POPULATION CHARACTERISTICS OF BLACK CRAPPIE AND WHITE CRAPPIE IN HIGH ROCK LAKE 2003

Piedmont Fisheries Investigations

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Abstract

Black and white crappie were sampled at High Rock Lake on October 27-29, 2003. A total of 328 black crappie and 92 white crappie were collected in 24 net nights of effort. Crappie ranged in size from 145 mm to 360 mm and greater than 75% were less than the minimum size limit of 203 mm. Length at age calculations indicated that both species reached harvestable size in 1.5 to 2 years of age and the relative weights of both species were at or above average. The mean total length and mean relative weight of fish in 2003 differed from data collected in 2000. Black crappie collected in 2000 had a mean total length of 214 mm while black crappie collected in 2003 were smaller and had an overall mean of 186 mm. However, mean relative weight values for black crappie collected in 2000 were lower (94) than in 2003 (98). Potential discrepancies between years may be attributed to density dependent factors. The overall recommendations based on results from the present study are to maintain the current size and creel limits and continue sampling the reservoir every 2 to 3 years to monitor crappie populations.

Introduction

Black crappie (*Pomoxis nigromaculatus*) and white crappie (*Pomoxis annularis*) are significant warm-water sport fishes in the Southeast. Crappie are the most harvested fish in reservoirs in the United Sates (Miranda 1999). With a high amount of angling pressure directed at both black and white crappie (USFWS 1996; Miranda 1999), population monitoring for these species is vital. Continuous monitoring of the species also is important because the population fluctuates widely in density and age structure (Miranda and Allen 2000). This can be impacted further by the fact that most crappie anglers are interested in harvest (Allen and Miranda 1996; Miranda 1999). Therefore, thorough data collection on a routine basis is necessary to ensure crappie harvest regulations are consistent with population characteristics.

The most recent crappie population monitoring sample for High Rock Lake was conducted in 2000. From that sample, it was noted that the black and white crappie populations were in good condition. In addition, the catch rates for both species, particularly black crappie, were high, and the length frequency data demonstrated that a large percentage of the population was at or above harvestable size. The overall recommendations based on results from the sample were to maintain the current size and creel limits and to sample and reevaluate the crappie population every 2 to 3 years.

The objectives of the current study were two-fold and based, in part, on previous data collections and recommendations: 1) to collect current data on black and white crappie populations in High Rock Lake and 2) to compare the data from the current study with data collected in previous samples.

Study Area

High Rock Lake is a 6374 ha mainstream impoundment located on the Yadkin River in Davidson and Rowan Counties and is classified as a eutrophic reservoir by the NC Division of Water Quality (NCDENR 2002). The reservoir is operated by Yadkin-APGI and was incorporated for hydropower generation. As a result of operational

objectives, the water level in High Rock Lake fluctuates year round. Furthermore, the reservoir facilitates flood control and recreational uses on a yearly basis.

Shoreline development is relatively heavy as homes, lawns, boathouses, piers, and other facilities are found along most of the lake. Aquatic cover consists mostly of tree laps and buttonbushes and riprap along railroad and highway approaches. High Rock Lake contains several fish species of interest to anglers including largemouth bass (*Micropterus salmoides*), white bass (*Morone chrysops*), striped bass (*Morone saxatilis*), black and white crappie, flathead catfish (*Pylodictus olivaris*), and blue catfish (*Ictalurus furcatus*).

Methods

Samples were collected using trap nets (25.4-mm bar mesh) from October 27, 2003 to October 29, 2003. Trap nets were set throughout all sections of the reservoir. Sites for this study were selected from locations used in previous samples (NCWRC District 6, unpublished). Each net was fished for two consecutive nights.

All captured crappie were removed from the net, identified to species, and measured to total length (mm). Ten fish per 10 mm size group of both species were sacrificed and sagittal otoliths removed. Additionally, representative subsets of both species were weighed to the nearest gram and were released.

Otoliths were allowed to dry for several weeks before being read. All otoliths were examined in whole view under a dissecting microscope at 10-40X. Two independent readers made age determinations. A joint reading rectified discrepancies in ages between readers.

