Indian Lake

Cass County, T5S, R16W, S30-31
St. Joseph River Watershed, last surveyed in 2014

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Environment

Indian Lake is a 499-acre natural lake located five miles west of the city of Dowagiac. The lake consists of a single basin with a maximum depth of 26 ft. Drop-offs are gradual, especially along the western shore of the lake. Sand (often mixed with gravel or marl) is the predominant substrate along the shoreline. Organic substrates are most common near the southwest corner of the lake. An unnamed stream flows into the north end, and an outlet flows out of the southeast part of the lake to its confluence with the Dowagiac River. A dam on the outlet influences water levels in the lake. There is no court-appointed water surface elevation for Indian Lake. However, the dam owners are required to get a permit from the Michigan Department of Environmental Quality (MDEQ) before making any changes to the dam (e.g., adding or removing stop logs) that would raise or lower the water surface elevation of the lake. From a fish habitat standpoint, the current situation is preferable to having court-appointed lake levels that involve artificially raising the lake level in the summer and dropping it in the winter.

Indian Lake lies within deposits of glacial outwash sand and gravel and postglacial alluvium. Well-drained, loamy soils of the Gilford, Kalamazoo, and Oshtemo series surround most of the shoreline, and slopes adjacent to the shoreline vary from <5% to 35% (Lakeshore Environmental, Inc. 2011). Darcy groundwater maps indicate moderate potential for groundwater inputs to the lake. Agriculture is the most common land use in the watershed. Nearly all of the land adjacent to Indian Lake has been modified for residential or vacation home development. The 2014 habitat survey revealed a dwelling density of 49.8 dwellings/mile, which is above the 75th percentile for lakes in southwest Michigan (K. Wehrly, Michigan Department of Natural Resources [MDNR] - Fisheries Division, unpublished). Approximately 73% of the shoreline is armored with seawalls or riprap. Coarse woody habitat is sparse and less than four logs were observed per mile of shoreline.

A municipal boat launch at the end of Maple Avenue provides public access to Indian Lake (Figure 1). There is no parking along Maple Avenue. After launching, boaters must drive approximately 700 ft up the hill and park along School Street.

Limnological sampling was conducted at the deepest point in Indian Lake on August 18, 2014. Total alkalinity was 140 mg/L. This is indicative of a hardwater lake with substantial buffering capacity (Shaw et al. 2004). The biological productivity of a lake is strongly dependent on its supply of two key nutrients: phosphorus and nitrogen. Nitrogen is the limiting nutrient when the ratio of total nitrogen to total phosphorus is <10:1, and phosphorus is the limiting nutrient when this ratio is >15:1 (Shaw et al. 2004). In Indian Lake, the ratio of total nitrogen to total phosphorus was 54:1. Thus, phosphorus is the limiting nutrient in this system. The total phosphorus concentration was 0.0124 mg/L. The chlorophyll a concentration, which provides an index of algal biomass, was 0.0044 mg/L. The Secchi disk depth (a measure of water transparency) was 12.5 ft. Based on these water quality parameters, Indian Lake is considered a mesotrophic or moderately productive lake (Carlson and Simpson 1996).

History

The first fisheries survey of Indian Lake was conducted in 1887. Bluegills, Yellow Perch, Black Crappies, Pumpkinseeds, suckers, bullheads, and shiners were collected during this initial sampling effort. The first recorded stocking occurred in 1878 when 5,000 Lake Trout fry were released into the lake (Table 1). Stocking was sporadic during the late 1800s through the early 1900s. Juvenile Bluegills, Yellow Perch, and Largemouth Bass were stocked in Indian Lake during 1933-1945. Throughout the state, annual stocking programs for these species were discontinued after research indicated that spawning habitat (i.e., aquatic vegetation for Yellow Perch, and sand, gravel, or firm mud for Bluegills and Largemouth Bass) was abundant in Michigan lakes and that supplemental stocking had minimal effects on the quality of the fishery (Cooper 1948).

Conservation officers recorded catch and effort data for anglers encountered on Indian Lake during 1954-1964. These qualitative creel reports indicated that Bluegill was the primary game species in this system, followed by Yellow Perch, Black Crappie, Pumpkinseed, Northern Pike, and Largemouth Bass. The Michigan Department of Conservation (predecessor to MDNR) used large seines to capture fish in 1964. Bluegills dominated the catch. Pumpkinseeds, Black Crappies, Yellow Perch, and Largemouth Bass also were common. Growth was average for Yellow Perch and below average for Bluegills and Largemouth Bass. The survey data and angler reports indicated that Common Carp were abundant. Only two Northern Pike were collected. Local anglers reported that Bluegills were small and that Northern Pike fishing had declined in recent years.

A fall electrofishing survey was completed by MDNR in 1979. Once again, Bluegill was the most abundant species in the catch, followed by Black Crappie, Yellow Perch, and Largemouth Bass. Mean lengths-at-age were average for Bluegills, Black Crappies, and Yellow Perch and above average for Largemouth Bass. No Northern Pike were collected. Eight Common Carp were captured and many more were observed during the survey. Local anglers expressed concerns about an overabundance of small panfish in the lake.

During late April-early May 1991, MDNR used a variety of gear types to assess the fish community in Indian Lake. Bluegills continued to be the dominant species in terms of numbers, making up 40% of the catch. The size structures for the panfish populations were skewed towards small fish. Only 13% of the panfish were of what is generally considered harvestable size (i.e., 6 inches or larger for Bluegills and Pumpkinseeds and 7 inches or larger for Black Crappies and Yellow Perch). The poor size structures appeared to be the result of high mortality rather than stunting, as mean lengths-at-age for all panfish species were similar to statewide averages. Predation pressure was intense. During the survey, 3.7 lb of predators (Largemouth Bass, Northern Pike, Bowfin, and Spotted Gar) were collected for every pound of panfish. Despite the apparent competition for forage, mean lengths-at-age were above average for juvenile Largemouth Bass and average for adult bass. As noted for previous surveys, Northern Pike were rare and Common Carp were abundant.

During the past 25 years, the Indian Lake Improvement Association (hereafter referred to as the Association) has led several projects that have affected the fish community in the lake. Thick muck deposits were present along much of the western shore of the lake in the 1980s. A dredging project that began in 1990 and continued through the early 2000s removed some of these deposits. Weed harvesters and herbicides were employed to control growth of Eurasian watermilfoil and other aquatic plants. A laminar flow aeration system was installed in the south bay of Indian Lake in 2010 and additional diffusers were installed in the northern portion of the lake in 2012. The primary objectives of the aeration and associated microbial augmentation were to improve water quality and reduce muck deposits. Many lakefront property owners also hoped that these activities would limit growth of Eurasian watermilfoil and eliminate the need for other control methods. The initial effects of aeration and microbial augmentation were summarized by Jermalowicz-Jones (2012). The Association also stocked adult Bluegills in 2000-2001 and fall fingerling Walleyes in 2001-2003, 2009, 2011, and 2014 (Table 1).

Current Status

The most recent fish community survey on Indian Lake was conducted by MDNR during May 2014. Fish were captured using fyke nets, gill nets, seines, and nighttime electrofishing gear (Table 2). Total lengths were recorded for all fish. For game fish species, spine or scale samples for age determination were collected from 10 fish per inch group. Weights for all fish species were calculated using the length-weight regression coefficients compiled by Schneider et al. (2000b). Weighted age frequencies and weighted mean lengths at age were derived using the procedures described by Schneider (2000b). Total annual mortality estimates for some game fish species were generated using catch curve analysis (Ricker 1975). Only the Black Crappie mortality estimate is included in this report as the regression P values for the other species were greater than 0.05.

Twenty-three fish species (plus hybrid sunfishes) were collected during the 2014 survey (Table 3). Bluegill (n = 463) was the most abundant species, making up 34% of the catch by number and 16% of the catch by weight. Sixty percent of the Bluegills were 6 inches or larger. Size structures of Bluegill populations can be challenging to interpret because each gear type exhibits some degree of size selectivity (Figure 2). 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 scores for the Indian Lake Bluegill population were 4.6 (satisfactory-good) based on the large-mesh fyke net sample and 3.8 (acceptable-satisfactory) based on the electrofishing sample.

Weighted mean lengths at age were below statewide averages for juvenile Bluegills and near or above average for adult Bluegills (Figure 3). Seven year classes of Bluegills were collected (Figure 4). Age 4 fish were relatively abundant and made up 61% of the Bluegill catch.

Black Crappies (n = 239) constituted 18% of the total fish biomass during the survey. The average length for this species was 8.6 inches and fish larger than 10 inches were rare (Figure 5). The age range for captured crappies was 2-11 years (Figure 6). Fish from the 2008-2010 year classes (i.e., ages 4-6) made up 88% of the crappie catch. Total annual mortality for Black Crappies ages 5-11 was estimated to be 50% (Figure 7). The mean length for age 2 crappies was identical to the statewide average, whereas mean lengths at ages 4-7 were 0.6-1.1 inches below statewide averages (Figure 8).

Pumpkinseeds (n = 61) and Yellow Perch (n = 28) constituted 5% of the total fish biomass in the catch. Eighty-seven percent of the Pumpkinseeds were 6 inches or larger and weighted mean lengths at age for this species were above statewide averages (Figure 9). Eighty-two percent of the Yellow Perch had total lengths between 7.0 inches and 8.9 inches. Weighted mean lengths at age for adult perch were below statewide averages (Figure 10).

Ninety-five Largemouth Bass were captured during the general survey and an additional 16 bass were collected during the extra electrofishing transect. Overall, 7% of the Largemouth Bass collected exceeded the minimum size limit of 14 inches (Figure 11). Age 6 and older fish were rare (Figure 12). The mean growth index for Largemouth Bass was +0.3, which is indicative of average growth (Figure 13).

