Bankson Lake 2011 Survey Report

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Introduction

Bankson Lake is a 217-acre natural lake located four miles southeast of the village of Lawton. The lake consists of two basins, with maximum depths of 42 ft in the southwest basin and 26 ft in the northeast basin (Figure 1). About 76% of the lake (by surface area) is less than 20 ft deep, and 57% of the lake is less than 10 ft deep. These numbers are approximate, as water levels are tied to the groundwater table and vary considerably. Bankson Lake has no inlets or outlets. Water enters the lake from springs, surface runoff, and direct precipitation.

Sand and organics are the major substrate types in shoal areas. Brush is common along undeveloped shorelines, and this brush is flooded during periods of high water levels (such as April 2011). The abundance and species diversity of aquatic vegetation in Bankson Lake is variable and is influenced by water levels and herbicide treatments. The entire lake was treated with fluridone in 2001 to reduce abundance of Eurasian watermilfoil.

Bankson Lake is surrounded by deposits of ice contact outwash sand and gravel. These materials are highly porous, and Darcy maps indicate substantial groundwater movement into the lake. Forests and agriculture are the predominant land uses in the watershed. There are multiple wetland complexes adjacent to the lake (Figure 2). These wetlands have limited residential and vacation home development along the shoreline. The 2011 habitat survey revealed a dwelling density of 28.0 dwellings/mile (17.4 dwellings/km), which is considered moderate for southwest Michigan lakes. Approximately 18% of the shoreline is armored with seawalls or riprap. Large woody structure is scarce. The Michigan Department of Natural Resources (MDNR) boat launch on the north shore provides public access to the lake.

Limnological sampling was conducted at the deepest point in Bankson Lake on September 12, 2011. As expected, the lake was thermally stratified (Figure 3). The epilimnion extended from the surface to a depth of 19 ft. Water temperatures in the epilimnion ranged from 70.8 ^{o}F at the surface to 68.3 ^{o}F at 19 ft. The metalimnion (zone of thermal change) extended from 19 ft to 33 ft. Water temperatures declined from 68.3 ^{o}F at the top to 50.5 ^{o}F at the bottom of the metalimnion. The cold waters of the hypolimnion extended from 33 ft to the bottom of the lake. The oxygen distribution within Bankson Lake followed a clinograde curve, with the highest oxygen concentrations occurring near the surface (Figure 3). At depths of 23 ft and greater, the dissolved oxygen concentration was < 1 ppm. The total alkalinity was 88 mg/L, which is indicative of a moderately hardwater lake with average buffering capacity.

The biological productivity of a lake is strongly dependent on its supply of two key nutrients: phosphorus and nitrogen. The ratio of total nitrogen to phosphorus was 21:1 in Bankson Lake in 2011, so it appears that phosphorus is the limiting nutrient in this system (Shaw et al. 2004). The total phosphorus concentration was 0.032 mg/L. The chlorophyll a concentration, which provides an index of algal biomass, was 0.0027 mg/L. The Secchi disk depth (an index of water clarity) was 13 ft. The Secchi disk depth and chlorophyll a concentration were indicative of a mesotrophic lake, whereas the phosphorus concentration was more typical of a eutrophic system (Carlson and Simpson 1996). Overall, the water quality data suggest that Bankson Lake is best classified as a mesotrophic (moderately productive) lake.

During 1933 through 1945, bluegills and largemouth bass were stocked in Bankson Lake (Table 1). Throughout the state, annual stocking programs for these species were discontinued after fisheries managers determined that such programs were unnecessary and could have undesirable effects on the receiving population (e.g., reduced growth due to increased competition for forage).

Conservation officers recorded catch and effort data for anglers encountered on Bankson Lake during 1953-1961. These qualitative creel reports indicated that bluegill was the primary game species in this system. Smaller numbers of black crappie, largemouth bass, pumpkinseeds, and yellow perch also were harvested by anglers. Anglers reported good fishing for largemouth bass and bluegills during the 1950s.

The first fish community surveys on Bankson Lake were completed in 1962 and 1963. Because most of the fish were collected with seines, the samples were biased toward juveniles. Bluegills composed the bulk of the catch, but pumpkinseeds, largemouth bass, and yellow perch also were common.

Fingerling muskellunge were introduced into Bankson Lake in 1962 (Table 1). During 1971-1997, Northern strain muskellunge were stocked nearly every year. Research studies conducted during the mid 1970s indicated much greater survival and lower cost per return for muskellunge stocked as fall fingerlings compared to fish stocked as spring fingerlings. From 1977 through 1987, muskellunge stocking density varied from 9 fall fingerlings/acre to 19 fall fingerlings/acre. During 1989-1997, muskellunge stocking density generally was 2-5 fall fingerlings/acre. Since 1997, Fisheries Division has strived to stock fall fingerling muskellunge in Bankson Lake every other year. Due to variability in hatchery production, there have been some minor deviations from this biennial schedule (Table 1). In recent years, the target stocking density for muskellunge has been 3 fall fingerlings/acre.

During 1977-1995, Bankson Lake was one of the Division's broodstock lakes for Northern strain muskellunge. Each spring, gametes were collected from Bankson Lake muskellunge to support stocking programs throughout the state. Although no egg takes have been completed on Bankson Lake since 1995, this system still is considered a backup broodstock lake for Northern strain muskellunge. Mark-recapture population estimates were calculated from data collected during the 1985-1989 egg takes. Population estimates for muskellunge larger than 20 inches ranged from a high of 2,525 fish (11.6/acre) in 1986 to a low of 757 fish (3.5/acre) in 1989. Although a portion of the fish collected during the broodstock netting were immature, it is obvious that the muskellunge population density in Bankson Lake was well above the target of 1 adult fish per 3 surface acres recommended by MDNR (2004).

Muskellunge management in Michigan has been controversial, and the Bankson Lake fishery has been no exception. Many anglers have enjoyed fishing for muskellunge on Bankson Lake and have expressed their support for the stocking program. Conversely, other anglers and some riparian landowners have complained that muskellunge were negatively affecting other game fish populations.

Four adult walleyes were captured during the 1983 muskellunge egg take. These fish apparently were survivors from unauthorized introductions by anglers. Local anglers expressed interest in enhancing the walleye population in Bankson Lake, and the Division began a walleye stocking program in 1986 (Table 1). Although fish stocked as fall fingerlings or adults exhibited excellent growth, electrofishing surveys conducted during 1990 and 1991 indicated poor survival of fish stocked as spring fingerlings. As the Division did not have the facilities to consistently rear fall fingerling walleyes, the stocking program was discontinued in 1993.

Fisheries surveys repeatedly have shown that bluegill is the most abundant game fish species in Bankson Lake. Fishing reports indicate that the size structure of the bluegill population has varied during the last 50 years; however, the differences in sampling methods during this period complicate comparisons between sampling years. Length-at-age data indicates that bluegill growth was average (mean growth index [MGI] = -0.3) in 1962, above average in 1972 (MGI = +1.2), and below average (MGIs = -1.5 to -0.7) during 1977-1994 (Schneider et al. 2000). A similar temporal trend in growth patterns was observed for yellow perch.

Bankson Lake has supported one of the more popular largemouth bass fisheries in southwest Michigan, and many bass tournaments have been held on this lake. Growth of largemouth bass in Bankson Lake has changed over time, but has not exhibited any clear temporal trend. Since 1962, the MGI for largemouth bass has ranged from -2.3 to +0.9. During most sampling years, largemouth bass lengths-at-age have been at or below the state averages (Schneider et al. 2000).

Materials and Methods

A fisheries survey was conducted on Bankson Lake during April 9-14, 2011. The primary objective of this survey was to assess the survival and growth of stocked muskellunge. A secondary objective was to obtain information on the species composition and size structure of the rest of the fish community. Six trap nets were deployed in and around potential muskellunge spawning sites on April 9. The nets were checked on April 11th, and one of the nets was moved to another location within the lake. The nets were checked again on April 13 and removed on April 14. The total sampling effort for the survey was 30 trap net nights.

Total lengths were recorded for all fish captured during the survey, except total lengths for bluegills and redear sunfish only were recorded for the net lifts on 4/11 and the first two net lifts on 4/13 due to time constraints. (The total number of fish measured was 1,093 bluegills and 822 redear sunfish.) For the other net lifts, bluegills and redear sunfish were counted and the length-frequency distribution of the catch was assumed to match the length-frequency distribution of the fish measured during the first eight net lifts.

A dorsal fin ray sample was collected from each muskellunge for age determination. For other game fish species, dorsal spine samples were collected from 10 fish within each inch class. A population estimate for adult muskellunge was generated using the Schnabel method (Schnabel 1938).

A creel survey also was conducted in 2011 to collect information regarding fishing effort, harvest, and catch rates for various game fish species in Bankson Lake. The creel survey was scheduled to start on the last Saturday in April and continue through November. This schedule was disrupted when the Bankson Lake creel clerk was reassigned to cover for a Lake Michigan clerk that was off on medical leave. The clerk only was able to work on Bankson Lake during April 30-May 14 and November 4-30. During these periods, the creel clerk made boat and shore angler counts and interviewed anglers during one weekend day and one or two weekdays each week. Fifty angler interviews were completed during the creel survey.

Results

Thirty-eight muskellunge were captured during this sampling effort. Three fish were recaptured on April 13th and three fish were recaptured on April 14th. The Schnabel population estimate for adult muskellunge was 86 fish. The 95% confidence interval for this estimate was 40-198 fish. The catch included 19 males and 19 females.

The total length range for captured muskellunge was 29-45 inches (Figure 4). Females tended to be larger than males. The mean length for females was 41.0 inches, whereas the mean length for males was 37.3 inches. Muskellunge ages ranged from 7 years to 17 years (Figure 5). Mean lengths-at-age were greater for females than for males. For both sexes, lengths-at-age were substantially below average (Figure 6).

The estimated muskellunge catch during April 30-May 14 was 14 fish (Table 2). All of these fish were released. None of the anglers interviewed in November had caught a muskellunge.

Eleven additional fish species were collected during the 2011 survey (Table 3). Bluegill (n = 2,736) was the most abundant species in the catch. Seventy-two percent of the bluegills were 6 inches or larger. Bluegills in the 6-7 inch size range were common, but no fish > 8 inches were captured (Figure 7). Size structures of bluegill populations can be challenging to interpret because each gear type exhibits some degree of size selectivity. In an effort to minimize the subjectivity associated with analyses of bluegill catch data, Schneider (1990) developed a standardized scoring system for interpreting length-frequency distributions of bluegills collected with various types of sampling gear. The size score for the Bankson Lake bluegill population was 3.4 (acceptable-satisfactory) based on the trap net sample (Schneider 1990). Mean lengths-at-age were above average for young fish and below average for age 5 and older bluegills (Figure 8). Six year classes were represented in the catch (Figure 9). Bluegills from the 2005 and 2007 year classes composed 70% of the sample.

Redear sunfish (n = 2,080) was the second most abundant species in the catch. Approximately 88% of the redear sunfish catch consisted of fish in the 6-7 inch size classes (Figure 10). Only one fish > 10 inches was captured. Eight year classes were identified, but age 2-4 fish composed the bulk of the catch (Figure 11). Mean lengths-at-age were average for age 2 fish and below average for older fish (Figure 12). Annual total mortality was estimated to be 51% for adult redear sunfish (ages 3-9; Figure 13).

