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

Piedmont Fisheries Investigations

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Abstract

Crappies were sampled at High Rock Lake from October 30, 2000 to November 3, 2000. A total of 924 black crappies and 160 white crappies were collected in 44 net nights of effort. Length frequency and relative weights of both populations indicated a wide range of sizes and above average condition for black crappies. Several age-classes were present and growth rates were high for both species. Given the current data, size and creel limits at High Rock Lake should not be modified.

Introduction

With the high amount of angling pressure directed at both black crappie Pomoxis nigromaculatus and white crappie P. annularis (USFWS 1996), population monitoring for both of these species is vital. This is particularly important since most crappie anglers are interested in harvest (Allen and Miranda 1996), while largemouth bass Micropterus salmoides anglers primarily practice catch and release (Quinn 1996). Therefore, thorough data collection on a routine basis is necessary to ensure crappie harvest regulations are consistent with population characteristics.

A paucity of current information exists on the crappie population in High Rock Lake. Various anglers contacted informally and wildlife enforcement officers indicate the lake has a quality crappie fishery. The last sample collected by the North Carolina Wildlife Resources Commission (NCWRC) was in 1992 (Chapman and Chambers 1993). As a result of interest from anglers and supporting biological data, a 203 mm minimum size limit and 20 fish per day creel limit were placed on both crappie species at High Rock Lake effective July 1, 1993.

The objectives of this study were to:

1) Collect data on the black crappie and white crappie populations in High Rock Lake
2) Compare data from this sample with data collected in 1992

Study Area

High Rock Lake is a 6374 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 at scattered locations, as well as riprap along railroad and highway approaches. High Rock Lake is classified as a eutrophic reservoir by the NC Division of Water Quality (NCDENR 1988).

Several species of interest to anglers are present in High Rock Lake. They include largemouth bass, white bass Morone chrysops, striped bass M. saxatilis, black crappie, white crappie, flathead catfish Pylodictus olivaris, and blue catfish Ictalurus furcatus.

Methods

Samples were collected using trap nets from October 31, 2000 to November 3, 2000. Trap nets were set throughout the lower end of the reservoir as well as in the Abbott's Creek, Flat Swamp Creek, and Dutch Second Creek arms of the reservoir. Each net was fished for two consecutive nights except for four nets in the upper end of the reservoir, which were removed after one night due to falling water levels. Where possible, net sites were selected that had been used in 1992 (Chapman and Chambers 1993). This year four new sites were added in Abbott's Creek as a result of low water levels that allowed access under the NC Highway 8 bridge.

All crappies were removed from the net, identified to species, and measured to total length (mm). Additionally, a representative subset of both species was weighed to the nearest g before being released. Ten fish per 10 mm size group of both species were sacrificed and sagittal otoliths were removed.

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 frequency histograms and age frequency histograms were constructed for both species. Relative weights (Wr) were computed using the equations of Neumann and Murphy (1991). Mean lengths at age and their associated confidence intervals were also computed for each species. Also, a catch per unit effort (CPUE) was computed for both species. Comparisons of mean TL and mean Wr scores were made between data collected in this sample and data collected in the 1992 sample using a Student's t-test. Since black crappies are the predominant Pomoxis spp. in the lake, only values for this species were compared between years.

Results

A total of 924 black crappies and 160 white crappies were collected during this sample. CPUE for black crappies was 23 fish per net night while CPUE was 4 fish per net night for white crappies. Black crappies collected in this sample ranged in size from 128 mm to 332 mm with over 57% greater than or equal to the 203 mm minimum size limit (Figure 1). White crappies were collected over similar size ranges (165 mm to 323 mm) and 84 % were larger than the 203 mm minimum size limit (Figure 2). Relative weight scores for black crappie were constant across the range of sizes collected and the average Wr score was 94 (Figure 3). Most white crappies scored under 100 and the average Wr for this species was 89 (Figure 4).

Several age-classes were collected in this sample. Black crappies ranged in ages from 1 to 7 years with most fish less than 4 years old (Figure 5). The age distribution of white crappies showed fish from the 1 to 4 year old classes with most fish less than 2 years old (Figure 6). Length at age calculations indicated that both species reached harvestable size in 1.5 years (Figure 7 and Figure 8).

