LOOKOUT SHOALS LAKE LARGEMOUTH BASS SURVEY — 2015

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Abstract.—Boat-mounted electrofishing gear was used to collect Largemouth Bass (LMB) *Micropterus salmoides* in Lookout Shoals Lake in April 2015. Mean CPUE among sites was 61 fish/hr (SE = 5.8). LMB ranged in length from 68 to 572 mm TL and the percentage of LMB ≥ 400 mm TL collected (36%) was higher than it was during previous surveys. Relative weights averaged 88 during the 2015 survey, with body condition increasing slightly with increasing fish length. Ages of LMB ranged from 1 to 14, with year-class formation varying considerably between years. Older fish were more abundant than during previous surveys, with 73% of fish being ≥ 4 years old. Although recruitment was too variable to calculate total annual mortality, the high prevalence of older fish in the population suggests that survival is high. Growth rates were similar to those documented during previous surveys, with fish reaching harvestable size (354 mm) by age 4.

Lookout Shoals Lake on the Catawba River was impounded in 1915 by Duke Energy near the City of Statesville, North Carolina. Operated primarily for hydropower production, the reservoir covers 514 ha with an average depth of 7.3 m and an average retention time of only 7 days. Lookout Shoals Lake supports fisheries for Largemouth Bass (LMB) *Micropterus salmoides*, Striped Bass *Morone saxatilis*, crappies *Pomoxis spp*., sunfishes *Lepomis spp*., and catfishes *Ictalurus* and *Ameiurus spp*.

Biologists with the North Carolina Wildlife Resources Commission (Commission) collected data on the Lookout Shoals Lake LMB population on numerous occasions between 1957 and 1990 (Hining 2011). Since inconsistent methods and sample sites were employed during these early surveys, and since fish were aged using scales, which are now known to be unreliable for aging black bass (Besler 1999), the utility of these data is limited. Consequently, beginning in 2008, surveys have employed consistent sites and methods, and fish have been aged using otoliths. From 2008–2010, electrofishing surveys were conducted annually and updated data on LMB population parameters were obtained (Hining 2011). In response to annual declines in LMB catch rates during the 2008–2010 surveys, an additional survey was conducted in 2013 to monitor LMB abundance, but no age data were collected during this survey (Hining 2014).

Grass Carp *Ctenopharyngodon idella* were stocked into Lookout Shoals Lake in 2005 to control the growth of the Parrotfeather *Myriophyllum aquaticum* that was prevalent in the upper reaches of the reservoir. The Grass Carp were stocked in May 2005 and had achieved control of the Parrotfeather by August 2005. An initial assessment of the effects of the vegetation removal found that there were no significant short-term impacts to the fish community (Garner 2008). Although it is not clear if there is any relationship between the elimination of the Parrotfeather and the decline in LMB electrofishing catch rates documented between 2008 and 2013, Commission staff have received numerous complaints from anglers about the decline in the quality of the LMB fishery since the Parrotfeather was eliminated.

To assess the validity of these angler reports, and since a comprehensive assessment of the Lookout Shoals Lake LMB fishery had not been conducted since 2010, an electrofishing survey was conducted in 2015 to gather updated information on the relative abundance, size structure, body condition, age structure, and growth rates of the Lookout Shoals Lake LMB population. This report summarizes the results of the 2015 survey.

Methods

Field collections.—Boat-mounted electrofishing gear (Smith-Root 7.5 GPP) was used to collect LMB from ten sites throughout Lookout Shoals Lake on April 24 and April 27, 2015 (Figure 1). All transects were 300 m in length and were evenly distributed throughout the lake. Electrofishing settings of 500–1000 V, 4 A, and 120 pulses per second were used for all sites on both sampling occasions. All LMB collected were measured for total length (TL; mm) and weight (g). Finally, sagittal otoliths were removed from a randomly selected sample of LMB for age determination and placed in labeled vials.

Abundance.—Relative abundance was indexed by catch per unit effort (CPUE), which was calculated as the number of LMB collected per hour of electrofishing time.

Size structure.—The size structure of the population was graphically assessed by constructing length-frequency distributions and numerically assessed by calculating size-structure indices (proportional size distributions [PSDs]; Guy et al. 2007). The lengths for stock-, quality-, and preferred-size LMB were those proposed by Gabelhouse (1984).