Black crappies (n = 467) composed 7% of the total fish biomass in the catch. Seventy-six percent of the black crappies collected were of harvestable size (> 7 inches; Figure 14). The mean growth index for crappies was +0.2, which is indicative of average growth (Figure 15). Age 2-4 fish made up approximately 81% of the catch (Figure 16).

Other panfish species were minor components of the catch. Cumulatively, yellow perch (n = 139) and pumpkinseeds (n = 33) made up 2% of the fish biomass in the sample. Ninety-nine percent of the yellow perch captured were > 7 inches. Growth was average for both species.

Only 4% of the 229 largemouth bass collected during the survey were of legal size (Figure 17). The mean growth index for largemouth bass was -2.2, which is indicative of below average growth (Figure 18). Nine year classes were represented in the catch (Figure 19). Annual total mortality for largemouth bass ages 4-8 was estimated to be 56% (Figure 20).

Twelve walleyes were captured during the 2011 survey. The total length range for these fish was 24-29 inches. Seven of these fish were from the 2000 year class, five fish were from the 1998 year class, and one fish was from the 1996 year class.

Analysis and Discussion

According to MDNR guidelines, the target density for adult muskellunge is one fish per 3 surface acres (MDNR 2004). The population density for adult muskellunge in Bankson Lake was estimated to be one fish per 2.5 surface acres. Sampling for a mark-recapture study should include the entire muskellunge spawning period. In 2011, sampling began during the middle of the spawning period. The greatest catch (n = 26) occurred on April 11th and the catch dwindled to 5 fish on April 14th. Because the sampling period did not encompass the entire spawning season, it is likely that the actual muskellunge population density is greater than the estimated density.

The age structure of the muskellunge sample suggests that natural recruitment is minimal in Bankson Lake. Fall fingerlings were not stocked in Bankson Lake during 2002-2003, and no fish from those year classes were captured during the 2011 survey. Only one fish from the 2011 catch was traced back to a year when fall fingerlings were not stocked in the lake. This fish was from the 2000 year class. Twenty-one sub-adult muskellunge (mean length = 29.8 inches) were stocked in 2003. Based on the size at stocking, this group could have included age 3 fish (i.e., fish from the 2000 year class).

Two factors were responsible for the slow growth of muskellunge in Bankson Lake. (1) Muskellunge prefer soft-rayed prey and grow slowly when bluegills are the dominant forage species (Wahl and Stein 1988; Bozek et al. 1999). Lake chubsuckers are moderately abundant in Bankson Lake and provide suitable forage for juvenile muskellunge. (Note: The catch data does not accurately reflect abundance of lake chubsuckers, as most chubsuckers did not swim into the trap net pots. When the trap nets were removed, we observed numerous chubsuckers that were gilled in the leads.) However, adult muskellunge require a supply of large-bodied forage fish (e.g., suckers) to maintain rapid growth (Bozek et al. 1999). In Bankson Lake, the only large-bodied forage items are largemouth bass and other muskellunge. (2) During the 1980s-1990s, stocking densities were high and the muskellunge population density in the lake greatly exceeded current population targets (MDNR 2004). At such high densities, intraspecific competition for forage and habitat further reduced the growth potential for muskellunge in this system. Despite slow growth, Bankson Lake continues to produce legal-sized muskellunge. As population densities decline through more judicious stocking, the growth rate and the size structure of the population are expected to improve.

Due to the disruption in the sampling schedule, the creel survey data are of limited utility. It is clear, however, that Bankson Lake supports a targeted muskellunge fishery during the spring. Anecdotal reports also indicate that this lake is a popular destination for muskellunge anglers.

Bluegills are the most common game fish in Bankson Lake. The average trap net catch-per-effort (CPE) in Bankson Lake was 91.2 bluegills/net night. For lakes surveyed as part of Fisheries Division's Status and Trends (S&T) Program during 2002-2007, the statewide average was 48.1 bluegills/trap net night and the southwestern Michigan average was 78.8 bluegills/trap net night (K. Wehrly, MDNR - Fisheries Division, unpublished). Thus, the bluegill CPE in Bankson Lake was relatively high. Survey timing affects bluegill CPE. In general, bluegill CPE is greatest in May-early June when water temperatures are between 60 ^{o}F and 70 ^{o}F. S&T surveys were conducted during this period. By contrast, water temperatures during the 2011 Bankson Lake survey varied from 45 ^{o}F to 54 ^{o}F. Thus, bluegill abundance in Bankson Lake probably is even higher than the CPE data indicate.

Small "keeper" bluegills are abundant in Bankson Lake, but no fish > 8 inches were captured. The observed size structure does not appear to be due to recreational harvest, as older fish (ages 6-7) composed a higher than normal percentage (48%) of the catch. The length-at-age data suggest an alternative explanation for the poor size structure of the bluegill population. Mean lengths-at-age for young bluegills were above average. (This data must be interpreted with caution. Fast-growing individuals become vulnerable to capture in trap nets at a younger age than slow-growing individuals. Thus, the reported mean lengths for age 2 and 3 fish may not reflect the actual means for the entire population.) However, it is obvious that growth of adult bluegills is slow in Bankson Lake (Figure 7). This growth pattern may have been caused by a shortage of large zooplankton (e.g., *Daphnia pulicaria*), which are the primary forage for adult bluegills (Spotte 2007). Ehlinger (1997) and Spotte (2007) observed that stunting was more common in lakes where >50% of the surface area was less than 10 ft deep. In shallow lakes, the production of zooplankton is limited by the small size of the pelagic zone, whereas bluegill recruitment typically is high due to the abundance of spawning habitat.

No redear sunfish were collected during previous surveys on Bankson Lake. This species must have been introduced into the lake through unauthorized stocking. Because Bankson Lake is a public water body, it is illegal to stock fish in the lake without a public waters stocking permit. No permits have been issued for Bankson Lake. The abundance of redear sunfish and the presence of several year classes in the catch indicate natural recruitment or repeated stocking of this species. Redear sunfish commonly hybridize with bluegills, pumpkinseed, and warmouth. Hybrids (which included a mixture of different crosses) composed 5% of the sample by number in Bankson Lake.

Of the 17 redear sunfish lakes that were sampled as part of the S&T Program during 2002-2007, only two lakes had redear sunfish CPEs higher than the 2011 Bankson Lake CPE (K. Wehrly, MDNR - Fisheries Division, unpublished). The Bankson Lake survey was not conducted during the optimal sampling period for sunfish, so the observed CPE indicates that the population density is abnormally high in this system. The forage base (primarily snails and bottom-dwelling aquatic insect larvae) does not appear to be sufficient to support such a large population of redear sunfish, as evidenced by the fact that growth of adult sunfish was substantially slower than the state average (Figure 12).

The CPE, growth, and size structure data suggest that Bankson Lake supports a black crappie fishery that is average relative to other Michigan lakes. The yellow perch CPE in Bankson Lake was higher than the CPEs recorded during most S&T surveys (K. Wehrly, MDNR - Fisheries Division, unpublished), but this high CPE probably can be attributed to survey timing. The Bankson Lake survey was conducted during the yellow perch spawning period when fish were moving into shallow water. Conversely, S&T surveys are conducted during the post-spawn period when yellow perch typically have moved offshore and are less vulnerable to capture in trap nets.

Largemouth bass are abundant in Bankson Lake. The largemouth bass CPE in Bankson Lake was within the top 15% of the range recorded during S&T surveys (K. Wehrly, MDNR - Fisheries Division, unpublished). The size structure of the largemouth bass population was skewed toward sub-legal fish. Three factors determine the size structure of fish populations: recruitment, annual mortality, and growth. Because sampling only was conducted during a single year, data on year-to-year variation in recruitment of largemouth bass in Bankson Lake are not available. Based on the catch curve analysis (which assumes consistent recruitment from year-to-year), annual total mortality in Bankson Lake was estimated to be 56%. This estimate is close to the median (58%) of the annual mortality values reported by Allen et al. (2008) for North American largemouth bass populations. Thus, the available data suggest that annual total mortality of largemouth bass in Bankson Lake is within the normal range for this species.

As noted previously, largemouth bass growth is slow in this system. This growth pattern may be related to the presence of muskellunge. Similar growth patterns were recorded for largemouth bass in Round Lake (Van Buren County; Gunderman 2011) and Long Lake (St. Joseph County; Gunderman 2010), which also support robust muskellunge populations. In lakes without muskellunge, bass larger than 7 inches have little risk from predators and can adjust their movement patterns to optimize foraging efficiency. In lakes with muskellunge, bass are both predators and prey, so they probably adopt foraging strategies that balance predation risk and foraging efficiency.

MDNR has not stocked walleyes in Bankson Lake since 1993. The walleyes collected during the 2011 survey probably were survivors of unauthorized stocking events. No suitable spawning habitat (i.e., waveswept gravel or cobble shoals) was observed, and the absence of fish younger than age 10 indicates that there is no natural reproduction of walleye in this system.

Management Recommendations

Four fisheries management goals have been developed for Bankson Lake. Goal 1: Protect and rehabilitate habitat for fish and other aquatic organisms. Goal 2: Maintain the muskellunge fishery. Goal 3: Collaborate with anglers and riparian landowners to maintain a small walleye population in the lake. Goal 4: Establish and sustain a healthy predator:prey ratio within the fish community.

At least three different methods will be used to accomplish Goal 1. Fisheries Division personnel will continue to review Michigan Department of Environmental Quality permit applications for potential effects on aquatic resources. If a proposed project is likely to degrade the aquatic habitat, Fisheries Division staff will object to the proposal and suggest feasible alternatives. Fisheries Division will work with the lake association and other organizations to educate riparian landowners on the effects of various practices (e.g., chemical weed treatments and seawall construction) on aquatic ecosystems. As opportunities arise, Fisheries Division also will provide technical assistance to local units of government interested in establishing ordinances that protect aquatic habitats from pollution or unwise development.

To accomplish Goal 2, Fisheries Division will stock 650 fall fingerling Northern strain muskellunge (3/acre) in Bankson Lake on a biennial schedule. Muskellunge abundance is expected to decline over the next several years before stabilizing at a population density near the target of one adult per three surface acres (MDNR 2004). Although catch rates for muskellunge probably will be lower in the future, improved growth conditions may allow more fish to attain legal size. Bankson Lake currently is a backup broodstock lake for Northern strain muskellunge. If Fisheries Division decides to discontinue the rearing program for Northern strain fish, other muskellunge strains (e.g., Great Lakes or Iowa) could be stocked to maintain the fishery in Bankson Lake.

Goals 2-4 are interrelated. Muskellunge are the dominant predators in Bankson Lake. Thus, reducing the muskellunge population density will assist with attainment of Goal 4. Local anglers also have expressed interest in maintaining a walleye fishery in this system, and the Bankson Lake Association plans to stock 1,000 fall fingerling walleyes (5/acre) during October-November 2012. Private stocking may be permitted provided that stocking densities do not exceed 5 fall fingerlings/acre and the stocking frequency is no greater than once every three years. This approach will allow the continuation of a modest walleye fishery without overtaxing the available forage base.

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Table 1.–Fish stocking in Bankson Lake, 1933-2011.

