High Rock Lake Largemouth Bass Survey, 2009

SUMMARY REPORT

PIEDMONT FISHERIES INVESTIGATIONS

Federal Aid in Fish Restoration
Project F-23

Project Type: Survey

Period Covered: April 2009

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Funds from the Sport Fish Restoration Program are used for fisheries management and research, aquatic education, and boating access facilities. The program is administered cooperatively by the N.C. Wildlife Resources Commission and the U.S. Fish and Wildlife Service.

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 ten shoreline areas on April 14-17 and April 20, 2009 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 (death rate) 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 January 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.

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 383 largemouth bass were collected from High Rock Lake. The CPUE for largemouth bass was 105 fish/h (1 SE = 122), which is above the average for Piedmont reservoirs (30–60 fish/h; NCWRC unpublished data). Additionally, the CPUE value for 2009 was higher than the 50 fish/h collected in 2003 (NCWRC, unpublished data) and the 68 fish/h collected in 2006 (Dorsey 2007).

Size Structure.—Approximately 50% of largemouth bass collected were greater than harvestable size (356 mm) (Figure 1). This value is lower than the 77% reported in 2003 (NCWRC, unpublished data) but slightly higher than the 48% for 2006 (Dorsey 2007). The PSD value of 73 and PSD-P value of 48 for largemouth bass in High Rock Lake are slightly above average for a Piedmont reservoir (PSD between 50 and 70, PSD-P between 30 and 40; NCWRC unpublished data). The PSD and PSD-P values are similar to the values of 78 for PSD and 41 for PSD-P from the 2006 survey (Dorsey 2007) but still less than the PSD value of 94 and the PSD-P value of 70 reported in the 2003 survey (NCWRC, unpublished data). The PSD values observed in this survey indicate a fishery slightly skewed towards larger fish. (Gabelhouse 1984).

Age Structure. — Largemouth bass collected during this survey ranged in age from 1 to 14 years (Figure 2). The percentage of 1 and 2 year old fish in our sample was approximately 40%,

which suggests good recruitment. Adult mortality is not a concern with 27% of the fish collected being 5 years old or greater. These values are comparable to those obtained in 2006 (Dorsey 2007) and 2003 (NCWRC, unpublished data).

Growth. —Largemouth bass reached harvestable size on average between 3 and 4 years of age (Figure 3). Growth did not begin to slow on average until fish reached age 8. These values indicate adequate growth and do not suggest that largemouth bass in this reservoir are stunted.

Body Condition. —Relative weights (Wr) for largemouth bass were below the ideal value of 100 for most fish collected less than or equal to 300 mm (Figure 4). However, a larger proportion of fish greater than 300 mm had relative weight values above 90. Overall, there was a positive trend between fish size and relative weight values.

Summary

High Rock Lake continues to support a quality largemouth bass fishery. There is a balance of fish above and below the minimum size limit and growth is average in comparison to other Piedmont reservoirs. Relative weight values, while not ideal across all sizes, are at or above levels seen in other Piedmont systems. The lower than expected relative weight values may be negatively correlated with greater than average density. Recruitment and mortality are also within expected values and do not appear to be negatively impacting the largemouth bass population in this reservoir.

Recommendations

1. High Rock Lake should continue to be managed with a 356-mm minimum size limit and 5 fish daily creel limit.

2. Continue to sample the largemouth bass population in High Rock Lake on a 3-4 year interval.

References

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Gabelhouse, D. W. 1984a. 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.

