrofishing divided by the number of miles surveyed (3.5 fish/mile). This value was greater than 12 percent of surveys of similar waterbodies in Wisconsin.

Results

Walleye. A total of 158 adult walleye (sexable or unknown fish $\geq$ 15.0 in) were collected during spring fyke netting on Clam Lake and electrofishing on the Clam River. Though sampling effort was much higher in 1995 and 2004, only eight total adult walleyes were captured during those surveys. Catch per unit effort for walleye $\geq$ 10 in was 3.34 fish/net lift in 2011 compared to 0.05 fish/net lift in 1995 and 0.29 fish/net lift in 2004 (Table 1). A population estimate was not calculated for adult walleye in 2011.

Adult walleyes ranged from 12.0-30.4 in during 2011 spring sampling (Figure 2). Mean lengths of male and female walleyes were 16.1 in (S.D. = 4.0) and 20.4 in (S.D. = 4.6), respectively. PSD and RSDP values for the 2011 survey were low compared to surveys of similar waterbodies in Wisconsin (Table 1).

Growth rates for both female and male walleyes on Clam Lake in 2011 exceeded regional averages (Figures 3 and 4). The von Bertalanffy growth curves for female and male walleyes on Clam Lake in 2011 predicted greater lengths at age for most ages compared to other Burnett County populations (Figures 5 and 6). Catch curve analysis estimated annual mortality at 46 % (R^2 = 0.76) for adult walleye between the ages of 3 and 8 (Figure 7).

YOY walleye catch rates in 2010 and 2011 were 17.3 fish/mile (Table 2). In comparison, relative abundance of YOY walleye in 2003 was 0.5 fish/mile.

Northern pike. A total of 360 northern pike, ranging in length from 11-38 in were captured during 2011 spring fyke netting surveys (Figure 8). Relative abundance of northern pike was less than surveys in 2004 and 1995 (Table 3.) Mean lengths of male and female northern pike captured in 2011 were 18.8 in (S.D. = 4.3) and 21.8 in (S.D. = 4.7), respectively. PSD and RSDP values for northern pike sampled during spring netting were both higher in 2011 than in previous surveys (Table 3). Though calculated from a relatively small sample, catch rates in 2011 were higher for northern pike greater than 28 in than in previous surveys (Table 3).

Largemouth and Smallmouth bass. A total of 57 largemouth bass and 4 smallmouth bass were captured during all spring and fall sampling on Clam Lake in 2010 and 2011 (Figure 9). The mean length of largemouth bass and smallmouth bass collected during all phases of the fall 2010 and spring 2011 surveys on Clam Lake was 14.8 in (S.D. = 1.0) and 15.0 in (S.D. = 0.8), respectively (Table 4).

Growth rates of largemouth bass in 2011 and 2004 surveys on Clam Lake were similar to statewide averages (Figure 10). Predicted average ultimate length of largemouth bass decreased from 19.1 in (2004) to 16.2 in (2011) (Figure 11).

Panfish. Bluegill catch rates for all length classes were much lower in the 2011 survey than in 1995 (Table 5). Catch of bluegill > 3 in decreased from 262 fish/mile in 1995 to 8 fish/mile in 2011, while bluegill > 6 in catch during the same time period dropped from 163 fish/mile to 7 fish/mile (Table 5). Also, pumpkinseed catch rates declined from 148 fish/mile in 1995 to zero fish/mile in the 2011 survey. Black crappie catch rates were very similar in the two surveys (27 fish/mile in 2011; 25 fish/mile in 1995). Bluegill, black crappie, and yellow perch growth rates far exceeded statewide averages (Figures 12-14).

Recruitment assessments for YOY indicated catch rates for bluegill and largemouth bass were highest in 1995 and 2011 surveys. However, the 2003 survey had much higher catch rates of black crappie (Table 6).

Common carp. A total of 429 common carp (15.3 fish/net night) were captured during spring netting surveys in 2011. This was a much higher catch rate than in the 1995 spring netting survey (63 carp, 0.9 fish/net night). Though common carp ages ranged from 2-26 during 2009 electrofishing surveys, 42% of the common carp aged were from the 2005 year class (Figure 15).

Discussion

Historically Clam Lake supported a diverse, high quality, centrarchid dominated fishery. Results from surveys conducted in 1995 and 2004 support this assessment. However, since 2004 the Clam Lake fishery changed dramatically to one dominated by common carp. This shift has caused substantial ecological impacts to Clam Lake.

The cause of the sudden increase in carp numbers is unknown. Predation of carp larvae by a high density bluegill population likely inhibits carp reproductive success in Midwestern lakes (Bajer and Sorensen 2009). Environmental instability through severe winterkill of sensitive fish species such as bluegill is often a trigger for sudden increases in carp recruitment (Bajer and Sorensen 2009). No severe winterkills have been documented on Clam Lake in recent years. However, large numbers of dead fish may have gone undetected if carcasses were flushed downstream during spring runoff.

High densities of carp have severe ecological impacts on shallow lakes including reductions in aquatic vegetation and increases in turbidity (Bajer et al. 2009). Though not documented quantitatively, these impacts have been observed after the sudden increase in carp on Clam Lake. While aquatic vegetation historically reached nuisance levels during summer months, vegetation is now sparse through most of the lake. Also, after installing carp barriers in a southern bay of Clam Lake in 2011, an increase in native aquatic vegetation was observed (Johnson 2011).

Increased walleye reproductive success appears to have coincided with increasing carp densities. While only a few incidental walleyes were captured during previous Clam Lake surveys, 158 were captured during the 2011 survey. Year class assessment of adult walleye suggests that reproductive success increased in 2006, one year after the dominant carp year class. Strong year classes of walleye have also occurred every year since 2006. This increased reproductive success of walleye may be linked to increases in turbidity (Rieger and Summerfeldt 1997) on Clam Lake or decreases in larval predators such as bluegill and largemouth bass (Fayram et al. 2005).

Clam Lake historically supported high quality largemouth bass and bluegill fisheries, as indicated by the 1995-1996 creel survey. In previous electrofishing surveys, catch rates of bluegill and largemouth bass likely were not representative of actual densities due to the dense aquatic vegetation throughout the lake. However, catch rates of both largemouth bass and bluegill in 1995 and 2004 were still relatively high compared to surveys of similar waterbodies in Wisconsin. In the 2011 survey, catch rates of all size classes of largemouth bass and bluegill were very low.