Year	Species	Life stage	Number	Number/acre	Average length (inches)
1933	Bluegill	Fall fingerling	10,000	46	---
	Largemouth bass	Fall fingerling	11,000	5	---
1934	Bluegill	Fall fingerling	7,000	32	---
	Largemouth bass	Fall fingerling	1,000	5	---
1935	Bluegill	Fall fingerling	10,000	46	---
	Largemouth bass	Fall fingerling	500	2	---
1936	Bluegill	Fall fingerling	10,000	46	---
	Largemouth bass	Fall fingerling	400	2	---
1937	Bluegill	Fall fingerling	10,000	46	---
1938	Bluegill	Fall fingerling	50,000	230	---
	Largemouth bass	Fall fingerling	1,000	5	---
	Yellow perch	Fall fingerling	10,000	46	---
1939	Bluegill	Fall fingerling	100,000	461	---
	Largemouth bass	Fall fingerling	1,000	5	---
	Smallmouth bass	Fall fingerling	2,000	9	---
	Yellow perch	Fall fingerling	5,000	23	---
1940	Bluegill	Fall fingerling	20,000	92	---
	Largemouth bass	Fall fingerling	2,000	9	---
		Yearling	3,000	14	---
1941	Bluegill	Fall fingerling	50,000	230	---
	Largemouth bass	Fall fingerling	500	2	---
1942	Bluegill	Fall fingerling	10,000	46	---
	Largemouth bass	Fall fingerling	1,000	5	---
1943	Bluegill	Fall fingerling	5,000	23	---
	Largemouth bass	Fall fingerling	1,000	5	---
1944	Bluegill	Fall fingerling	10,000	46	1.50
	Largemouth bass	Fall fingerling	1,000	5	2.25
1945	Largemouth bass	Fall fingerling	3,000	14	3.50
1962	Muskellunge	Fingerling	2,000	9	---
1971	Muskellunge	Fingerling	1,005	5	---
1972	Muskellunge	Fingerling	615	3	---
1974	Muskellunge	Spring fingerling	400	2	3.00
		Fall fingerling	300	1	6.50
		Fall fingerling	300	1	10.00
1975	Muskellunge	Spring fingerling	594	3	3.00
		Fall fingerling	713	3	6.50
		Fall fingerling	593	3	10.00
1977	Muskellunge	Fall fingerling	2,052	9	---
1979	Muskellunge	Fall fingerling	2,000	9	6.42

Table 1.–Continued.

Year	Species	Life stage	Number	Number/acre	Average length (inches)
1980	Muskellunge	Fall fingerling	2,000	9	9.17
1981	Muskellunge	Fall fingerling	4,000	18	7.57
1982	Muskellunge	Fall fingerling	2,495	11	6.54
1983	Muskellunge	Fall fingerling	4,092	19	5.37
1984	Muskellunge	Fall fingerling	2,094	10	13.12
1986	Muskellunge	Fall fingerling	3,454	16	9.51
	Walleye	Fall fingerling	528	2	10.16
1987	Muskellunge	Fall fingerling	3,114	14	8.68
	Walleye	Adult	81	<1	21.92
1988	Walleye	Spring fingerling	2,006	9	1.92
1989	Muskellunge	Fall fingerling	1,146	5	8.31
	Walleye	Spring fingerling	3,405	16	1.76
1990	Muskellunge	Fall fingerling	1,061	5	7.97
	Walleye	Spring fingerling	10,881	50	1.68
1991	Muskellunge	Fall fingerling	686	3	8.20
	Walleye	Spring fingerling	10,884	50	1.56
1992	Muskellunge	Fall fingerling	539	2	8.24
	Walleye	Spring fingerling	7,770	36	2.72
	Largemouth bass	Adult	102	<1	19.2
1993	Walleye	Spring fingerling	575	3	3.92
1994	Muskellunge	Fall fingerling	873	4	8.93
		Adult	3	<1	19.96
1996	Muskellunge	Fall fingerling	32	<1	9.96
1997	Muskellunge	Fall fingerling	925	4	11.40
1999	Muskellunge	Fall fingerling	875	4	11.88
2001	Muskellunge	Fall fingerling	100	<1	12.20
2003	Muskellunge	Adult	21	<1	29.81
2004	Muskellunge	Fall fingerling	748	3	7.28
2006	Muskellunge	Fall fingerling	650	3	9.70
2008	Muskellunge	Fall fingerling	650	3	10.44

Table 2.–Angler survey estimates for Bankson Lake (Z. Su., MDNR – Fisheries Division, unpublished). The survey periods were April 30-May 14 and November 4-30, 2011. None of the anglers interviewed had harvested any fish, so only released fish estimates are included in the table. Two standard errors are given in parentheses. NA = estimates not available and CPH = catch per angler hour.

Species	CPH	April-May	November	Season
Largemouth bass	0.0582	34	0	34
	(0.1103)	(51)	(0)	(51)
Yellow perch	0.0233	14	0	14
	(0.0429)	(20)	(0)	(20)
Bluegill	0.0466	27	0	27
	(0.0857)	(39)	(0)	(39)
Muskellunge	0.0233	14	0	14
	(0.0433)	(20)	(0)	(20)
TOTAL RELEASED	0.1514	89	0	89
	(0.2126)	(70)	(0)	(70)
ANGLER HOURS		536	52	588
		(651)	(NA)	(684)
ANGLER TRIPS		94	15	109
		(119)	(NA)	(134)

Table 3.–Numbers, weights, lengths, and growth indices for fish species collected during the fish community survey on Bankson Lake, April 9-14, 2011. Fish were captured using trap nets.

Species	Number	Percent by number	Weight (lbs)	Percent by weight	Length range (inches)	Percent legal or harvestable[1]	Growth index[2]
Bluegill	2,736	42.0	481.9	20.6	4-7	72	+0.1
Redear sunfish	2,080	31.9	461.3	19.8	4-10	91	-1.7
Black crappie	467	7.2	165.1	7.1	4-11	76	+0.2
Hybrid sunfish	313	4.8	82.7	3.5	4-8	92	---
Warmouth	309	4.7	68.9	3.0	5-8	81	---
Largemouth bass	229	3.5	147.5	6.3	7-19	4	-2.2
Yellow perch	139	2.1	41.8	1.8	6-10	99	-0.2
Lake chubsucker	64	1.0	28.1	1.2	5-11	---	---
Muskellunge	44	0.7	753.2	32.2	29-45	16	
Yellow bullhead	40	0.6	13.3	0.6	6-10	---	---
Pumpkinseed	33	0.5	5.0	0.2	4-6	24	+0.7
Walleye	12	0.2	81.8	3.5	24-29	100	---
White sucker	3	0.0	5.2	0.2	13-18	---	---
Total	6,469		2,355.8				

[1] Harvestable size is 6 inches for bluegill, pumpkinseed, redear sunfish, hybrid sunfish, and warmouth, and 7 inches for black crappie and yellow perch.
[2] Average deviation from the state average length at age. Mean growth indices <-1 indicate below average growth, indices between -1 and +1 indicate average growth, and indices >+1 indicate growth is faster than the state average.

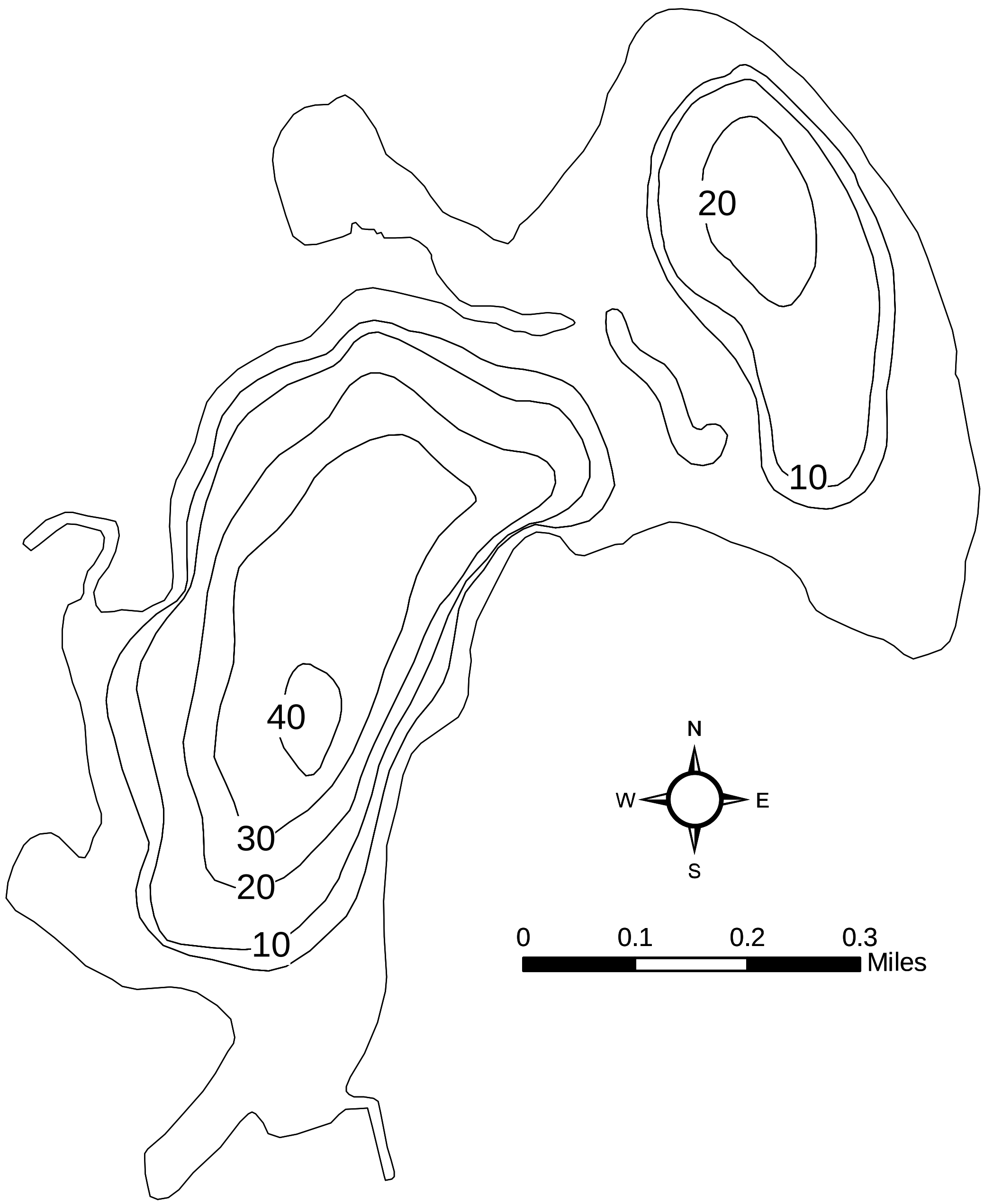
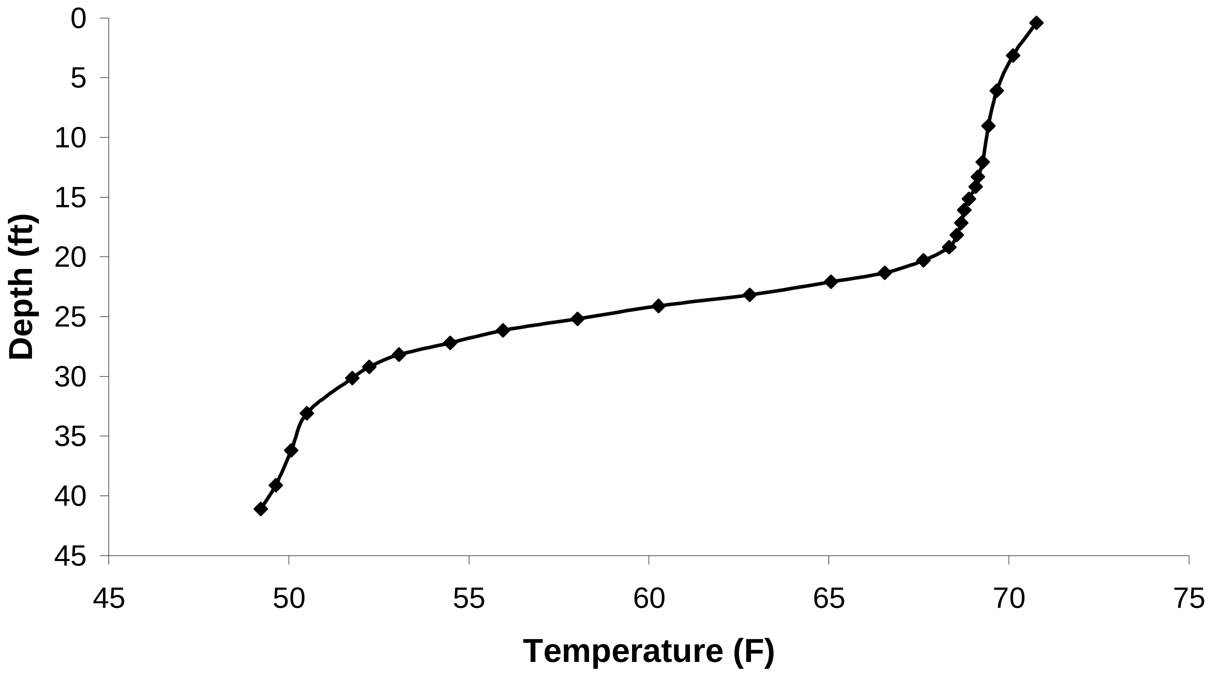


