LAKE JAMES BLACK BASS INVESTIGATION
SURVEY SUMMARY 2004

Mountain Fisheries Investigations

Federal Aid in Fish Restoration Project F-24

Project Type: Survey

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2005


SPORT FISH RESTORATION

Abstract.—This report summarizes the findings of a black bass *Micropterus spp*. shoreline electrofishing survey conducted on Lake James in May 2004. The largemouth *M. salmoides* and smallmouth bass *M. dolomieu* populations in Lake James are spatially segregated based on water quality differences associated with the two impounded river basins. A total of 134 largemouth bass and 100 smallmouth bass were collected during this survey. Seventy-seven percent of the largemouth bass were collected within the Catawba River arm, while 68% of the smallmouth bass were collected from the Linville/Paddy Creek arm of Lake James. Catch rates of largemouth bass (19.5 fish/hour) were higher than smallmouth bass catch rates (14.7 fish/hour). Largemouth bass ranged from 69-576 mm total length compared to 68-510 mm total length for smallmouth bass. Of the largemouth bass collected 35% were in the preferred (>380 mm) and 2% were in the memorable (>510 mm) size class, with no trophy fish collected. Forty-two percent of the smallmouth bass were in the preferred (>350 mm) size class, 16% were in the memorable (>430 mm) size class, and 1% were in the trophy (>510 mm) size class. Mean relative weights of largemouth bass (89) and smallmouth bass (83) were low indicating that the Lake James black bass population may be competing with walleye *Sander vitreus* and white bass *Morone chrysops* for available forage. Largemouth bass up to age-11 were found, with the majority of fish ≤ age-5. Smallmouth bass up to age-8 were found, with the majority of fish ≤ age-4. The presence of older black bass age classes suggest that recruitment is fairly consistent. Mortality rates of largemouth bass (24%) were low, while smallmouth bass mortality rates (43%) were moderate. Largemouth bass reached legal harvestable size (356 mm) by age-4, while smallmouth bass reached the minimum size limit (305 mm) prior to age-3. Overall, the black bass population in Lake James is comprised primarily by stock-sized, relatively fast growing fish in moderate condition, which appear to be exploited at low levels. Black bass data will be collected again in the spring of 2005 and 2006 during a scheduled shoreline electrofishing survey.

Lake James, located in Burke and McDowell counties, is the uppermost reservoir in the Catawba River chain of Duke Power Company lakes. The watershed associated with Lake James is 984 km^2. Lake James was impounded in 1923, covers 2,634 ha at full pool, and has 242 km of shoreline. Average depth is 13.5 m, maximum depth is 43 m, and mean hydraulic retention time is 228 days. Lake James has low alkalinity (9-14 mg/l $CaCO_3$), a pH range of 6.4-7.4, and a typical surface water temperature range of 2-30^o C. The reservoir is classified as oligotrophic and has an average secchi depth of 2.8 m (NCDENR 1998).

Initial black bass *Micropterus* spp. population assessments in Lake James were based on cove rotenone sampling and were inefficient at capturing adult black bass (Brown et al. 1989) which prevented accurate population assessments. In 1989, shoreline electrofishing investigations of the Lake James black bass population were initiated by the NCWRC following a 1987-1988 creel survey which estimated 77% of the black bass were harvested under the 356-mm minimum size limit two fish exemption (Borawa 1989). Catch rates from the 1989-1991 electrofishing surveys were highly variable between years, however the data indicated that recruitment failure and/or over harvest was not impacting black bass populations within Lake James (NCWRC unpublished data). Beginning in 2003, the NCWRC initiated a study to compare day versus nighttime shoreline electrofishing techniques for black bass sampling within three Catawba River reservoirs (Hinning 2004). Based on this initial day versus night electrofishing pilot study, a three year black bass population assessment was initiated on Lake James in the spring of 2004. This report summarizes the findings of a survey conducted on Lake James in the spring of 2004.

Methods

Black bass were collected from 3 May to 6 May, 2004 using boat mounted, 120-V pulsed direct current electrofishing equipment (high voltage setting, 3-4 A). Sample sites consisted of twenty four 300-m shoreline transects equally distributed throughout Lake James. Twelve sites were located in the Catawba arm of Lake James and twelve sites were located in the Linvile River/ Paddy Creek arm (Figure 1). Catawba River arm sites were sampled during the day and Linville River/Paddy Creek arm sites were sampled at night. Water temperatures ranged from 17-21 ^{o}C on the Catawba River arm to 15-18 ^{o}C on the Linville River/Paddy Creek arm.