Recent reproductive success has been very low for both bluegill and largemouth bass, as indicated by age class assessment. Minifyke survey data from 2011 indicate remnant adults of both species continue to produce offspring that survive until late summer. However, due to the lack of littoral vegetation on Clam Lake, age-0 bluegills and largemouth bass may have poor survival through fall and winter months. After feeding on pelagic zooplankton, bluegill fry return to littoral zone vegetation at approximately 0.5 in (Werner and Hall 1988). Also, winter survival of age-0 largemouth bass may be impacted by lack of cover (Miranda and Hubbard 1994).

Northern pike have historically provided a popular sport fishery on Clam Lake. Spring survey results suggest than while densities have declined, size structure may have improved in recent years. For example, both PSD and RSDP were higher in the 2011 survey than either of the previous spring surveys.

Though not targeted in the 2011 survey, channel catfish appear to be at high densities, at least seasonally, in Clam Lake. During spring seining targeting carp in 2011, a large number (N = approximately 1,000) of channel catfish were captured incidentally.

Conclusions and Management Recommendations

1. Measures should be taken to reduce the common carp populations in Clam Lake. Removal of carp through netting operations should begin immediately. With carp reproduction likely not density dependent (Bajer and Sorensen 2009), removals may be effective at reducing short term carp densities.
2. Long term measures should also be taken to limit carp reproductive success. A high density bluegill population appears to be important in limiting carp reproduction on lakes similar to Clam Lake (Bajer and Sorensen 2009). Efforts

to increase bluegill densities such as transfers from other local populations, stocking of fingerling bluegill from federal hatcheries, and habitat improvement should be considered.

3. Winter dissolved oxygen levels should be monitored to determine the likelihood of winterkills on Clam Lake. Periodic winterkills may induce instability and create an environment favoring carp reproduction. Aeration systems may be necessary to stabilize recovering fisheries and prevent future winterkills.
4. Along with most Burnett county waterbodies, the 14 in minimum length limit on largemouth and smallmouth bass will be eliminated in 2011 and replaced with a no minimum length size limit. As bluegill may be key to limiting carp reproductive success, more restrictive panfish regulation changes should be considered. No other fisheries regulation changes for Clam Lake are necessary at this time. Future survey work should focus on obtaining baseline population data for channel catfish
5. Fish passage at the dam below Clam Lake should be assessed. Options to facilitate passage should be considered if necessary.
6. Efforts to increase habitat complexity in Clam Lake should be strongly encouraged. Input of coarse woody debris, protection of aquatic vegetation, and maintenance or restoration of 35 foot vegetative buffers are some examples of work that can increase habitat complexity.
7. Exotic species monitoring and control programs should continue. Efforts to keep aquatic invasive species out of a waterbody are much more effective than controlling these species once they are established.

Acknowledgements

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Table 1. Walleye PSD and RSDP values and catch per net night from fish collected during spring spawning population assessments on Clam Lake, Burnett County. Only fish captured during spring fyke netting were included in analyses. CPE10 is the number of fish sampled that were ≥ 10 in divided by the number of net nights. The numbers in parentheses refers to the percentage of surveys of similar waterbodies in Wisconsin below the value for that survey as calculated from the FACT database.

Parameter	Clam Lake (2011)	Clam Lake (2004)	Clam Lake (1995)
PSD (percentile)	74 (25)	24 (01)	100 (100)
RSDP (percentile)	18 (34)	18 (34)	50 (88)
CPE10	3.34	0.29	0.05

Table 2. Catch rates of Young of Year walleye during fall electrofishing surveys on Clam Lake, Burnett County.

Parameter	Clam Lake (2011)	Clam Lake (2010)	Clam Lake (2003)
YOY walleye captured/Mile	17.3	17.3	0.5
Size Range	5.0-8.3	6.5-9.4	6.7-7.9
Modal Length	6.2-6.7	8.5-8.9	None

Table 3. Northern pike PSD and RSDP values and catches per net night from fish collected during spring spawning population assessments on Clam Lake, Burnett County. Only fish captured during spring fyke netting were included in analyses. CPEx was calculated as the number of fish captured above stock, preferred, and quality sizes divided by the number of net nights for the survey.

Parameter	Clam Lake (2011)	Clam Lake (2004)	Clam Lake (1995)
PSD	27	14	8
RSDP	3	<1	<1
CPE14	10.7	28.4	27.1
CPE21	2.8	4.1	2.3
CPE28	0.4	0.1	0.1

Table 4. Largemouth bass PSD and RSDP values and catches per mile from fish collected during spring electrofishing assessments on Clam Lake, Burnett County. Only surveys with distance surveyed recorded were included in analyses. CPEx was calculated as the number of fish captured above stock, preferred, and quality sizes divided by the number of net nights for the survey. The numbers in parentheses refers to the percentage of surveys of similar waterbodies in Wisconsin below the value for that survey as calculated from the FACT database.

Parameter	Clam Lake (2011)	Clam Lake (2004)	Clam Lake (1995)
PSD (percentile)	95(95)	83(85)	68(63)
RSD14 (percentile)	71(91)	75(94)	47(61)
CPE8 (percentile)	3.5 (12)	5.6(17)	8.1(24)
CPE12 (percentile)	3.3(31)	4.6(38)	5.6(43)
CPE15 (percentile)	0.7(18)	2.0(41)	3.0(57)

Table 5. Bluegill PSD values and catch per mile from fish collected during spring electrofishing assessments on Clam Lake, Burnett County. Only surveys with distance surveyed recorded were included in analyses. CPEx was calculated as the number of fish captured above stock, preferred, and quality sizes divided by the number of net nights for the survey. The numbers in parentheses refers to the percentage of surveys of similar waterbodies in Wisconsin below the value for that survey as calculated from the FACT database.

Parameter	Clam Lake (2011)	Clam Lake (1995)
PSD	92	62
Mean Length (S.D.)	7.0 (2.2)	5.6 (1.9)
Length Range	2.0-9.0	1.5-9.0
CPE3 (percentile)	8 (10)	262 (89)
CPE6	7	163
CPE8	4	12

Table 6. Catch/net night of Young of Year fish during summer minifyke netting surveys on Clam Lake, Burnett County.

Species	Clam Lake (2011)	Clam Lake (2003)	Clam Lake (1995)
Bluegill	505	20	888
Largemouth bass	20	7	21
Black crappie	32	280	41
Yellow perch	0.1	4.6	0.4

Figure 1. Map depicting Clam Lake and areas of the Clam River, Burnett County sampled during spring 2011.