Thirty-six Walleyes were collected during the survey. The total length range for these fish was 14-26 inches (Figure 14). Four year classes were represented in the catch (Figure 15). These cohorts corresponded to years in which Walleyes were stocked in Indian Lake (Table 1). Length at age data revealed rapid growth of Walleyes in this system (Figure 16).

As in previous sampling efforts, Northern Pike (n = 3) and Smallmouth Bass (n = 3) were minor components of the catch. The limited data available suggest that growth is rapid for Northern Pike and average for Smallmouth Bass. No Spotted Gar were captured during the survey.

Analysis and Discussion

Bluegills are the primary game fish in Indian Lake. Catch-per-effort (CPE) with specific gear types provides abundance indices that can be compared to lakes sampled throughout Michigan during 2002-2007 as part of the MDNR's Status and Trends Program (K. Wehrly, MDNR - Fisheries Division, unpublished). In Indian Lake, the Bluegill CPE in large-mesh fyke nets was between the 50th and 75th percentiles for all lakes and slightly above the 25th percentile for lakes in southwest Michigan. For electrofishing, the Bluegill CPE in Indian Lake was between the 25th and 50th percentiles for all lakes and below the 25th percentile for lakes in southwest Michigan. These data suggest that Bluegill abundance in Indian Lake is below average for southwest Michigan lakes and is more typical of lakes in northern regions of the state. On the other hand, the gill net CPE for Bluegills in Indian Lake was relatively high. Only 5% of the lakes sampled as part of the Status and Trends Program had higher gill net CPEs for Bluegills than Indian Lake.

These conflicting results can be reconciled by considering the timing of the survey and the habitat in Indian Lake. Residential and vacation home development, beach sanding, seawall construction, and herbicide treatments have altered shoreline habitat. Aquatic vegetation and logs are rare in the nearshore zone. Conversely, submergent vegetation (primarily Eurasian watermilfoil) is abundant in offshore areas. To find cover, fish in Indian Lake need to wander farther from shore than Bluegills in most other lakes. In addition, water temperatures were only in the mid 50s (Fahrenheit) at the time of the netting survey. Bluegills move closer to shore to find spawning areas when water temperatures rise above 60 F. Thus, Bluegill CPE probably would have been higher for fyke nets and lower for gill nets if the survey had been conducted later in the spring.

The size structure of the Bluegill population has improved since 1991, as evidenced by the increase in the electrofishing size score from 2.0 (poor) to 3.8 (acceptable-satisfactory). This change is not the result of faster growth. Mean lengths-at-age were lower in 2014 than in 1991. On the other hand, the ratio of adult Bluegills to juvenile Bluegills was much higher in 2014. The data suggest that either juvenile fish were located farther offshore in 2014 due to the scarcity of vegetation in the nearshore area (and thus were less vulnerable to electrofishing gear) or recruitment was poor in 2011-2013 relative to 2010 (Figure 4).

The observed increase in growth of Indian Lake Bluegills between ages 2 and 3 likely is the result of a change in foraging strategy (Figure 3). Juvenile Bluegills are confined to vegetation to avoid predators, whereas larger fish often forage on Daphnia in open water (Spotte 2007). Most Bluegills in Indian Lake reach harvestable size (i.e., 6 inches) at age 4. The sharp drop in abundance after age 4 suggests that fishing mortality (which consists of harvest and hooking mortality) is high, but no creel survey data are available to evaluate this hypothesis.

Black Crappie CPEs for large-mesh fyke nets and gill nets were above the regional and statewide 75th percentiles for lakes sampled as part of the Status and Trends Program. The high catch rate in large-mesh fyke nets was due at least in part to survey timing as crappies are most vulnerable to this gear prior to the onset of spawning. However, high catch rates in both fyke nets (i.e., nearshore) and gill nets (i.e., offshore) during the same time period indicates that crappies are abundant in Indian Lake.

Parsons and Reed (1998) studied Black Crappie populations in four Minnesota lakes and estimated that total annual mortality ranged from 48% to 66%. Natural mortality estimates for these populations varied from 33% to 40% (Parsons and Reed 1998). Similarly, Paukert et al. (2001) estimated that total annual mortality for Black Crappies in lightly fished lakes in Nebraska averaged 39%. The annual mortality estimate of 50% generated from the Indian Lake catch data suggests that fishing mortality is moderate in this system.

Abundance of Yellow Perch and Pumpkinseeds in Indian Lake appears to be typical of lakes in this region. With the exception of the gill net CPE for Pumpkinseeds (which was above the 75th percentile), CPEs for the various gear types were between the 25th and 75th percentiles for lakes in southwest Michigan. Adult Pumpkinseeds probably have benefitted from the invasion of zebra mussels. Zebra mussels were found to be a major component of the diet of Pumpkinseeds in Lake Champlain (Watzin et al. 2008) and Lake Erie (Andraso 2005), and growth rates of Pumpkinseeds in Rice Lake (Ontario) increased after the introduction of zebra mussels (Mercer et al. 1999).

Mean lengths for age 5-6 Yellow Perch in Indian Lake were approximately one inch below average, which suggests a scarcity of suitable forage. Adult Yellow Perch primarily consume insect larvae and small fish (Becker 1983). No insect sampling was conducted as a part of this survey. Seine CPEs for shiners and other minnows in Indian Lake were low relative to other lakes in southwest Michigan.

Predators (Largemouth Bass, Walleye, Northern Pike, Bowfin, and Smallmouth Bass) made up 40% of the total fish biomass in the catch. Schneider (2000a) observed that predators typically make up 20-50% of the biomass in lakes with desirable fish communities. Based on this standard, Indian Lake appears to have a healthy predator-prey ratio.

Nighttime electrofishing typically is the most effective method for capturing adult and sub-adult Largemouth Bass. The Largemouth Bass CPE for Indian Lake was 1.6 fish/minute, which is between the 50th and 75th percentiles for lakes in southwest Michigan. This indicates that Largemouth Bass abundance is average for this region of the state. Due to the unusual age frequency distribution for bass in the sample, it was not possible to estimate total annual mortality. However, the scarcity of age 6 and older fish suggests that fishing mortality is high.

Survival of Walleyes stocked as fall fingerlings appears to be excellent. The Walleye CPE in large-mesh fyke nets was between the 50th and 75th percentiles for Michigan lakes, whereas the CPE in gill nets was above the 75th percentile. The absence of fish from non-stocking years indicates that there is little or no natural recruitment of Walleyes in Indian Lake.

Northern Pike have been scarce or absent in survey catches since 1964. Fishing reports and Conservation Officer records suggest that Northern Pike were more abundant during the early 1950s and that the population density for this species declined in the late 1950s and early 1960s. At present, the paucity of nearshore vegetation appears to be limiting natural recruitment of Northern Pike in this system.

The 2014 survey data indicate that Indian Lake anglers should expect average catch rates for Bluegills and Largemouth Bass and above average catch rates for Black Crappies. Harvestable Bluegills and Black Crappies are common, but large panfish and legal-sized Largemouth Bass are rare. Walleye abundance is sufficient to support a targeted fishery. Due to rapid growth of stocked Walleyes, anglers can expect a high percentage of captured Walleyes to exceed the minimum size limit of 15 inches.

Management Direction

Five fisheries management goals have been developed for Indian Lake. Goal 1: Protect and rehabilitate habitat for fish and other aquatic organisms. Goal 2: Assess thermal stratification and dissolved oxygen distribution in the lake. Goal 3: Sustain the existing Walleye fishery. Goal 4: Maintain a healthy predator-prey ratio within the fish community. Goal 5: Explore opportunities to improve the parking situation at the public access site.

At least three different methods will be used to accomplish Goal 1. Fisheries Division personnel will continue to review MDEQ 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 Association and other organizations to inform riparian landowners of the effects of various practices (e.g., chemical weed treatments, seawall construction, and removal of coarse woody habitat) on aquatic ecosystems. As opportunities arise, Fisheries Division also will collaborate with MDEQ, the Michigan Natural Shoreline Partnership, and other organizations to help landowners utilize bioengineering or other best management practices for reducing inputs of sediment, nutrients, and other pollutants to Indian Lake.

One of the concerns when the aeration system was installed was that water movement caused by the diffusers would disrupt thermal stratification in the lake. Water temperatures and dissolved oxygen concentrations will be measured at the deepest basin on Indian Lake during late summer 2015. These results will be shared with MDEQ personnel involved with permitting and monitoring of aeration systems.

Private fish stocking by the Association has created a popular Walleye fishery. As these fish are accessible to the public, the Association has asked MDNR to take over responsibility for the stocking program. In southwest Michigan survival typically has been much greater for Walleyes stocked as fall fingerlings as opposed to spring fingerlings. Only a small percentage of Fisheries Division's Walleye ponds are suitable for rearing fall fingerlings. These fish are expensive to produce and annual production is insufficient to meet existing stocking requests. Most of the Walleyes produced in MDNR rearing ponds are harvested as spring fingerlings (average length = 1.0-1.5 inches). Relative to fall fingerlings, higher numbers of spring fingerlings must be stocked to yield the same number of adult Walleyes. However, spring fingerlings are inexpensive to produce and spring fingerling stocking often is the most cost effective option for maintaining a Walleye fishery. Thus, biennial stocking of 35,000 spring fingerling Walleyes (70/acre) is prescribed for Indian Lake beginning in 2016.

Goals 3 and 4 are interrelated. Previous Walleye stocking in Indian Lake has produced a fish community in which predators make up 40% of the fish biomass. This is an acceptable predator-prey balance (Schneider 2000a). Michigan studies indicated that survival of stocked spring fingerlings to the first fall varied from 2% to 8% and averaged 5% (MDNR 2004). Thus, spring fingerling stocking densities should be approximately 20 times higher than fall fingerling stocking densities. The prescribed MDNR stocking is expected to yield roughly the same number of adult Walleyes as past fall fingerling stocking. No private Walleye stocking will be permitted as this activity could reduce panfish abundance and negatively affect growth and condition of Walleyes and other predators in Indian Lake.