Black bass collected were placed in a plastic bag labeled by site, placed on ice, and returned to the Marion State Fish Hatchery. All black bass collected were identified to species, weighed (g), measured (mm, TL) and sexed. Black bass were considered immature if the gonads were not developed.

Abundance was indexed by catch-per-unit-effort (CPUE) of electrofishing time and expressed as fish per hour. Proportional stock density (PSD) and relative stock densities (RSD) indices were calculated for largemouth *Micropterus salmoides* and *M. dolomieu* independently following Gabelhouse (1984a). Size designations used for largemouth bass were stock (200 mm), quality (300 mm), preferred (380 mm), memorable (510 mm) and trophy (630 mm). Size designations for smallmouth bass were stock (180 mm), quality (280 mm), preferred (350 mm), memorable (430 mm) and trophy (510 mm). Relative weights (Wr) were calculated for largemouth bass >150 mm using the standard weight equations (Ws) of Wedge & Anderson (1978). Wr were calculated for smallmouth bass >150 mm using the Ws equations of Kolander et al. (1993). The Von Bertalanffy growth model was used to estimate growth rates of largemouth and smallmouth bass independently. Unweighted catch curve analysis was used to determine total annual mortality rates for largemouth bass age-1 to age-7 and smallmouth bass age-1 to age-6.

Saggital otoliths were removed from all black bass captured. Otoliths were air-dried for a minimum of 14 days, immersed in water, and read in whole view under a 10X dissecting microscope (Taubert and Tranquilli 1982, Hoyer et al. 1985, Heidinger and Claudfelter 1987). Otoliths aged greater than age-2 in whole view were broken perpendicular to the long axis, polished with 400 grit wet-dry sandpaper, and read under a 10X dissecting scope using a fiber optic light. Otoliths were read independently by two readers. Any aging discrepancies between readings were rectified by jointly reading the otolith. If the age could not be rectified, the age data were not used in further analysis.

Results and Discussion

Largemouth bass:

A total of 134 largemouth bass were collected from Lake James in May 2004. Of the largemouth bass collected, 77% were collected from the Catawba River arm sites. Combined mean CPUE was 19.5 fish/hour (Table 1). Mean CPUE from the Catawba River arm was 28.8 fish/hour compared to 10.2 fish/hour from the Linville River/Paddy Creek arm.

Largemouth bass collected ranged from 69-576 mm total length (TL) with the majority of fish in the 250-450 mm size range (Figure 2). Of the largemouth bass collected, 41% were of legal harvestable size (356 mm). The PSD value (73) was slightly above the preferred value range of 40-70%. Of the 134 largemouth bass collected, 35% were in the preferred (>380 mm)

size class and 2% were memorable (>510 mm). No trophy (>630 mm) size class fish were obtained. Wr values for Lake James largemouth bass averaged 89 (Figure 3).

Largemouth bass up to age-11 were collected in 2004 with the majority of fish ≤ age-5 (Figure 4). The presence of these older year classes suggest that recruitment is fairly constant and the population is being exploited at low levels. The overall largemouth bass annual mortality rate was low (24%) based on catch curve analysis of age-1 through age-7 fish. Growth rates of largemouth bass up to age-5 are above average for an oligotrophic reservoir, however growth slows dramatically within the older age classes (Figure 5). Largemouth bass reached legal harvestable size (356 mm) by age-4 and reached their predicted Von Bertalanffy growth model asymptotic maximum length (461 mm) by age-8.

Smallmouth bass:

A total of 100 smallmouth bass were collected from Lake James in May 2004. Of the smallmouth bass collected, 68% were collected from the Linville River/Paddy Creek arm sites. Combined mean CPUE was 14.7 fish/hour (Table 1). Mean CPUE from the Linville River/Paddy Creek arm was 19.3 fish/hour compared to 10.1 fish/hour from the Catawba arm.

