BIOLOGICAL SURVEY OF THE YADKIN RIVER FISH COMMUNITY

Final Report

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Abstract.—This report summarizes the findings from an electrofishing survey of the Yadkin River between W. Kerr Scott Dam and High Rock Lake in 2001 and 2005. Spotted bass *Micropterus punctulatus* were the dominant gamefish collected, with catch rates ranging from 5.2–57.2 fish/hr. Ictalurid species were collected using both high-pulse and low-pulse settings. Bullhead species *Ameiurus* sp., primarily snail bullhead *Ameiurus brunneus*, dominated the ictalurid assemblage above Idols dam, the only migration barrier within the Yadkin River reach surveyed during this study. Bullheads also accounted for the highest catch rates recorded during the study (range, 118.7–286.7 fish/hr). Flathead catfish *Pylodictis olivaris* were found in limited numbers above Idols Dam (range, 0.0–2.9 fish/hr), but densities were as high as 16.0 fish/hr downstream of Idols Dam. A qualitative assessment was also made of the nongame fish community. Even though catch rates were not determined, catostomids appeared to be the dominant fish species upstream of Idols Dam with respect to both density and biomass. The information obtained from this study will be used in promoting the fisheries currently available in the Yadkin River, as well as in exploring the creation of additional angling opportunities in the future.

The Yadkin-Pee Dee River basin is the second largest in North Carolina, covering 7,213 square miles. Originating in the mountains of Watauga and Caldwell Counties, the Yadkin River flows through Wilkes, Surry, Yadkin, Forsyth, Davie, and Davidson Counties before it joins the South Yadkin River and enters High Rock Lake. Between W. Kerr Scott Reservoir in Wilkesboro, the uppermost impoundment of the Yadkin, and High Rock Lake, the river is free of major impoundments for 120 miles. The only dam within this stretch is Idols Dam, a small, defunct hydroelectric dam that backs up a negligible portion of the river on the Davie-Forsyth County border .

Although W. Kerr Scott Reservoir impounds a minor portion of the Yadkin River, far more is known about the fisheries of this reservoir than about those of the river itself. North Carolina Wildlife Resources Commission (NCWRC) management of the Yadkin River between W. Kerr Scott Reservoir and High Rock Lake has been limited to several sportfish stockings and a small number of biological surveys. From 1978–1983, a total of 83,540 largemouth bass *Micropterus salmoides*, channel catfish *Ictalurus punctatus*, and muskellunge *Esox masquinongy* was stocked into the river from the W. Kerr Scott Reservoir tailrace downstream to NC 421 in Yadkin County. Additionally, spotted bass *Micropterus punctulatus* (1976–1979), smallmouth bass *Micropterus dolomieu* (1964, 1969), and walleye *Sander vitreus* (1974–1977) were introduced into W. Kerr Scott Reservoir, and in recent years, these species have been documented in the river downstream of the reservoir.

NCWRC biologists documented the distribution of catfishes in the Yadkin and South Yadkin Rivers in 1987 using a hand cranked telephone generator and catfish basket traps (Mickey 1988). At that time, flathead catfish *Pylodictis olivaris*, blue catfish *Ictalurus furcatus*, channel catfish, and white catfish *Ameiurus catus* were present below Idols Dam on the Yadkin River. No native bullheads were collected downstream of Idols Dam, presumably because of predation from flathead catfish. Conversely, no flathead catfish were collected above Idols Dam, and the ictalurid community there was comprised of brown bullheads *Ameiurus nebulosus*, flat bullheads *Ameiurus platycephalus* and snail bullheads *Ameiurus brunneus*. However, in 1997, several flathead catfish specimens were collected at the base of W. Kerr Scott Dam. The current distribution of flathead catfish in the Yadkin River upstream of Idols Dam is unknown.

In fall of 1994, and spring of 1995 and 2000, electrofishing samples were conducted below Idols Dam. Largemouth, smallmouth, and spotted bass were collected, along with flathead and white catfish. During the spring samples, striped bass *Morone saxatilis*, white bass *Morone*

chrysops, and striped x white bass hybrids were collected during their upstream spawning migrations from High Rock Lake (NCWRC unpublished data). Given the paucity of survey effort that has been expended on the Yadkin River in relation to the extent of its fisheries resources, a more comprehensive sampling effort is needed to document the distribution and population characteristics of the river's gamefish and nongame fish communities.

The goal of this study was to describe the fish community within the Yadkin River from the base of W. Kerr Scott Dam downstream to High Rock Lake. The primary objectives were to 1) determine the distribution, relative abundance, and size structure of gamefish and ictalurids that were observed, 2) determine if walleye and muskellunge are present in the river, 3) determine the distribution of flathead catfish in the portions of the Yadkin River upstream of Idol's Dam, and 4) compile a species list of nongame fishes throughout the river.

