High Rock Lake Crappie Survey, 2006

SUMMARY REPORT

PIEDMONT FISHERIES INVESTIGATIONS

Federal Aid in Fish Restoration
Project F-23

Project Type: Survey

Period Covered: November 2006

Troy Thompson

Fisheries Biologist

North Carolina Wildlife Resources Commission
Division of Inland Fisheries
Raleigh

2008

This project was funded under the Federal Aid in Sport Fish Restoration Program utilizing state fishing license money and federal grant funds derived from federal excise taxes on fishing tackle and other fishing related expenditures.

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 for hydropower generation but also facilitates recreational uses. As a result of operational objectives, the lake is subject to a fall drawdown of approximately three meters**.** Shoreline development is relatively heavy with private developments along most of the lake. Shoreline habitat primarily consists of piers, riprap, tree laps and emergent vegetation. The reservoir is classified as eutrophic by the North Carolina Division of Water Quality (2007). Species of interest to anglers 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 blue catfish *Ictalurus furcatus*. The minimum size limit for black and white crappies in aggregate is 203 mm with a daily creel limit of 20 fish.

The objective of this survey was to obtain stock assessment data needed to evaluate and manage crappies in High Rock Lake.

Methods

Field Collections

Black and white crappies were collected from shoreline areas during the nights of November 7–8, 2006 using 25.4-mm-bar-mesh trap nets. Total length (mm) and weight (g) were measured and sagittal otoliths were collected from a subsample of 10 fish per 10-mm length interval. When fewer than 10 fish were collected per length interval, all fish collected within the interval were utilized. Those fish not subsampled were returned to the reservoir.

Data Assessment

The status of each crappie population was determined by evaluating several variables: 1) Relative Abundance; 2) Size Structure; 3) Age Structure; 4) Growth; and 5) Body Condition. Data were compared with surveys from previous years to monitor population trends and develop management recommendations to maintain and improve the crappie fishery.

Relative Abundance—Relative abundance was quantified by using catch-per-unit-effort (CPUE) data and was measured as the number of crappies collected per net night. High catch rates may indicate overcrowding, which can lead to poor growth rates and stunted populations. Low catch rates may indicate high annual mortality (natural and fishing) and poor survival of young fish (recruitment). However, low catch rates can also be due to sample bias. Because trap nets are stationary, catch rates can vary depending on fish movement and the density of fish within the area of the net set.

Size Structure—Size structure was evaluated using length frequency histograms and stock density indices. A length frequency index commonly used is the proportion of fish collected that are over the standard minimum length limit (203 mm for crappies). Stock density indices are numerical descriptors of length-frequency data. Two commonly used stock density indices are Proportional Size Distribution (PSD, the percentage of stock-size and larger fish that are also quality-size and larger) and Proportional Size Distribution-Preferred (PSD-P, the percentage of stock-size and larger fish that are also preferred-size and larger). The length categories for

crappies are: 130-199 mm (stock), 200-249 mm (quality), 250-299 mm (preferred), 300-379 mm (memorable), and >380 mm (trophy) (Gabelhouse 1984a). Low PSD and PSD-P values indicate that few large fish were collected, which may be due to insufficient forage or an overcrowded population. High values suggest poor recruitment or sampling bias, such as small fish escaping through the net mesh.

Age Structure—Age structure is the number of fish per age in the sample. An age-length key was used to expand age information from the subsample of sacrificed fish to the entire sample. The age structure was evaluated based on the percentage of age-3 and older crappies in the sample. A low percentage indicates that there are few older fish in the population due to high annual mortality caused by either natural events or overharvest. High percentages of older fish in the population may indicate poor recruitment or overcrowding.

Growth—Growth was evaluated by examining mean length at age at time of capture. Fast growth may be due to high harvest rates, poor recruitment, or the ability of the reservoir to support more fish. Slow growth may indicate overcrowding or an insufficient food supply.

