

Rankin Lake Largemouth Bass Survey (2011–2018)



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Abstract.—Rankin Lake, located in Gaston County, is a 32-ha, city of Gastonia-owned emergency water supply reservoir for the city of Gastonia. Constructed in 1925, Rankin Lake historically served the recreational public passively via family events, picnicking and bank fishing, and was the city of Gastonia’s primary water supply resource for decades. The city of Gastonia prohibited public access to Rankin Lake in the late-1980s to protect the lake as a water supply resource; consequently, public access to Rankin Lake was denied for more than twenty years. Governing perceptions changed regarding public access to Rankin Lake in the late-2000s due to the lake converting to a secondary/emergency water supply for the city of Gastonia. Rankin Lake Park received support and funding for a major renovation project that was completed in August 2012. In 2011, the North Carolina Wildlife Resources Commission was contacted by park staff to evaluate the current fisheries within Rankin Lake. Results from April–May, 2011–2018, electrofishing surveys proved Rankin Lake supports numerous fish species, most notably, a moderate-density, high-quality Largemouth Bass *Micropterus salmoides* population consisting primarily of preferred- to memorable-sized fish in excellent condition. Rankin Lake Largemouth Bass may be vulnerable to angler overharvest due to the lake’s relatively small size, unbalanced proportional size-structure indices, and seemingly low annual recruitment. Increased shoreline habitat is recommended to provide juvenile rearing areas and potentially reduce interspecific predation and competition with other sunfishes at early life stages. Additional measures such as reduced boat angling pressure facilitated through the park’s boat-loaner program coupled with enacting a conservative harvest regulation may help conserve Rankin Lake’s quality Largemouth Bass population.

Background

Rankin Lake, located in Gaston County, is a 32-ha, City of Gastonia-owned emergency water supply reservoir for the city of Gastonia. Constructed in 1925, Rankin Lake historically served the recreational public passively via family events, picnicking, and bank fishing, and was the city of Gastonia's primary water supply resource. The city of Gastonia prohibited public access to Rankin Lake in the late-1980s to protect the lake as a water supply resource; consequently, public access to Rankin Lake was denied for more than twenty years. Governing perceptions changed regarding public access to Rankin Lake in the late-2000s due to the lake converting into a secondary/emergency water supply for the city of Gastonia. Rankin Lake Park (98 ha) received support and funding for a major renovation project that was completed in August 2012 (City of Gastonia 2014). The park features a clubhouse, multiple picnic tables and shelters, disc golf course, horseshoe courts, outdoor classroom, greenway system, and a lake office to facilitate boat-loaner rentals and fishing permits (City of Gastonia 2014). To enhance lake use, the North Carolina Wildlife Resources Commission (NCWRC) constructed two fishing piers, provided automated fish feeders, and deployed artificial offshore fish attractors.

In 2011, the NCWRC was contacted by Rankin Lake Park staff to evaluate the current fisheries within Rankin Lake. Results from spring 2011–2018 electrofishing surveys showed Rankin Lake supports various fish species including White Catfish *Ameirus catus*, Warmouth *Lepomis gulosus*, Redbreast Sunfish *Lepomis auritus*, Bluegill *Lepomis macrochirus*, Redear Sunfish *Lepomis microlophus*, Gizzard Shad *Dorosoma cepedianum*, Grass Carp *Ctenopharyngodon idella*, White Perch *Morone americana*, and Channel Catfish *Ictalurus punctatus*. Most notably, a high-quality Largemouth Bass *Micropterus salmoides* population was observed. The Largemouth Bass population at Rankin Lake is currently managed under a 356-mm minimum size limit, except two fish may be under 356 mm, and 5-fish creel limit per angler per day. This report summarizes the findings of a Largemouth Bass population survey during April–May, 2011–2018.

Methods

Field Collections.—Largemouth Bass were collected in April–May of 2011, 2014, 2015, 2016, and 2018. Fish were sampled via boat mounted, 120-V pulsed direct current, electrofishing equipment (4–6 A). Sample sites consisted of shoreline transects (900 s of effort each) until the entire lake was sampled (Figure 1). All Largemouth Bass collected were weighed (g), measured for total length (TL; mm) and released after each transect. Water quality data [i.e., dissolved oxygen (mg/L), conductivity (μ S), and water temperature ($^{\circ}$ C)] were recorded for each transect.