Figure 1.–Bathymetry of Bankson Lake, Van Buren County. Depths are in feet.

Figure 2.–Aerial view of Bankson Lake and the surrounding area. Ovals indicate riparian wetlands. Image from www.bing.com/maps.



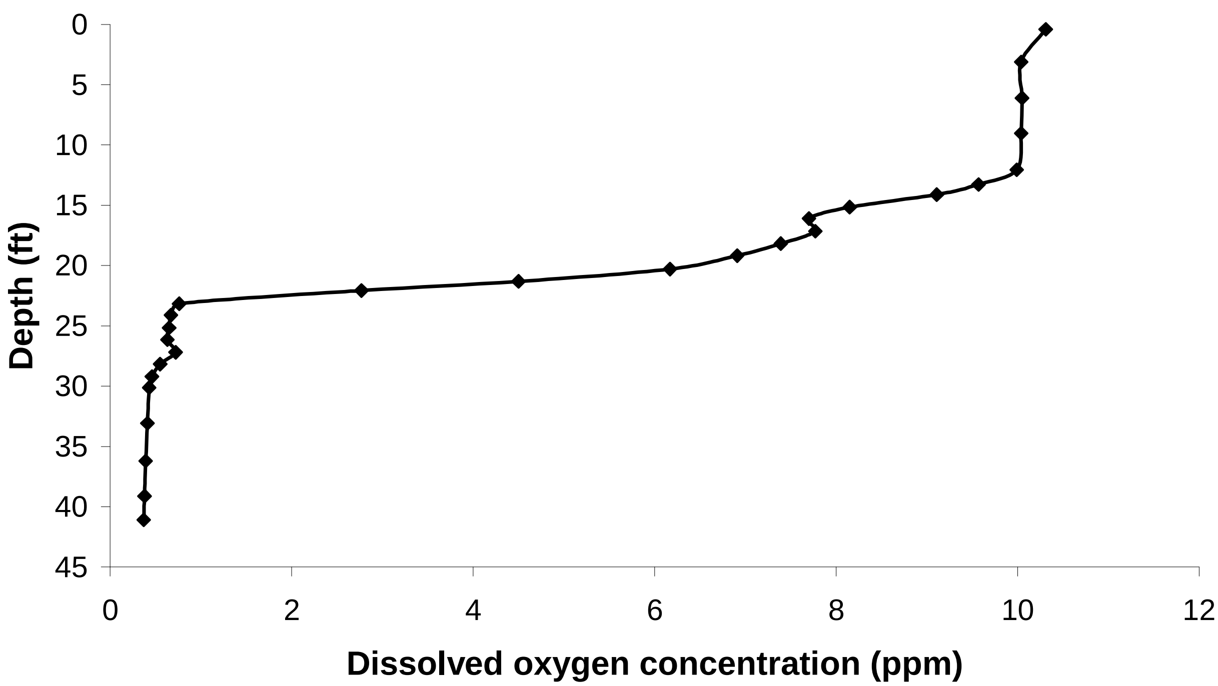
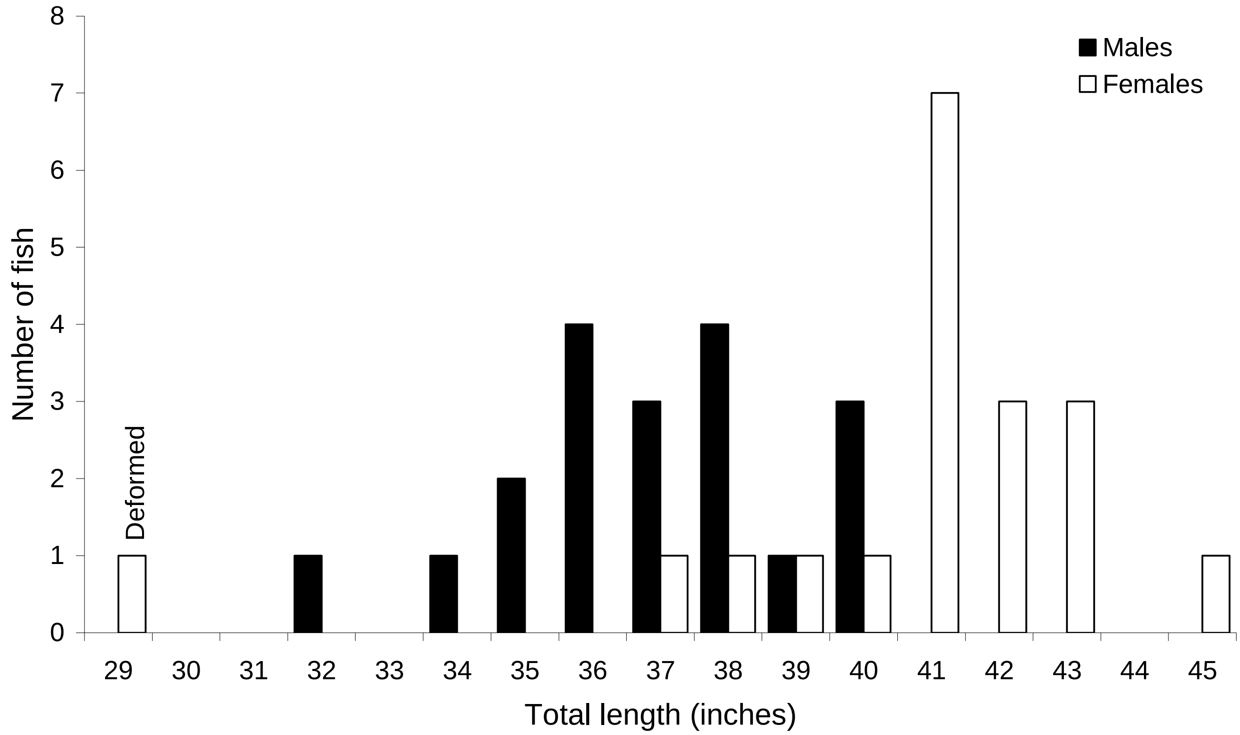


Figure 3.–Temperature and dissolved oxygen profiles for Bankson Lake on September 12, 2011.



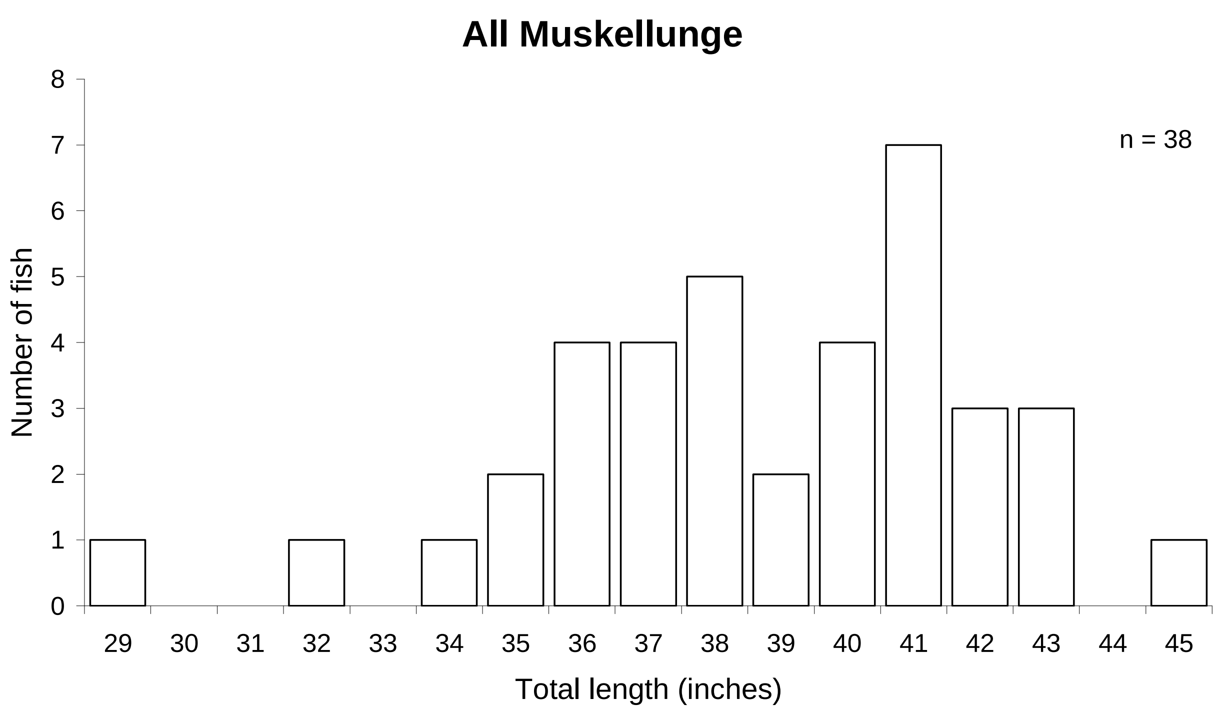


Figure 4.–Length frequency distributions for male, female, and all muskellunge captured in Bankson Lake during April 9-14, 2011.