Mean TL and mean Wr scores differed between samples collected in 1992 and 2000. Black crappies collected in 1992 had a mean TL of 205 mm while black crappies collected in 2000 were larger overall with a mean of 214 mm ($t = -2.43$; $df = 223$; $P = 0.02$). However, mean Wr values for black crappies were lower in 2000 (94) than in 1992 (97) ($t = 2.63$; $df = 110$; $P = 0.01$).

Discussion

The black crappie and white crappie populations in High Rock Lake appear to be in good condition. Catch rates for both species, particularly black crappie, were high and length frequency data showed a large percentage of the population at or above harvestable size. Growth rates also suggested a fast growing population indicating the lake's ability to sustain healthy populations of both species. Reproduction appeared to be fairly constant among years and no missing year-classes were detected.

Chapman and Chambers (1993) found the crappie populations in High Rock Lake to be somewhat different in 1992. A higher number of harvestable black crappies were collected in this study than in 1992. Also mean TL was greater in this study than the previous sample. However, mean Wr was lower in 2000 than in 1992. A confounding factor may inhibit direct comparisons between this study and Chapman and Chambers (1993). In 1998, the NCWRC selected the 25.4-mm bar mesh net, as it's standard crappie sampling tool. All samples in 1992 were collected using 12.7-mm bar mesh nets. Concurrent samples taken with both gears showed higher catch rates with the 25.4-mm nets as opposed to the 12.7-mm nets (Besler et al. 1998). Also, length frequencies of crappie collected in both mesh sizes suggested the 25.4-mm nets sampled large crappies more effectively.

It appears that the 203 mm minimum size limit and 20 fish per day creel limit are adequately maintaining a healthy crappie fishery in this reservoir. There is some sentiment among local anglers for a more restrictive minimum size limit. However, a change in harvest restrictions does not appear warranted at this time. Restrictive size limits are most effective when growth is rapid and natural mortality is low (Allen and Miranda 1995). Although no estimates of natural mortality versus fishing mortality are available, current Wr scores suggest an increased size limit may reduce growth rates and lead to a reduction in mean total length. Although these scores are not below average currently, additional fish in the population would force increased competition for a fixed amount of prey resources. Also, restrictive size limits are often used to dampen the effects of missing year classes. Reproduction of both species has been steady over the past four years further indicating the need to stay with current regulations. The NCWRC 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. Continue the 203 mm minimum size limit and 20 fish per day creel limit on High Rock Lake
2. Sample the reservoir every 2-3 years to monitor the crappie population and evaluate current regulations
3. Utilize FAST software to predict changes in the population with more restrictive regulations

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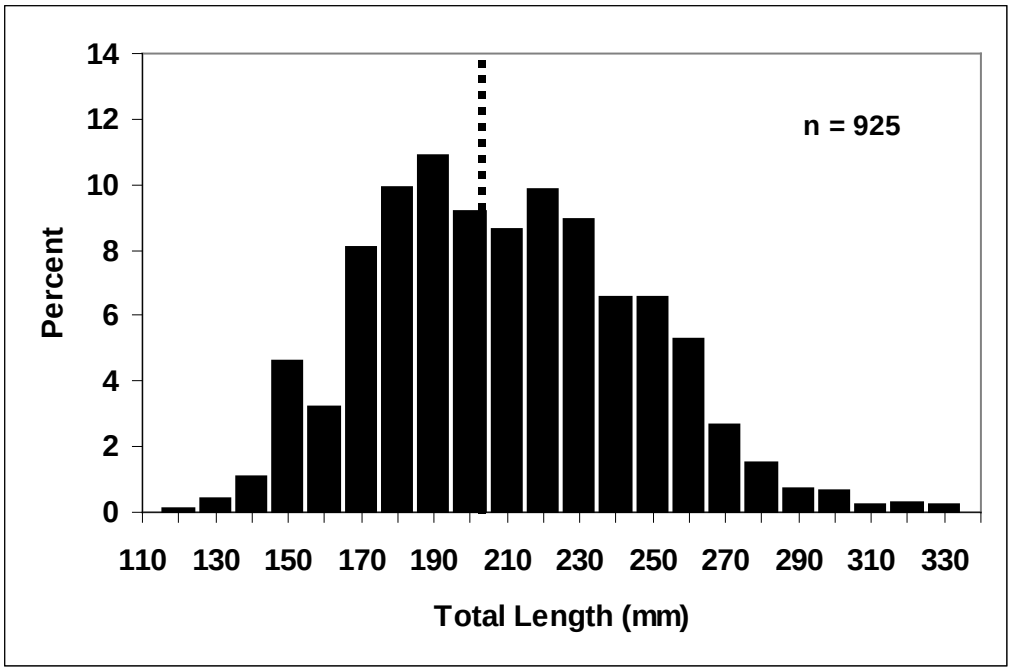

Figure 1. Total length of black crappies collected from High Rock Lake using trap nets on October 30 – November 3, 2000. Dashed line indicates the 203- mm size limit in effect on High Rock Lake.