Smallmouth bass collected ranged from 68-510 mm total length (TL) with the majority of fish in the 76-250 mm size range (Figure 2). Of the smallmouth bass collected, 24% were of legal harvestable size (356 mm). The majority of the adult smallmouth bass collected appeared to be post-spawn which likely attributed to the size structure being skewed towards smaller fish. The PSD value for smallmouth bass was 63. Of the 100 smallmouth bass collected, 42% were in the preferred (>350 mm) size class, 16% were memorable (>430 mm), and 1% were in the trophy (>510 mm) size class. Wr values for Lake James smallmouth bass averaged 83 (Figure 3).

Smallmouth bass up to age-8 were collected in 2004 with the majority of fish ≤age-4 (Figure 4). The presence of these older year classes suggest that recruitment is fairly consistent and the population is being exploited at low levels. The overall smallmouth bass mortality rate was moderate (43%) based on catch curve analysis of age-1 through age-6 fish. Growth rates of smallmouth bass up to age-4 are above average for an oligotrophic reservoir, however growth slows dramatically within the older age classes (Figure 5). Smallmouth bass reached legal harvestable size (305 mm) prior to age-3 and reached their predicted Von Bertalanffy growth model asymptotic maximum length (508 mm) at age-8.

Conclusions

The spatial segregation between Lake James black bass species indicates that the largemouth and smallmouth bass populations are strongly influenced by differences in water quality between the Catawba River and Linville River/Paddy Creek arms of the lake. The largemouth bass population is primarily confined within the upper nutrient rich portions of the Catawba River arm of Lake James while the smallmouth bass population utilizes the oligotrophic zones throughout Lake James; primarily the Linville River/Paddy Creek arm. Although the preferred largemouth habitat is limited within Lake James, catch rates of largemouth bass were higher than smallmouth bass. Lower catch rates of smallmouth bass may be correlated with sampling the population post-spawn. The larger individuals appeared to be under represented during this sample.

The black bass populations within Lake James appears to be comprised of multiple year classes represented primarily by stock-sized, relatively fast growing fish, in moderate condition.

Competition between white bass and walleye, as well as low angler harvest, may be influencing the black bass population in Lake James.

Recommendations

1) Continue to manage Lake James black bass populations under the current statewide regulation.
2) Sample the black bass population during the spring of 2005 and 2006.

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TABLE 1.—Mean CPUE (fish/hour) of black bass captured during spring electrofishing samples from Lake James, 3-6 May 2004. Values in parenthesis are standard deviations.

Location	All black bass	Largemouth	Smallmouth
Combined	34.4 (13.5)	19.5 (15.2)	14.7 (13.4)
Catawba	38.9 (13.3)	28.8 (14.9)	10.1 (9.6)
Linville/Paddy Creek	29.9 (12.7)	10.2 (8.4)	19.3 (15.4)