Condition.—Body condition of individuals ≥ 150 mm TL was indexed by calculating relative weights using the equation from Henson (1991).

Age and growth.— Otoliths were prepared for reading by breaking them in half perpendicular to their longest axis and polishing the broken end using 320–400 grit sandpaper (Besler 1999). The otolith section was then submerged in a shallow dish of water, with the unbroken end embedded in a layer of clay lining the bottom of the dish. The otolith section was illuminated from the side with a fiber optic light and read under a dissecting microscope. Otoliths were read independently by two readers, and discrepancies in annuli counts between readers were rectified at a joint reading.

The reported age of fish in this survey was not equal to the number of annuli that were present. Previous work in Illinois has shown that annulus formation in LMB occurs between April and June (Taubert and Tranquilli 1982). For fish collected in this survey, the annulus for the year in which they were collected had not yet begun to form and there was significant growth between the last annulus and the otolith margin. As such, fish were assigned an age equal to the number of annuli plus one because additional annulus formation was imminent. Age-frequency distributions were constructed and mean length at age at time of capture was determined for all year-classes represented by at least two fish.

Results and Discussion

Abundance.—We collected 159 LMB in 2.6 hrs of electrofishing effort for an aggregate CPUE of 61 fish/hr; mean CPUE among sites was also 61 fish/hr (SE = 5.8). Catch rates of LMB in Lookout Shoals Lake have declined since surveys employing consistent sites and methods were initiated by the Commission in 2008. During surveys conducted in 2008, 2009, and 2010, catch rates were 86, 79, and 61 fish/hr, in that order (Hining 2011). Catch rates remained at the low end of the range observed from 2008–2010 during a 2013 survey when 59 fish/hr were collected (Hining 2014). In comparison to other upper Catawba River reservoirs, catch rates of Largemouth Bass in Lookout Shoals Lake were lower than catch rates from 2005–2007 surveys of Lake Rhodhiss (86–117 fish/hr; Rash 2007) and 2004–2006 surveys of Lake Hickory (74–98 fish/hr; Hodges 2007), and higher than catch rates from 2010–2011 surveys of Lake James (24–43 fish/hr; Wood 2014).

Given that the number of fish collected per hour of electrofishing can vary in response to abiotic factors unrelated to fish abundance (i.e., efficiency of netter, water levels, wind speed), changes in catch rates do not always reflect differences in the number of fish collected. To provide additional insight into trends in LMB abundance since 2008, direct comparisons of the raw numbers of fish collected during each survey between 2008 and 2015 were made since consistent sample sites and methods were employed among years. Total numbers of LMB collected in 2008, 2009, 2010, and 2013 were 187, 191, 131, and 128, respectively. Similar to the catch rate data, these data show that relative abundance of LMB appeared to be highest in 2008 and 2009 before declining substantially in 2010 and 2013. However, the number of LMB collected in 2015 was 23% higher than the average number collected in 2010 and 2013 despite CPUE being nearly identical among all three surveys. Therefore, LMB abundance appears to have rebounded slightly despite CPUE values remaining similar since 2010.

Since surveys conducted prior to 2008 employed sites or methods that were different than those employed since 2008, it is difficult to determine whether LMB abundance since 2010

represents a decrease relative to historical levels of abundance or if LMB numbers were just unusually high during the 2008 and 2009 surveys. Consequently, additional surveys are needed to better understand long-term trends in Lookout Shoals Lake LMB abundance.

Size structure.—LMB ranged in length from 68 to 572 mm TL and the length-frequency distribution was multi-modal, with fish being well represented throughout the range of sizes collected (Figure 2). In addition to modes of fish in the 180–280 and 300–420 mm ranges, a mode of larger fish in the 440–500 mm range was also present. The percentage of LMB ≥ 400 mm TL collected during the 2015 survey (36%) was substantially higher than it was during surveys conducted annually between 2008 and 2010 (16–23%) and marginally higher than it was during a single survey conducted in 2013 (34%).