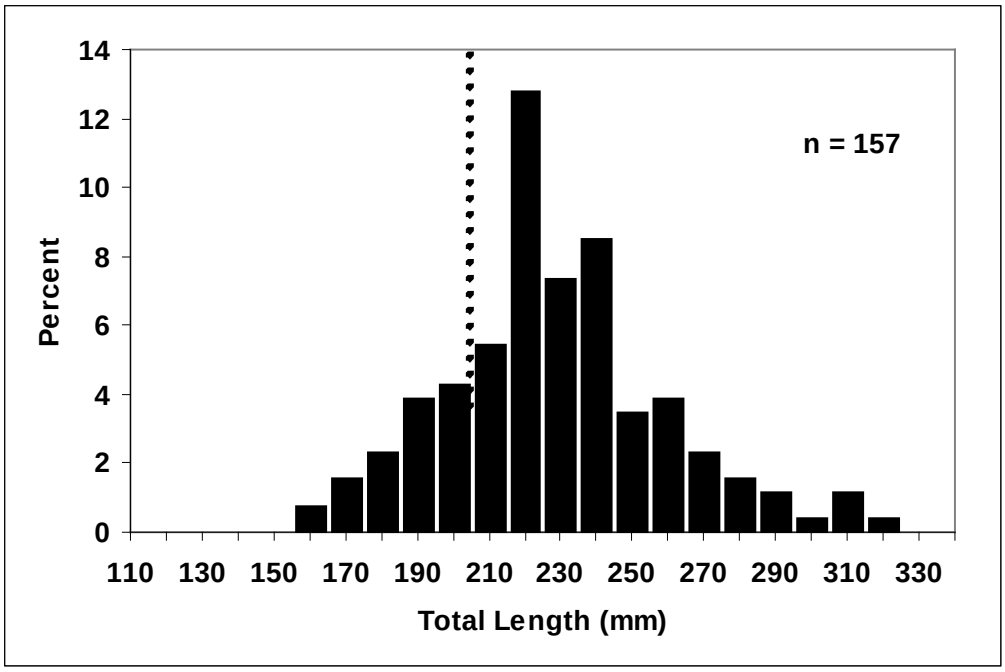

Figure 2. Total length of white crappies collected from High Rock Lake using trap nets on October 30 – November 3, 2000. Dashed line indicates the 203- mm size limit in effect on High Rock Lake.