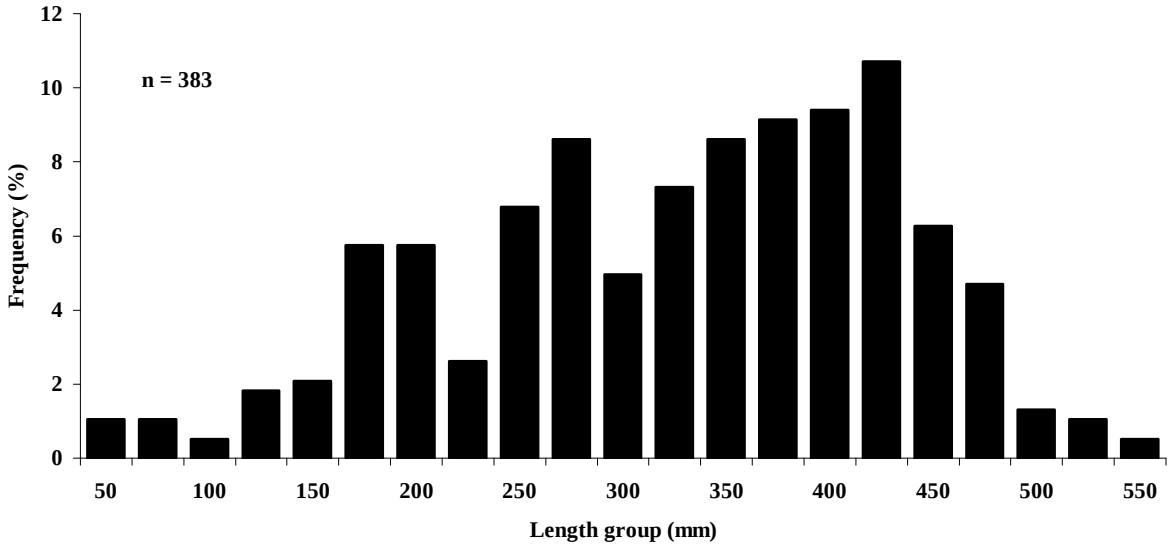

FIGURE 1.—Length frequency of largemouth bass collected by electrofishing from High Rock Lake during April 26 – May 3, 2006.

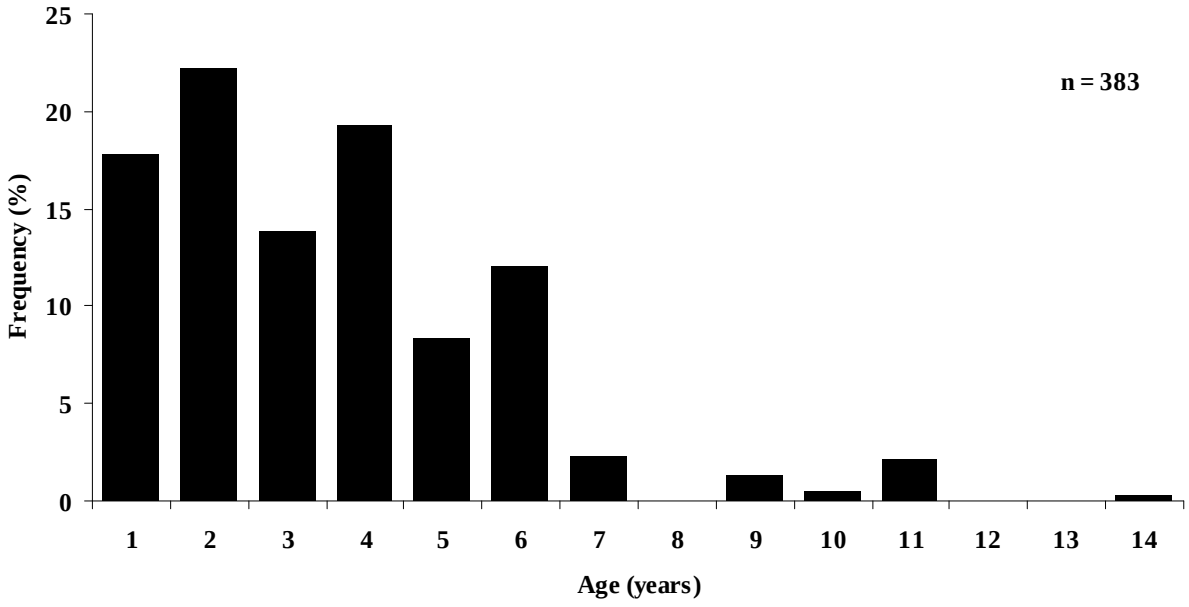

FIGURE 2.—Age structure of largemouth bass collected by electrofishing from High Rock Lake during April 26 – May 3, 2006. Ages were expanded from a subsample using an age-length key.