Values for PSD, PSD-P, and PSD-M were 77, 43, and 4, in that order. PSD and PSD-P values were slightly higher than the desired ranges for balanced populations of 40–70 for PSD and 10–40 for PSD-P (Willis et al. 1993) and within the range of values observed during previous surveys conducted between 2008 and 2013 (Hining 2011, 2014). PSD-M values reflected the higher proportion of large fish in the population and were greater than any values from the surveys conducted between 2008 and 2013 (range 0–2; Hining 2011, 2014). Stock-sized LMB (200 mm TL) did not appear to be fully recruited to electrofishing gear in Lookout Shoals Lake in 2015; consequently, these size-structure index values are likely to be slightly inflated. However, LMB became fully recruited to electrofishing gear at similar sizes during the 2008–2013 surveys. As such, size-structure indices from 2008–2013 should be similarly inflated, allowing for direct comparisons of size-structure indices among years.

Condition.—Relative weights averaged 88 during the 2015 survey, with body condition increasing slightly with increasing fish length (Figure 3). These relative weights were below the recommended range for balanced fish populations (95–105; Anderson 1980) and were also less than values in most Piedmont reservoirs, where LMB relative weights average > 90 (Oakley and Dorsey 2013). During previous surveys of Lookout Shoals Lake LMB conducted between 2008 and 2013, relative weights averaged 91–102 and there was no relationship between body condition and fish length. However, the electronic scale used to weigh fish during previous surveys malfunctioned during the 2015 survey and a hanging spring scale had to be used instead. Given that the accuracy of the spring scale is unknown, it may be responsible for the difference in relative weights between the current survey and previous surveys.

Age structure and growth.—Ages of LMB ranged from 1 to 14, with year-class formation varying considerably between years (Figure 4). Strong year-classes were formed in 2001, 2002, and 2008, with weak year-classes being formed in 2009 and 2012. Older fish were more abundant in 2015 than during previous surveys. In 2015, 73% of fish were ≥ 4 years old while only 31–42% of fish collected between 2008 and 2010 were ≥ 4 years old.

Due to the lack of constant recruitment among year-classes, it was not possible to generate an accurate estimate of total annual mortality using catch-curve analysis. However,

the high proportion of fish from the 2001 and 2002 year-classes (4% combined), along with the high overall numbers of fish ≥ 4 years old, suggests that survival is high and that the quality of the fishery is not being inhibited by high mortality rates.

Growth rates were similar to those documented during the 2008–2010 surveys (Hining 2011), with fish reaching harvestable size (354 mm) by age 4 (Table 1; Figure 5). The time it took Lookout Shoals Lake LMB to reach 354 mm was comparable to other lakes on the upper Catawba River, with fish reaching 354 mm at approximately age 4 in Lake James (Wood 2014) and Lake Hickory (Hodges 2007) and at age 5 in Lake Rhodhiss (Rash 2007).

Management Recommendations

1. Conduct a follow-up electrofishing survey of the Lookout Shoals Lake LMB population in 2018.
2. Monitor variability in LMB recruitment during future surveys to determine if recent Federal Energy Regulatory Commission-mandated alterations in Catawba River minimum flow requirements result in more consistent year-class formation.
3. Continue plantings of beneficial, native aquatic plant species to improve fish habitat.

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TABLE 1.— Mean total length (TL) at age (mm), with range, standard error (SE), and sample size (n) for Largemouth Bass collected from Lookout Shoals Lake by electrofishing, 2015.

Age	Mean TL	Range	SE	n
1	144	68–195	16.2	8
2	240	180–287	5.4	26
3	311	256–351	5.8	15
4	357	300–420	6.1	21
5	407	327–469	9.8	17
6	436	350–492	25.8	5
7	464	396–550	10.8	16
8	453	392–519	19.2	6
9	460	403–520	24.1	5
10	476	459–493	17.0	2
11	—	—	—	—
12	—	—	—	—
13	488	450–551	31.9	3
14	495	418–572	77.0	2

