High Rock Lake Largemouth Bass Survey, 2012

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Survey Summary Report

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Abstract. — In April 2012, an electrofishing survey was conducted on High Rock Lake for Largemouth Bass. A total of 403 Largemouth Bass were collected during this survey. Population metrics such as density, size structure, and length at age were within or above expected ranges. Mean relative weight values were below average, particularly for smaller fish. A new size limit that will go into effect on August 1, 2013 will allow anglers to harvest two fish below 356 mm TL in the daily creel and should encourage harvest of smaller fish which may in turn increase relative weight values for this size class.

Background

High Rock Lake is a 6,374-ha mainstream impoundment located on the Yadkin River in Davidson and Rowan counties. The reservoir is operated by Yadkin-APGI incorporated for hydropower generation but also facilitates flood control and recreational uses. The reservoir is subject to water level fluctuations as a result of operational objectives. Shoreline development is relatively heavy with homes, lawns, boathouses, piers, and other facilities occurring around most of the lake. Aquatic cover mostly consists of tree laps and buttonbush *Cephalanthus occidentalis* at scattered locations, as well as riprap along railroad and highway approaches. The NC Division of Water Quality (NCDWQ) classifies High Rock Lake as a eutrophic reservoir (NCDWQ 2007).

Several species of interest to anglers are present in High Rock Lake. They include Largemouth Bass *Micropterus salmoides*, White Bass *Morone chrysops*, Striped Bass *M.*

saxatilis, Black Crappie *Pomoxis nigromaculatus*, White Crappie *P*. *annularis*, Flathead Catfish *Pylodictus olivaris*, and Channel Catfish *Ictalurus punctatus.* The minimum size limit for Largemouth Bass on High Rock Lake is 356 mm with a five fish daily creel. The objective of this survey was to obtain stock assessment data needed to evaluate and manage Largemouth Bass in High Rock Lake.

Methods

Field Collections

Largemouth Bass were collected from shoreline areas on April 16–20 and April 25, 2012 during daylight hours using a Smith-Root 7.5 GPP boat electrofisher. Fish collected were measured (mm) and weighed (g). Sagittal otoliths were collected from a subsample of 10 fish per 25-mm size group for age and growth analysis. All other fish were returned to the reservoir.

Data Assessment

The Largemouth Bass population was assessed by evaluating several parameters: 1) Relative Abundance; 2) Size Structure; 3) Age Structure; 4) Growth; and 5) Body Condition. Information from these parameters was used to develop management recommendations to maintain and improve the Largemouth Bass fishery.

Relative Abundance.—Relative abundance was quantified by using catch-per-unit-effort (CPUE). CPUE was measured as the number of Largemouth Bass collected per hour of electrofishing time.

Size Structure.—The size structure of a Largemouth Bass population represents the percentage of small, medium, and large size fish in the population. Proportional Size Distribution (PSD) and Proportional Size Distribution-Preferred (PSD-P) are indices used to express the proportion of quality and preferred size fish, respectively. PSD is an estimate of the number of Largemouth Bass greater than 300 mm divided by the number of Largemouth Bass greater than 200 mm. PSD-P is the number of Largemouth Bass greater than 380 mm divided by the number of fish greater than 200 mm (Gabelhouse 1984).

Age Structure.—Age structure provides information on the different ages of Largemouth Bass in the sample and the percentage of Largemouth Bass within each age group. An age-length key was used to expand age information from the subsample of sacrificed fish to the entire sample. Lack of 1 or 2 year old fish or very low percentages of fish within these age groups may indicate problems with recruitment; that is, reproduction is failing or small Largemouth Bass are not surviving their first year. Lack of older fish (5 years and greater) may indicate high mortality caused by either natural events or overharvest by anglers.

Growth.—Growth of Largemouth Bass was evaluated by examining a von Bertalanffy growth curve:

$$L_t = L_{inf} (1 - e^{-k(t - t_0)})$$

where L_t = length at time t, L_{inf} = maximum length, k = growth coefficient, and t_0 = the theoretical age at which the fish would have zero length (Ricker 1975). In fitting the growth curve, a May 1 hatch date was used to assign an age to each fish. Fast growth might be due to

high harvest rates, problems with recruitment, or the ability of the reservoir to support more fish. Slow growth might indicate overcrowding or an insufficient food supply. Fast growth might be due to high harvest rates, problems with recruitment, or the ability of the reservoir to support more fish. Slow growth might indicate overcrowding or an insufficient food supply.

Body Condition.—Relative weight is a parameter that provides an indication of body condition compared to a national average and a value of 100 is considered ideal. Low relative weight values mean fish are skinnier than average and high values indicate that fish are heavier than average.