The public currently has legal access to Indian Lake. However, anglers have to park along the edge of the road and walk several hundred feet down a steep hill to the boat launch. Fisheries Division will work with the Township and County officials and local landowners to determine if there are any feasible options for making the access site safer and more convenient for anglers.

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Figure 1.–Aerial view of Indian Lake and the surrounding area. Image from www.bing.com/maps.

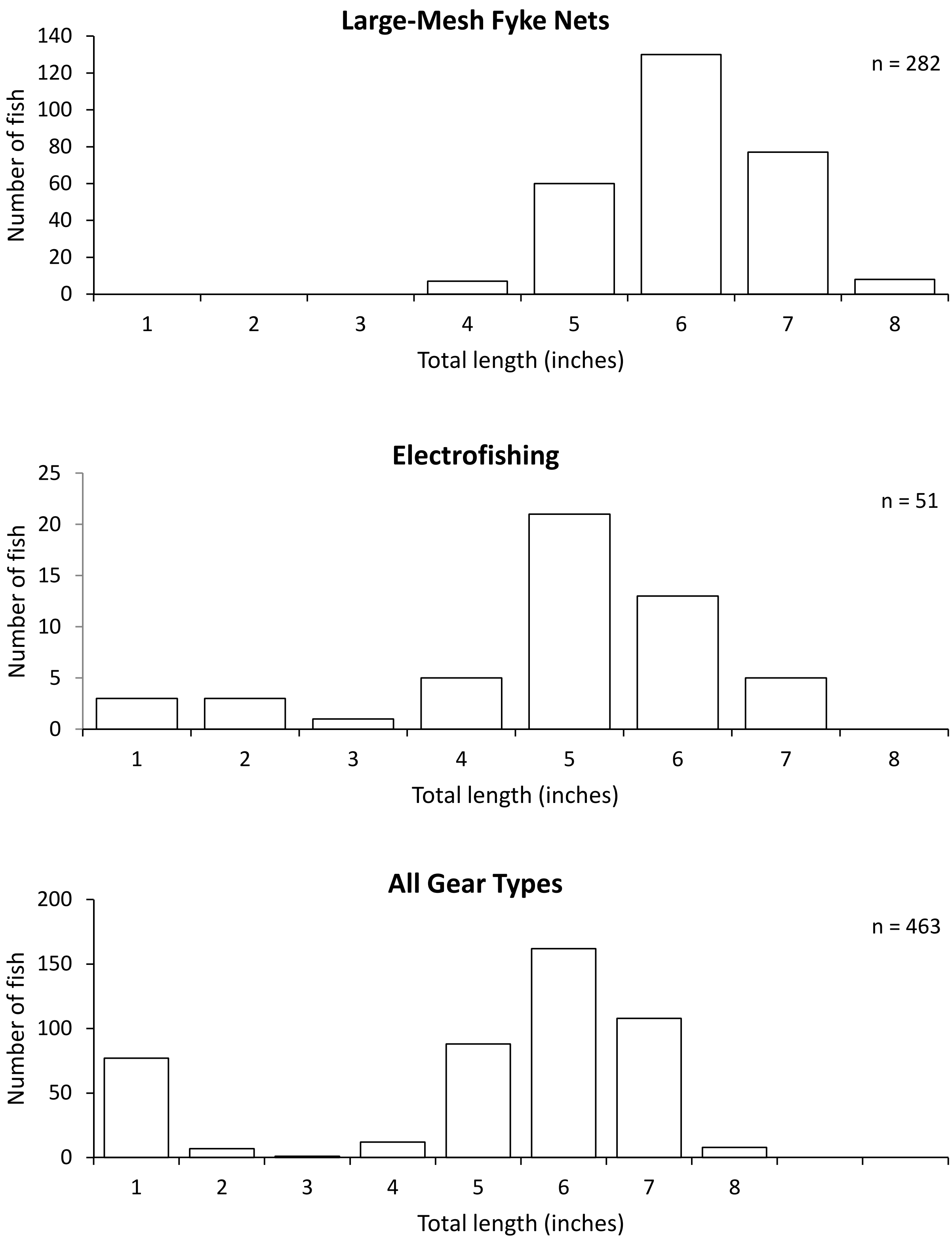

Figure 2.–Length frequency distributions for Bluegills captured in Indian Lake using large-mesh fyke nets, nighttime electrofishing gear, and all gear types during May 2014.

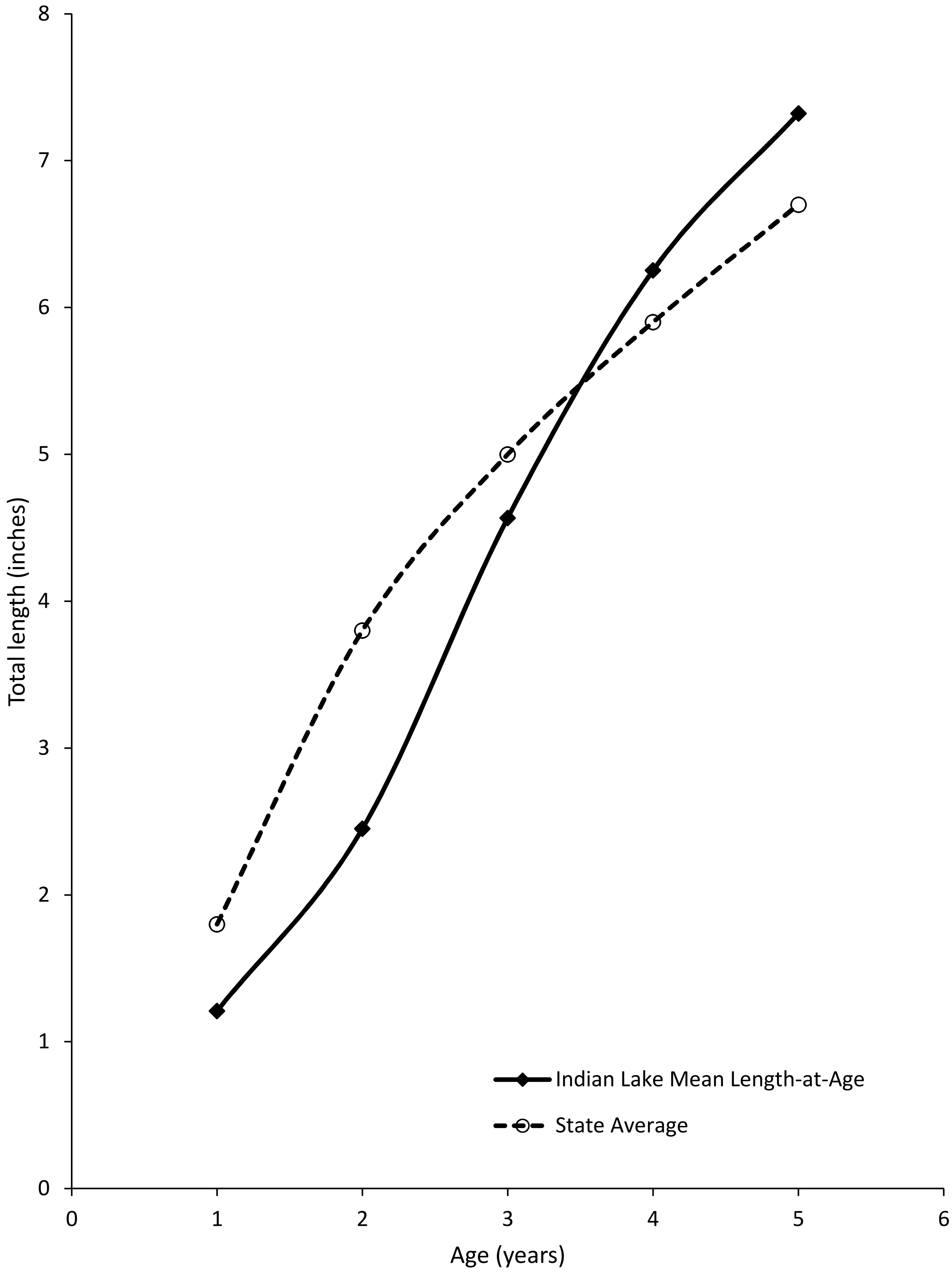

Figure 3.–Growth of Bluegills in Indian Lake, as determined from scale and anal spine samples collected during May 2014. State average lengths are from Schneider et al. (2000a).