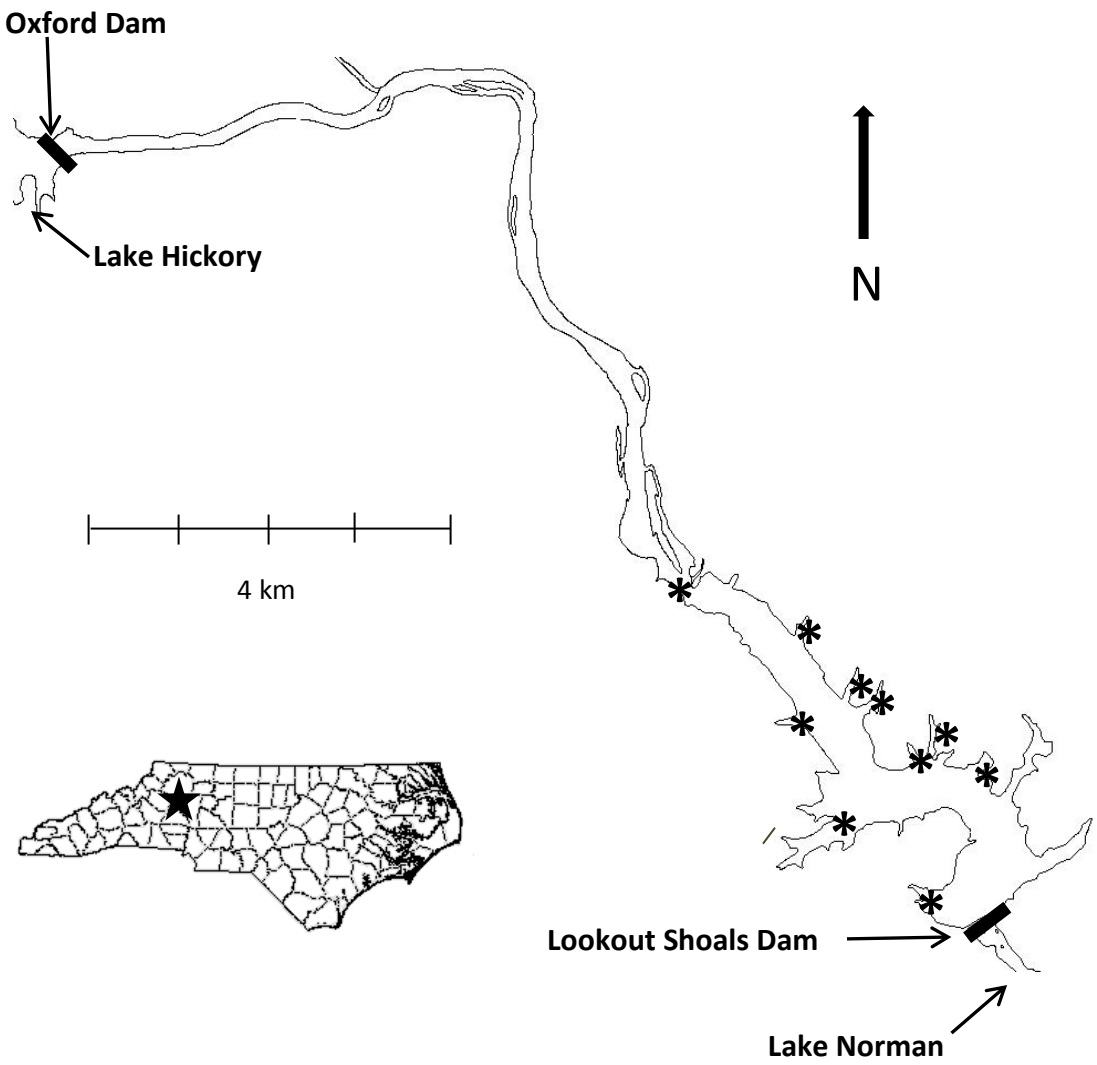

FIGURE 1.— Map of Lookout Shoals Lake in Alexander, Catawba, and Iredell counties, North Carolina, showing Largemouth Bass electrofishing sites (✱), 2015.