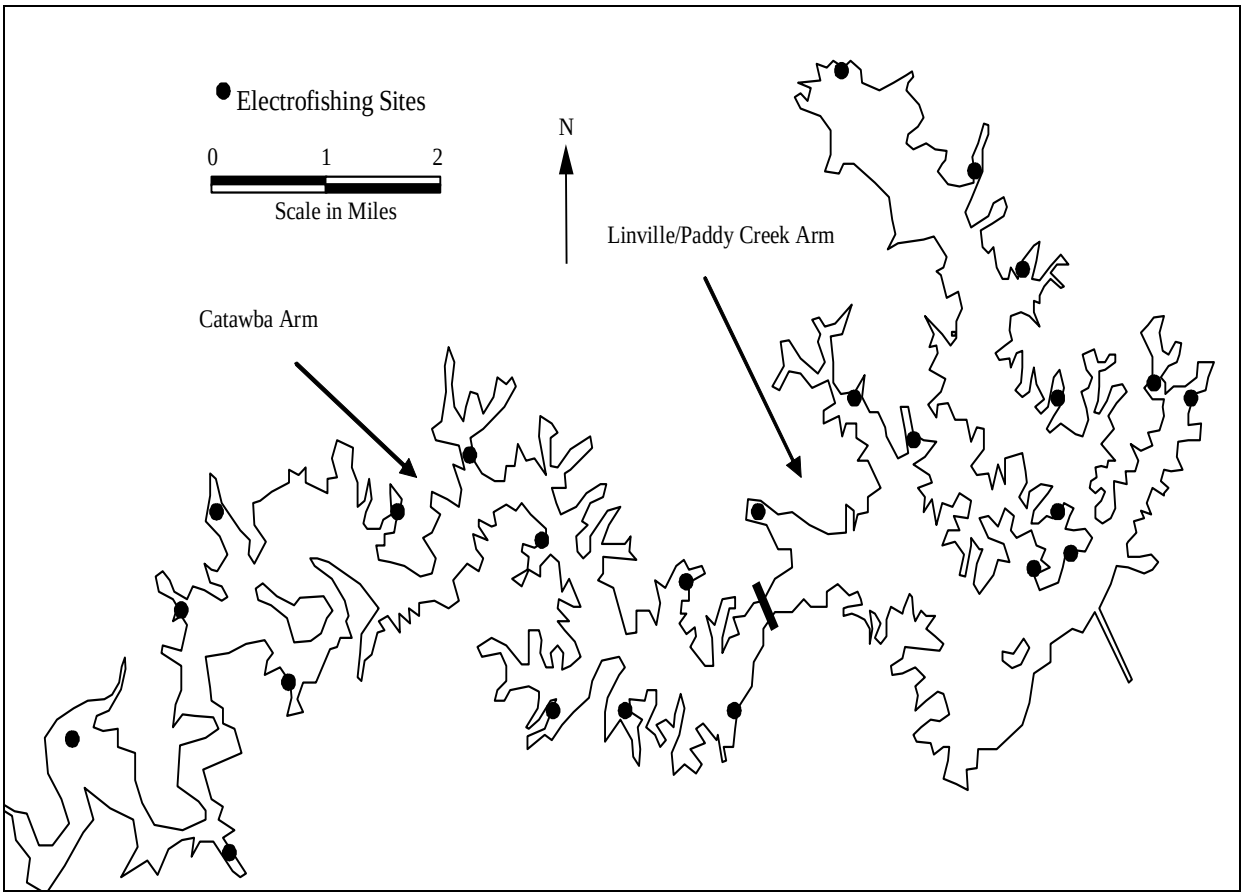


FIGURE 1.—Map of Lake James, Burke and McDowell counties, North Carolina. Catawba and Linville River/Paddy Creek reservoir zones (dark bar) are indicated as well as electrofishing sites (dark dots).