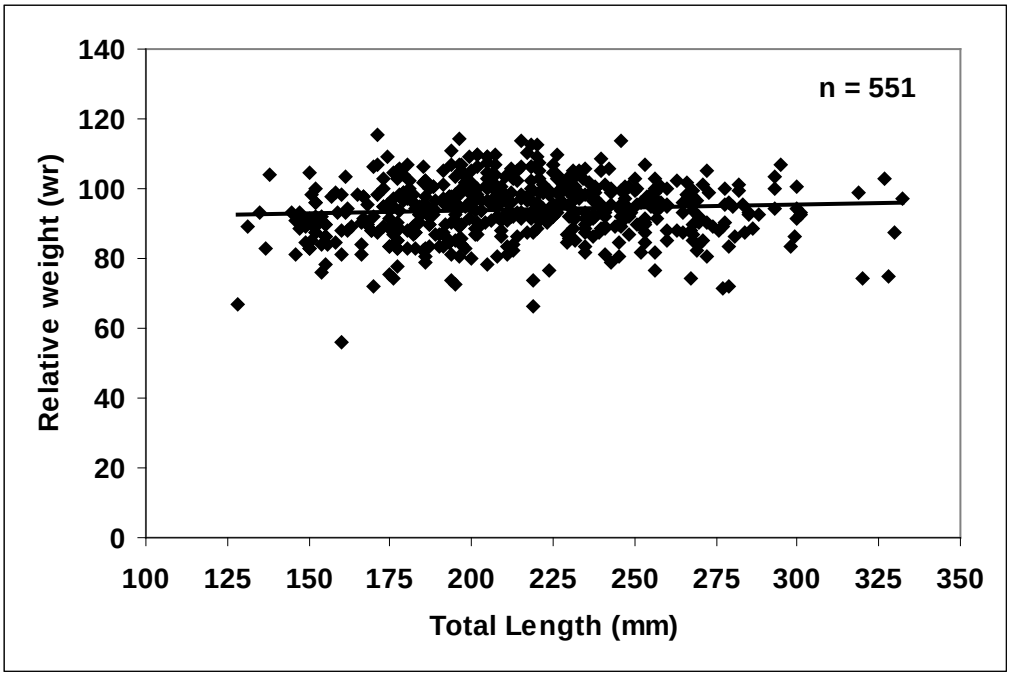

Figure 3. Relative weight (Wr) values of black crappies collected from High Rock Lake using trap nets on October 30, 2000 – November 3, 2000.

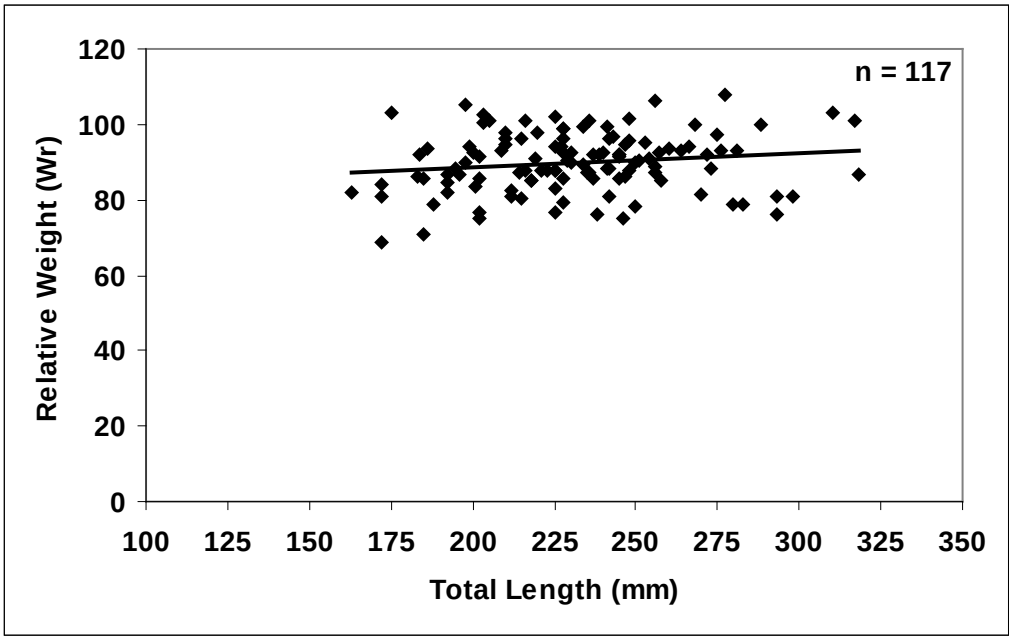

Figure 4. Relative weight (Wr) values of white crappies collected from High Rock Lake using trap nets on October 30, 2000 – November 3, 2000.