Body Condition—Relative weight provides an indication of body condition compared to a national average and a value of 100 is considered ideal. Relative weight can fluctuate with season. 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 744 black crappies were collected from High Rock Lake. Mean CPUE for black crappies was 31.0 fish per net night, which is well above the Yadkin-Pee Dee River reservoir average of 11.8 fish per net night (NCWRC, unpublished data). The CPUE was also higher than the mean CPUE values of 2003 (14 fish per net night; Nelson and Dorsey 2005) and 2000 (23 fish per net night; Dorsey 2001).

A total of 269 white crappies were collected from High Rock Lake. Mean CPUE was 11.2 fish per net night. The CPUE was also higher than the mean CPUE values of 2003 (4 fish per net night; Nelson and Dorsey 2005) and 2000 (4 fish per net night; Dorsey 2001).

Size Structure

Approximately 51% of black crappies collected were over the minimum length limit of 203 mm (Figure 1). This is an increase from the 2003 value of 12% (Nelson and Dorsey 2005) but is less than the 2000 value of 57% (Dorsey 2001). The 2006 value was below the Yadkin-Pee Dee River reservoir average of 64% (NCWRC, unpublished data). Values for PSD and PSD-P were 56 and 12, respectively, and are in the ideal ranges of 30-60 for PSD and 10-20 for PSD-P (Gabelhouse 1984b).

Approximately 65% of white crappies collected were over the minimum length limit of 203 mm (Figure 2). This is an increase from the 2003 value of 37% (Nelson and Dorsey 2005) but is less than the 2000 value of 84% (Dorsey 2001). The 2006 value was slightly higher than the Yadkin-Pee Dee River reservoir average of 59% (NCWRC, unpublished data). The PSD value

of 70 is above the minimum ideal range 30-60 while the PSD-P value of 7 is slightly below the ideal range of 10-20 (Gabelhouse 1984b).

Age Structure

A total of 170 black crappies were aged and ranged in age from 1 to 6. The percentage of age-3 or older fish was 25% (Figure 3), and is above the Yadkin-Pee Dee River reservoir average of 18% (NCWRC, unpublished data). This value is also higher than the 2003 value of 9% and the 2000 value of 22% (NCWRC, unpublished data).

A total of 109 white crappies were aged and ranged in age from 1 to 5. The percentage of age-3 or older fish was 6% (Figure 4) and is less than the Yadkin-Pee Dee River reservoir average of 19% (NCWRC, unpublished data). This value is also higher than the 2003 value of 0% and the 2000 value of 5% (NCWRC, unpublished data).

Growth

Mean length of age-2 black crappies at the time of capture was 220 mm (Figure 5) and is below the Yadkin-Pee Dee River reservoir average of 236 mm (NCWRC, unpublished data). This value is higher than the 183 mm recorded in 2003 and is similar to the 2000 value of 218 mm (NCWRC, unpublished data). Mean total length for age-3 black crappies was 239 mm. This value is above the 2003 value of 214 mm but is below both the 2000 value of 248 mm and the Yadkin-Pee Dee River reservoir average of 268 mm (NCWRC, unpublished data).

Mean length of age-2 white crappies at the time of capture was 234 mm (Figure 6). This value is higher than the 2003 value of 211 mm and is slightly less than the 2000 value of 240 mm and the Yadkin-Pee Dee River reservoir average of 241 mm (NCWRC, unpublished data). Mean total length for age-3 white crappies was 264 mm and is very close to the Yadkin-Pee Dee River reservoir average of 266 mm (NCWRC, unpublished data) but slightly below the 2000 average of 272 mm (NCWRC, unpublished data). No white crappies over age-2 were caught in 2003.

Body Condition

Mean relative weight for quality-size black crappies was 98. This is similar to relative weights of 99 in 2003, 96 in 2000, and the Yadkin-Pee Dee River reservoir average of 96 (NCWRC, unpublished data). Relative weights remained fairly constant as length increased (Figure 7).

Mean relative weight for quality-size white crappies was 94. This is an increase over the 2003 value of 83 and is also higher than the 2000 value of 90 and the Yadkin-Pee Dee River reservoir average of 88 (NCWRC, unpublished data). Relative weights remained fairly constant as length increased (Figure 8).