Data analysis was separated by species. Length and age frequency histograms were constructed for both species. Relative weights (Wr) were computed for both species using the equations of Neumann and Murphy (1991). Mean lengths at age and their associated confidence intervals also were computed for each species. Furthermore, a catch per unit effort (CPUE) was computed for both species. Comparisons of mean total length and mean Wr scores were made between data collected in this sample and data collected in the 2002 sample using a Student's t-test. Since black crappies were the predominant Pomoxis spp. collected in the lake, only values for this species were compared between years.

Results

A total of 328 black crappie and 92 white crappie were collected during this sample. CPUE for black crappie was 14 fish per net night while CPUE was 4 fish per net night for white crappie. Black crappie collected in this sample ranged in size from 145 mm to 360 mm with 88% being less than the minimum size limit of 203 mm (Figure 1). White crappie were also collected over similar size ranges (160 mm to 310 mm) and 63% were less than the minimum size limit of 203 mm (Figure 2). Relative weight scores for black crappie were constant across the range of sizes collected and the average Wr score was 98 (Figure 3). Most white crappie scored under 100 and the average Wr for this species was 83 (Figure 4).

Several age-classes were collected in this sample. Black crappie ranged in age from 1 to 7 years, with most fish being less than 3-years-old (Figure 5). The age distribution of white crappie showed fish from the 1- to 2-year-old classes (Figure 6). Length at age calculations indicated that both species reached harvestable size in 1.5 to 2 years of age (Figure 7 and Figure 8).

Mean total length and mean Wr scores differed between samples collected in 2000 and 2003. Black crappie collected in 2000 had a mean total length of 214 mm while black crappie collected in 2003 were smaller and had an overall mean of 186 mm ($t = 11.73$; $df = 875$; $P = < 0.01$). However, mean Wr values for black crappie collected in 2000 were lower (94) than in 2003 (98) ($t = -8.36$; $df = 859$; $P = <0.01$).

Discussion

The black and white crappie populations in High Rock Lake appear to be adequate and in good condition. Catch rates for both species, particularly black crappie, were high and mean Wr for both species were at or above average. However, the length frequency data revealed that a large percentage of the population was at or below harvestable size. Length at age calculations indicated that black and white crappie did not reach harvestable size until 2 years of age (Figures 7 and 8). Growth rates and Wr suggest a growing and well-conditioned population, which suggests that the lake is able to sustain a healthy population of both crappie species. Reproduction appeared to be fairly constant across years and no missing year-classes were detected.

The crappie population in High Rock Lake, as measured in 2003, appears to be somewhat different than what was observed in 2000. A small percentage of harvestable crappie were collected in the present study than in 2000. Also, mean total length was lower in this study than in the 2000 study. However, mean Wr values were lower in 2000 than in the present study. The results from the present study are more comparable to the results of Chapman and Chambers (1993), despite the differences in sampling equipment (12.7-mm net vs. 25.4-mm net). Chapman and Chambers (1993) found that the mean total length for black crappie in High Rock Lake was 205 mm and the mean Wr value was 97.

Anglers at High Rock Lake expressed concerns regarding the size structure of the crappie population during 2002 and 2003. Many of those concerns centered on the impacts of the large drawdown that occurred during the summer of 2002. Although there is no precise estimate of the number of crappie that perished during that event, it appears that an adequate crappie population has persisted in High Rock Lake. It is likely that the presence of a smaller size distribution is a result of density dependent effects on growth. Age frequency data collected in this study suggest that most of the crappie present in the lake were from the 2001 year-class. These smaller fish were below the legal harvest limit (203 mm) which probably reduced fishing mortality for this age class. Therefore, these smaller fish persisted for a longer period of time than previous year classes. However, as these fish grow to a size vulnerable to harvest, the size structure for 2001 year class should expand since fewer crappie will be vying for available forage.

Conclusions

Currently, it appears that the minimum size limit of 203 mm and the 20 fish per day creel limit are maintaining a healthy crappie fishery in High Rock Lake. Given the stochastic nature of recent year-class strengths and the associated effects on the crappie populations at High Rock Lake, a change in harvest restrictions does not appear warranted at this time. We will continue to collect data on this reservoir to determine if size and creel limits are appropriate for the crappie population characteristics in High Rock Lake.