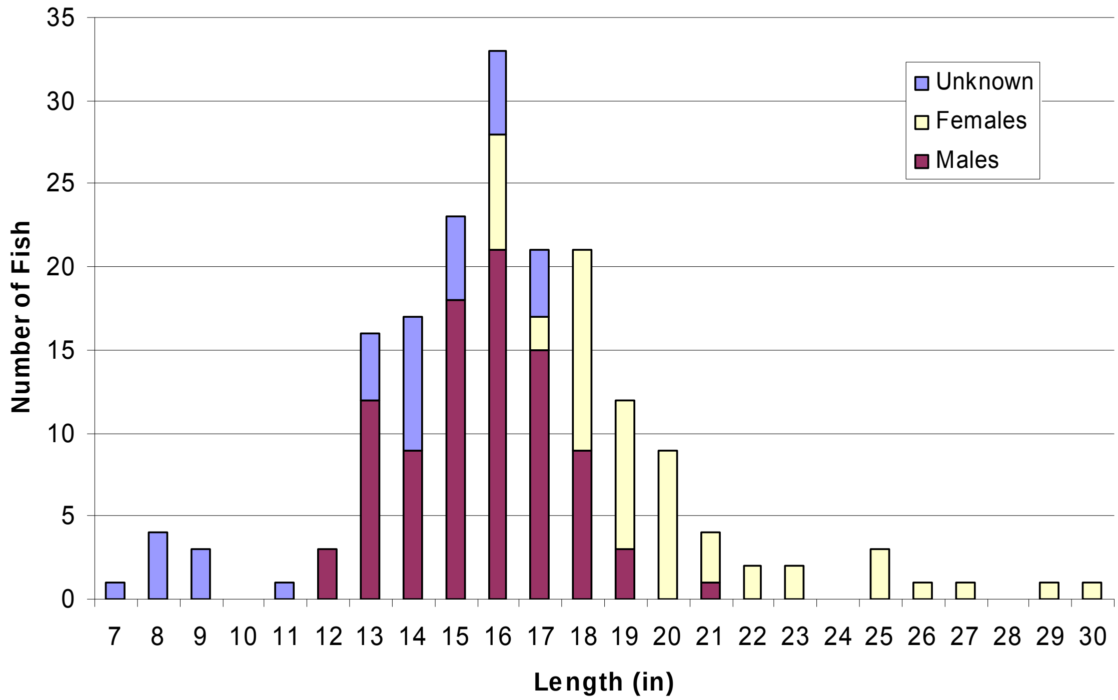

Figure 2. Length frequencies of walleyes captured during 2011 early spring surveys (N = 158) on Clam Lake and Clam River, Burnett County.

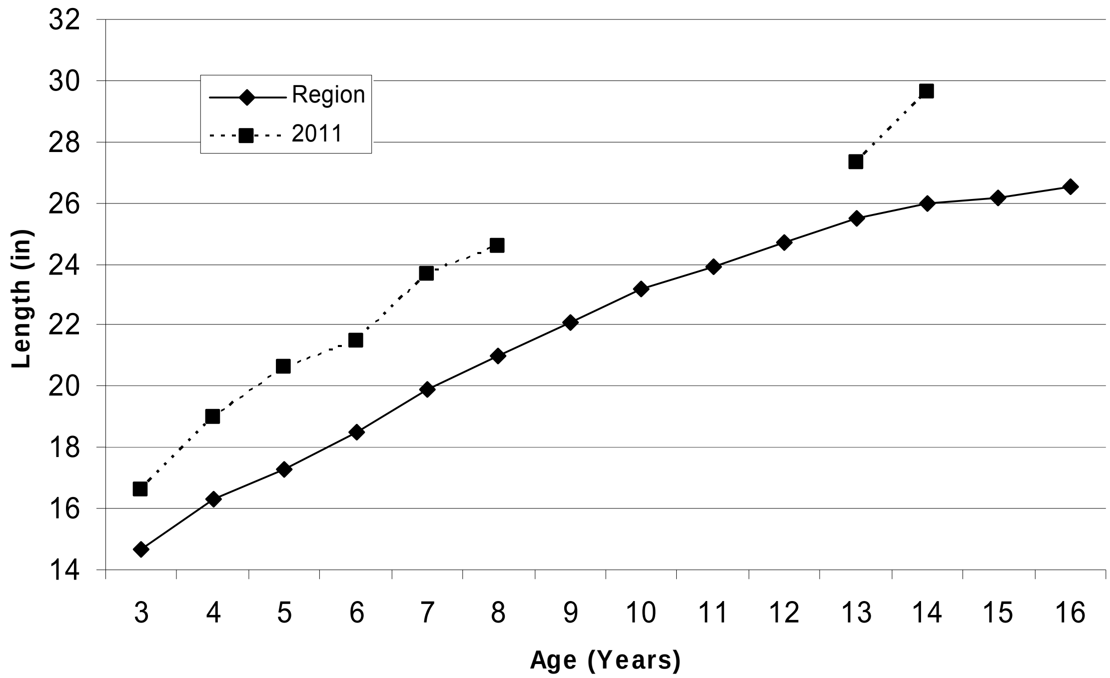

Figure 3. Mean lengths at age for female walleyes captured during spring surveys on Clam Lake and Clam River, Burnett County. Regional averages are displayed for comparison.