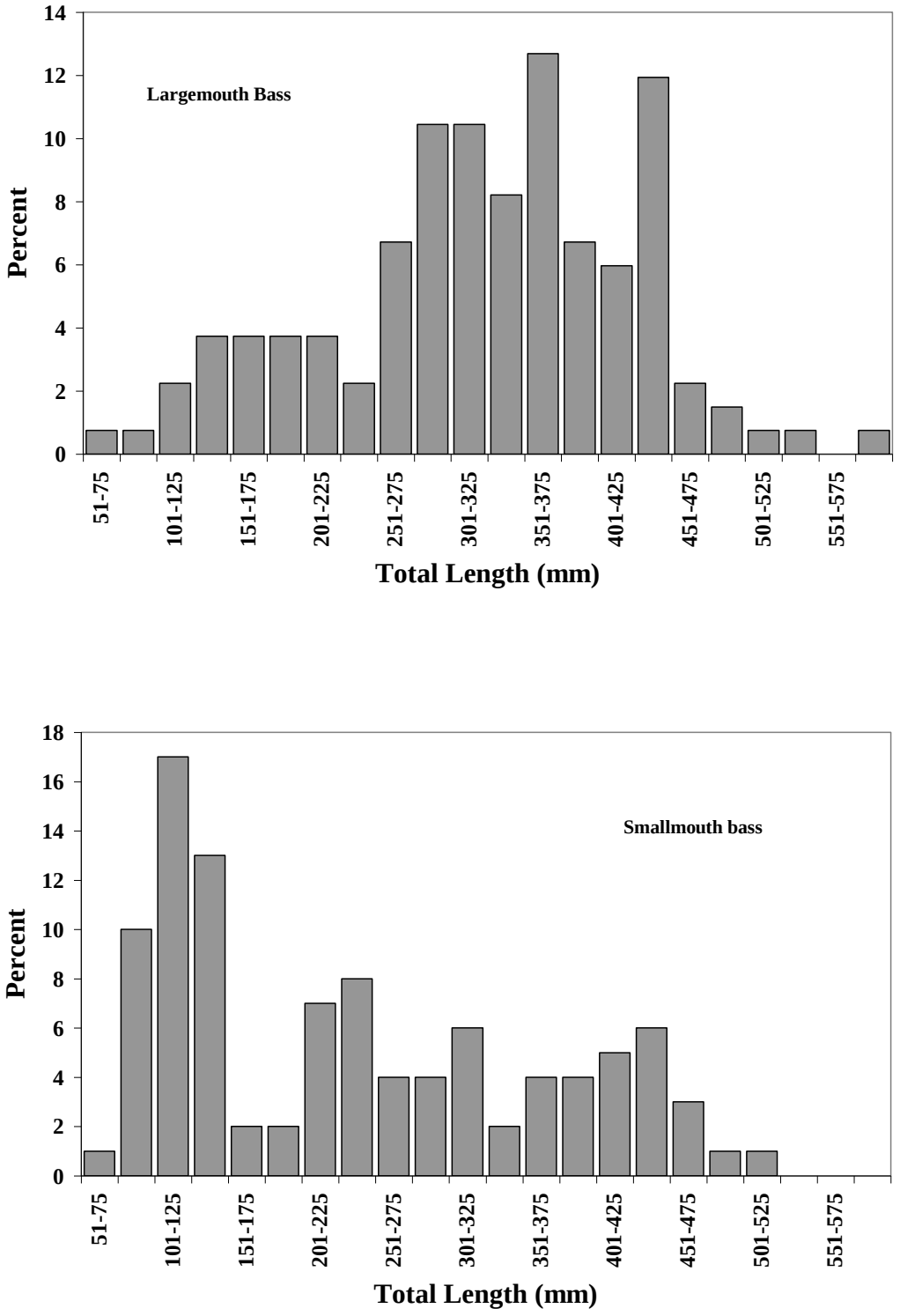
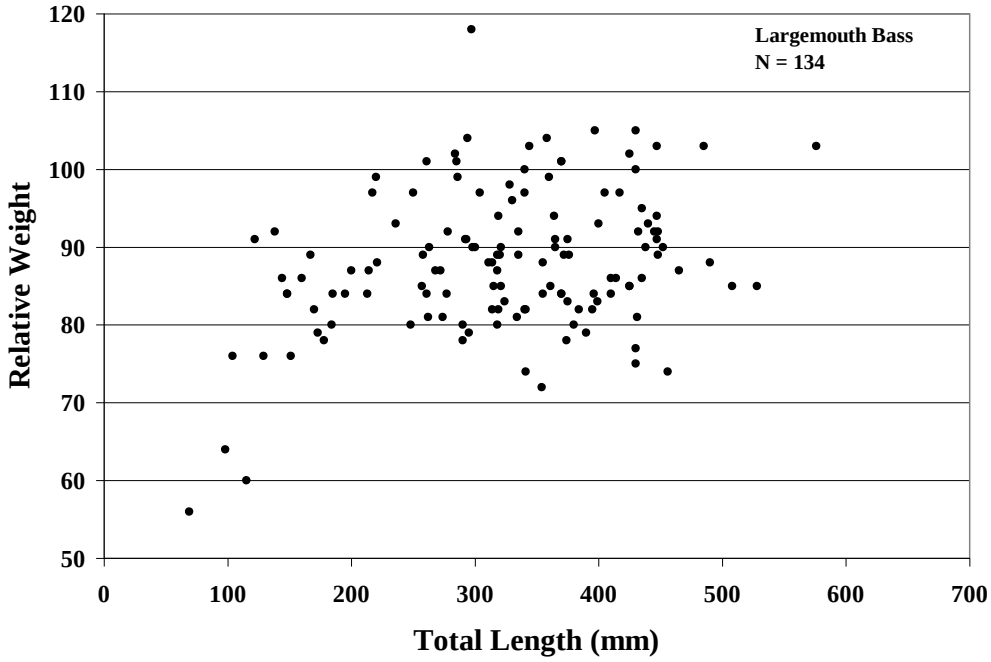


FIGURE 2.—Size structure of largemouth and smallmouth bass captured during spring electrofishing samples from Lake James, 3-6 May 2004.