Management Recommendations

1. Maintain the current minimum size limit of 203 mm and the 20 fish per day creel limit on High Rock Lake
2. Continue to sample the reservoir every 2-3 years to monitor the crappie population and to evaluate current regulations

References

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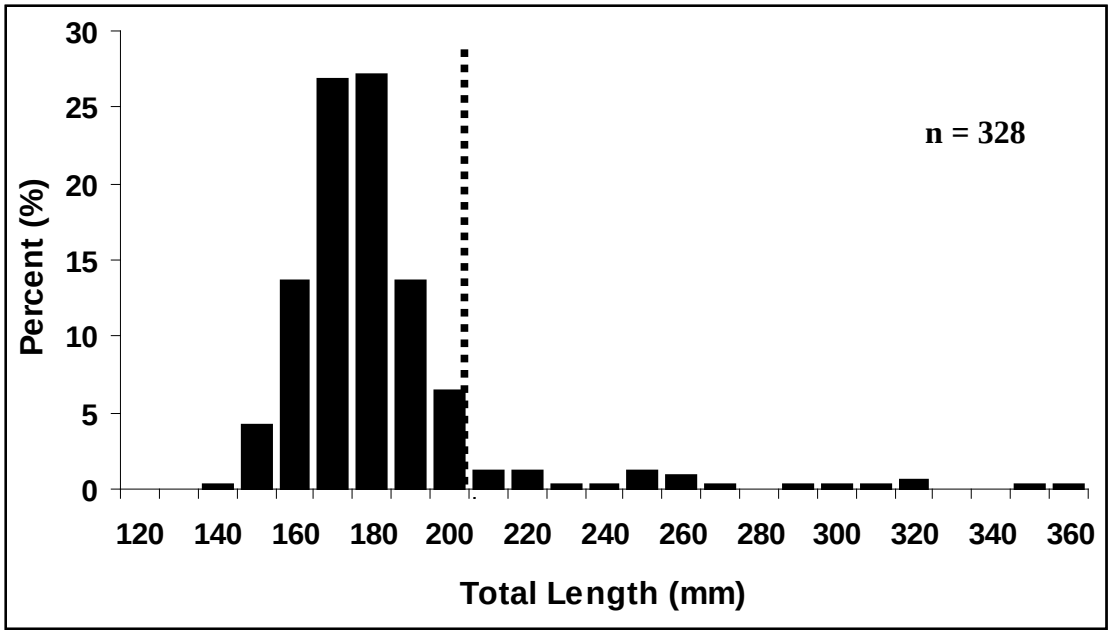

Figure 1. Total length of black crappie collected from High Rock Lake using trap nets October 27 – October 29, 2003. Dashed line indicates the 203 mm size limit in effect on High Rock Lake.

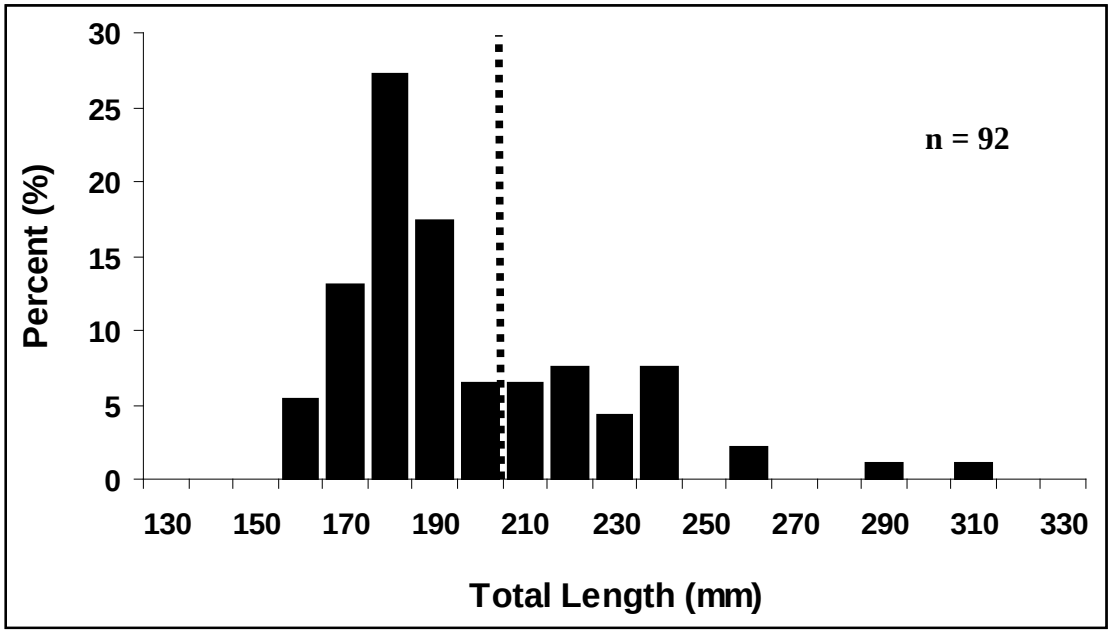

Figure 2. Total length of white crappie collected from High Rock Lake using trap nets October 27 – October 29, 2003. Dashed line indicates the 203 mm size limit in effect on High Rock Lake.