Results

Relative Abundance.—A total of 403 Largemouth Bass were collected from High Rock Lake during this survey. The CPUE for Largemouth Bass was 82 fish/h (SE = 10) of electrofishing, which is above the average for Piedmont reservoirs (30–60 fish/h; NCWRC unpublished data). This value is between the values calculated in the 2006 and 2009 surveys (Table 1).

Size Structure.—Approximately 64% of the Largemouth Bass collected were greater than harvestable size (356 mm) (Table 1). This value is comparable to the values found in recent surveys (Table 1) where approximately one third of the Largemouth Bass collected were harvestable size. The PSD value of 56 and PSD-P value of 53 for Largemouth Bass in High Rock Lake are within the average range for PSD but higher than the average range for PSD-P values for Piedmont reservoirs (PSD between 50 and 70, PSD-P between 30 and 40; NCWRC unpublished data). The PSD-P value in this survey is higher than the values from the previous two surveys (Table 1).

Age Structure.—Largemouth Bass collected in this survey ranged from 1 to 16 years (Figure 2). The percentage of 1 and 2 year old fish in this sample was approximately 36%, which suggests good recruitment. Adult mortality does not appear to be excessive with 31% of the fish collected being five years old or greater. When comparing fish greater than 3 years old, the values in 2012 were greater than the 2006 and 2009 surveys (Table 1).

Growth.—Largemouth Bass reached harvestable size between 3 and 4 years of age on average (Figure 3). These values indicate adequate growth and do not suggest that Largemouth Bass in this population are stunted. Largemouth Bass reached harvestable size on average in a similar time frame in 2006. Increases in length at age values appeared to plateau at or around age-8 (Figure 3).

Body Condition.—Mean relative weights (Wr) for Largemouth Bass were below the ideal value of 100 for the majority (66%) of Largemouth Bass collected in this sample (Figure 4). In general, relative weight values did increase with length, but there was a large amount of variability for relative weight values in terms of fish length. The mean Wr values for preferred sized Largemouth Bass were at or above 98 for the three most recent surveys (Table 1).

Discussion

High Rock Lake continues to support a quality Largemouth Bass fishery. The fishery is comprised of a well-balanced population and the age structure suggests that reproduction is

adequate and that total mortality is not excessive. Growth of Largemouth Bass in this system is on par with previous surveys. While all other population metrics are at or above expected ranges, relative weight values are slightly less than expected. It is possible that the high density of Largemouth Bass in this system may be inhibiting growth of smaller fish.

On August 1, 2013, the regulation for Largemouth Bass will change at High Rock Lake and the new regulation will allow two fish less than 356 mm to be possessed in the daily creel. While Largemouth Bass harvest is typically low, this regulation change will encourage harvest of small fish and may result in improved relative weight values for smaller Largemouth Bass in High Rock Lake.

Management Recommendations

1. High Rock Lake should continue to be managed with a 356-mm minimum size limit and five fish daily creel limit and two fish in the daily creel may be less than 356 mm.

2. Continue to sample the Largemouth Bass population in High Rock Lake on a 3–4 year interval.

Literature Cited

Gabelhouse, D. W. 1984. A length categorization system to assess fish stocks. North American Journal of Fisheries Management 4:273–285.

NCDWQ (North Carolina Division of Water Quality). 2007. Lake and Reservoir Assessments-Yadkin-Pee River Basin. Final Report. Raleigh.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada 191.

TABLE 1. —Catch per unit effort, percent of fish that were 356 mm and longer, Proportional Size Distribution-Preferred, percent of fish that were age 3 and older, and mean relative weight of preferred sized largemouth bass collected from High Rock Lake with electrofishing, April–May 2006, 2009, and 2012. Standard errors are in parentheses.

Year	CPUE (fish/h)	% fish ≥ 356 mm	PSD-P	% fish ≥ Age-3	Mean W_r (Preferred Size)
2006	68 (9)	45	41	36	102 (0.8)
2009	105 (2)	50	48	60	106 (0.8)
2012	82 (10)	64	53	64	98 (1.5)