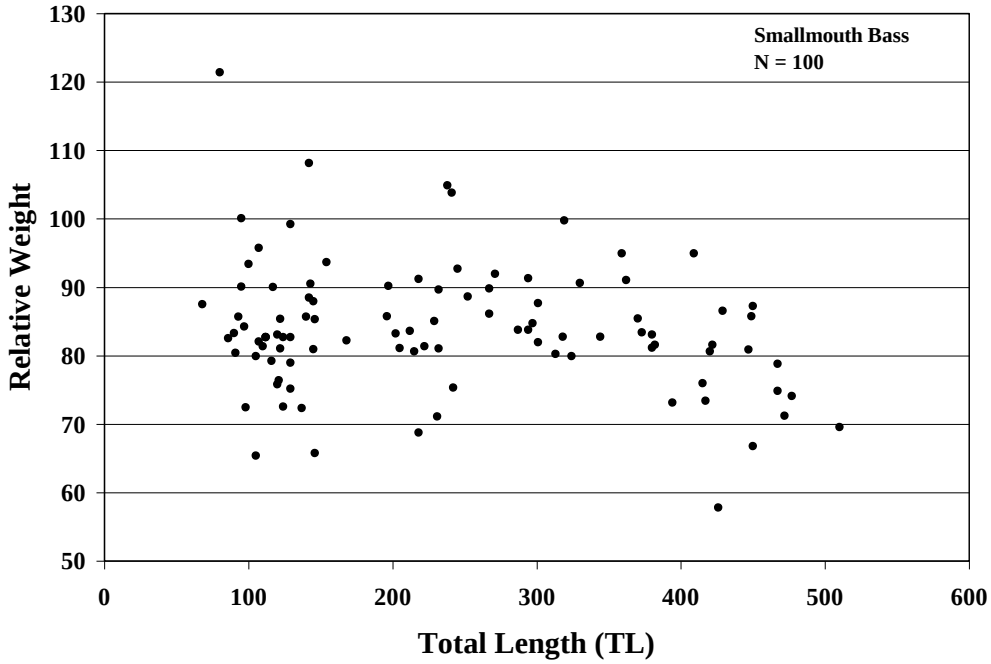


FIGURE 3.—Relative weights of largemouth and smallmouth bass captured during spring electrofishing samples from Lake James, 3-6 May 2004.

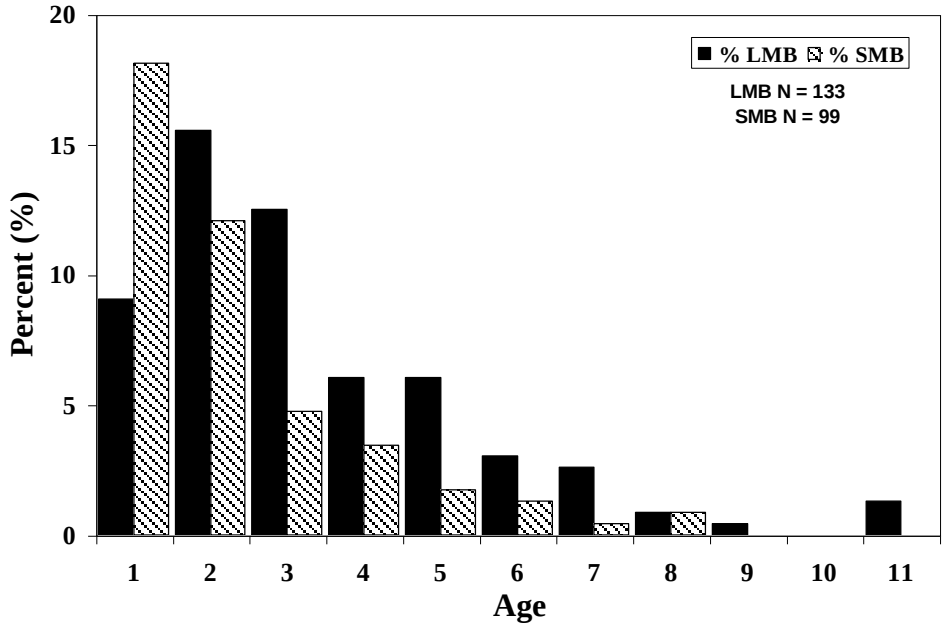


FIGURE 4.—Age Distributions of largemouth and smallmouth bass captured during spring electrofishing samples from Lake James, 3-6 May 2004.