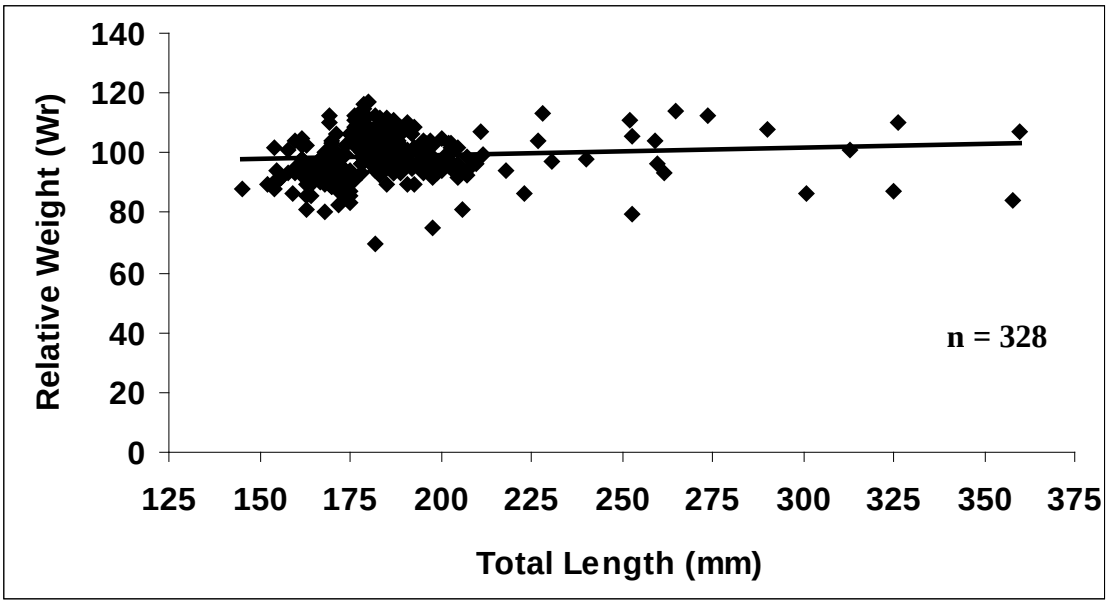

Figure 3. Relative weight (Wr) values of black crappie collected from High Rock Lake using trap nets October 27 – October 29, 2003.