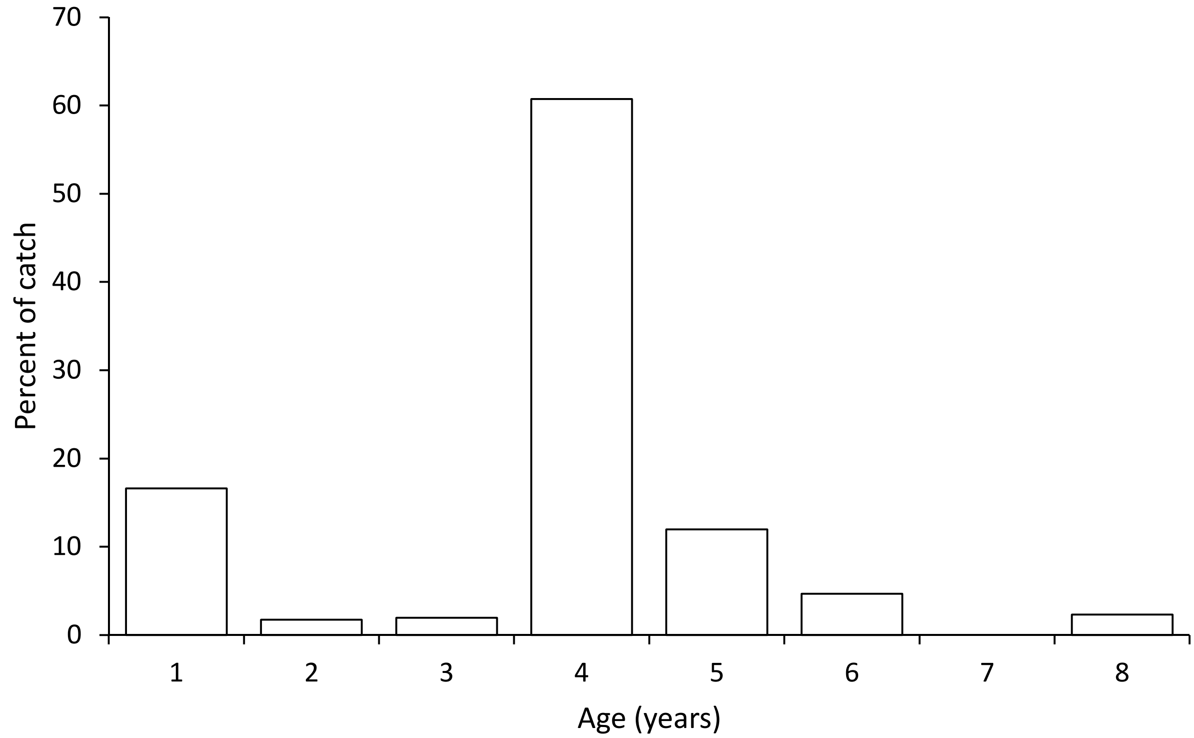

Figure 4.–Age frequency distribution for Bluegills captured in Indian Lake during May 2014.

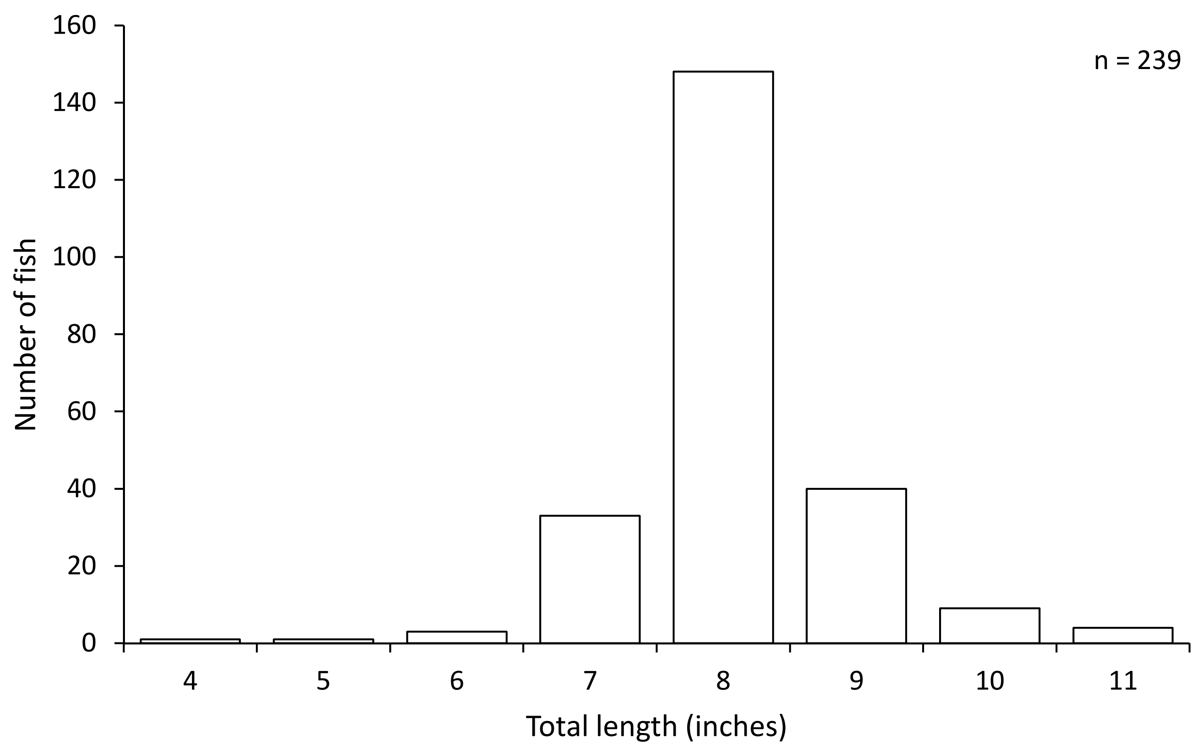

Figure 5.–Length frequency distribution for Black Crappies captured in Indian Lake during May 2014.

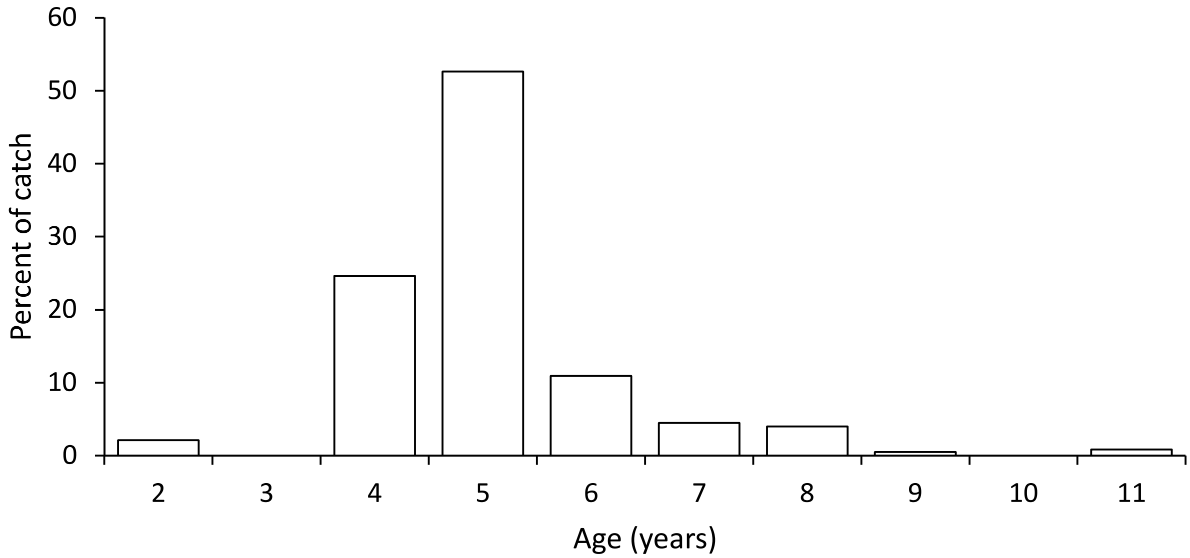

Figure 6.–Age frequency distribution for Black Crappies captured in Indian Lake during May 2014.

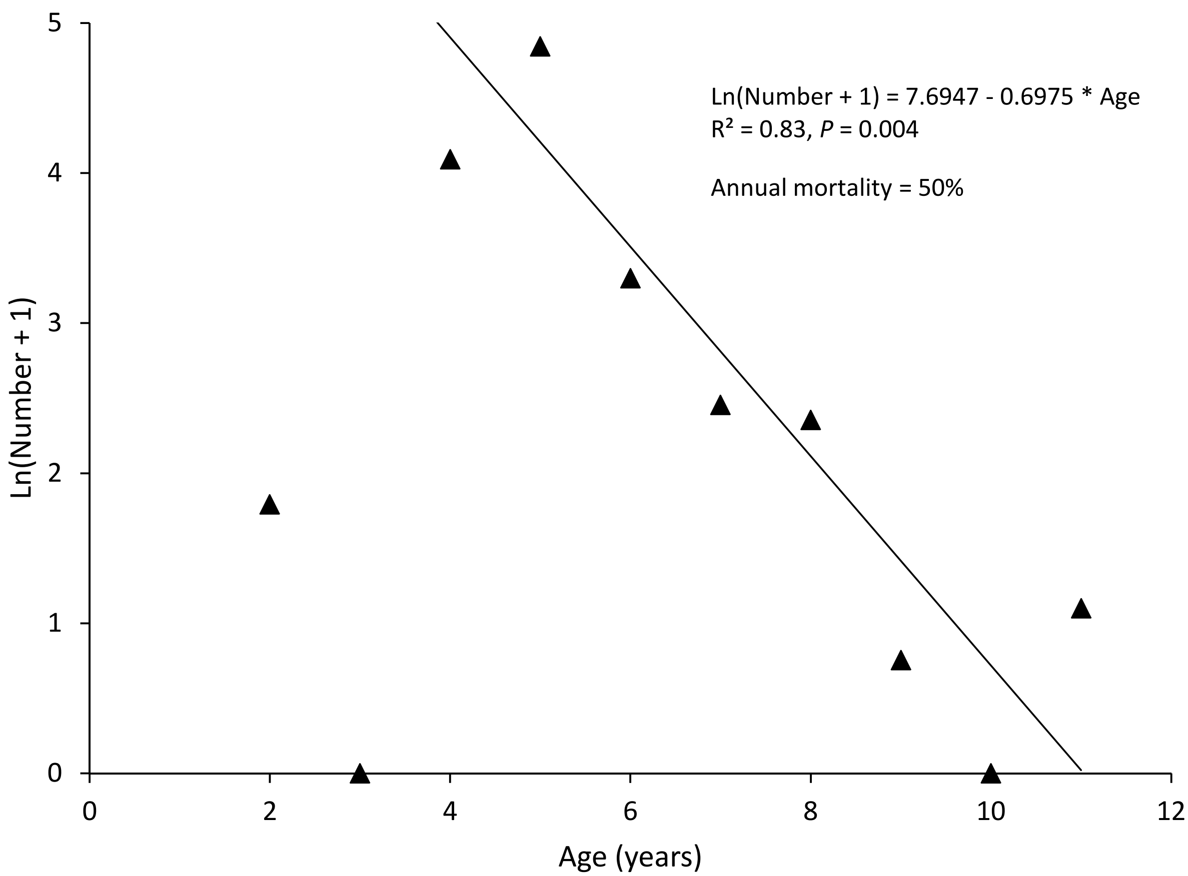

Figure 7.–Natural log of observed numbers of fish plus one versus age for Black Crappies captured in Indian Lake during May 2014.