The information obtained from this survey will provide data necessary to better manage and publicize the fisheries of the Yadkin River. Additionally, it will obtain valuable distribution information for nongame fish species.

Methods

In the summer of 2001 and 2005, fish were collected from the Yadkin River between. W. Kerr Scott Dam and High Rock Lake. Sampling effort focused around areas with the greatest concentration of fish habitat, such as woody debris, rock outcroppings, aquatic vegetation, and deep pools and runs. A boat equipped with a jet-drive outboard was used to facilitate navigation in the shallow water areas that are common throughout the river. In 2001 and 2005, fish were collected with a pulsed direct current electrofishing unit set to output four amps at 1000 V and 120 pulses per second (pps). Since electrofishing settings used to collect scaled fishes are often not as effective at collecting ictalurids, samples at most sites in 2005 also employed a period of time with the electrofishing unit set to output two amps at 1000 V and 15 pps.

In 2001, sampling occurred at Wilkesboro, Ronda, Elkin, Shallowford Road near West Bend, and Concord Church, an NCWRC owned boat access at Highway 801 (Figure 1). In 2005, sampling occurred below W. Kerr Scott Dam, and at Ronda, Elkin, Donnoha, and Concord Church.

All gamefish were collected and measured for total length (mm) and weight (g). All ictalurids were measured for total length. Nongame fish species collected from each site were identified to species and released without being measured for length and weight. Catch per unit effort (CPUE) for all gamefish and ictalurids captured was summarized for the 120 pps electrofishing setting in 2001 and 2005, and CPUE data for all ictalurids were summarized for the 15 pps electrofishing unit setting in 2005. Length distributions were constructed, and proportional stock densities and relative weights were determined for all gamefish when more than 10 individuals of that species were collected. Length distributions were constructed for all ictalurids.

Results and Discussion

Gamefish

Thirteen gamefish species were captured during this study in the Yadkin River (Table 1). Spotted bass were the most abundant gamefish in the Yadkin River during the 2001 and 2005 samples, and were found in all habitat types, from rocky riffles to slow pools. Spotted bass CPUE exceeded 50 fish/hr at the W. Kerr Scott Tailrace site in 2005 and the Wilkesboro site in 2001. Furthermore, in 2001, spotted bass CPUE exceeded 30 fish/hr at the Elkin, Shallowford, and Concord Church sites.

Largemouth and smallmouth bass catch rates were considerably lower than those for spotted bass at all sites, regardless of year. The only exception was at the Ronda site in 2005, when CPUE was 8.7 fish/hr for smallmouth bass and 5.2 fish/hr for spotted bass. Largemouth bass CPUE was highest below W. Kerr Scott Dam in 2005 (18.8 fish/hr), with the second highest CPUE (6.7 fish/hr) coming at the Shallowford site in 2001. Aside from the fish collected at these two sites, only 13 additional largemouth bass were collected from all other sampling locations during both years of the study. This suggests that largemouth abundance throughout the portion of the Yadkin River studied is low. Smallmouth bass CPUE was the highest between Wilkesboro and Elkin, with the highest recorded CPUE for this species (12.1 fish/hr) occurring at Elkin in 2005. Smallmouth bass were not captured below Idols dam at the Concord Church site, possibly due to higher water temperatures in this portion of the river.

For all three species of black bass, length-frequency distributions suggest the presence of several age classes (Figure 2). In 2001, proportional stock density (PSD) values for spotted, largemouth, and smallmouth bass were 38, 89, and 60, respectively. In 2005, PSD values remained high with values of 58, 74, and 75 for spotted, largemouth, and smallmouth bass, respectively. Although the densities of largemouth and smallmouth bass in the Yadkin River appear to be low, the high PSD values recorded reveals that most of the fish captured were of quality size or larger. Although comparative stock index data for riverine spotted and largemouth bass populations is limited for this part of North Carolina, smallmouth bass from the New River in North Carolina had a PSD of 25 in 2003 (Hodges 2004). Furthermore, statewide surveys of riverine smallmouth bass in Tennessee revealed a mean PSD of 34 (Fiss et al. 2001) and in Virginia the mean was 33 (VDGIF 2003). Given the low densities of largemouth and smallmouth bass in the Yadkin River, anglers that target black bass will likely not record high catch rates of largemouth or smallmouth bass. However, catch rates of spotted bass have the potential to be very good and a high percentage of largemouth and smallmouth bass that anglers catch will be of quality size and larger.