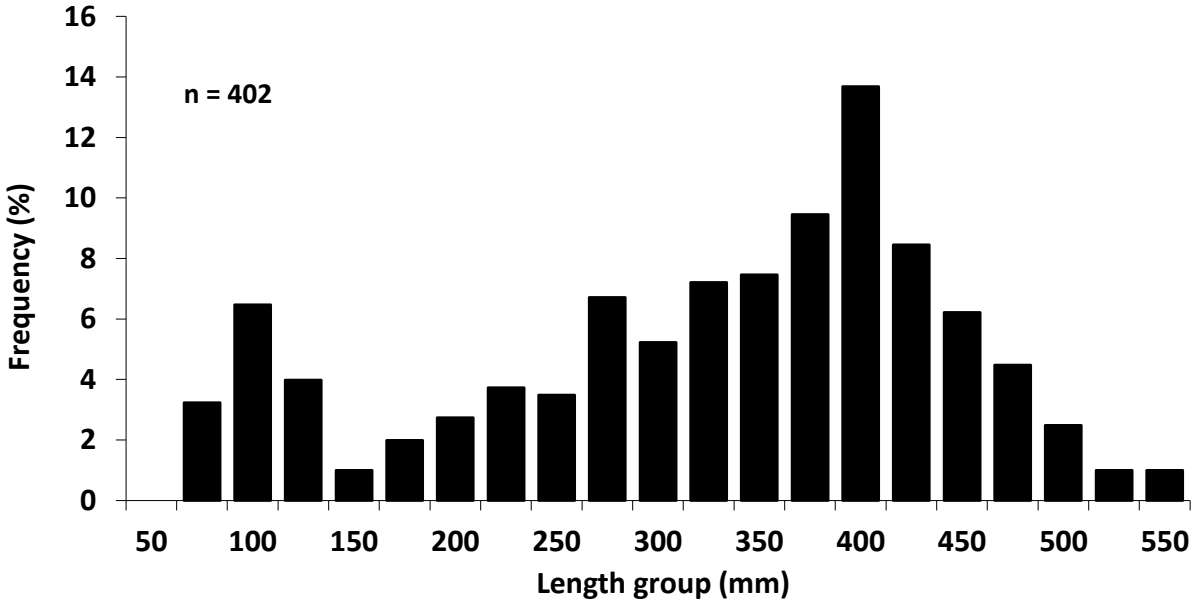

FIGURE 1.—Length frequency of Largemouth Bass collected by electrofishing from High Rock Lake during April, 2012.

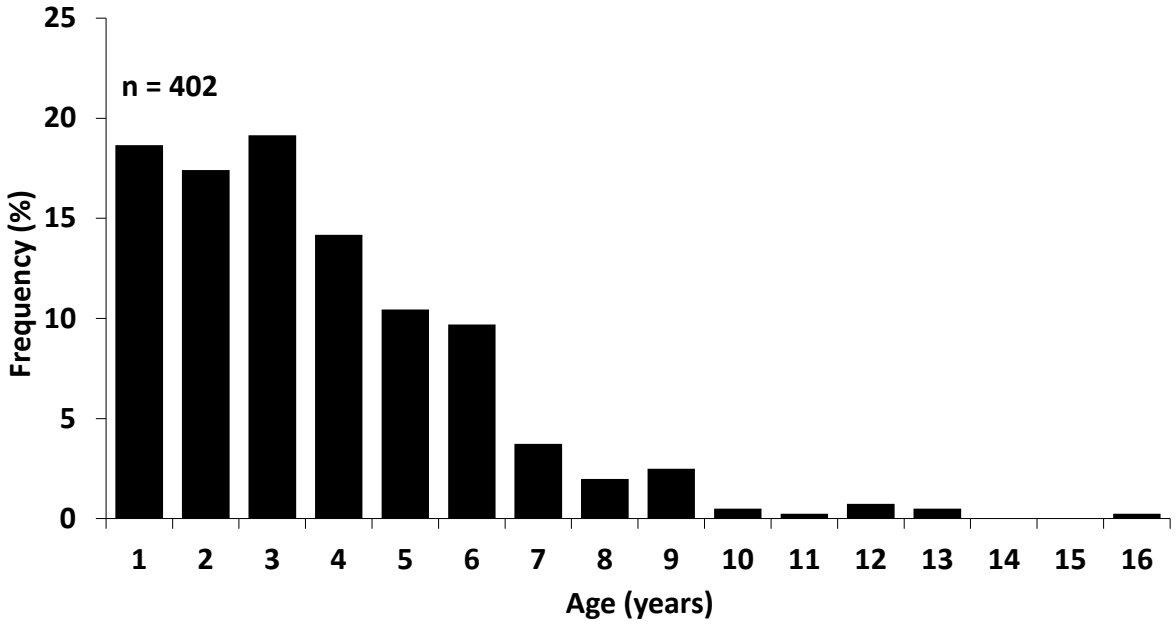

FIGURE 2.—Age structure of Largemouth Bass collected by electrofishing from High Rock Lake during April, 2012. Ages were expanded from a subsample using an age-length key.