Hook-and-Line Collections.—Largemouth Bass were also collected by angling during May 2011. Two anglers fished 4.5 hrs (9.0 man-hours) and caught 30 Largemouth Bass. These fish were weighed (g), measured for total length (TL; mm), and released. Data collected using angling gear were used to supplement Largemouth Bass condition data for the 2011 electrofishing survey.

Catch-per-unit-effort.—Relative abundance was indexed by catch-per-unit-effort (CPUE) of electrofishing and was expressed as number of fish collected per pedal-hour (Hubert and Fabrizio 2007).

Size Structure.—Length-frequency histograms were constructed and stock indices were calculated for Largemouth Bass by year (Neumann and Allen 2007). Proportional size distribution (PSD) and PSD values of preferred- (PSD-P) and memorable- (PSD-M) sized Largemouth Bass were calculated as described by Gabelhouse (1984), as modified by Guy et al. (2007). Length-classes used for Largemouth Bass were stock (≥ 200 mm TL), quality (≥ 300 mm TL), preferred (≥ 380 mm TL), and memorable (≥ 510 mm TL).

Condition.—Relative weight (W_r) was used to index fish condition and was calculated for Largemouth Bass ≥ 150 mm TL using the standard weight (W_s) equations described by Anderson and Nuemann (1996).

Results and Discussion

Catch-per-unit-effort.—A total of 368 Largemouth Bass were collected at Rankin Lake during the 5-year survey period (Table 1). Mean annual catch rates of Largemouth Bass were moderate, ranging from 48.3 fish/h (SE = 10.0) in 2018 to 80.0 fish/h (SE = 15.4) in 2016 (Table 1). Catch rates during this survey were higher than Largemouth Bass relative abundance values reported by Wood (2014) of 23.6 fish/h (SE = 3.4) in 2010 to 42.6 fish/h (SE = 5.0) in 2011 at Lake James but comparable to relative abundances reported from Largemouth Bass surveys at Lake Wylie during 2016 [54.7 fish/h (SE = 6.9)] and 2017 [80.3 fish/h (SE = 8.2)], respectively (NCWRC unpublished data). Largemouth Bass catch rates at Rankin Lake were also similar to the mean relative abundances of 69.6 fish/h (SE = 8.3) reported for Lake Rhodhiss during the 2013 electrofishing survey (NCWRC unpublished data) and 65 fish/h (SE = 3.9) reported for Salem Lake during 1996–2016 surveys (Johnson 2017). Therefore, it appears Largemouth Bass catch rates reflected at Rankin Lake are comparable to select Piedmont reservoirs.

Size Structure.—Largemouth Bass total lengths ranged from 78 to 583 mm [mean = 356 mm (SE = 6.1)] (Figure 2). Proportional size distributions of quality-length (PSD) fish ranged from 57 to 96 [mean = 82 (SE = 6.8)] (Table 1). Fish of preferred-length (PSD-P) ranged from 34 to 69 [mean = 60 (SE = 6.5)], and Largemouth Bass of memorable-length (PSD-M) ranged from 2 to 17 [mean = 6 (SE = 2.8)] (Table 1). Over 50% of all the Largemouth Bass collected at Rankin Lake were of preferred to memorable size (Figure 3). Largemouth Bass sizes were generally similar among years of this survey (Figure 2), but greater than lengths reported by Wood (2014) at Lakes James during 2010 (PSD = 67, PSD-P = 40, and PSD-M = 1) and 2011 (PSD = 78, PSD-P = 35, and PSD-M = 2) surveys. Fish of quality-size collected at Rankin Lake were comparable to lengths observed at Lake Rhodhiss during the 2013 survey (PSD = 83) and Lake Wylie during the 2015 (PSD = 78), 2016 (PSD = 81), and 2017 (PSD = 82) surveys; however, Largemouth Bass of preferred-size were less representative at Lake Rhodhiss (PSD-P = 55) and Lake Wylie (PSD-P = 29, 23, and 19) (NCWRC unpublished data). Similar quality- and preferred-size Largemouth Bass were collected at Salem Lake during the 1996–2016 surveys, as PSD and PSD-P values averaged 85 (SE = 2.3) and 61 (SE = 3.2), respectively (Johnson 2017). Therefore, it appears size structures of preferred-size and larger Largemouth Bass at Rankin Lake are above average when compared to select Piedmont reservoirs.