Mean relative weights were 105 for spotted bass in both years, 91 in 2001 and 105 in 2005 for largemouth bass, and 87 in 2001 and 85 in 2005 for smallmouth bass (Figure 3). Relative weights did not vary substantially in relation to total length for spotted bass or largemouth bass, but declined as total length increased for smallmouth bass. Given that smallmouth bass prefer cooler water temperatures than largemouth or spotted bass, it is possible that their reduced condition is related to the relatively warm water temperatures in the Yadkin River. However, relative weights of smallmouth bass in the New River, a coolwater river in the mountains of northwest North Carolina, averaged only 86 in 2003 and also declined as fish length increased (Hodges, 2004). As such, factors other than water temperature appear to be responsible for the reduced body condition observed in Yadkin River smallmouth bass.

Redbreast sunfish *Lepomis auritus* were the dominant sunfish species in the Yadkin, followed by bluegill *Lepomis macrochirus*. Redbreast sunfish and bluegill length distributions were primarily composed of fish < 150 mm in length in 2001, but several redbreast sunfish > 150 mm were captured in 2005 (Figure 4). Bluegill PSD values were 7 in 2001 and 15 in 2005. These PSD values further demonstrate the lack of bluegill ≥ 150 mm captured during this study. Relative weights for bluegill averaged 95 in 2001 and 106 in 2005 (Figure 5). Relative weight and PSD values were not calculated for redbreast since a relative weight equation and length categories do not exist for this species.

Other gamefish captured in the Yadkin River during electrofishing surveys in 2001 and 2005 included redear sunfish *Lepomis microlophus*, pumpkinseed *Lepomis gibbosus*, warmouth *Lepomis gulosus*, rock bass *Ambloplites rupestris*, white perch *Morone americana*, black crappie *Pomoxis nigromaculatus*, and chain pickerel *Esox niger*. Although CPUE for these species were provided in this report, length distributions and relative weights were not since fewer than 10 individuals of each species were captured.

No walleye or muskellunge were observed in the Yadkin River during this study. However, chain pickerel were captured in 2005 at the W. Kerr Scott Tailrace sample site. Recent reports of anglers catching muskellunge in this portion of the Yadkin River may have been a result of misidentification by anglers who actually caught chain pickerel. Although only six pickerel were captured, three of the six individuals captured exceeded 500 mm in total length, and two exceeded the memorable length classification for chain pickerel (≥ 630 mm). Although it is possible that muskellunge and/or walleye are present, we have no proof that either species currently exists in the Yadkin.

Catfish

Ictalurids, primarily snail bullheads, comprised a major portion of the fish community in the Yadkin River (Table 2). Although all five ictalurid species observed in the Yadkin River were collected using both the 120 pps and 15 pps electrofishing settings, the efficiencies of each setting varied depending on the species of interest.

The 15 pps setting used in 2005 was more efficient at collecting bullheads than the 120 pps setting (Table 2). With the 15 pps setting, bullheads would come to the surface at great distances from the boat, often in large numbers. However, capture of these individuals was difficult, as many individuals would swim away from the boat or down to deeper water once the boat came close enough for the fish to be netted. Even with this avoidance behavior, bullhead catch rates were extremely high, with >286 fish/hr being collected at the Ronda site using the 15 pps setting. Furthermore, catch rates exceeded 100 fish/hr at all sites above Idols Dam when the 15 pps setting was used. Snail bullheads (N = 109) were the main bullhead species collected, although flat bullheads (N = 14) were collected at most sites as well. Brown bullheads were not observed in this study, but were collected in the 1987 survey (Mickey 1988). However, brown bullheads made up a very small percentage of the total bullheads captured in the 1987 survey (Mickey 1988). As a result, it is possible that they were present during this survey, but low densities of this species at our sample sites prevented us from observing any. As was observed in the 1987 survey (Mickey 1988), no bullheads were collected downstream of Idols Dam, with either electrofishing setting, presumably due to their numbers being decreased as a result of predation by flathead catfish. The total lengths of bullheads ranged from 62–347 mm (Figure 6). Given

the high densities of bullheads upstream of Idols Dam, the ease with which they can be caught, and their qualities as a food fish (Etnier and Starnes 1993), angling for bullheads should be promoted through outreach.

Channel catfish were the second most abundant ictalurid after bullheads, and catch rates for this species in 2005 were higher with the 120 pps setting (8.4 fish/hr) than the 15 pps setting (2.1 fish/hr). Although channel catfish were captured immediately below W. Kerr Scott Dam in 2005 (N = 3), the remaining channel catfish captured in 2005 were all found below Idols Dam (N = 44). However, a few individuals were collected at the Ronda and Shallowford sites in 2001. Channel catfish ranged in length from 73–567 mm (Figure 7), with a PSD of 43 in 2001, and 25 in 2005.