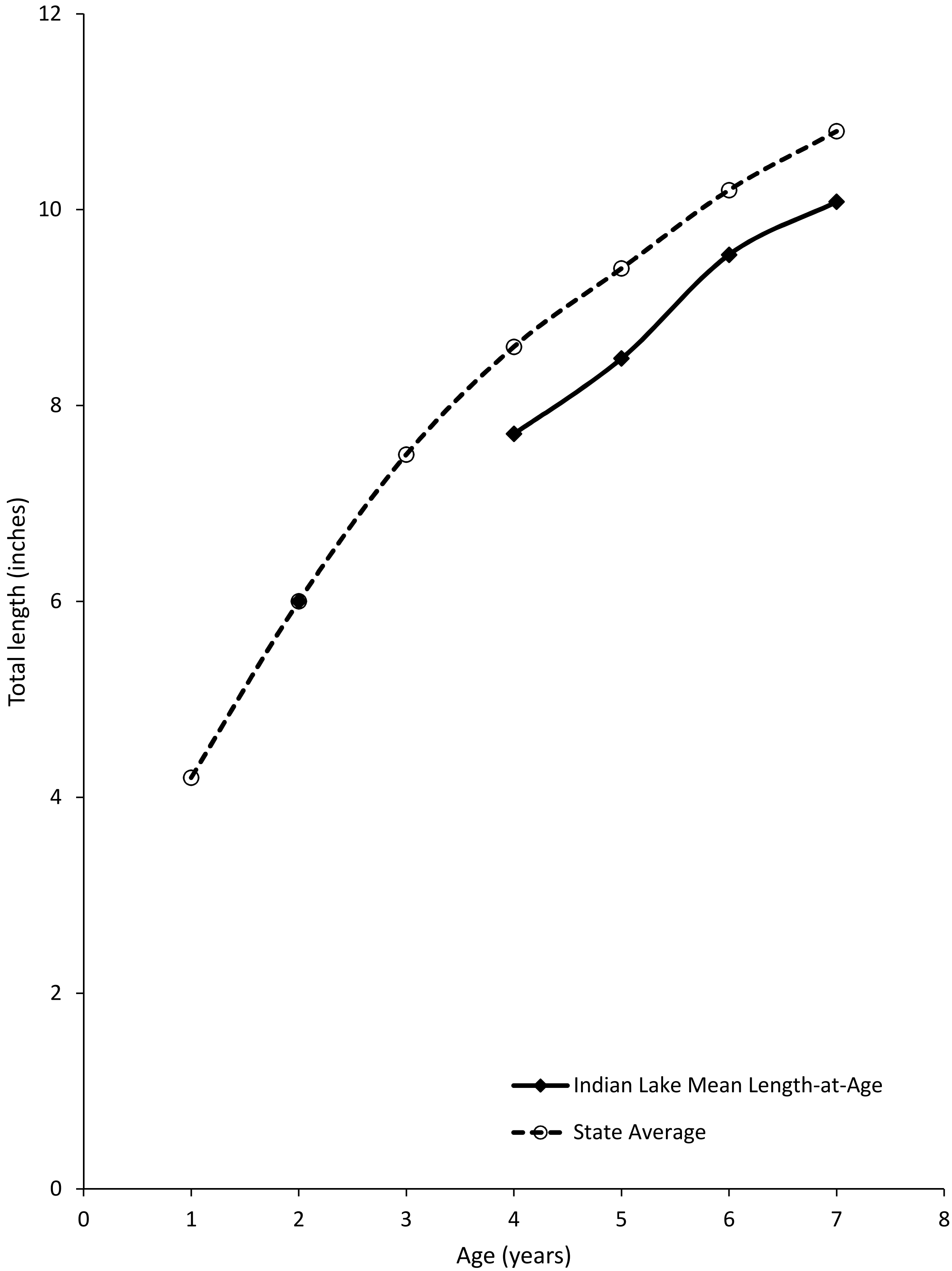

Figure 8.–Growth of Black Crappies in Indian Lake, as determined from anal spine samples collected during May 2014. State average lengths are from Schneider et al. (2000a).

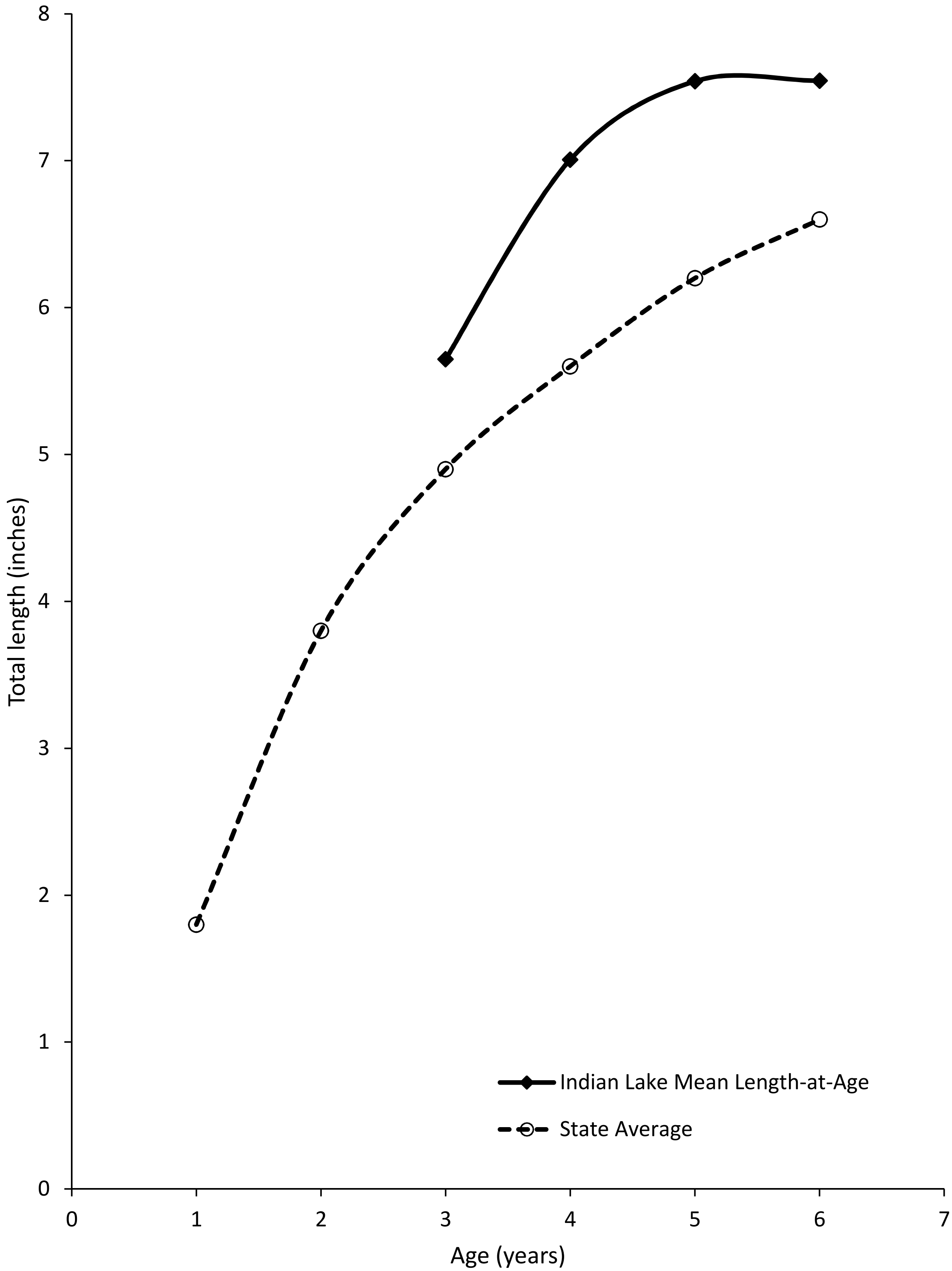

Figure 9.–Growth of Pumpkinseeds in Indian Lake, as determined from scale and anal spine samples collected during May 2014. State average lengths are from Schneider et al. (2000a).