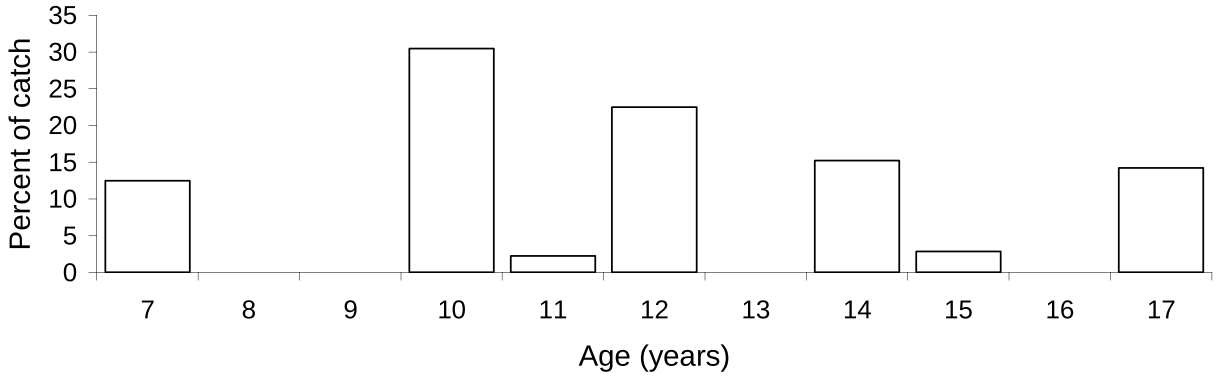


Figure 5.–Age frequency distribution for muskellunge captured in Bankson Lake during April 9-14, 2011.

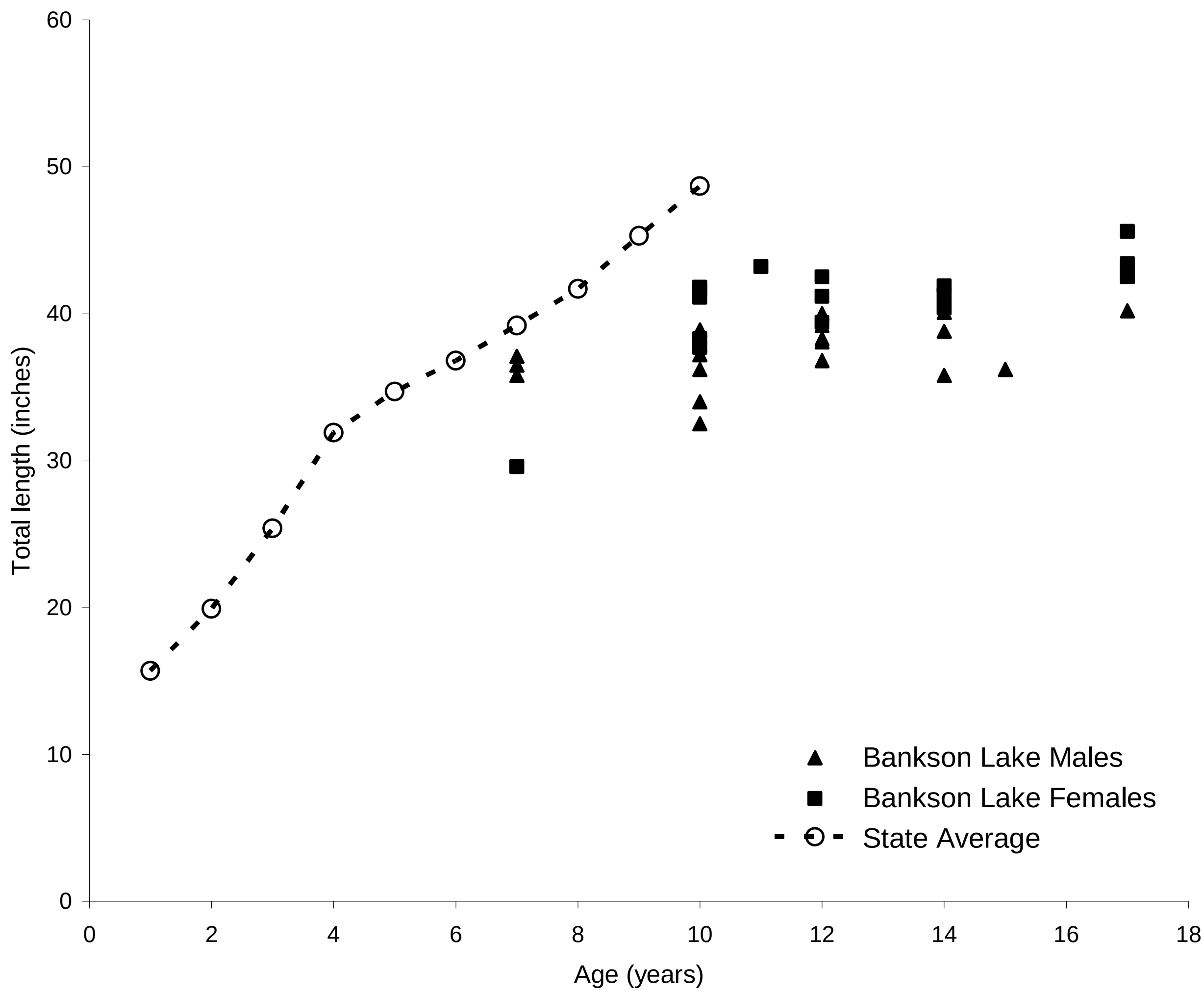


Figure 6.–Growth of muskellunge in Bankson Lake, as determined from dorsal spine samples collected during April 9-14, 2011. State average lengths from Schneider et al. (2000).

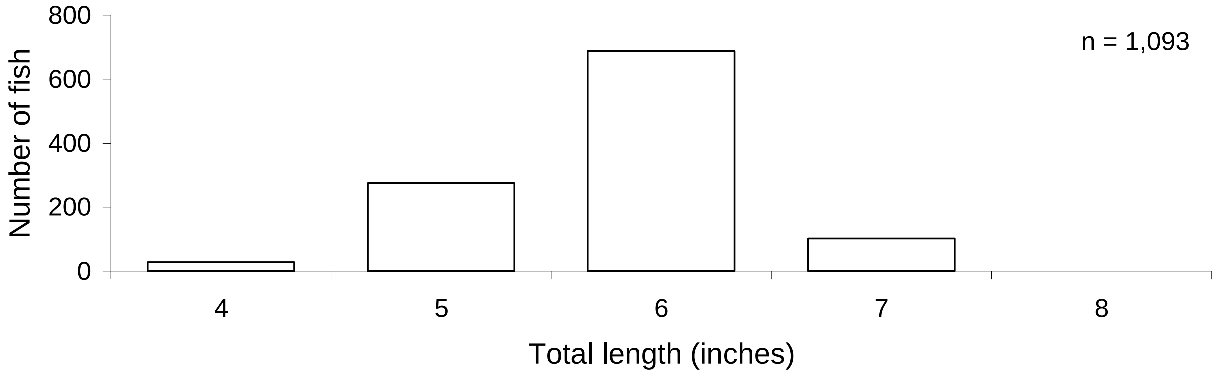


Figure 7.–Length frequency distribution for bluegills captured in Bankson Lake during April 9-14, 2011.

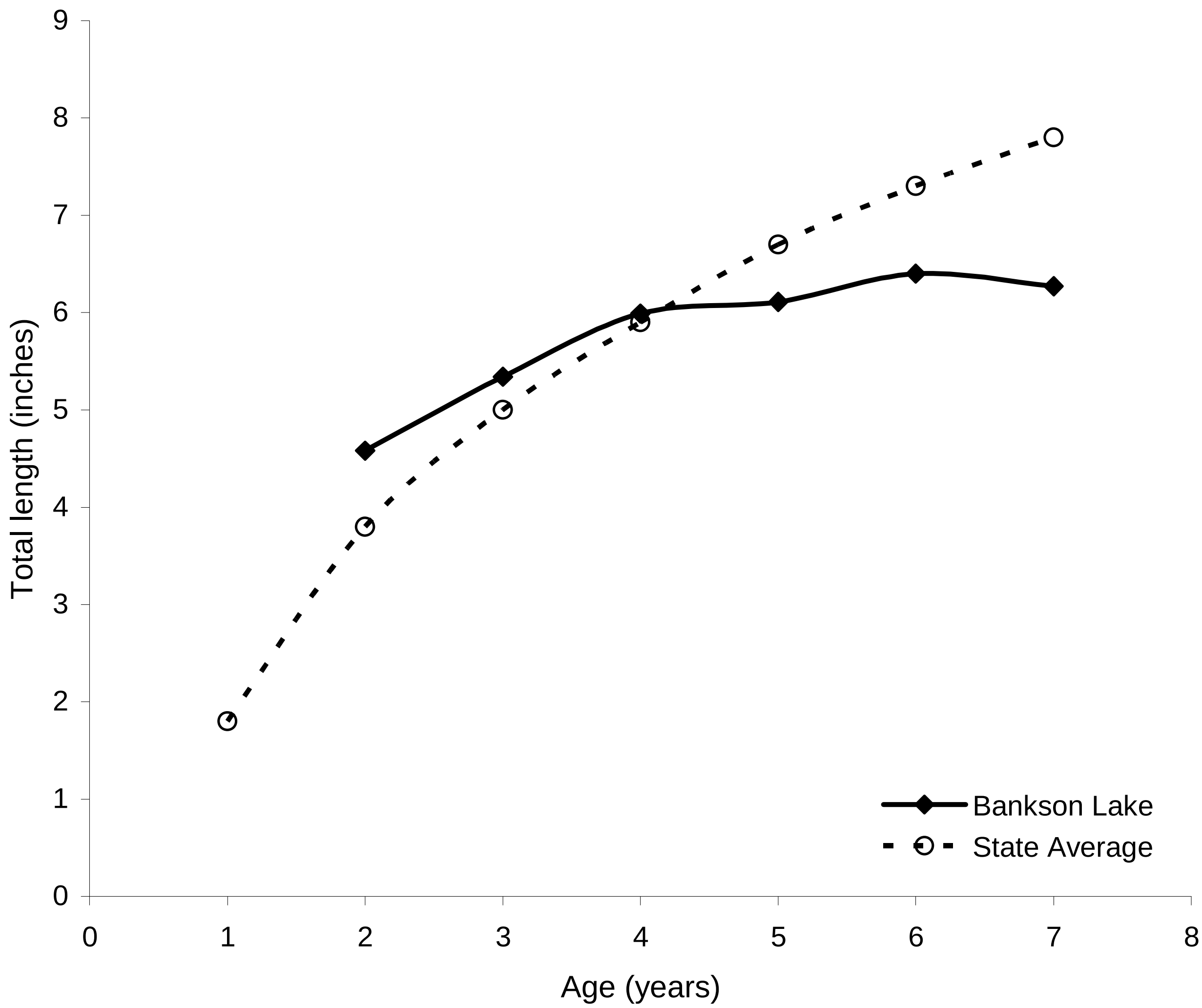


Figure 8.–Growth of bluegills in Bankson Lake, as determined from scale and dorsal spine samples collected during April 9-14, 2011. State average lengths from Schneider et al. (2000).