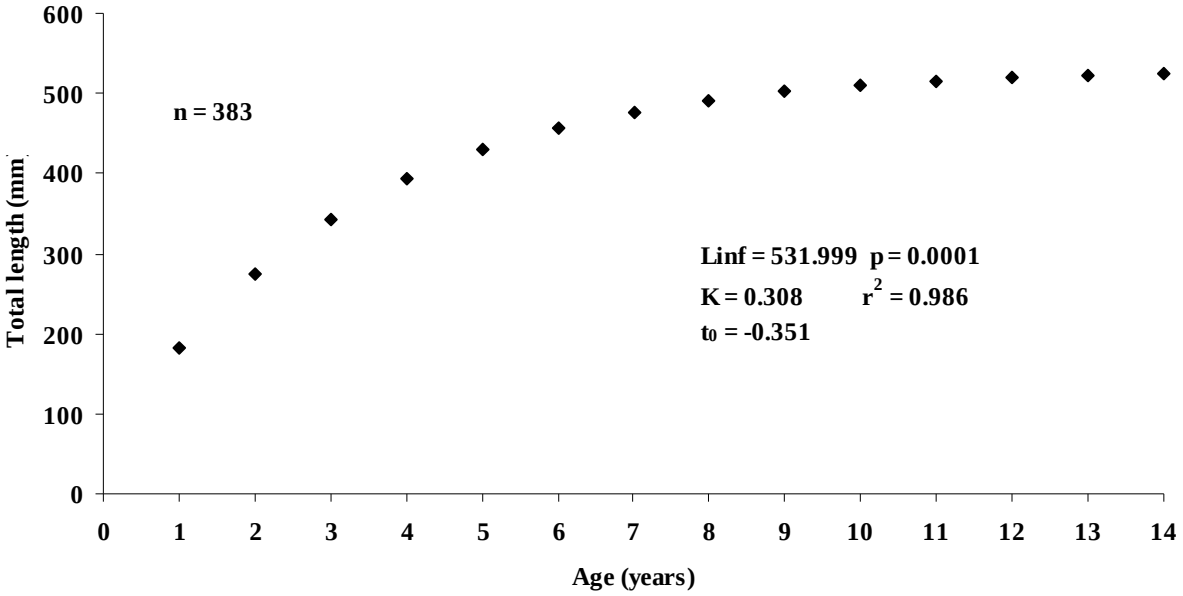

FIGURE 3.—von Bertalanffy growth curve for largemouth bass collected by electrofishing from High Rock Lake during April 26 – May 3, 2006.

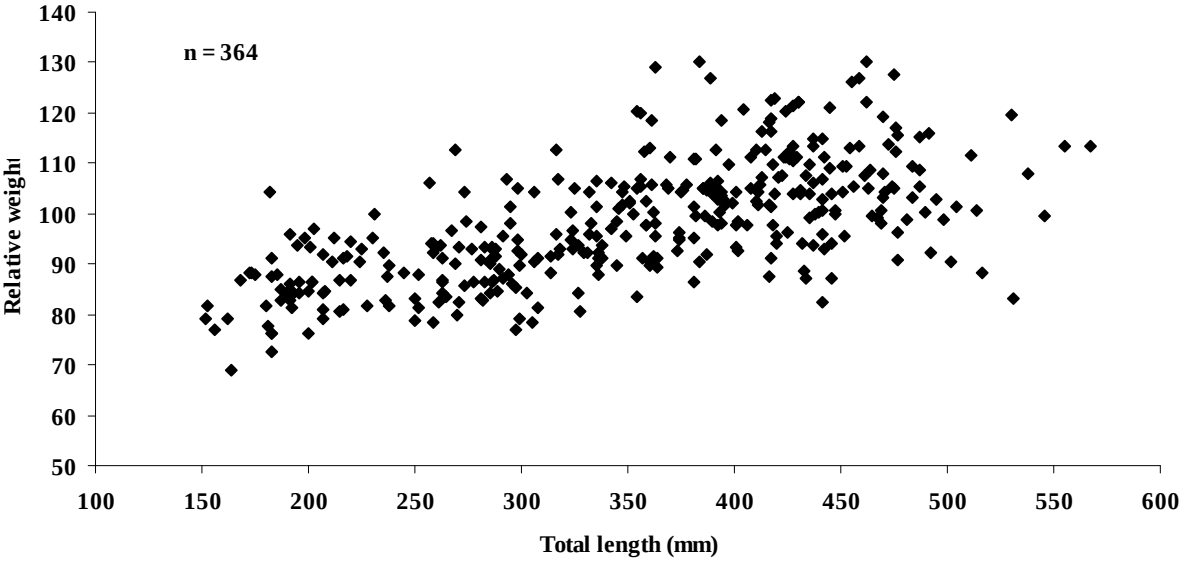

FIGURE 4.—Relative weights (Wr) by size of largemouth bass collected by electrofishing from High Rock Lake during April 26 – May 3, 2006.