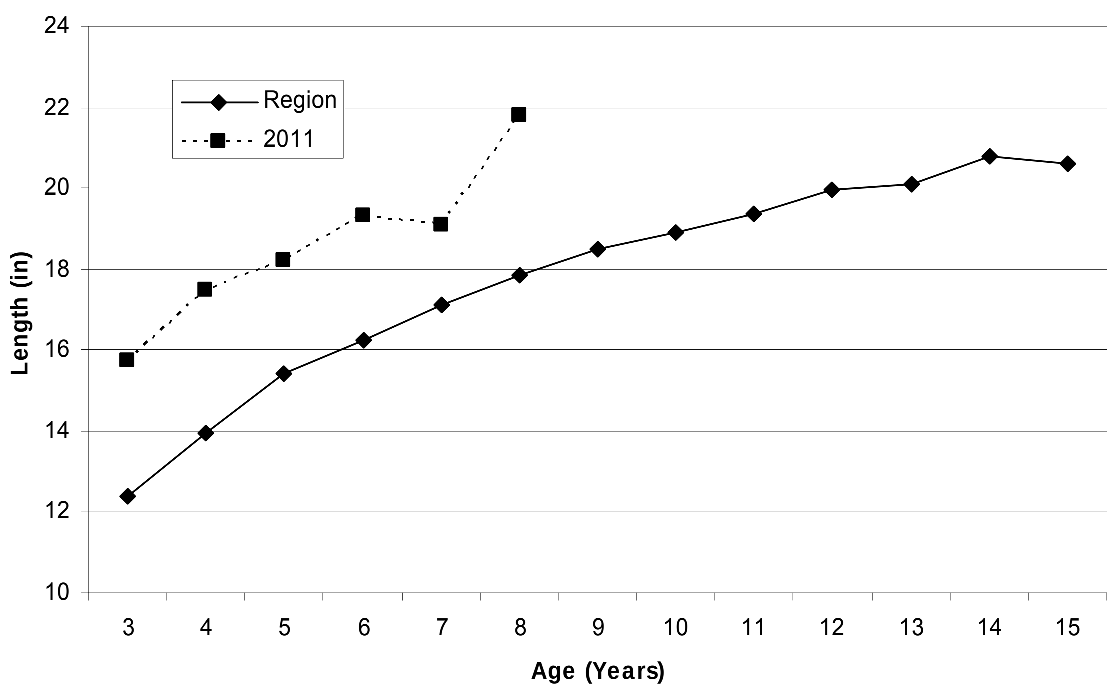

Figure 4. Mean lengths at age for male walleyes captured during spring surveys on Clam Lake and Clam River, Burnett County. Regional averages are displayed for comparison.

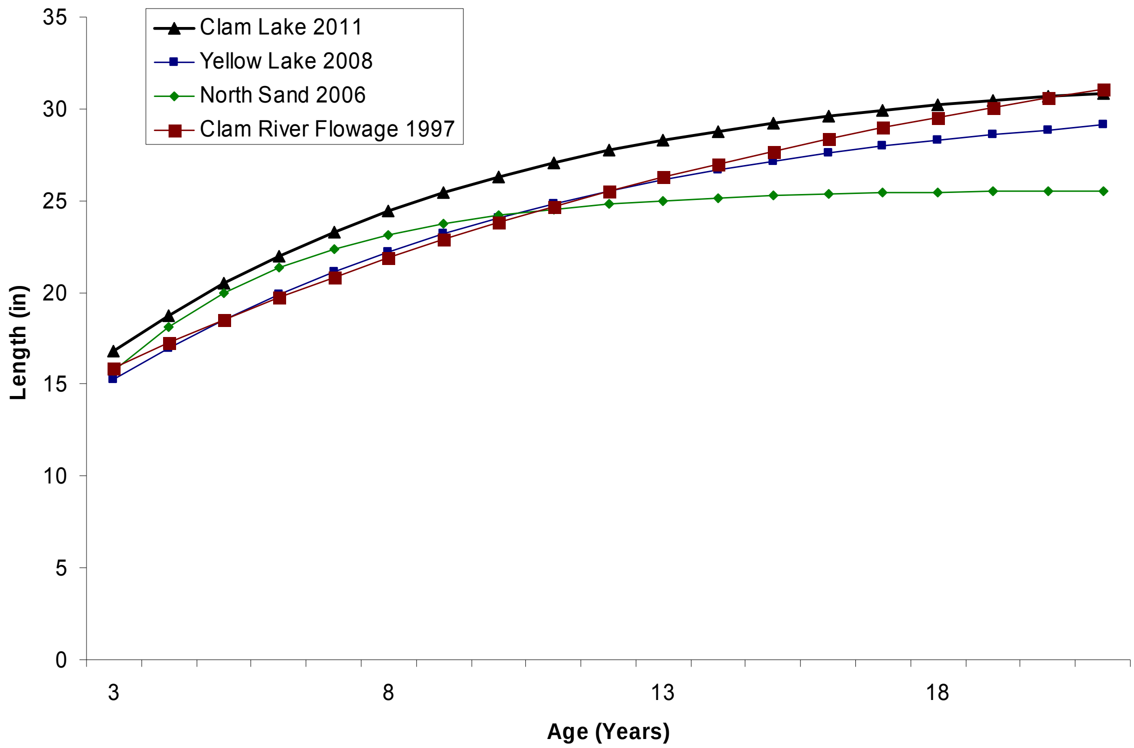

Figure 5. von Bertalanffy growth curves for female walleyes captured during spring surveys on Clam Lake and Clam River, Burnett County. Other Burnett County lakes are displayed for comparison.