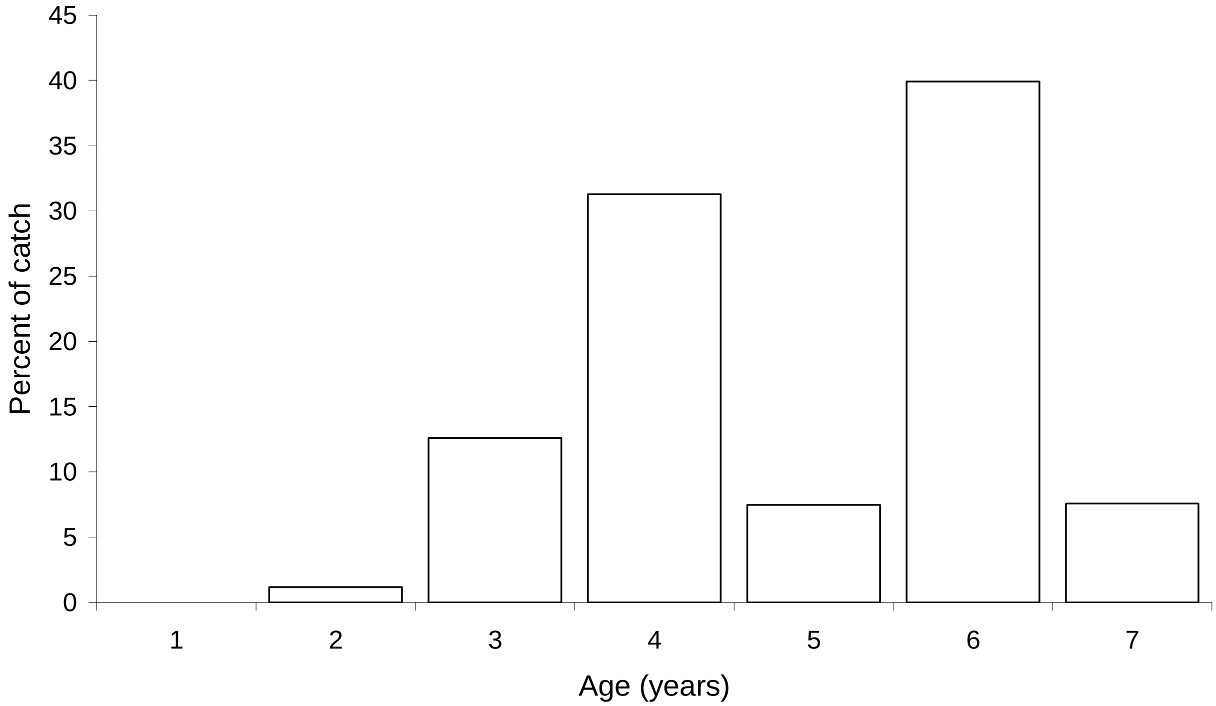


Figure 9.–Age frequency distribution for bluegills captured in Bankson Lake during April 9-14, 2011.

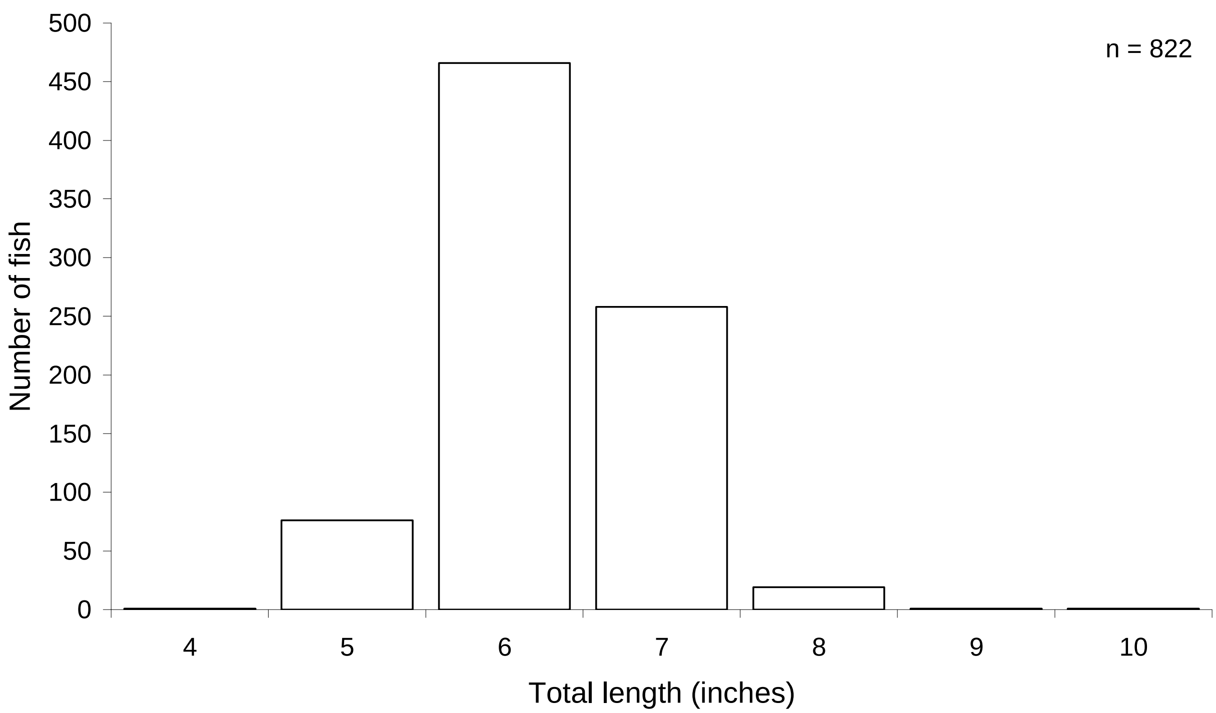


Figure 10.–Length frequency distribution for redear sunfish captured in Bankson Lake during April 9-14, 2011.

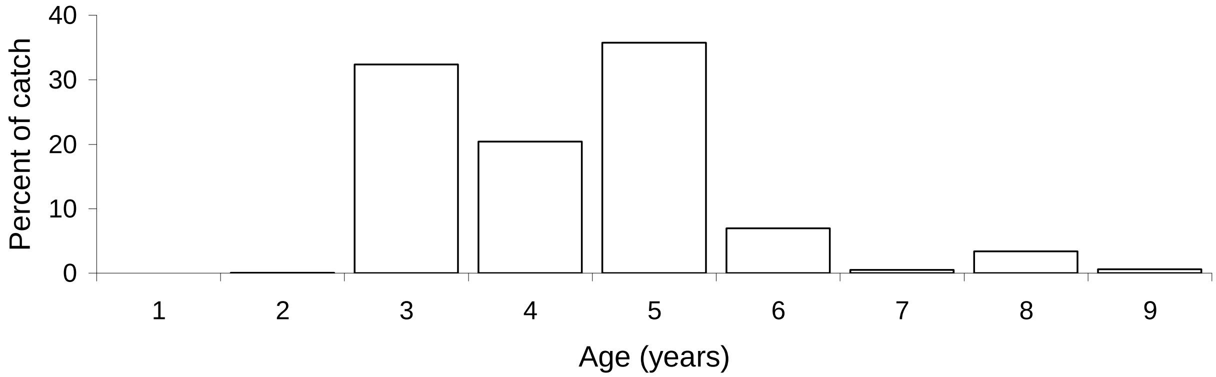


Figure 11.–Age frequency distribution for redear sunfish captured in Bankson Lake during April 9-14, 2011.

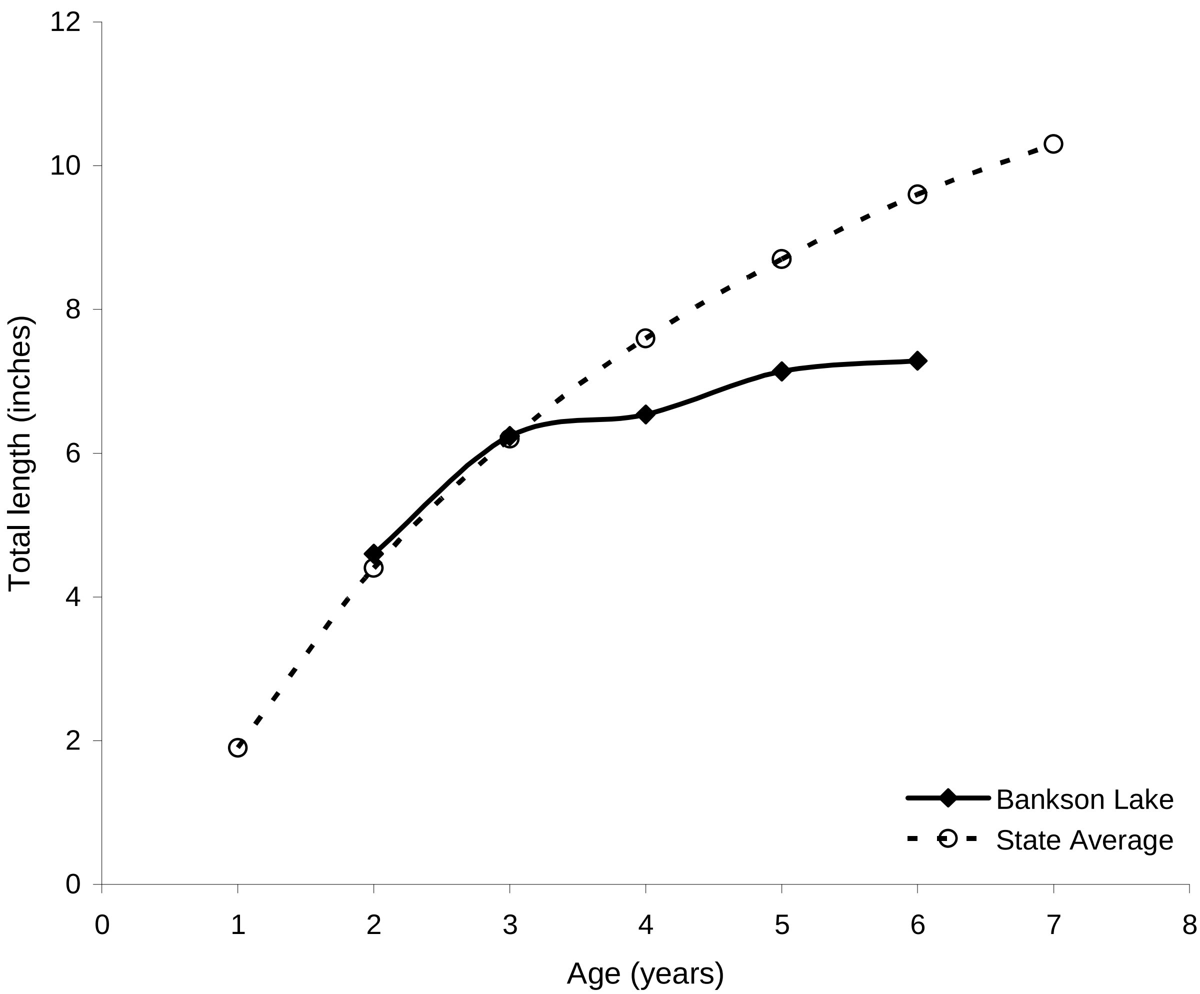


Figure 12.–Growth of redear sunfish in Bankson Lake, as determined from scale and dorsal spine samples collected during April 9-14, 2011. State average lengths from Schneider et al. (2000).