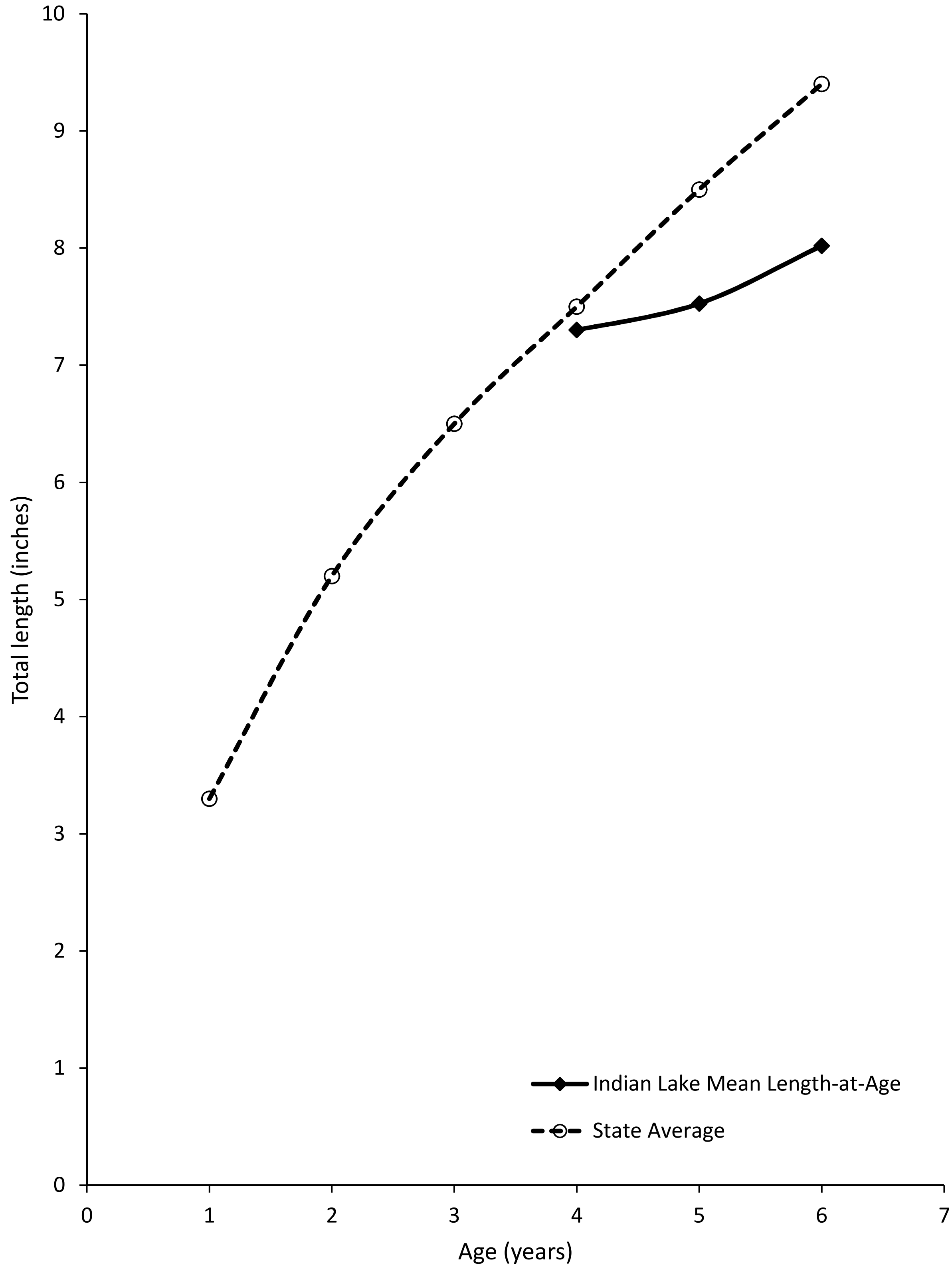

Figure 10.–Growth of Yellow Perch in Indian Lake, as determined from anal spine samples collected during May 2014. State average lengths are from Schneider et al. (2000a).

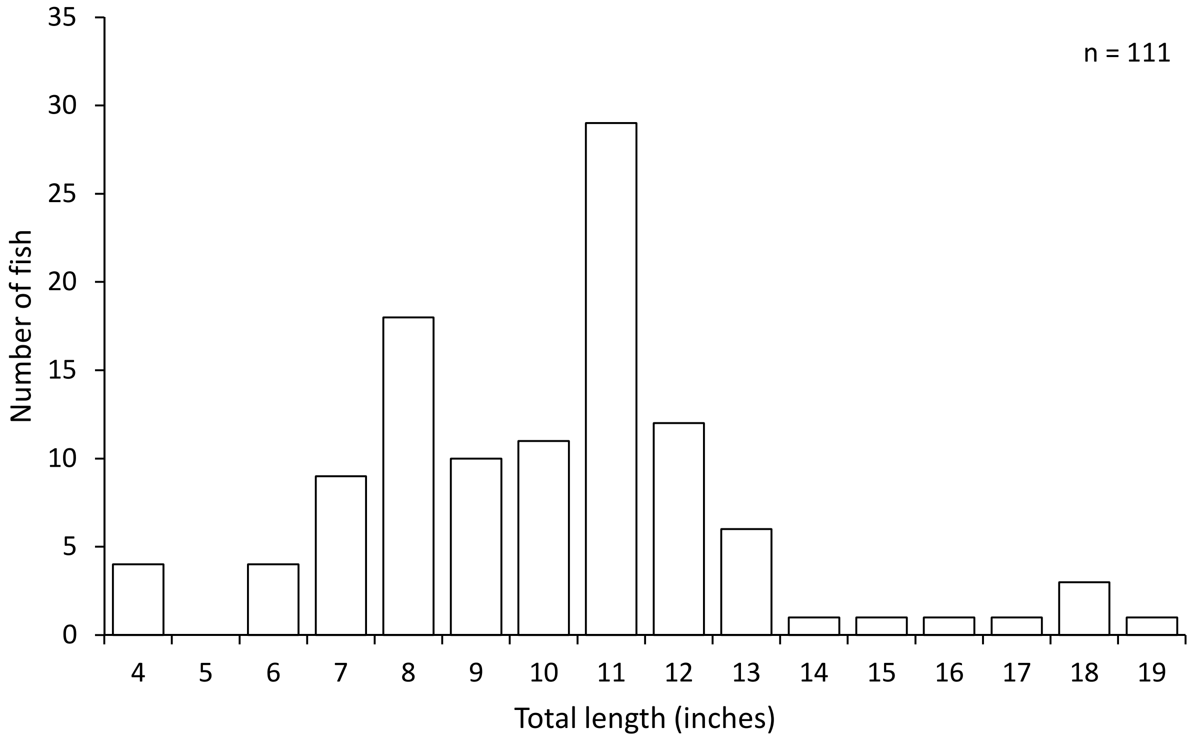

Figure 11.–Length frequency distribution for Largemouth Bass captured in Indian Lake during May 2014.

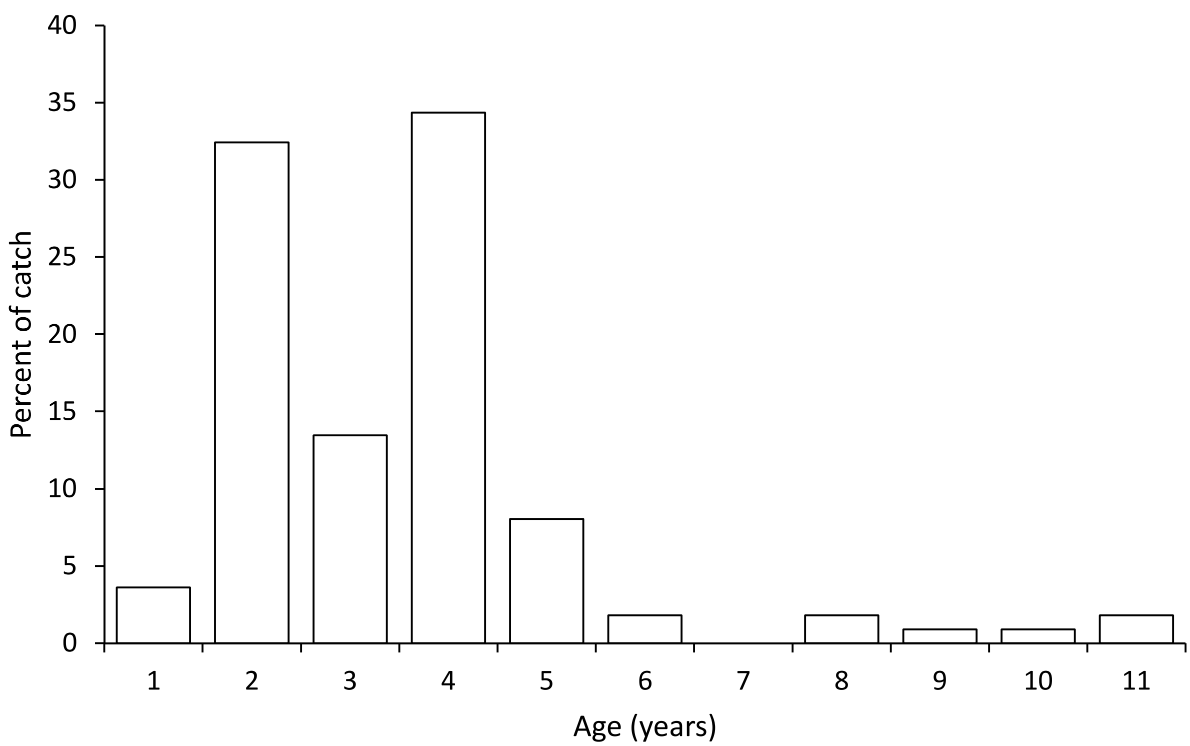

Figure 12.–Age frequency distribution for Largemouth Bass captured in Indian Lake during May 2014.