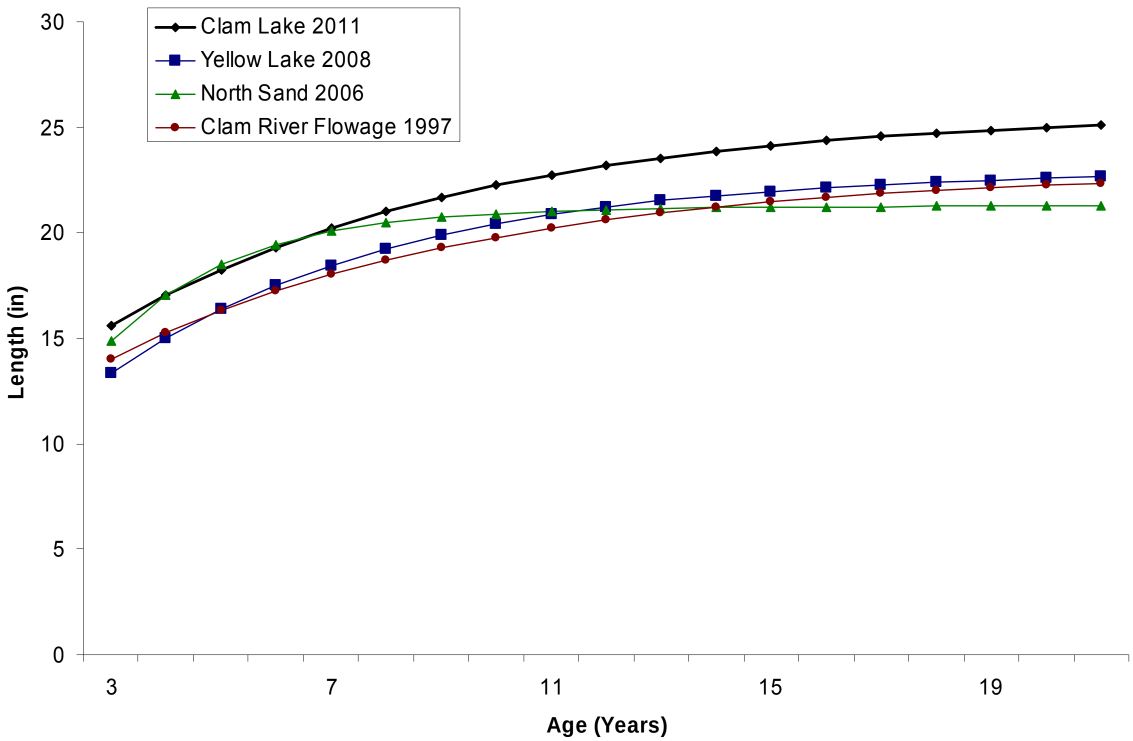

Figure 6. von Bertalanffy growth curves for male walleyes captured during spring surveys on Clam Lake and Clam River, Burnett County. Other Burnett County lakes are displayed for comparison.

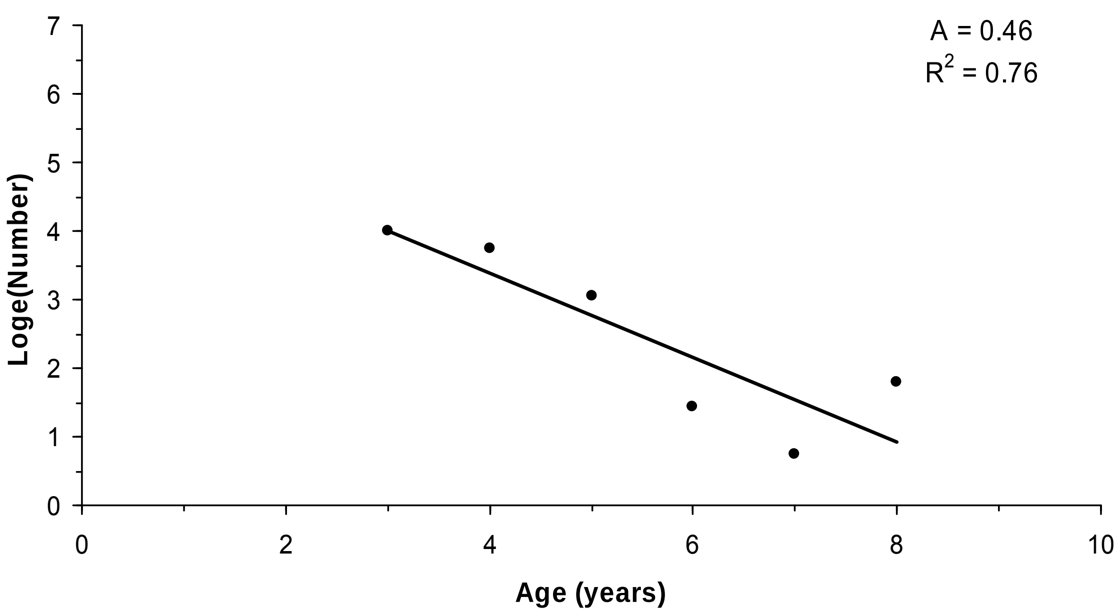

Figure 7. Catch curve for adult walleye sampled in Clam Lake and Clam River, Burnett County in spring 2011.

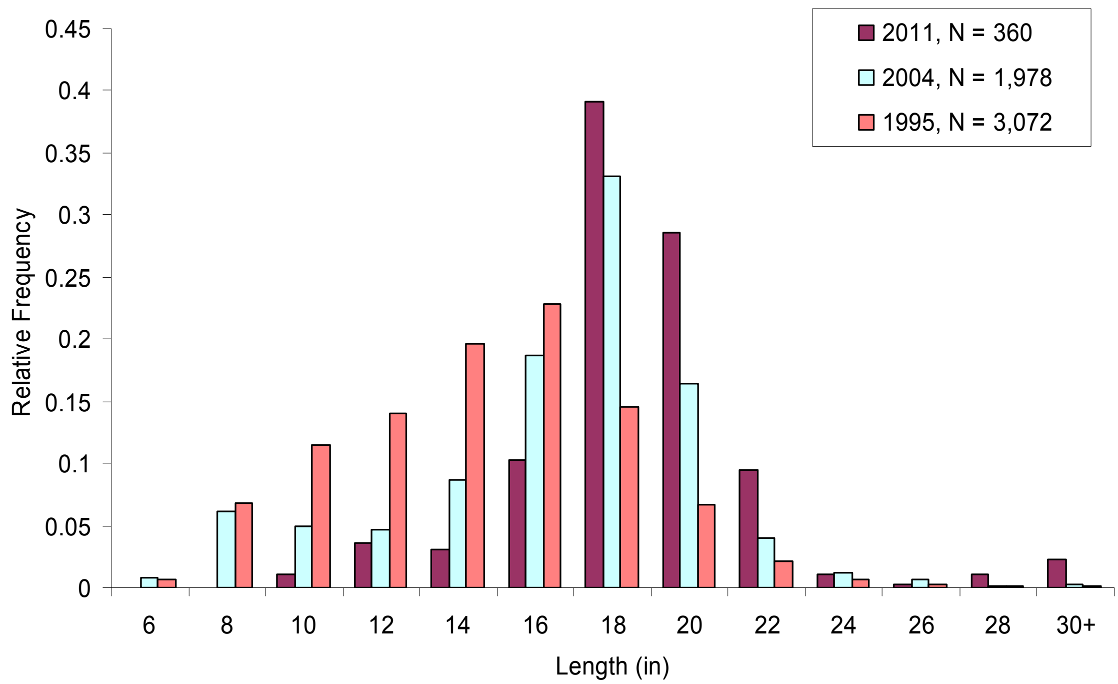

Figure 8. Relative length frequency of northern pike captured during spring fyke netting surveys on Clam Lake, Burnett County.