Summary

In 2006, High Rock Lake had high densities of black and white crappies that also exhibited good body condition. Every parameter measured had rebounded to historical levels from the lows recorded in 2003, indicating both populations have fully recovered from the low-water conditions and weak year-classes of 2002. In fact, the black crappie population may be slightly crowded, with strong year-classes from 2003 to 2005. Growth was somewhat slow compared to other lakes in the Yadkin-Pee Dee River chain, with black crappies reaching the minimum length limit between age 2 and age 3.

The white crappie population recovered slower than the black crappie population. Few white crappies over age 1 (2005 year-class) were sampled in 2006, indicating weak year-classes were produced from 2002 to 2004. Consequently, the growth rate for white crappies was better, with fish reaching the minimum length limit by age 2. However, angling success was likely reduced in previous years when a strong year-class was not present.

Recommendations

1. Maintain current 203-mm minimum size limit and 20-fish daily creel limit on crappies at High Rock Lake.

2. Continue to sample High Rock Lake every 2-3 years during fall with trap nets to examine temporal trends in population and recruitment variability and evaluate current regulation.

References

Dorsey, L. G. 2001. Population characteristics of black crappie and white crappie in High Rock Lake. North Carolina Wildlife Resources Commission, Federal Aid in Fish Restoration, Project F-23-S, Final Report, Raleigh.

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

Gabelhouse, D. W. 1984b. An assessment of crappie stocks in small midwestern private impoundments. North American Journal of Fisheries Management 4:371-384.

NCDWQ (North Carolina Division of Water Quality). 2007. Lake and reservoir assessments – Yadkin-Pee Dee River Basin. Final Report, Raleigh.

Nelson, C., and L. Dorsey. 2005. Population characteristics of black crappie and white crappie in High Rock Lake 2003. North Carolina Wildlife Resources Commission, Federal Aid in Fish Restoration, Project F-23-S, Final Report, Raleigh.

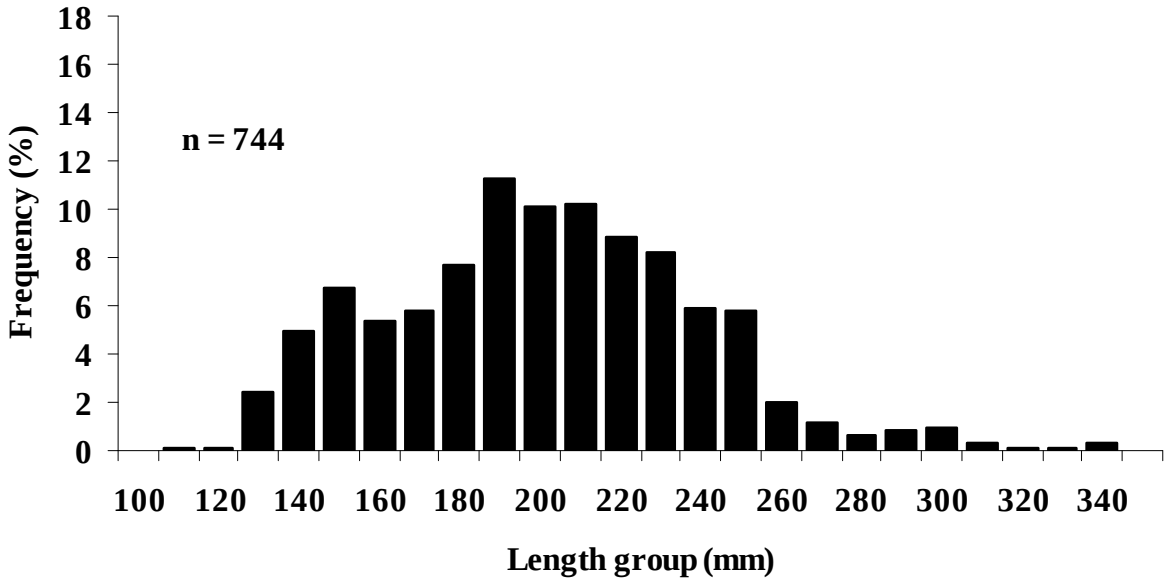

FIGURE 1.—Length frequency distribution of black crappies collected from High Rock Lake with trap nets, November 2006.