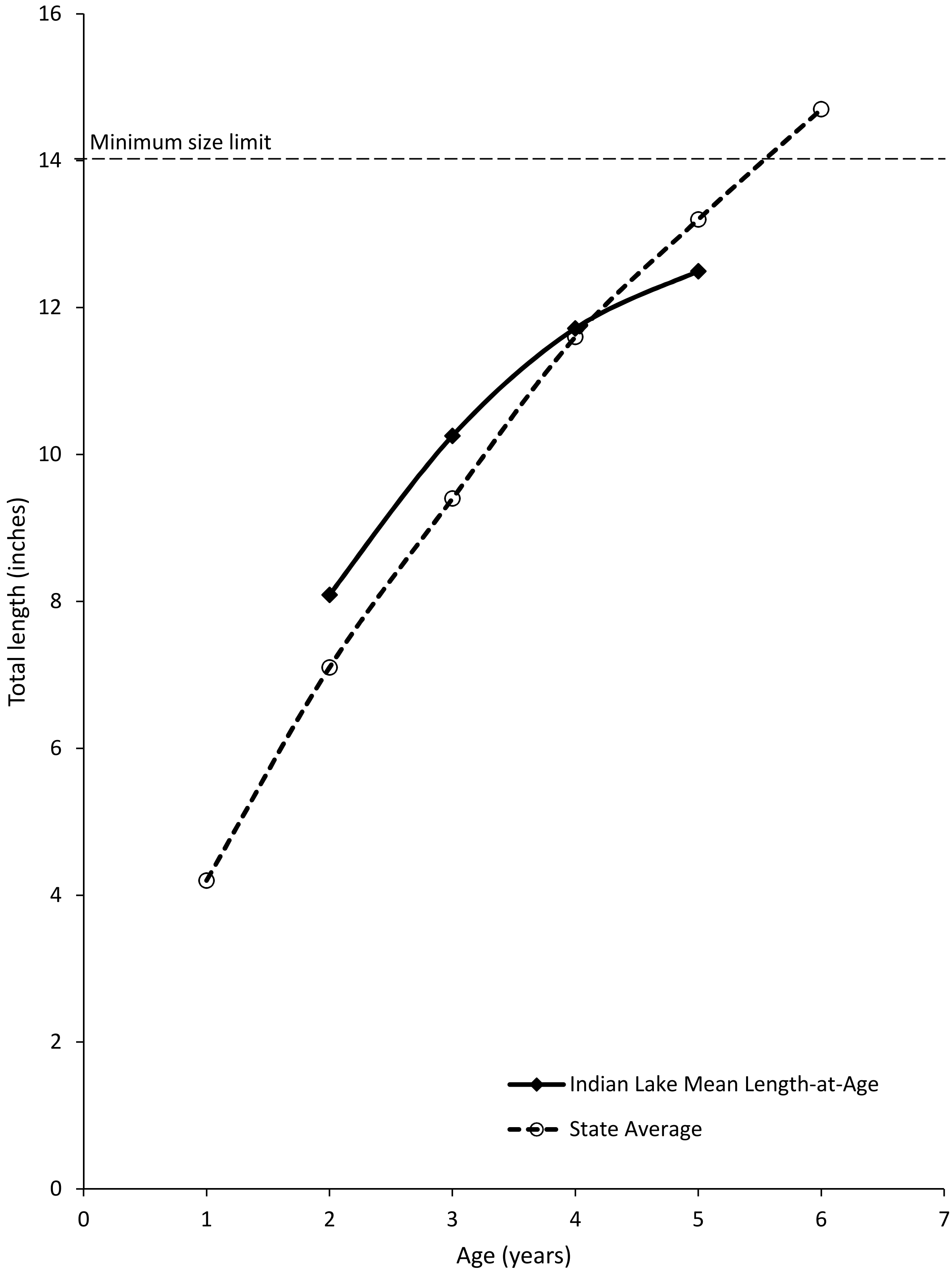

Figure 13.–Growth of Largemouth Bass in Indian Lake, as determined from anal spine samples collected during May 2014. State average lengths are from Schneider et al. (2000a).

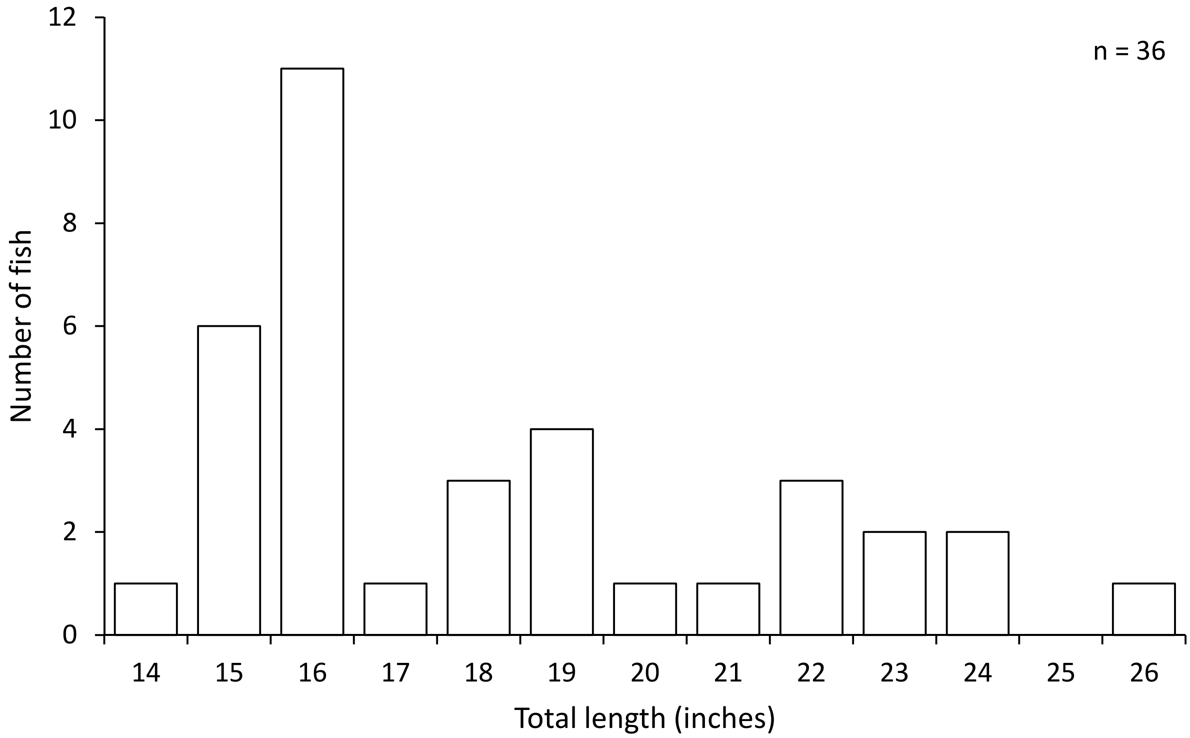

Figure 14.–Length frequency distribution for Walleyes captured in Indian Lake during May 2014.

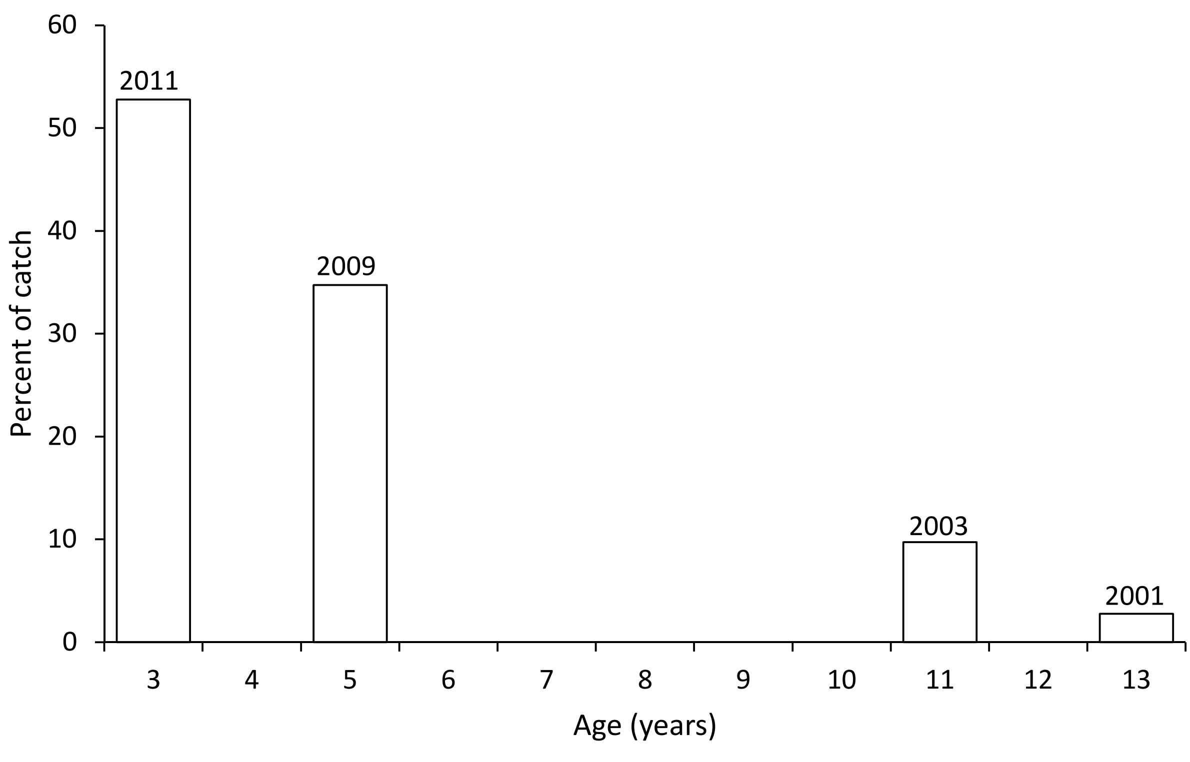

Figure 15.–Age frequency distribution for Walleyes captured in Indian Lake during May 2014. Year classes are listed above the columns.