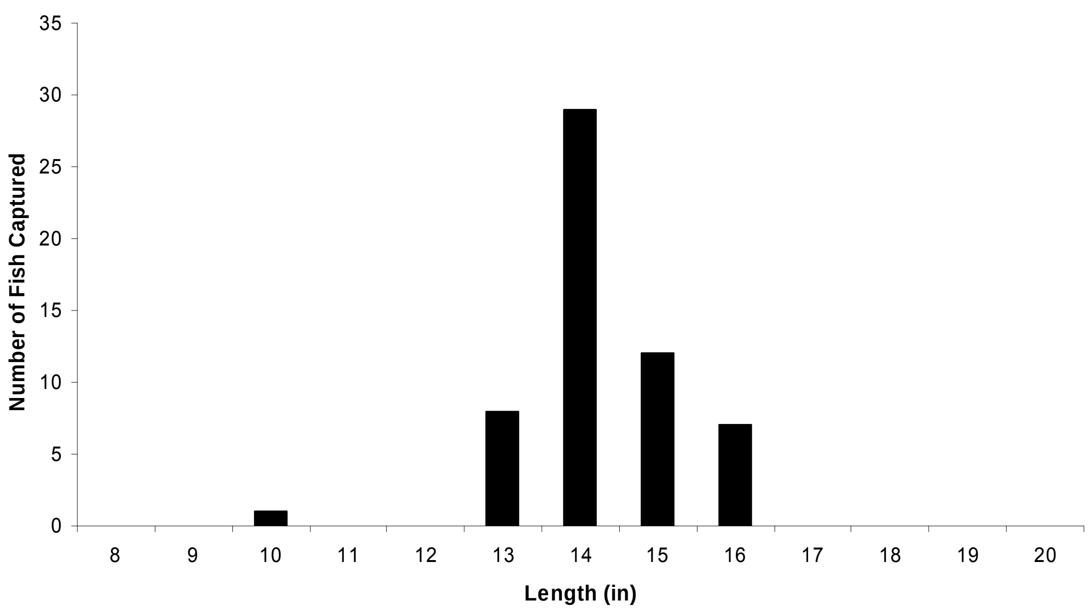

Figure 9. Length frequency of largemouth bass captured during 2010 and 2011 surveys on Clam Lake, Burnett County (N = 57).

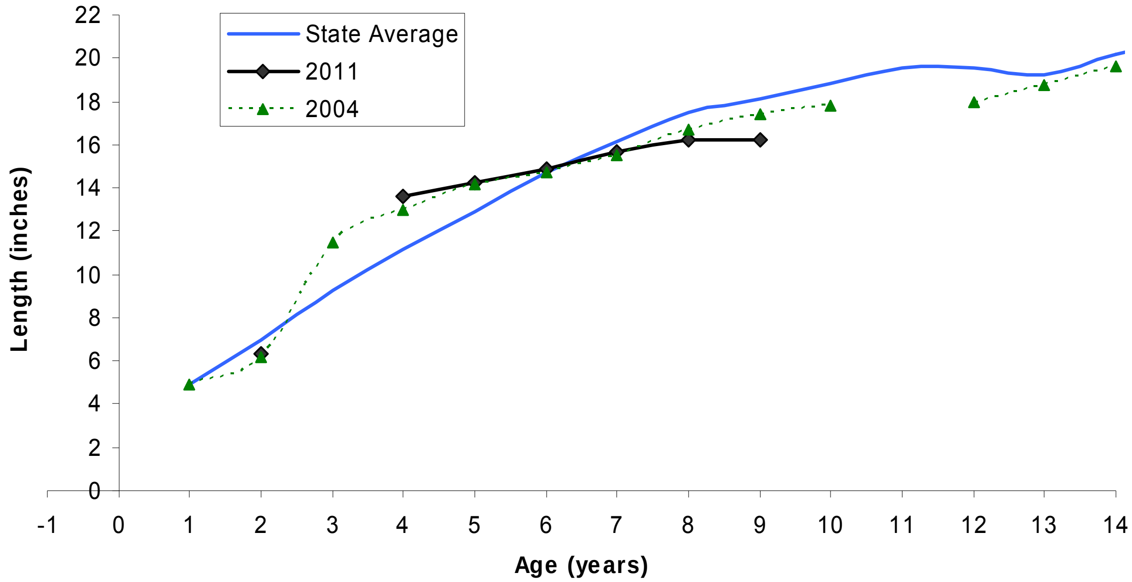

Figure 10. Mean lengths at age for largemouth bass captured during fall 2010 and spring 2011 surveys on Clam Lake, Burnett County. Wisconsin statewide averages are displayed for comparison.

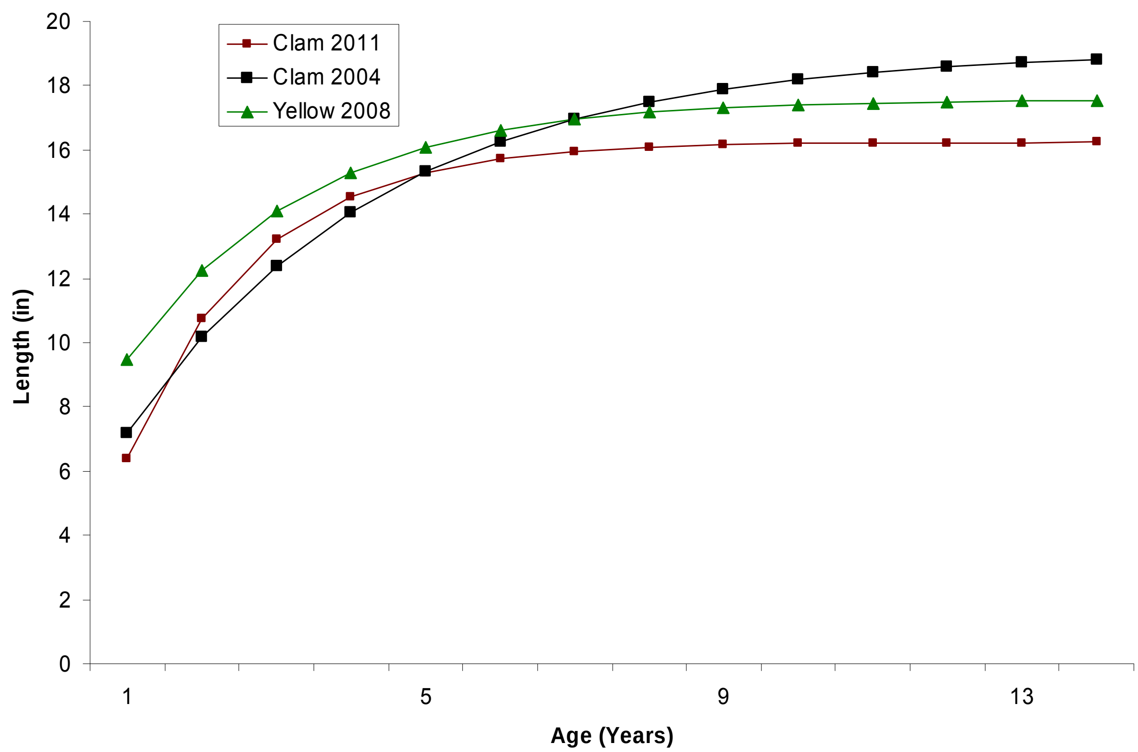

Figure 11. von Bertalanffy growth curve for largemouth bass captured in Clam Lake, Burnett County with Yellow Lake, Burnett County results shown for comparison.