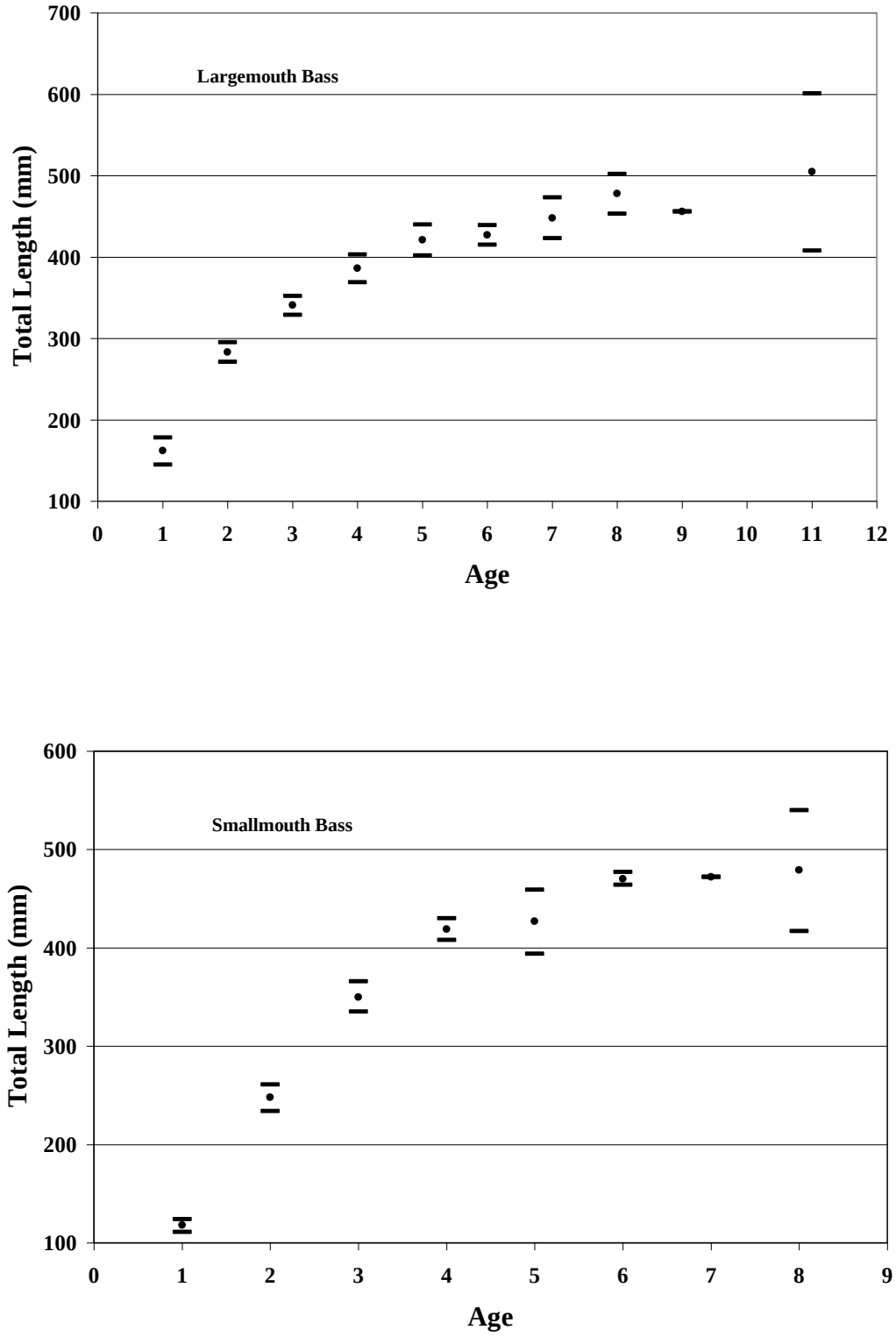


FIGURE 5.—Mean total lengths (mm) at age at capture of largemouth and smallmouth bass captured during spring electrofishing samples from Lake James, 3-6 May 2004.