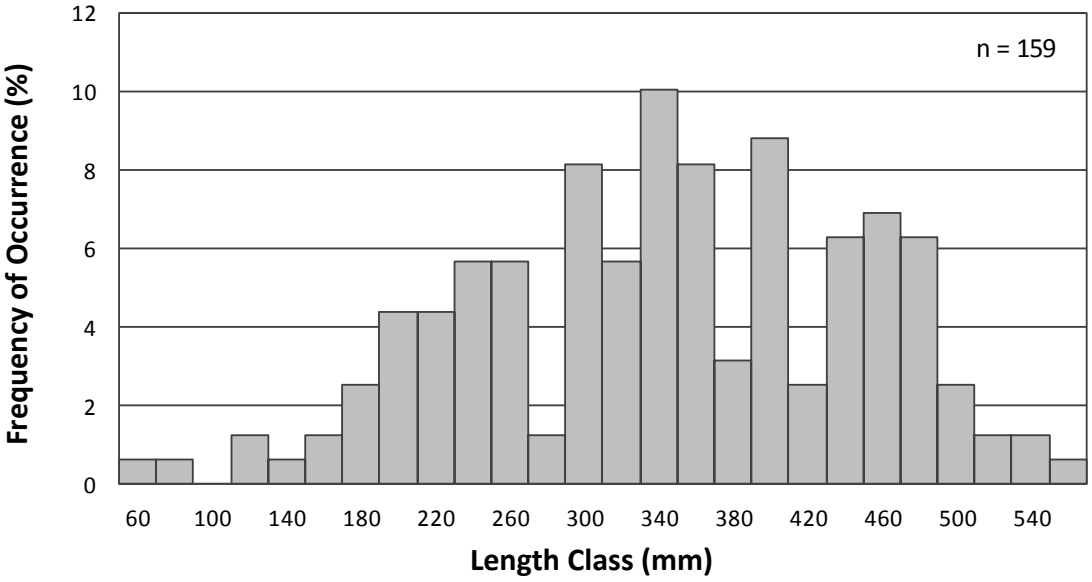

FIGURE 2.—Length-frequency distribution of Lookout Shoals Lake Largemouth Bass collected by electrofishing, 2015

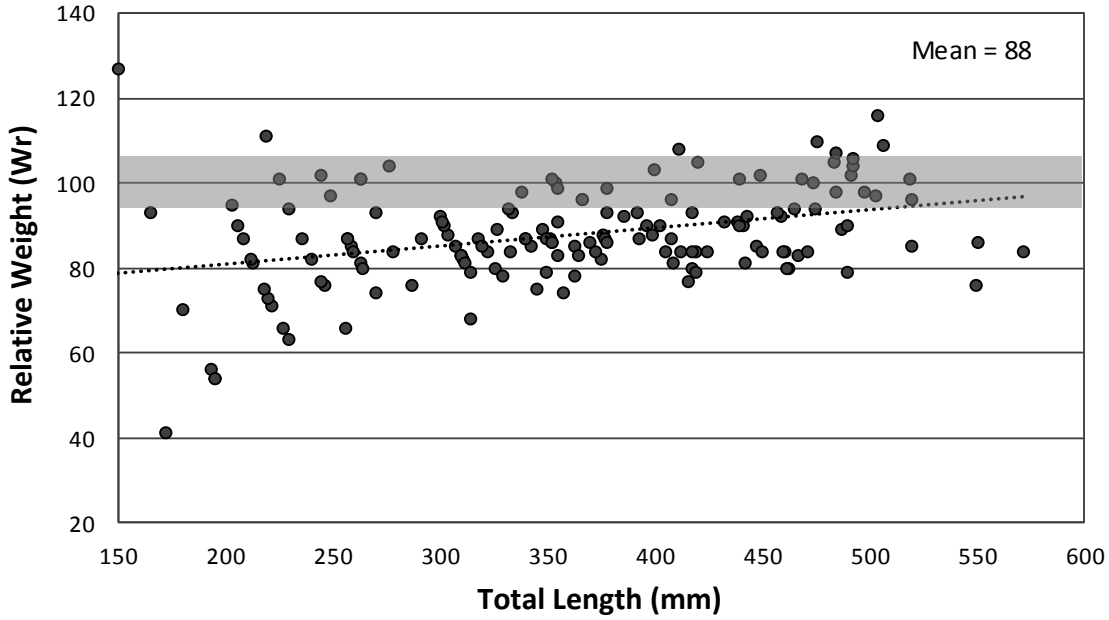

FIGURE 3.—Relative weights of Lookout Shoals Lake Largemouth Bass collected by electrofishing, 2015. The shaded area in the figure represents the desired range of relative weights (95–105).