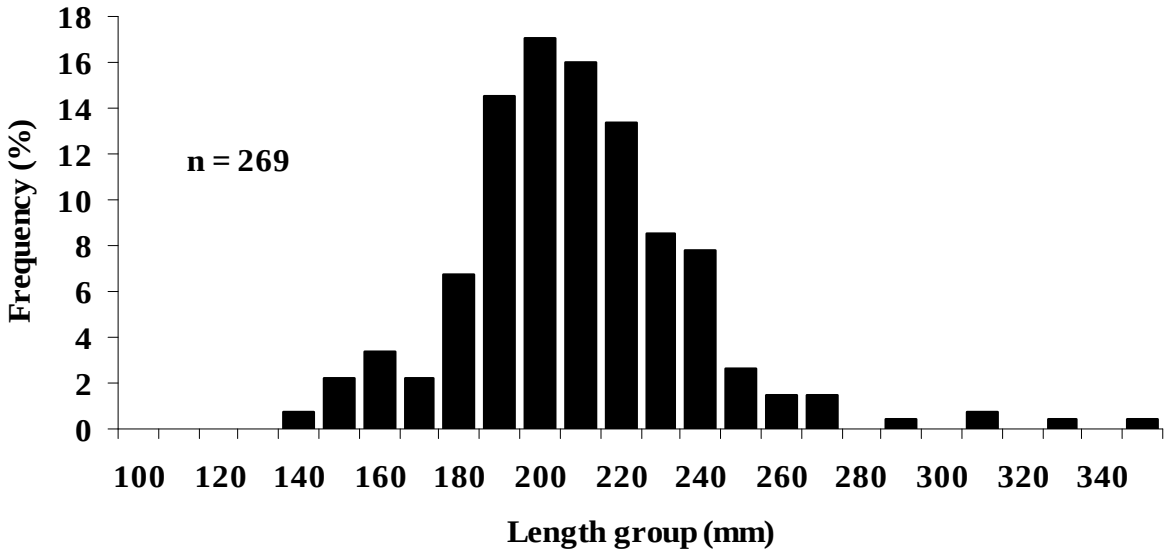

FIGURE 2.—Length frequency distribution of white crappies collected from High Rock Lake with trap nets, November 2006.

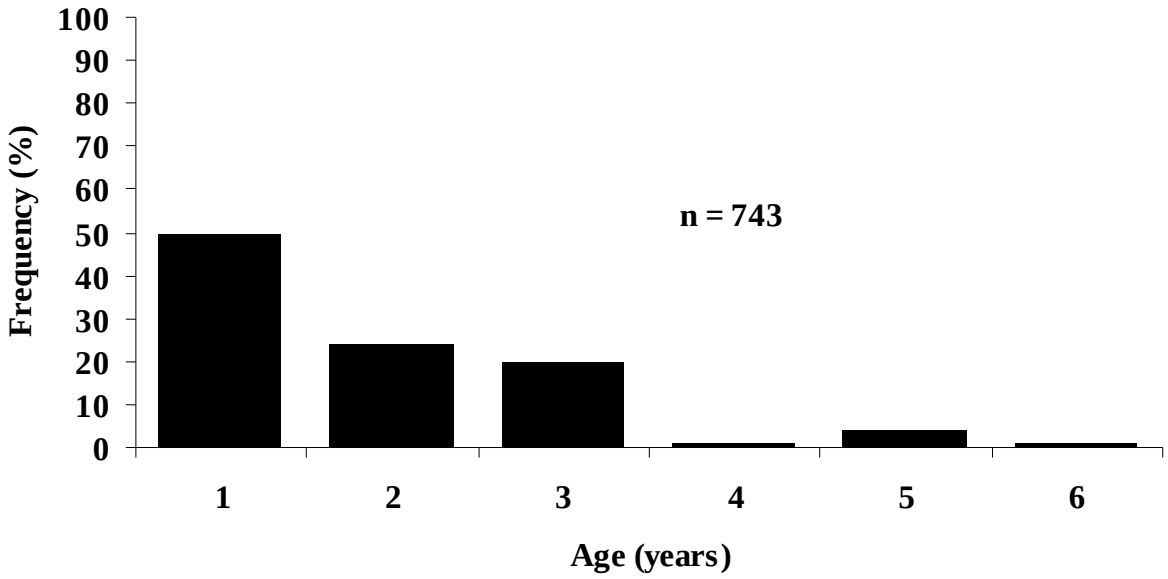

FIGURE 3.—Age frequency distribution of black crappies collected from High Rock Lake with trap nets, November 2006.