Condition.—Largemouth Bass condition was generally excellent, as annual mean W_r values ranged from 88 in 2016 (SE = 1.0) to 106 (SE = 1.7) in 2015 (Figure 4). Mean W_r values in our survey were higher than values from Lake James Largemouth Bass during 2010 [mean W_r = 86 (SE = 0.7)] and 2011 [mean W_r = 90 (SE = 0.8)] surveys (Wood 2014). Similarly, incremental length-class mean condition values during our survey at Rankin Lake (Figure 4) were higher than values from Lake Wylie Largemouth Bass during 2015–2017 surveys, as mean stock-, quality-, and preferred-length W_r values were 87 (SE = 2.0), 88 (SE = 2.1), and 87 (SE = 2.8), respectively (NCWRC unpublished data). Memorable-length Largemouth Bass were only collected at Lake Wylie during the 2015 survey, which reflected a mean W_r value of 85 (SE = 6.0) (NCRWC unpublished data). Mean W_r values at Rankin Lake were also higher than values from Lake Rhodhiss Largemouth Bass during the 2013 survey [mean W_r = 92 (SE = 1.1)] (NCWRC unpublished data). Johnson (2017) observed comparable Largemouth Bass condition at Salem Lake, as the overall mean W_r value was 98 (SE = 0.6) for 1996–2016 surveys. Therefore, it appears condition of Largemouth Bass at Rankin Lake is excellent when compared to select Piedmont reservoirs and is likely indicative of an adequate forage base and rapid growth (Anderson and Neumann 1996).

Conclusions

Based on our observations, Rankin Lake contains a moderate-density, high-quality Largemouth Bass population primarily consisting of preferred- to memorable-size fish in excellent condition. Size structures reflected from our surveys indicate PSD and PSD-P values are nearly within the ranges (i.e., PSD = 50–80; PSD-P = 30–60) for trophy Largemouth Bass populations (Anderson and Neumann 1996). However, PSD values greater than 70% may be indicative of a Largemouth Bass population maintained by low annual recruitment and susceptible to future declines in population density and abundance of larger fish (Anderson and Neumann 1996). Consequently, the Rankin Lake Largemouth Bass population may be vulnerable to angler overharvest, due to the lake's relatively small size, unbalanced proportional size-structure indices (i.e., PSD and PSD-P), and seemingly low annual recruitment (Figure 2). Shoreline habitat is very limited at Rankin Lake due to the historic protection status as a water supply resource for the city of Gastonia, and where habitat (e.g., riprap banks) does occur, numerous sunfish species were concentrated during our surveys. Increased shoreline habitat is recommended to provide juvenile rearing areas and potentially reduce interspecific predation and competition with other sunfishes at early life stages. NCWRC staff constructed five 3.0 x 3.0-m wooden-framed gravel spawning beds during February 2013 to improve Largemouth Bass recruitment; however, recruitment remained consistently low during subsequent surveys (Figure 2). Reduced boat angling pressure facilitated through Rankin Lake Park's boat-loaner program coupled with a conservative harvest regulation may also benefit the Largemouth Bass population at Rankin Lake. Goodfred (2008) analyzed 2001–2008 boat-loaner creel data at Turkey Lake (137 ha), Florida and found that by enacting a conservative harvest regulation and limiting boat angler pressure to four days per week resulted in consistent, quality Largemouth Bass fishing and high angler catch rates (i.e., 0.7–0.9 fish/angler-h). Therefore, more conservative angler use and creel strategies along with actions to improve shoreline habitat may help conserve Rankin Lake's quality Largemouth Bass population.

Management Recommendations

1. Investigate potential with Rankin Lake Park staff to limit boat angler pressure at Rankin Lake to maintain quality Largemouth Bass fishing and reduce angler harvest.
2. Investigate potential to add shoreline habitat at Rankin Lake to improve Largemouth Bass recruitment and survival of juvenile fish.
3. Investigate potential to enact a conservative Largemouth Bass harvest regulation at Rankin Lake to reduce the risk of angler overharvest.
4. Continue to monitor the Largemouth Bass population at Rankin Lake via spring electrofishing.

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TABLE 1.—Catch statistics for Largemouth Bass (LMB) collected during April–May, 2011–2018 electrofishing surveys, Rankin Lake, North Carolina. Catch (N), effort (pedal-hours), catch-per-unit effort [CPUE (fish/h)] with associated standard error (SE), total length range, mean total length (mm) with associated SE, proportional size distribution (PSD), PSD-preferred (P), and PSD-memorable (M) values with 95% confidence intervals in parentheses are shown by sample year.