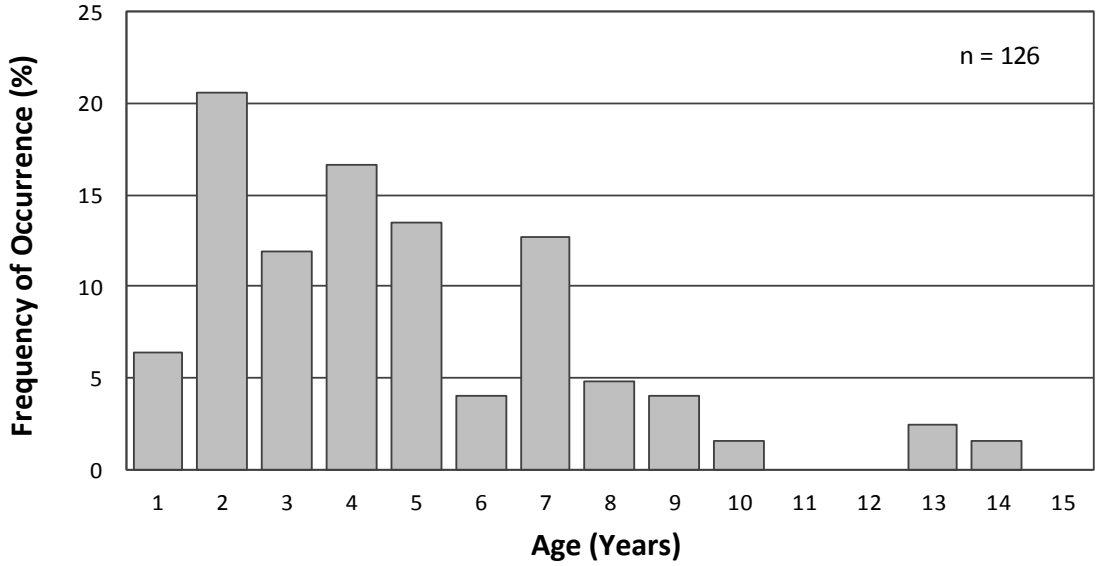

FIGURE 4.— Age-frequency distribution of Lookout Shoals Lake Largemouth Bass collected by electrofishing, 2015.

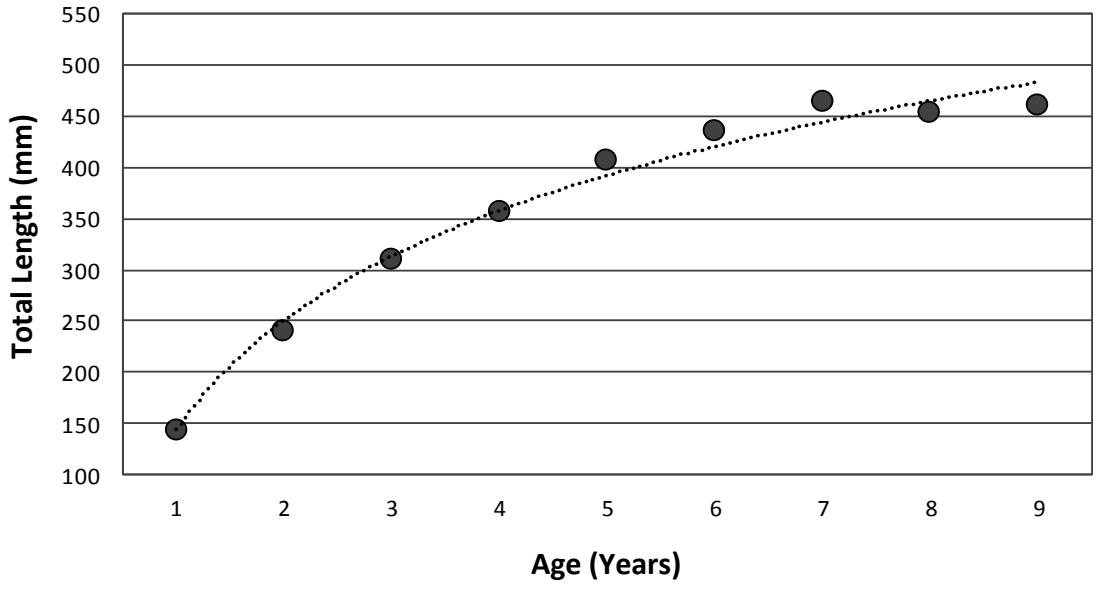

FIGURE 5.— Growth curve, showing mean total length at age, for Largemouth Bass collected from Lookout Shoals Lake by electrofishing, 2015. Data are only shown for age classes containing ≥ 5 fish.