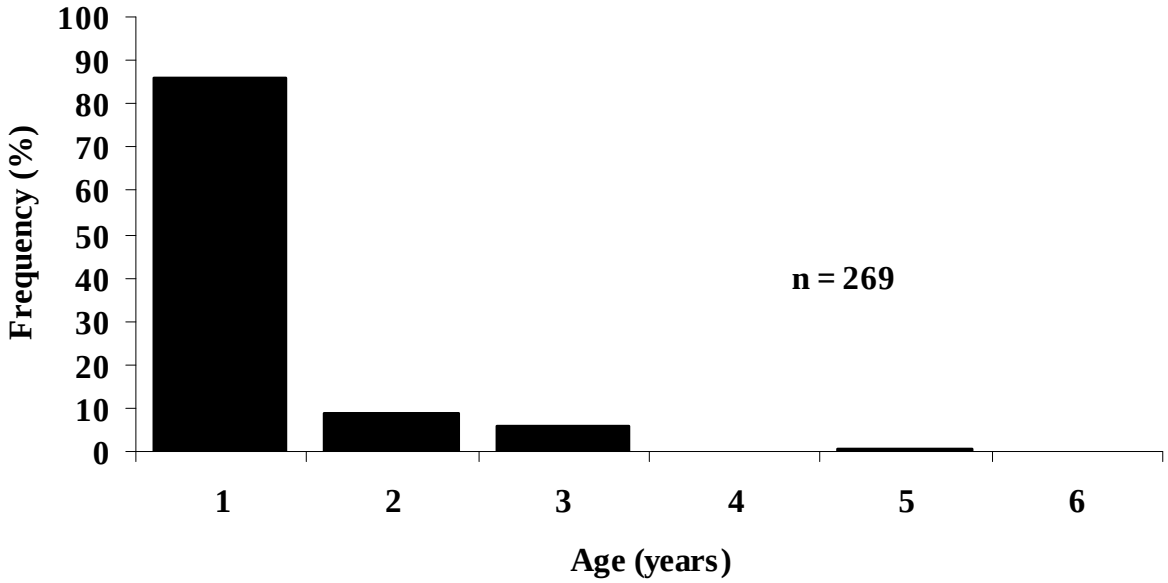

FIGURE 4.—Age frequency distribution of white crappies collected from High Rock Lake with trap nets, November 2006.