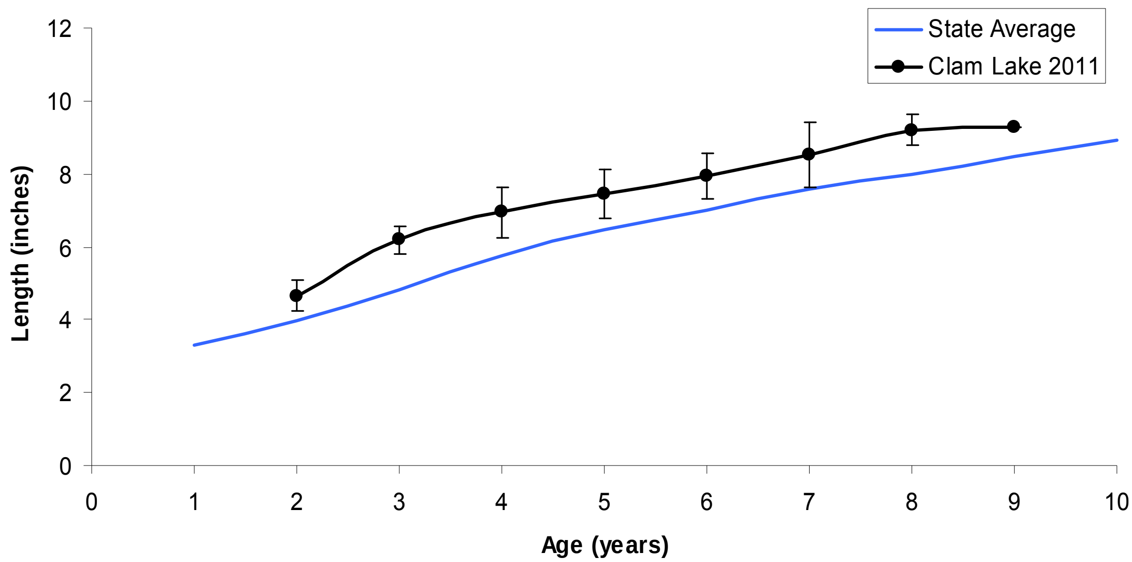

Figure 12. Mean lengths at age + one standard deviation for bluegill captured during fall 2010 and spring 2011 surveys on Clam Lake, Burnett County. Wisconsin statewide averages are displayed for comparison.

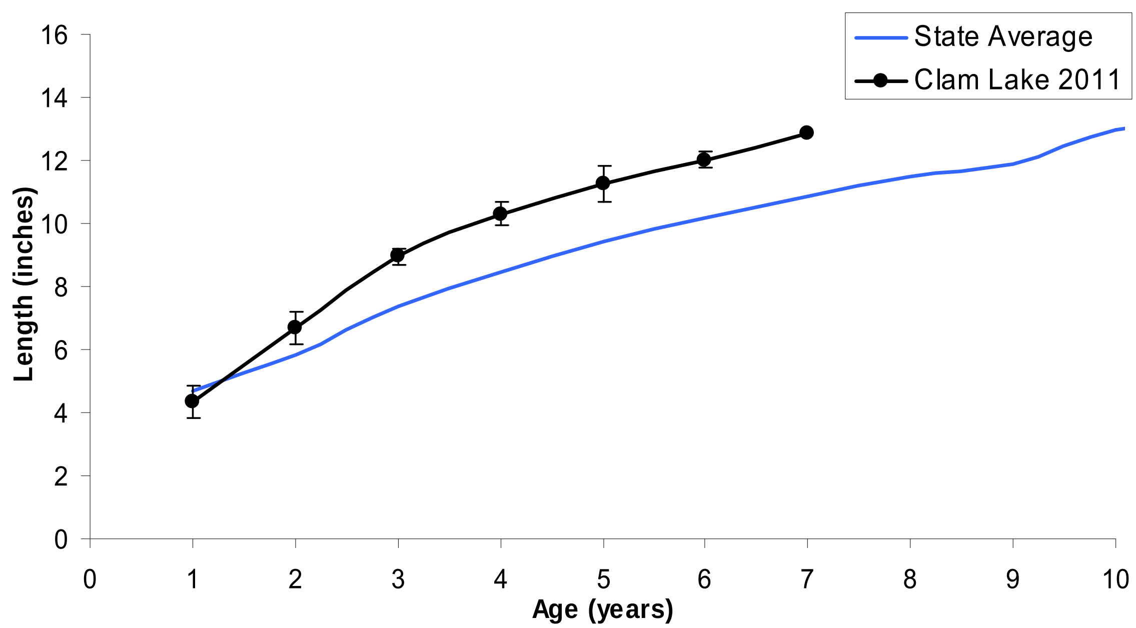

Figure 13. Mean lengths at age + one standard deviation for black crappie captured during fall 2010 and spring 2011 surveys on Clam Lake, Burnett County. Wisconsin statewide averages are displayed for comparison.