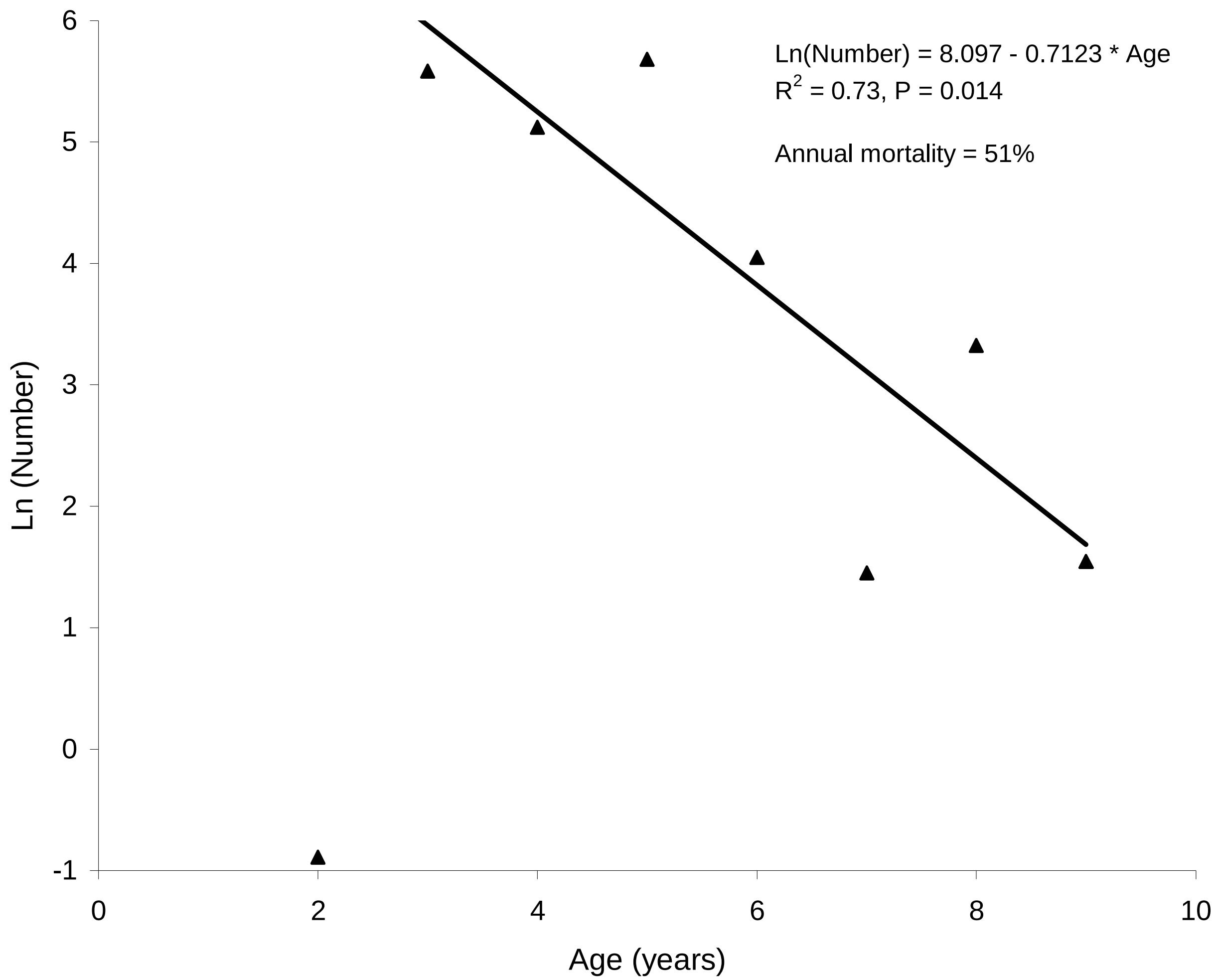


Figure 13.–Observed ln(number) versus age for redear sunfish captured in Bankson Lake during April 9-14, 2011.

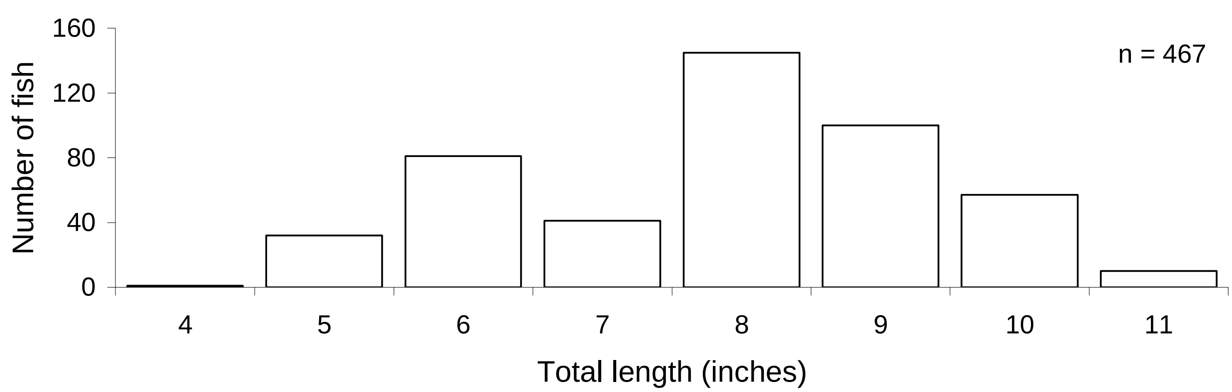


Figure 14.–Length frequency distribution for black crappies captured in Bankson Lake during April 9-14, 2011.

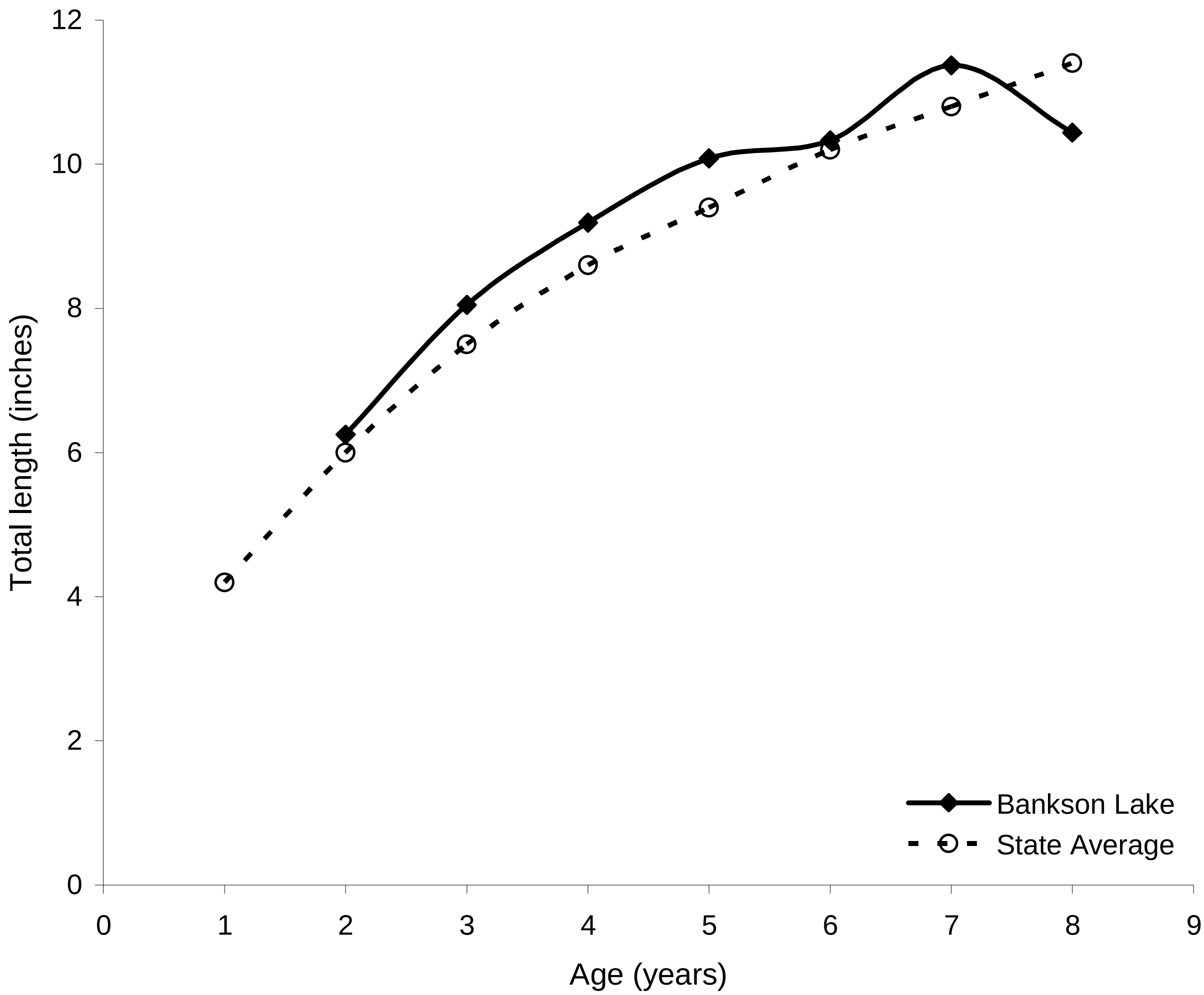


Figure 15.–Growth of black crappies in Bankson Lake, as determined from scale and dorsal spine samples collected during April 9-14, 2011. State average lengths from Schneider et al. (2000).

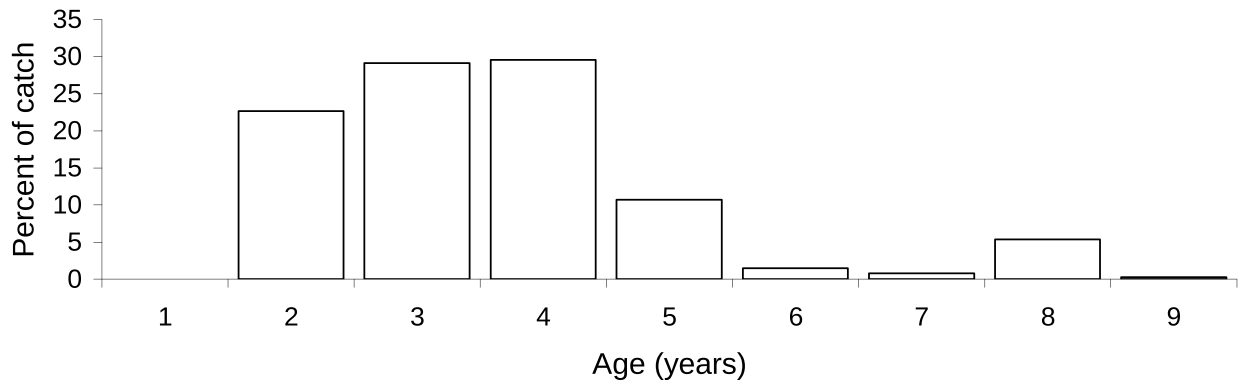


Figure 16.–Age frequency distribution for black crappies captured in Bankson Lake during April 9-14, 2011.