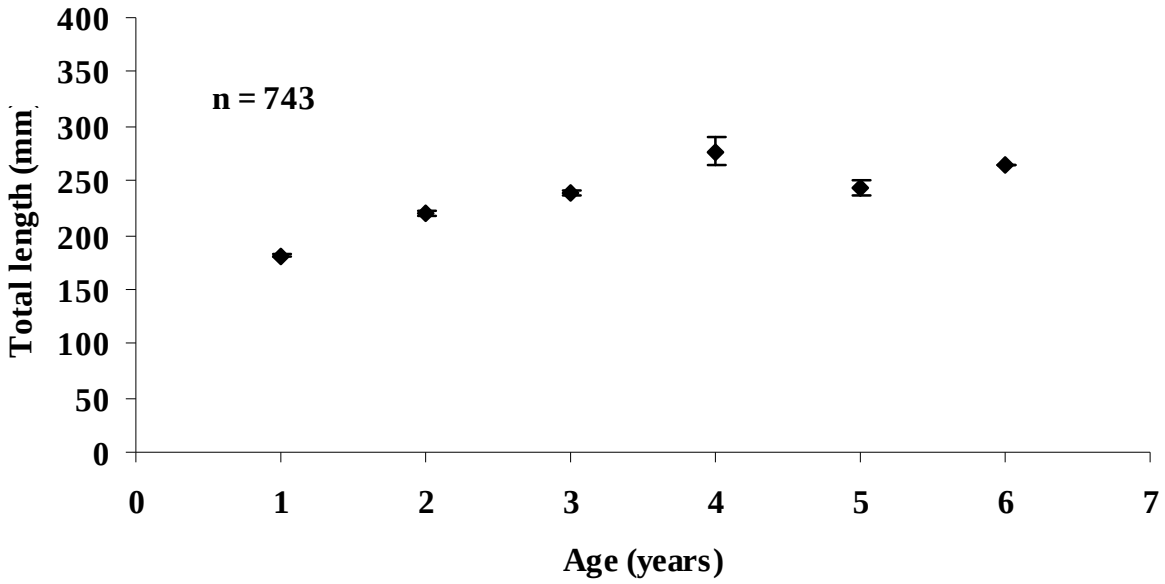

FIGURE 5.—Mean total length at age (± SE) at time of capture of black crappies collected from High Rock Lake with trap nets, November 2006.

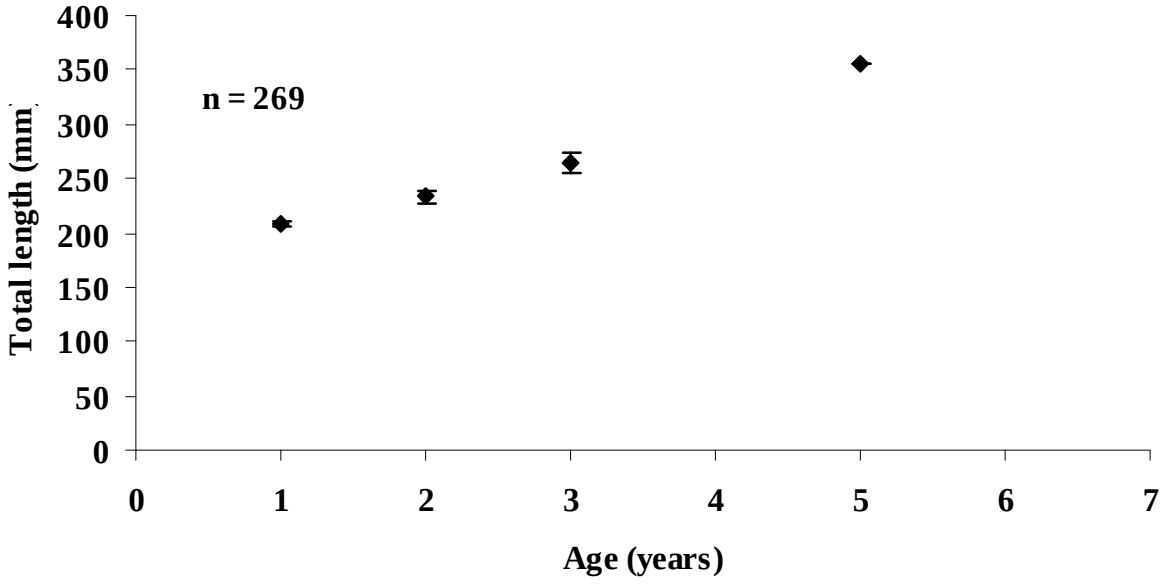

FIGURE 6.—Mean total length at age (± SE) at time of capture of white crappies collected from High Rock Lake with trap nets, November 2006.