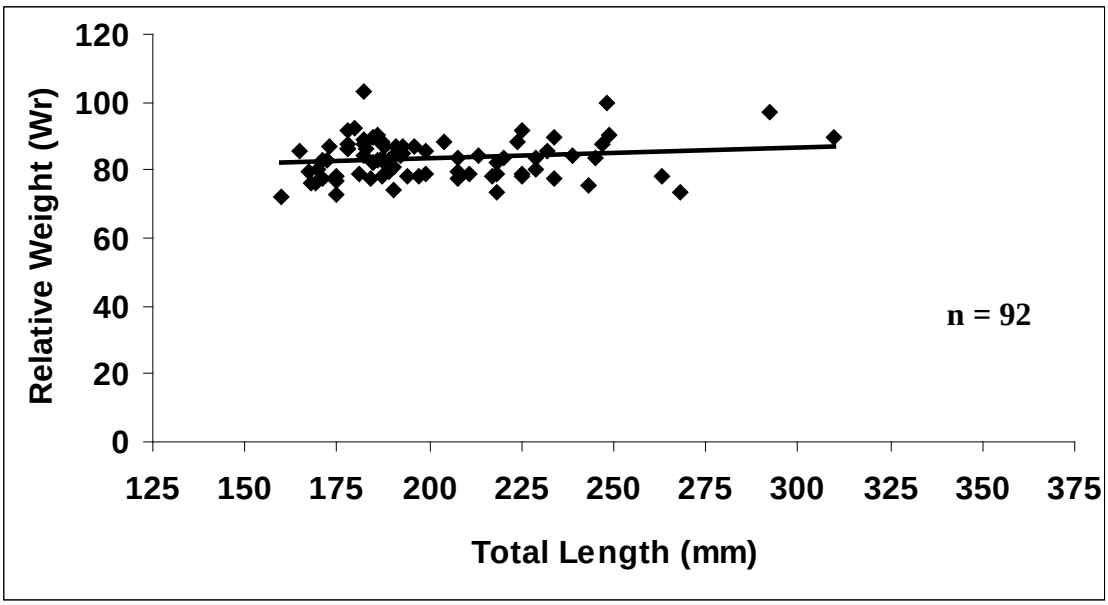

Figure 4. Relative weight (Wr) values of white crappie collected from High Rock Lake using trap nets October 27 – October 29, 2003.

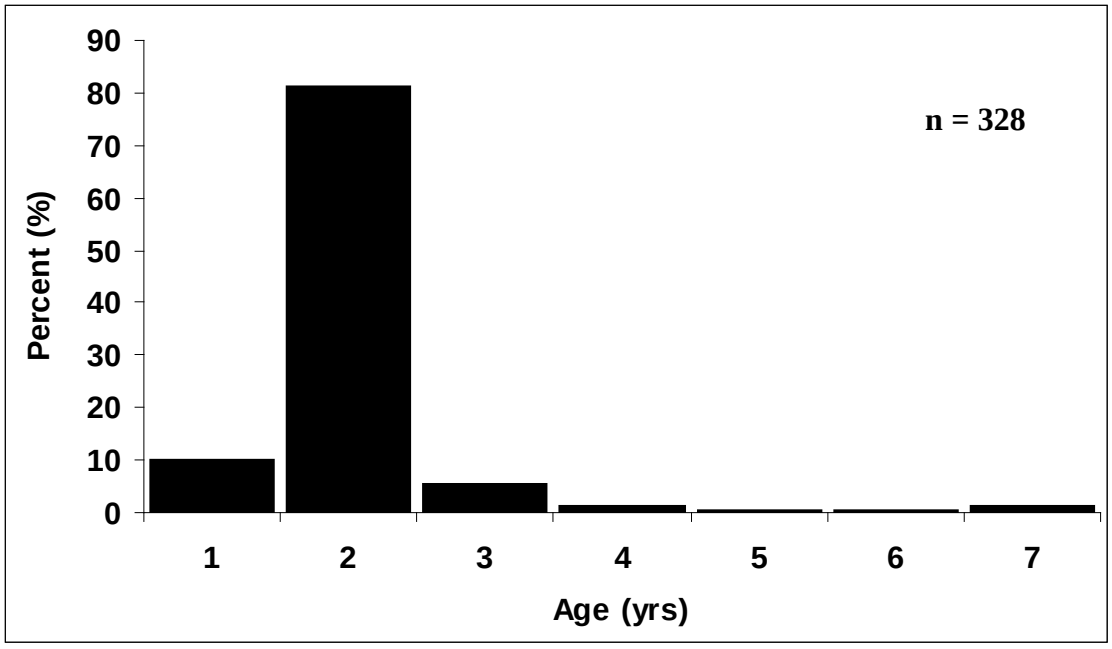

Figure 5. Age distribution of black crappie collected from High Rock Lake using trap nets October 27 – October 29, 2003.