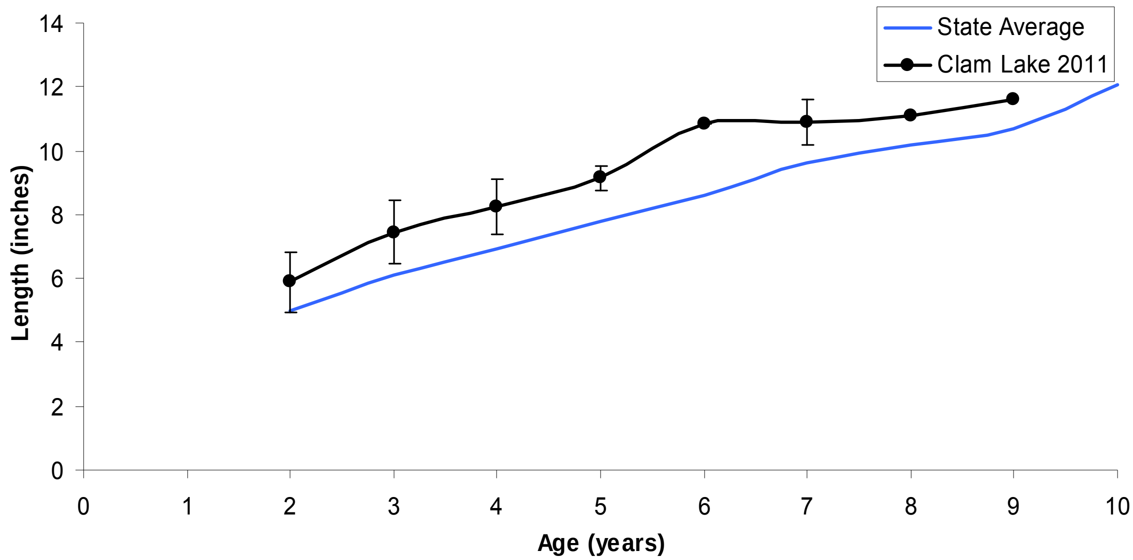

Figure 14. Mean lengths at age ± one standard deviation for yellow perch captured during fall 2010 and spring 2011 surveys on Clam Lake, Burnett County. Wisconsin statewide averages are displayed for comparison.

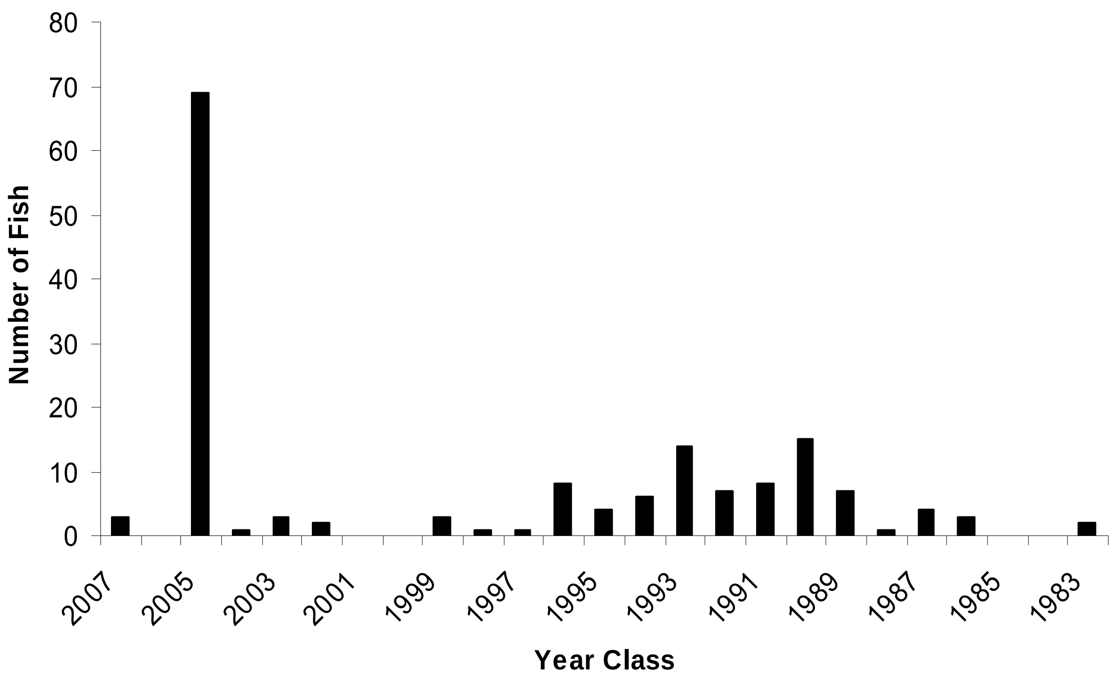

Figure 15. Number of common carp (N = 162) captured per year class during 2009 electrofishing surveys on Clam Lake, Burnett County .

Appendix

Appendix Table 1. General Fishing Regulations for Clam Lake, Burnett County, in 2011.

Fish Species	Open Season	Daily Limit	Minimum Length (in)
Walleye	May 07-March 04	5	15
Largemouth and Smallmouth Bass	May 07-March 04	5	14
Muskellunge	May 28-November 30	1	40
Northern Pike	May 07-March 04	5	None
Lake Sturgeon	No Open Season	NA	NA
Panfish	Open Season Year Round	25	None

Appendix Table 2. Total and directed angling effort summary for Clam Lake, Burnett County, during the 1995-1996 creel survey. Effort is displayed in estimated hours and hours/acre in parentheses for Clam Lake. Burnett county and ceded territory averages are displayed in hours/acre only.

Effort (Hours/Acre)	Clam Lake	Burnett County Average	Ceded Territory Average
Total	97,221 (63.0)	24.0	32.9
Walleye	502 (0.3)	7.5	11.4
Northern Pike	21,446 (13.9)	6.4	4.8
Largemouth Bass	32,282 (20.9)	5.3	3.9
Smallmouth Bass	170 (0.1)	0.2	2.3
Bluegill	51,935 (33.6)	NA	NA
Black Crappie	17,984 (11.6)	NA	NA
Yellow Perch	189 (0.1)	NA	NA

Appendix Table 3. Size cutoffs used to determine whether primary or secondary fin clips should be applied to gamefish when gender could not be determined.

Fish Species	Primary Fin Clip	Secondary Fin Clip
Walleye	≥15 in	≥ 7" < 15" (TC Clip)
Bass	≥8 in	< 8" (TC Clip)
Muskellunge	≥30 in	Immature fish < 30" (TC Clip)
Northern Pike	≥12 in	< 12" (TC Clip)

Appendix Table 4. Values used in proportional and relative stock density calculations.

Fish Species	Stock Size (In)	PSD (Quality Size In)	RSDP (Preferred Size In)
Largemouth Bass	8	12	15
Northern Pike	14	21	28
Walleye	10	15	20