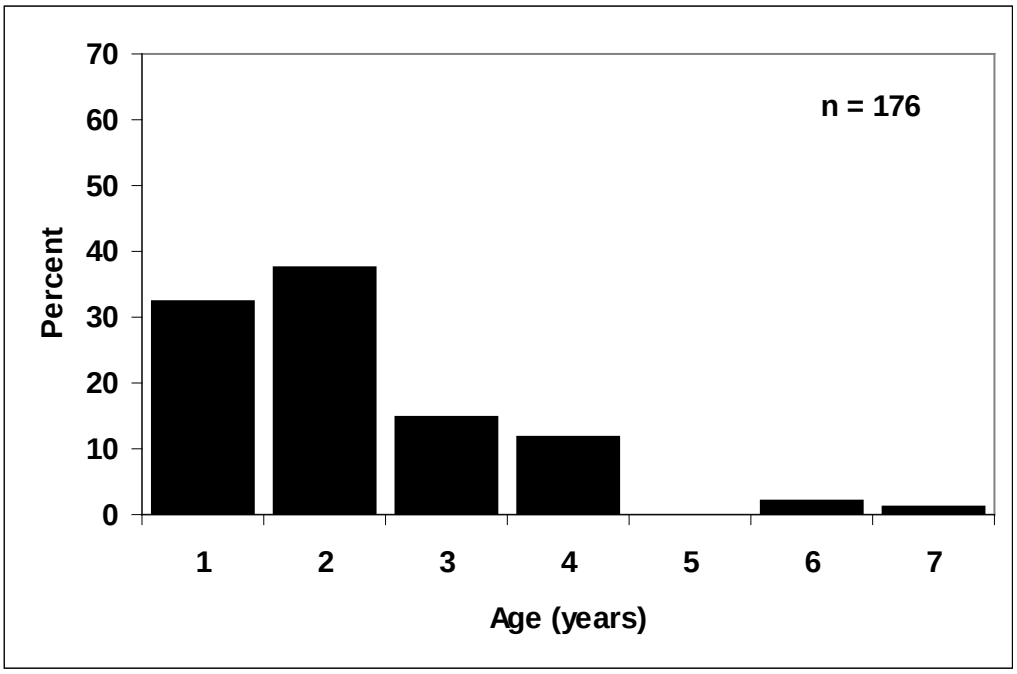

Figure 5. Age distribution of black crappies collected from High Rock Lake using trap nets on October 30, 2000 to November 3, 2000.

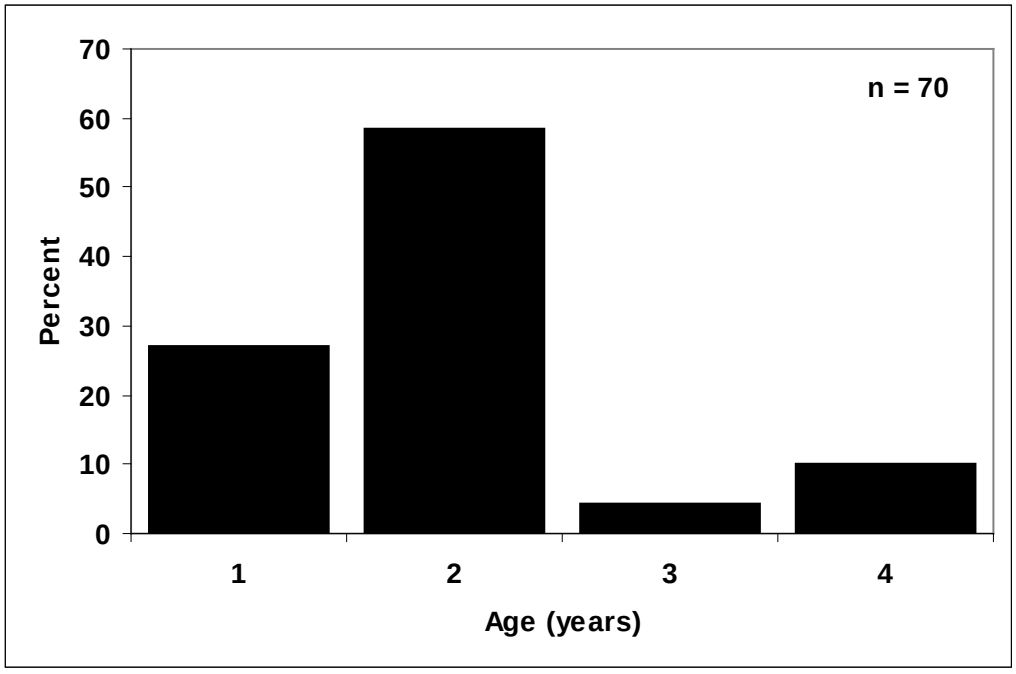

Figure 6. Age distribution of white crappies collected from High Rock Lake using trap nets on October 30, 2000 to November 3, 2000.