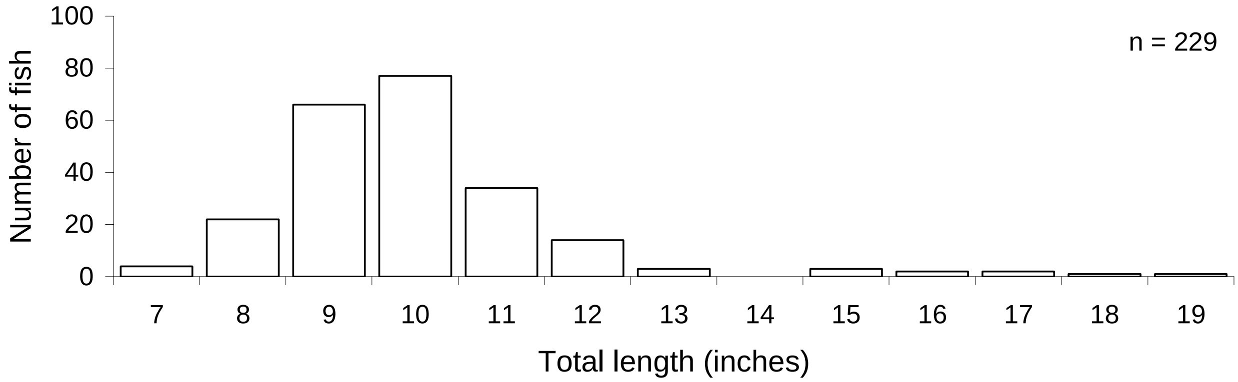


Figure 17.–Length frequency distribution for largemouth bass captured in Bankson Lake during April 9-14, 2011.

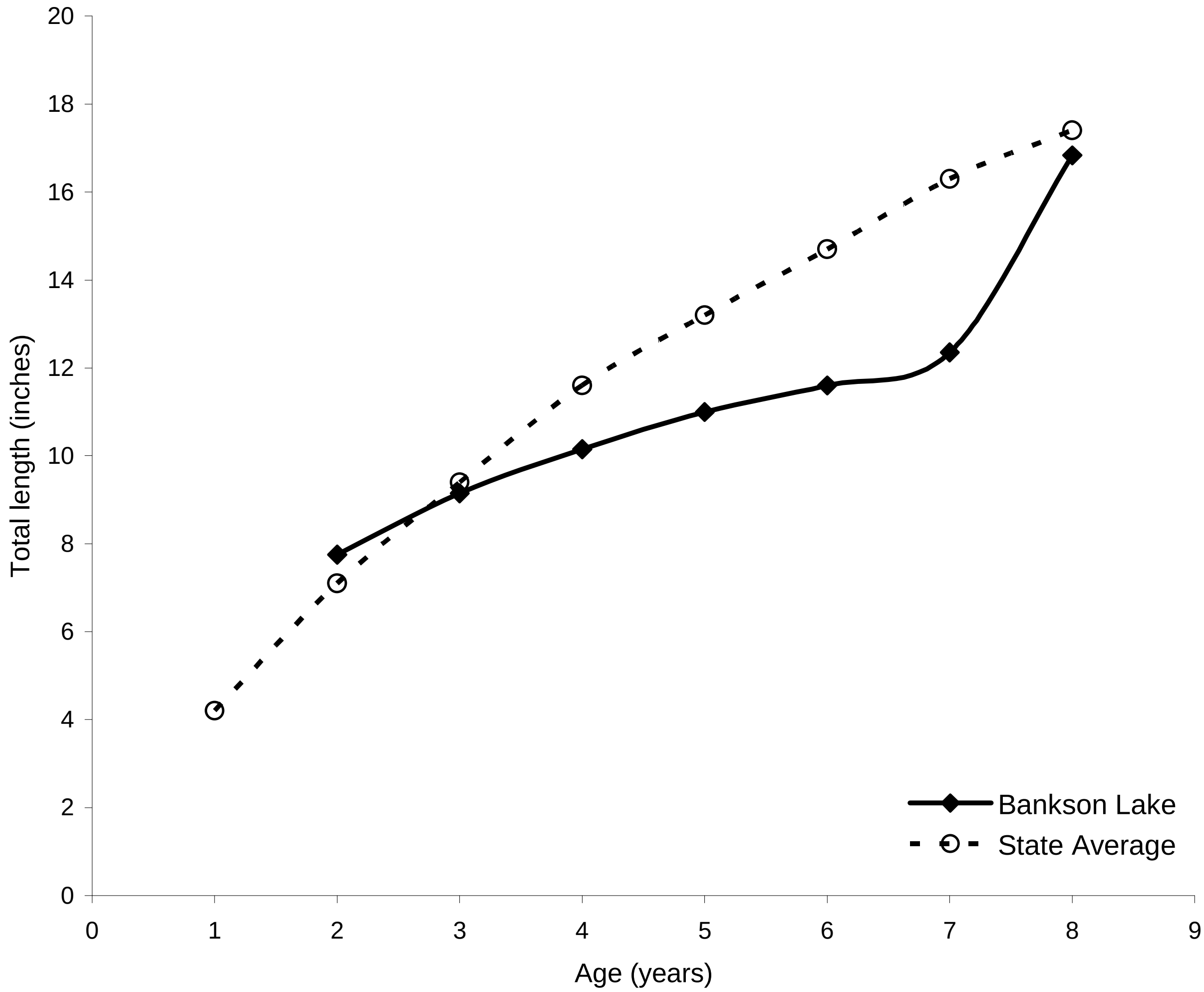


Figure 18.–Growth of largemouth bass in Bankson Lake, as determined from dorsal spine samples collected during April 9-14, 2011. State average lengths from Schneider et al. (2000).

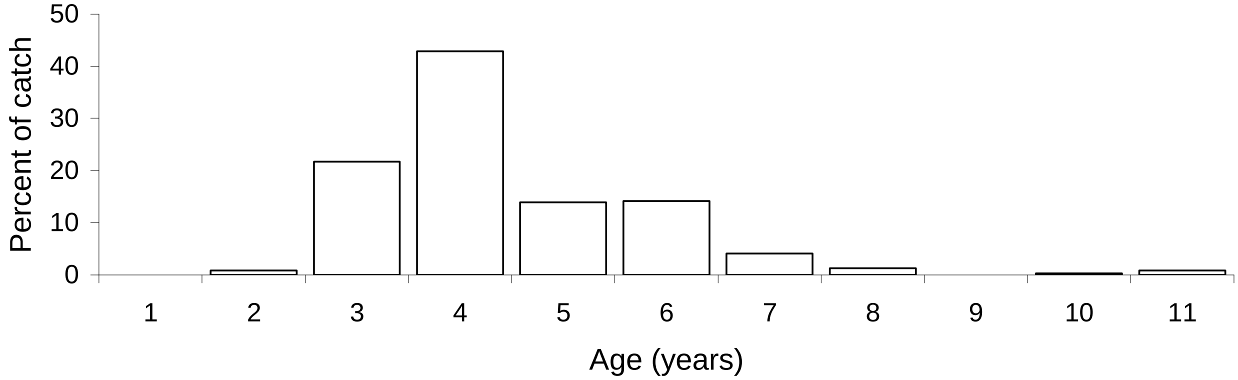


Figure 19.–Age frequency distribution for largemouth bass captured in Bankson Lake during April 9-14, 2011.

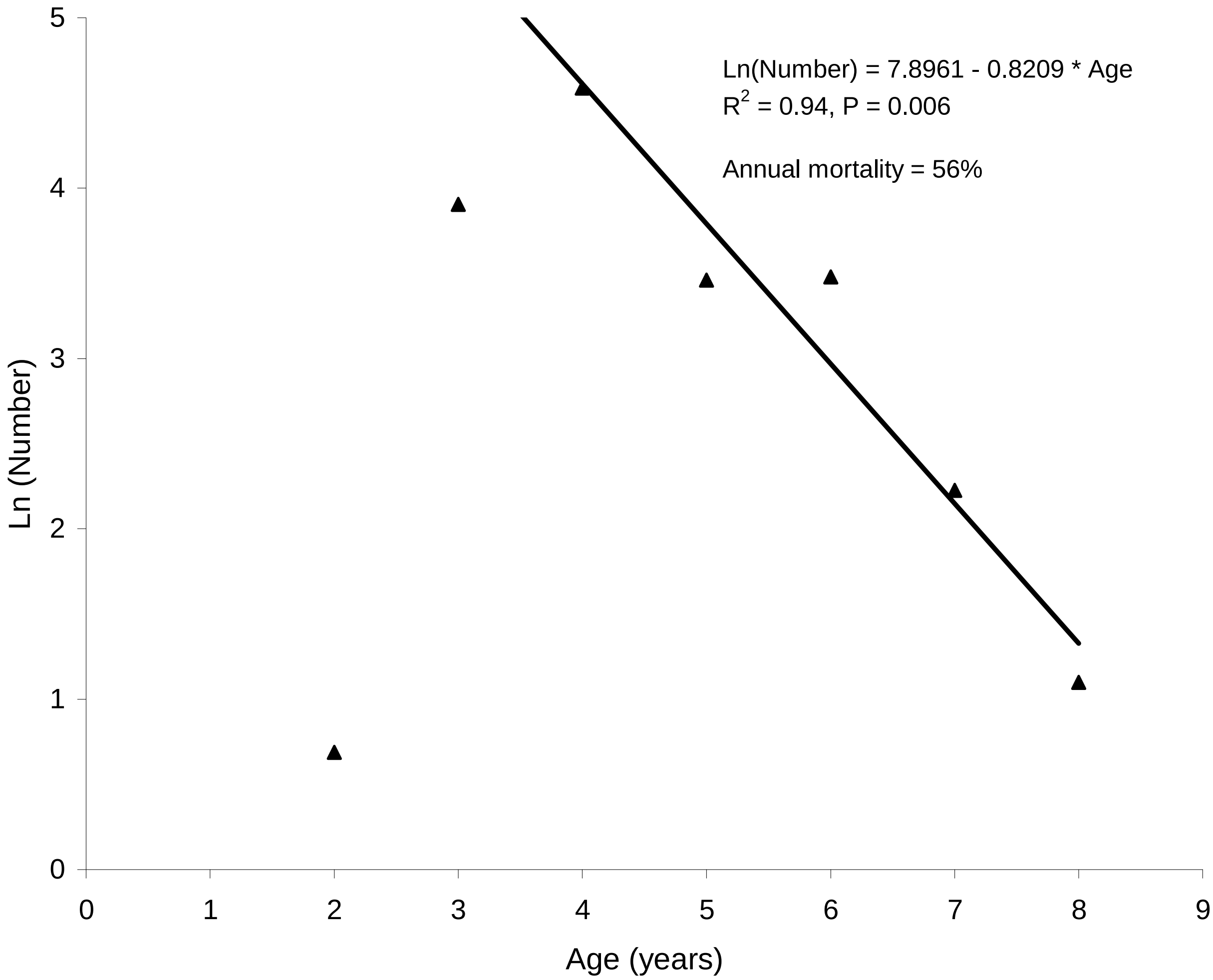


Figure 20.–Observed ln(number) versus age for largemouth bass captured in Bankson Lake during April 9-14, 2011.