Year	Species	N	Effort	CPUE (SE)	Range (mm)	Mean (SE)	PSD	PSD-P	PSD-M
2011	LMB	56	1.00	56.0 (12.5)	104–536	361 (15.3)	92 (84–100)	67 (54–80)	2 (0–6)
2014	LMB	100	1.25	80.0 (15.4)	95–584	369 (13.4)	79 (71–88)	67 (57–77)	17 (9–25)
2015	LMB	75	1.25	60.0 (9.9)	78–470	350 (13.4)	84 (74–93)	61 (48–73)	2 (0–5)
2016	LMB	78	1.14	70.6 (14.7)	172–583	321 (11.4)	57 (45–68)	34 (23–45)	4 (0–9)
2018	LMB	59	1.21	48.3 (10.0)	101–532	391 (12.7)	96 (91–100)	69 (57–81)	7 (0–14)



FIGURE 1.—Map of Rankin Lake, Gaston County, North Carolina. The entire lake was shoreline electrofished in 900-second transects during April–May, 2011–2018 Largemouth Bass surveys.

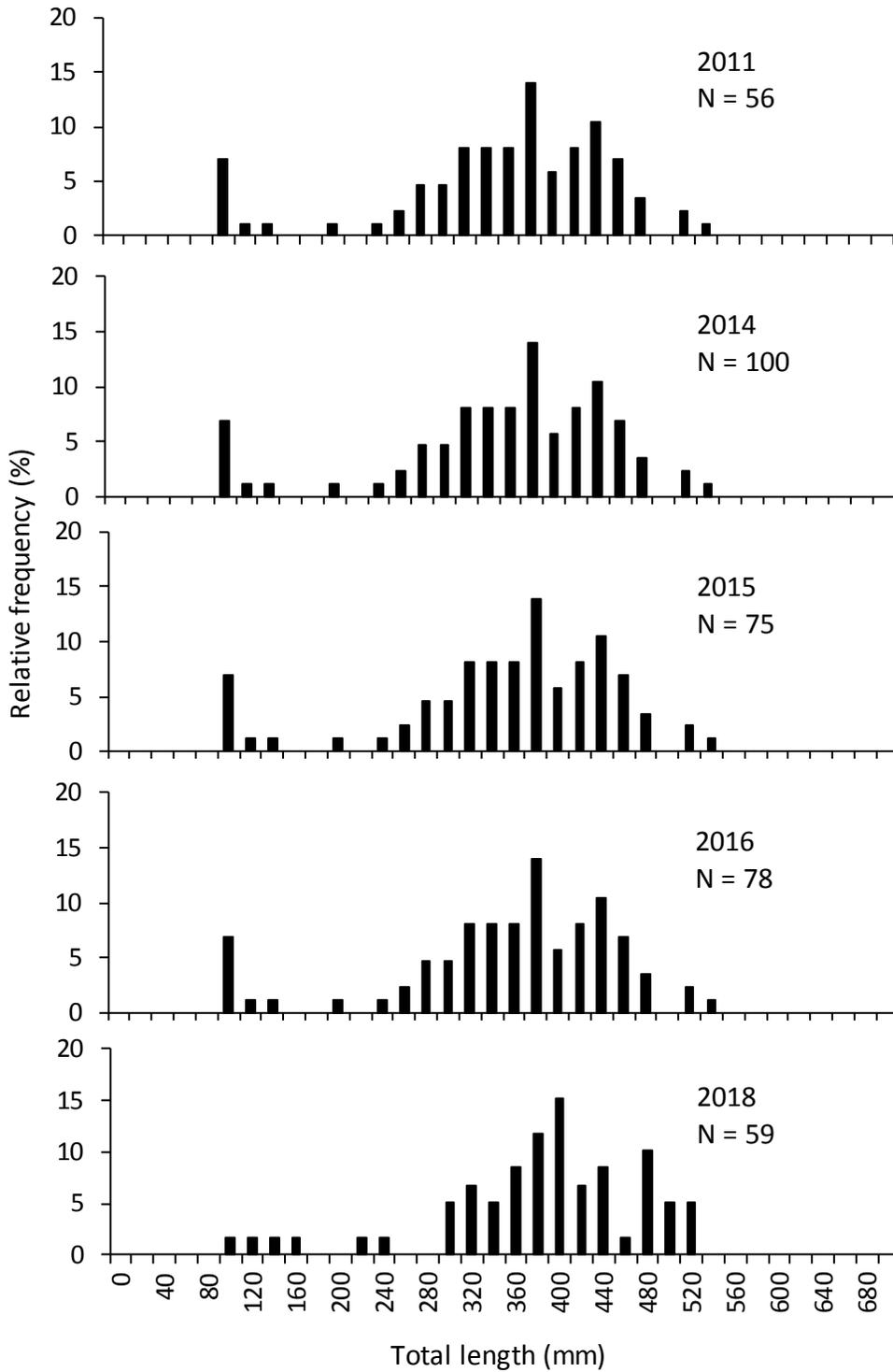


FIGURE 2.—Length-frequency distributions for Largemouth Bass collected during April–May, 2011–2018 electrofishing surveys, Rankin Lake, North Carolina.

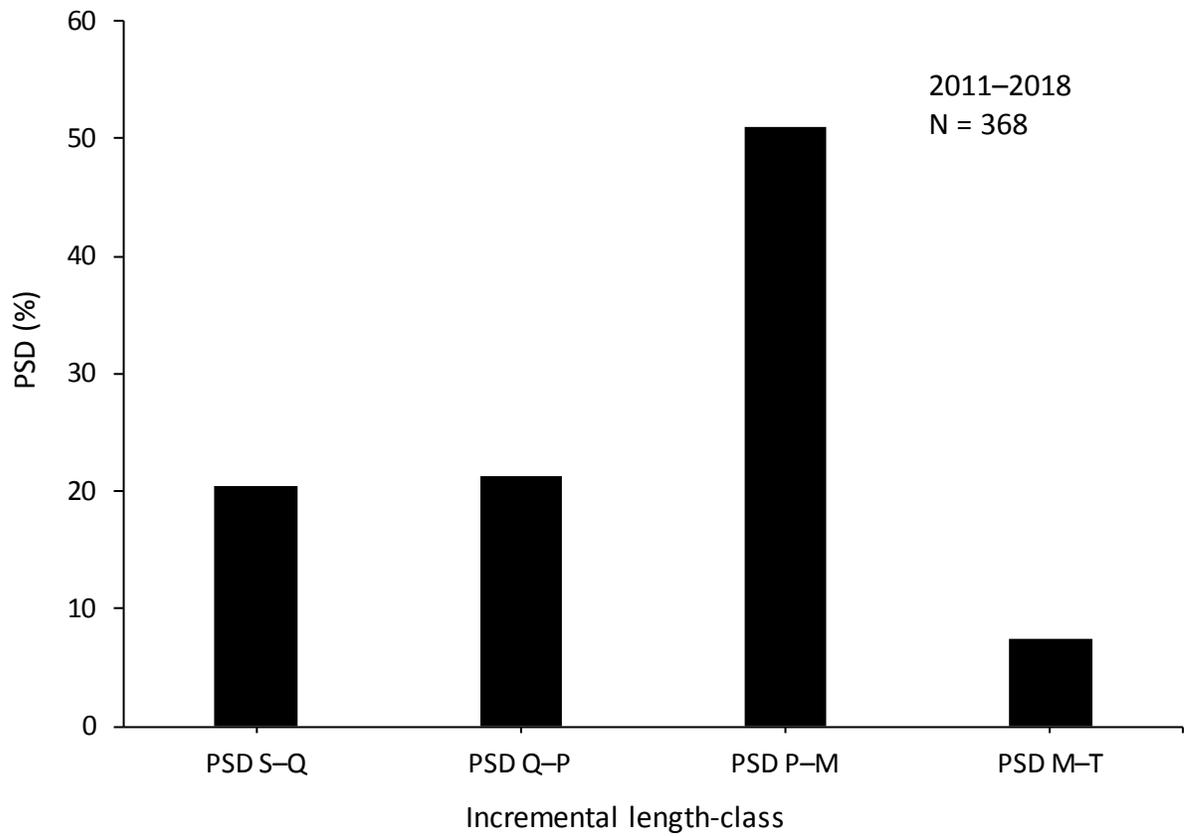


FIGURE 3.—Proportional size distribution (PSD) values for Largemouth Bass for stock (S), quality (Q), preferred (P), memorable (M), and trophy (T) length-classes collected during April–May, 2011–2018 electrofishing surveys, Rankin Lake, North Carolina.