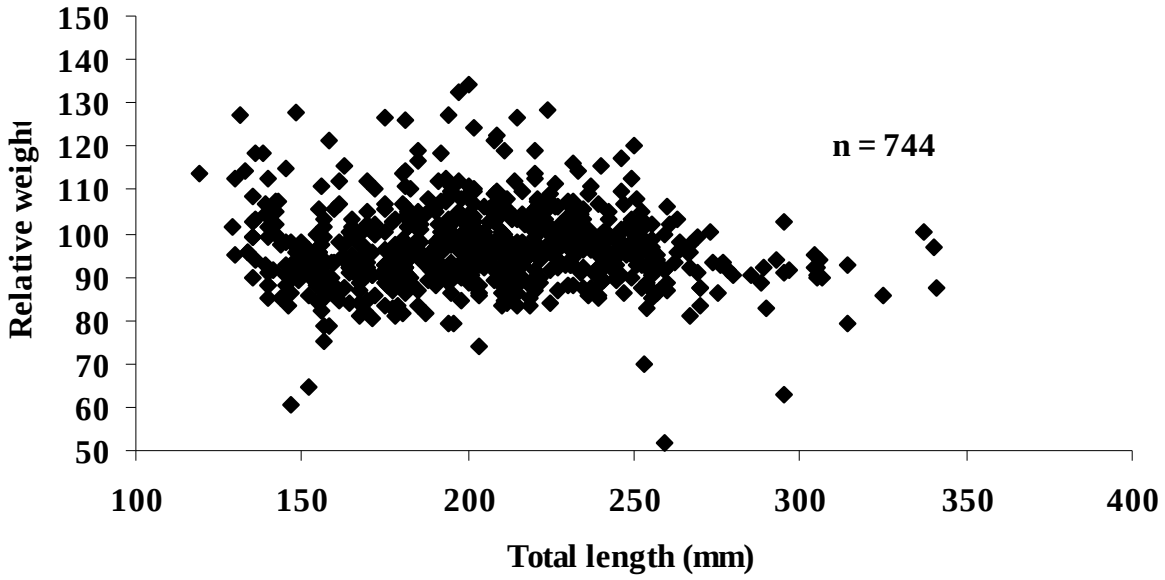

FIGURE 7.—Relationship between length and relative weight of black crappies collected from High Rock Lake with trap nets, November 2006.

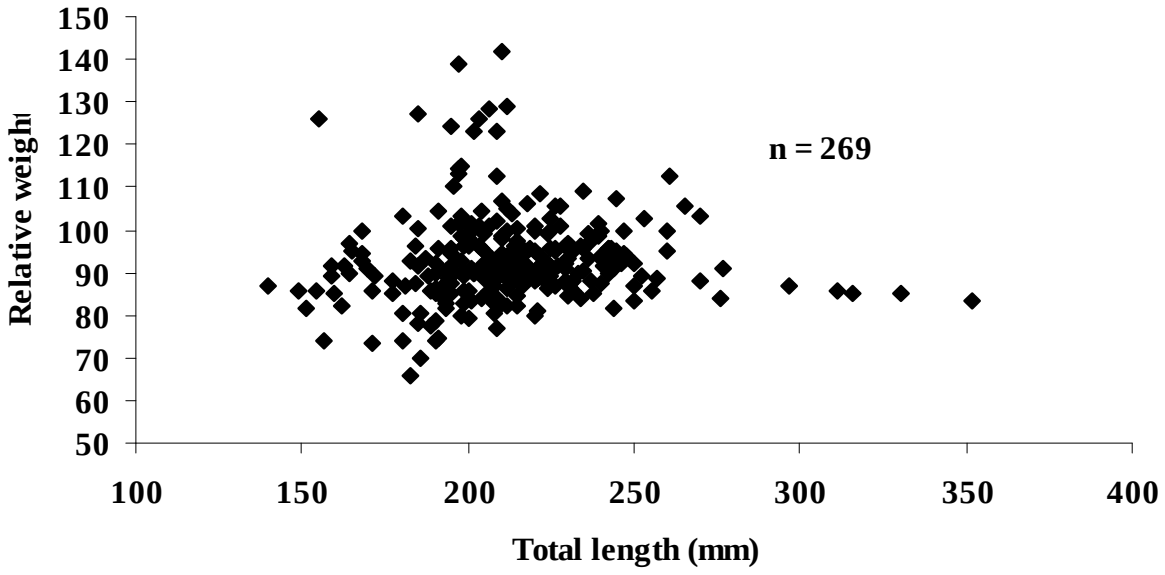

FIGURE 8.—Relationship between length and relative weight of white crappies collected from High Rock Lake with trap nets, November 2006.