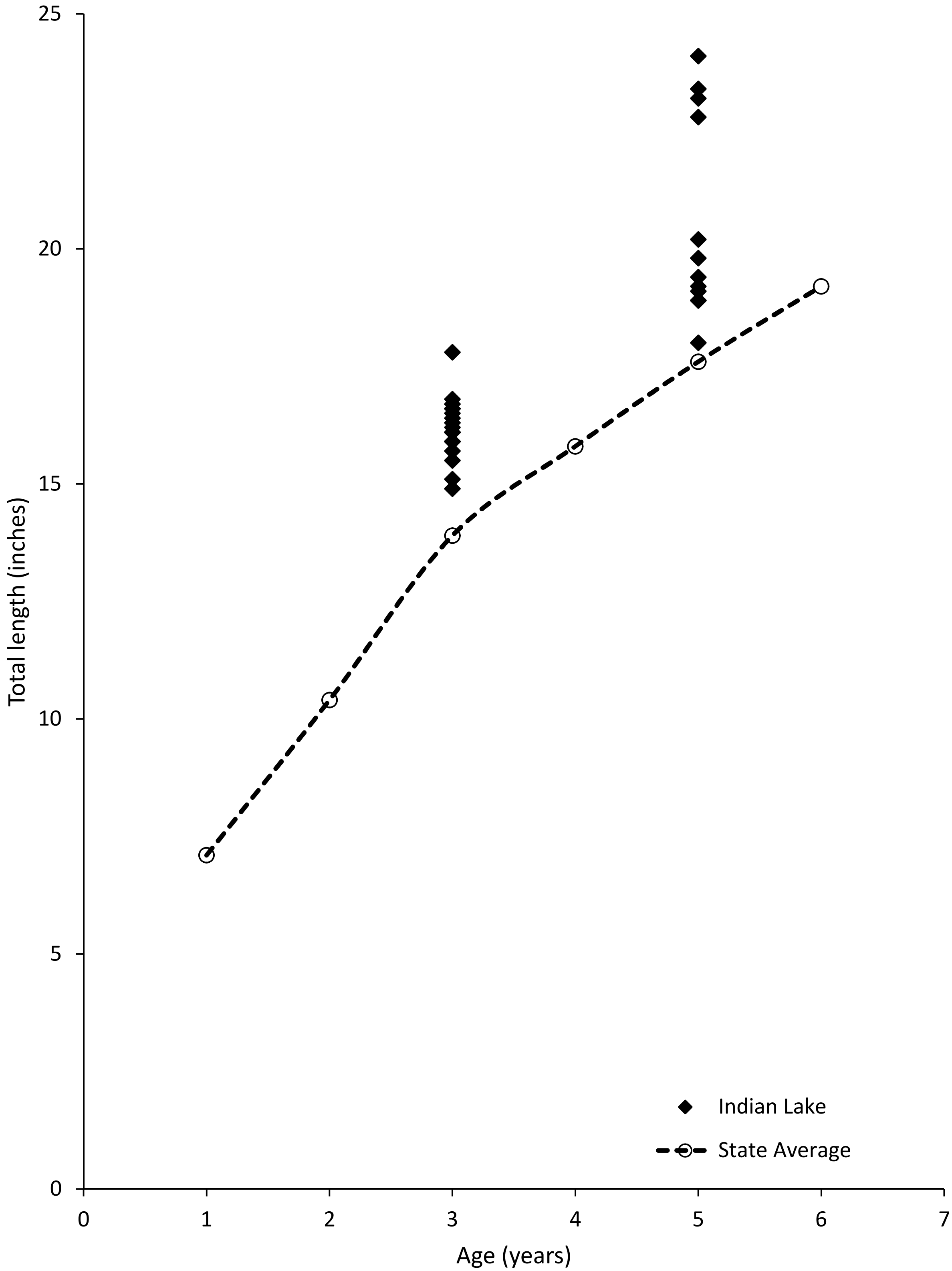

Figure 16.–Growth of Walleye in Indian Lake, as determined from anal spine samples collected during May 2014. State average lengths are from Schneider et al. (2000a).

Table 1.–Fish stocking in Indian Lake, 1878-2014.

Year	Species	Life stage	Number	Number/acre	Average length (inches)
1878	Lake Trout	Fry	5,000	10	---
1879	Lake Trout	Fry	5,000	10	---
1893	Walleye	Fry	400,000	802	---
1897	Walleye	Fry	400,000	802	---
1905	Largemouth Bass	Fall fingerling	4,000	8	---
1909	Largemouth Bass	Fall fingerling	4,000	8	---
1910	Largemouth Bass	Fry	4,000	8	---
	Smallmouth Bass	Fry	6,000	12	---
	Yellow Perch	Fry	160,000	321	---
1933	Bluegill	Fall fingerling	10,200	20	---
	Largemouth Bass	Fall fingerling	300	1	---
1934	Bluegill	Fall fingerling	30,000	60	---
	Largemouth Bass	Fall fingerling	2,500	5	---
1935	Bluegill	Fall fingerling	35,000	70	---
	Largemouth Bass	Fall fingerling	1,000	2	---
1936	Bluegill	Fall fingerling	20,000	40	---
	Largemouth Bass	Fall fingerling	1,000	2	---
1937	Bluegill	Fall fingerling	75,000	150	---
	Yellow Perch	Fall fingerling	20,000	40	---
1938	Bluegill	Fall fingerling	75,000	150	---
	Largemouth Bass	Fall fingerling	4,000	8	---
	Yellow Perch	Fall fingerling	15,000	30	---
1939	Bluegill	Fall fingerling	75,000	150	---
	Largemouth Bass	Fall fingerling	4,000	8	---
	Yellow Perch	Fall fingerling	10,000	20	---
1940	Bluegill	Fall fingerling	31,000	62	---
	Largemouth Bass	Fall fingerling	2,000	4	---
	Largemouth Bass	Yearling	1,000	2	---
1941	Bluegill	Fall fingerling	135,000	271	---
	Largemouth Bass	Fall fingerling	1,000	2	---
1942	Bluegill	Fall fingerling	60,000	120	---
	Largemouth Bass	Fall fingerling	1,000	2	---
1943	Bluegill	Yearling	1,500	3	---
	Largemouth Bass	Fall fingerling	1,500	3	---
	Smallmouth Bass	Fall fingerling	1,000	2	---
1944	Bluegill	Yearling	2,000	4	4.75
	Bluegill	Fall fingerling	15,000	30	0.75
	Largemouth Bass	Fall fingerling	1,500	3	2.50
1945	Bluegill	Yearling	3,000	6	4.00
	Bluegill	Fall fingerling	10,000	20	2.00
	Largemouth Bass	Fall fingerling	3,000	6	3.00

Table 1.–Continued.

2000	Bluegill[1]	Adult	2,000	4	6.08
2001	Bluegill[1]	Adult	500	1	5.60
	Walleye[1]	Fall fingerling	1,300	3	7.12
2002	Walleye[1]	Fall fingerling	1,545	3	7.11
2003	Walleye[1]	Fall fingerling	2,500	5	7.12
2009	Walleye[2]	Fall fingerling	1,500	3	---
2011	Walleye[1]	Fall fingerling	3,500	7	7.11
2014	Walleye[1]	Fall fingerling	1,000	2	7.11

[1] Private stocking by Indian Lake Improvement Association under permit from Michigan Department of Natural Resources

[2] Number of fish stocked is approximate. Fish were stocked by the Indian Lake Improvement Association but the information was not entered into the fish stocking database.

Table 2.–Sampling effort during the fish community survey on Indian Lake, May 2014. Each net night equals one overnight set of one net.

Sampling period	Gear	Effort
May 5-8	Large-mesh fyke net	12 net nights
May 5-7	Small-mesh fyke net	6 net nights
May 5-8	Graded-mesh gill net	6 net nights
May 28	Seine	5 hauls (25 ft each)
May 28	Nighttime electrofishing (all species collected)	30 minutes
May 28	Nighttime electrofishing (only Largemouth Bass collected)	10 minutes

Table 3.–Numbers, weights, and lengths for fish species collected during the fish community survey on Indian Lake, May 2014. Fish were captured using fyke nets, gill nets, seines, and nighttime electrofishing gear. Only Largemouth Bass were collected during the last electrofishing transect. Those fish are not included in this table.

Species	Number	Percent by number	Weight (lbs)	Percent by weight	Length range (inches)	Percent legal or harvestable[1]	Growth index[2]
Bluegill	463	34.2	77.0	15.7	1-8	60	-0.3
Black Crappie	239	17.7	85.6	17.5	4-11	98	-0.7
Spotfin Shiner	156	11.5	0.4	0.1	1-3	---	---
Bluntnose Minnow	117	8.6	0.4	0.1	1-2	---	---
Largemouth Bass	95	7.0	75.3	15.4	4-19	7	+0.3
Pumpkinseed	61	4.5	19.1	3.9	2-8	87	+1.1
Yellow Bullhead	38	2.8	23.2	4.7	7-14	---	---
Walleye	36	2.7	83.5	17.0	14-26	97	+2.7
Hybrid Sunfish	34	2.5	12.5	2.6	6-8	100	---
Yellow Perch	28	2.1	5.1	1.0	6-8	82	-0.9
Brown Bullhead	15	1.1	12.0	2.4	8-13	---	---
Warmouth	13	1.0	2.6	0.5	3-7	62	---
Golden Shiner	10	0.7	1.8	0.4	6-8	---	---
Sand Shiner	10	0.7	0.0	0.0	1-2	---	---
Common Carp	8	0.6	39.4	8.0	18-27	---	---
White Sucker	6	0.4	12.6	2.6	16-18	---	---
Iowa Darter	6	0.4	0.0	0.0	1-2	---	---
Northern Pike	3	0.2	22.9	4.7	27-35	100	---
Bowfin	3	0.2	12.3	2.5	20-24	---	---
Smallmouth Bass	3	0.2	2.4	0.5	10-12	0	---
Lake Chubsucker	3	0.2	1.6	0.3	7-10	---	---
Green Sunfish	3	0.2	0.4	0.1	2-7	33	---
Brook Silverside	3	0.2	0.0	0.0	3-3	---	---
Fathead Minnow	1	0.1	0.0	0.0	2	---	---
Total	1,354		490.1				

[1] Harvestable size is 6 inches for Bluegills, Pumpkinseeds, Green Sunfish, Hybrid Sunfish, and Warmouths, 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.