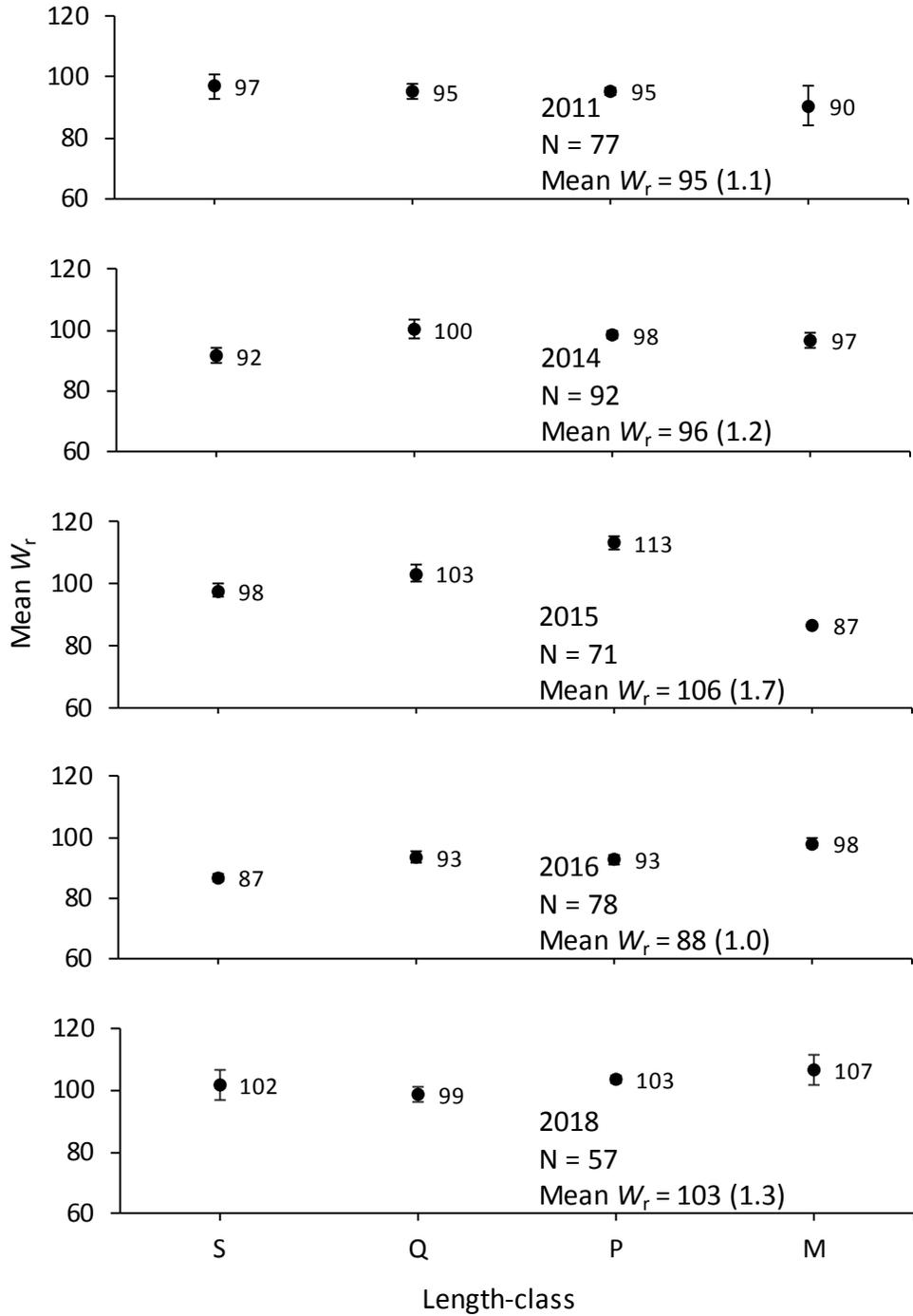


FIGURE 4.—Mean relative weight (W_r) values for stock- (S), quality- (Q), preferred- (P), and memorable- (M) size Largemouth Bass collected during April–May, 2011–2018 electrofishing surveys, Rankin Lake, North Carolina. Standard error bars associated with length-class mean values are shown, and standard errors for annual mean W_r values are listed in parentheses.