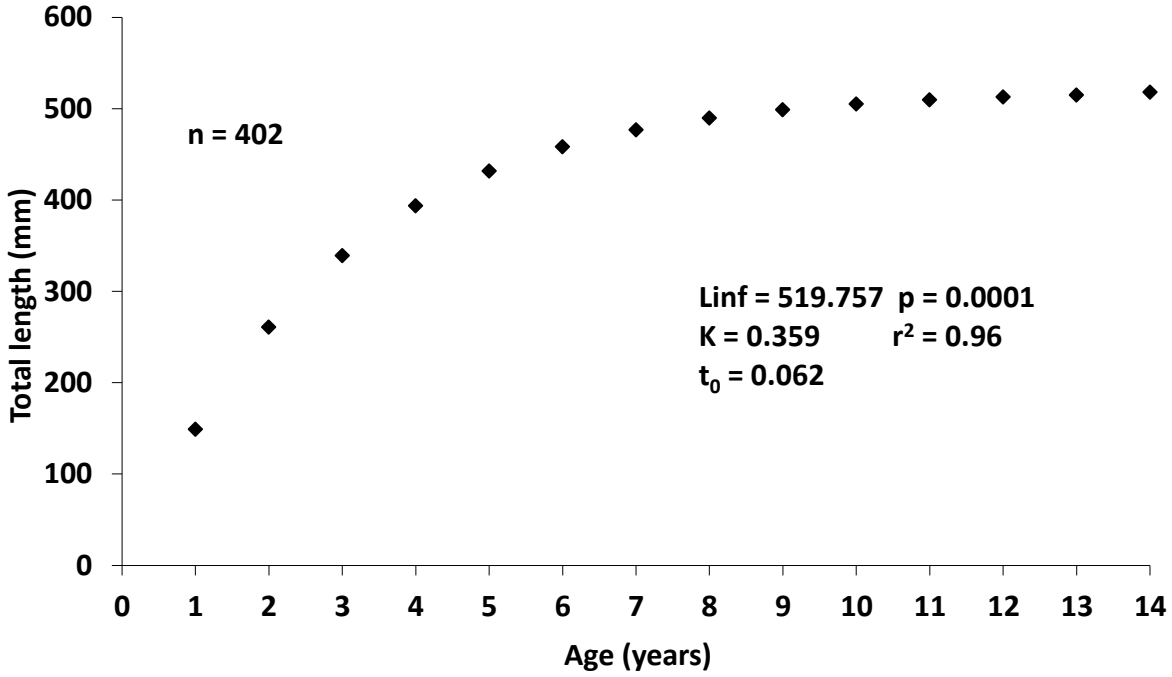

FIGURE 3.—von Bertalanffy growth curve for Largemouth Bass collected by electrofishing from High Rock Lake during April, 2012.

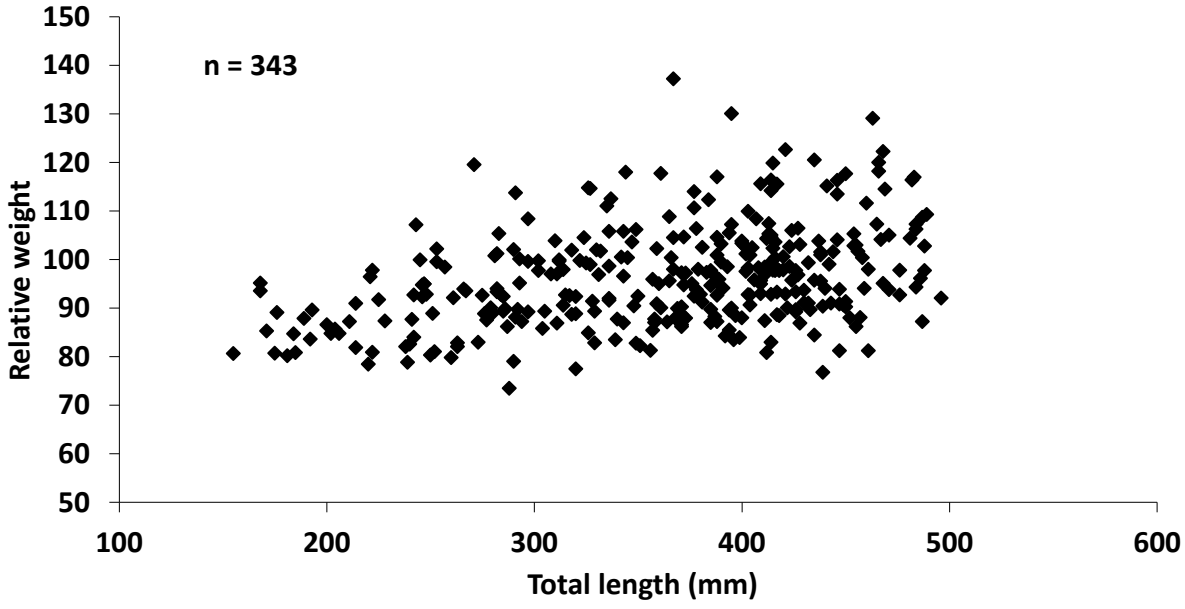

FIGURE 4.—Relative weight value (Wr) versus length of Largemouth Bass collected by electrofishing from High Rock Lake during April, 2012.