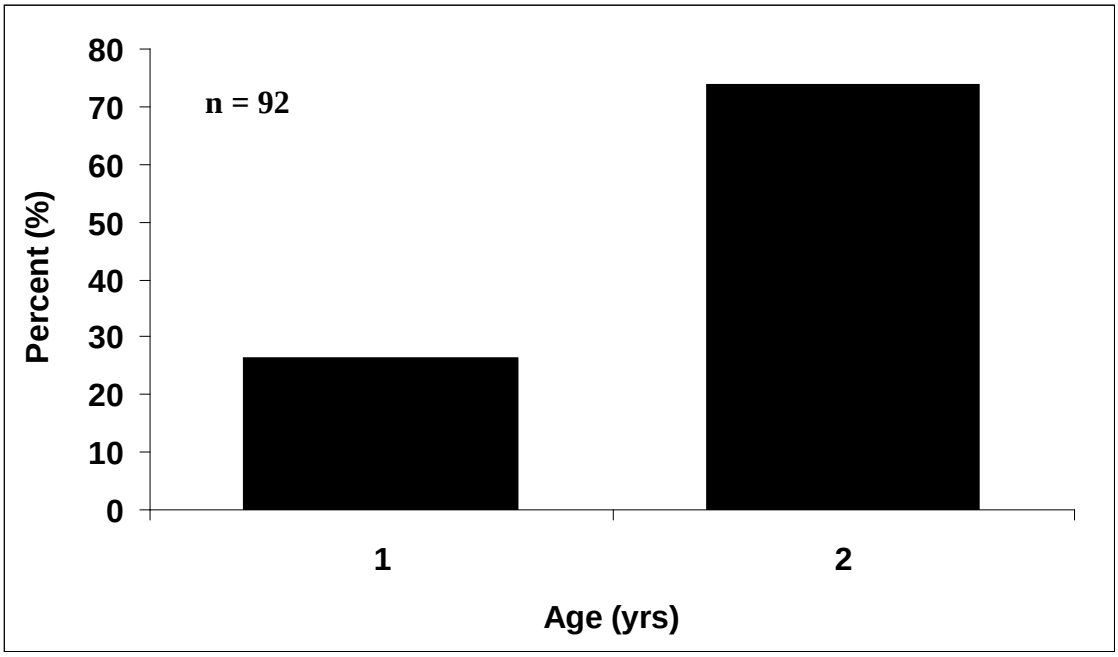

Figure 6. Age distribution of white crappie collected from High Rock Lake using trap nets October 27 – October 29, 2003.

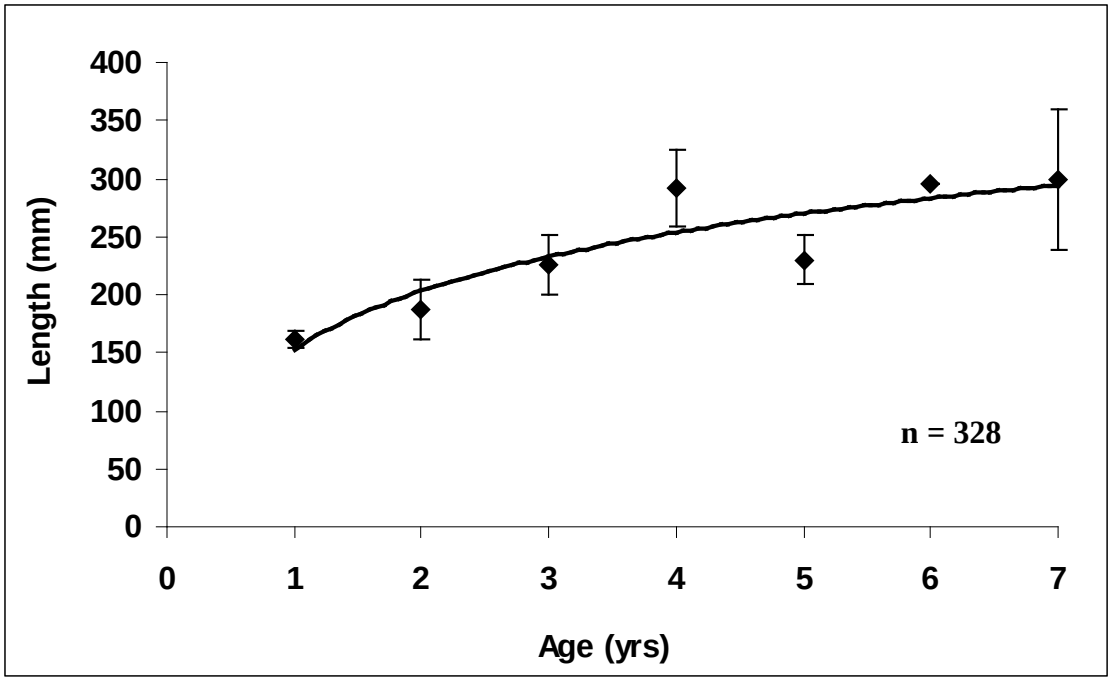

Figure 7. Mean total length at age with associated standard error bars of black crappie collected from High Rock Lake using trap nets October 27 – October 29, 2003.

Figure 8. Mean total length at age with associated standard error bars of white crappie collected from High Rock Lake using trap nets October 27 – October 29, 2003.