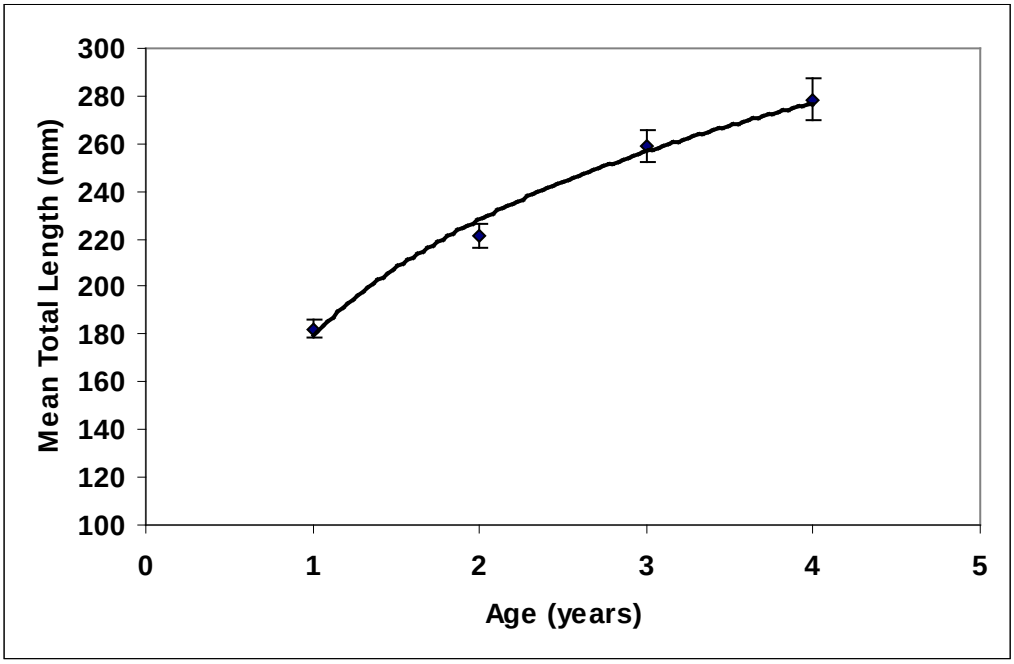

Figure 7. Mean total length at age with associated standard error bars of black crappies collected from High Rock Lake using trap nets on October 30, 2000 to November 3, 2000.

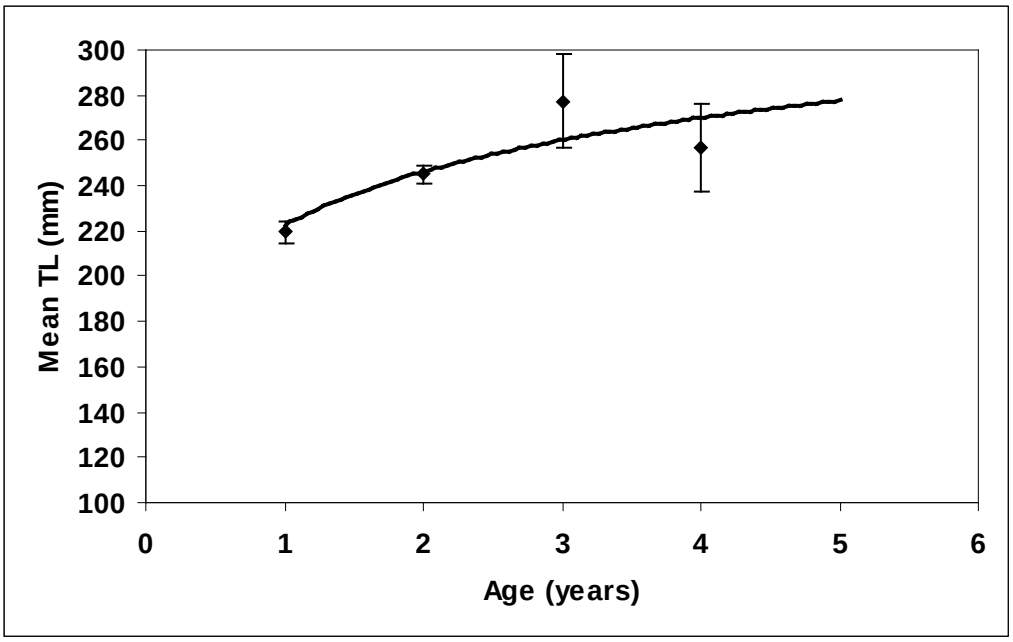

Figure 8. Mean total length at age with associated standard error bars of white crappies collected from High Rock Lake using trap nets on October 30, 2000 to November 3, 2000.