In 2001, flathead catfish were only captured at the Concord Church site (N = 11) below Idols Dam. During the 2005 sample, flathead catfish were again captured at the Concord Church site, but they were also captured at the Elkin (N = 1) and Donnoha sites (N = 5) upstream of Idols Dam. Catch rates were similar between the 120 pps (13.5 fish/hr) and 15 pps (16.0 fish/hr) settings at the Concord Church site, where the majority of flathead catfish were captured in 2005 (N = 33). However, the 120 pps setting caught a broader length range of fish in 2005 (Figure 8). The mean total length of flathead catfish collected with the 120 pps setting was 354 mm (range, 191–1150) , while the mean total length of individuals captured using the 15 pps setting was 254 mm (range, 146–810). It is unclear why densities of flathead catfish above Idols Dam are much lower than below, given that flathead catfish were collected as far upstream as W. Kerr Scott Dam in 1997. Habitat may be preferable downstream of Idols Dam, as the Concord Church site contained several large rock outcroppings, fallen trees, and moderately deep pockets of water, all of which are favorable habitat for flathead catfish (Kwak et al. 2004). The PSD for flathead catfish was 88 in 2001, and 33 in 2005. The disparity between the PSD for the two sample years may be due to the small sample size in 2001. Future monitoring of flathead catfish in the Yadkin River is needed, as future expansions of their population upstream of Idols Dam will likely interfere with other fish species, such as the bullhead catfishes and catostomids.

The only location on the Yadkin River where white catfish were observed was directly below the W. Kerr Scott Dam. All of these fish were captured with the 120 pps setting (Figure 9); however, only a limited amount of time was spent sampling this site with the 15 pps settings due to equipment failure. During a separate study in 2005, NCWRC biologists sampled the South Yadkin River upstream of the Cooleemee Dam and averaged 14.4 white catfish/hr with the 15 pps settings, but did not capture any white catfish using the 120 pps setting (NCWRC unpublished data). As a result, it is unclear which of the two electrofishing pulse rates is preferable for collecting white catfish.

Nongame Fish

Twelve nongame fish species were observed in the Yadkin River in 2005 (Table 3). Nongame species were collected arbitrarily since the main focus of this study was to characterize gamefish and ictalurid species in the river. As a result, CPUE data was not calculated for nongame species. Regardless, catostomids appear to be the dominant group of fish in the Yadkin River above Idols Dam, and probably exceed bullhead catfish with respect to density and biomass in this section of the river. Below Idols Dam, fewer catostomids were observed, possibly from predation by flathead catfish. Although catostomids are not routinely viewed as a

sportfish, some anglers do target them, mainly as a food fish. Promoting angling for this species may be worthwhile since densities are very high in the Yadkin.

The high density of catostomids, and the fact that no State or Federally listed nongame fish species were observed, suggests that a predatory gamefish large enough to utilize the catostomid assemblage as prey might do well in the Yadkin River. Soft-rayed prey, such as catostomids, are reported to be a favored prey item for muskellunge and tiger muskellunge *Esox masquinongy x Esox lucius*, with both favoring them over other taxa such as centrarchids (Wahl and Stein 1988; Bozek et al. 1999). Although stockings of muskellunge from 1978–1983 do not appear to have resulted in an established population, monitoring of these stockings did not occur. As a result, growth and survival of the muskellunge previously stocked in the Yadkin River is unknown. Given the problems often associated with stocking an exotic species, tiger muskellunge would probably be preferred over muskellunge for any future stocking in the Yadkin River since they are functionally sterile. Although the potential for angler pressure is high due to the many towns along the Yadkin River (i.e. the Wilkesboros, Elkin, Yadkinville, and Winston-Salem), angling use of the river is believed to be low. As a result, the possibility of stocking tiger muskellunge and providing a potentially valuable and high use fishery in the Yadkin River should be investigated.

Conclusions

The Yadkin River can be characterized as a diverse cool to warmwater fishery containing outstanding densities of bullhead catfishes above Idols Dam, moderate densities of spotted bass and redbreast sunfish, and lower densities of bluegill, largemouth bass, and smallmouth bass. Channel catfish and flathead catfish are present, but densities appear to be the highest below Idols Dam. Although CPUE data was not collected for nongame fish, sucker species appeared to be the dominant group of fish upstream of Idols Dam with respect to overall density and biomass. Expansion of gamefish opportunities through stocking an additional predator species is worth investigating. Finally, the bullhead fishery, as well as those for spotted bass, redbreast sunfish, and suckers, should be promoted through outreach.

Recommendations

1) Promote the fisheries that currently exist in the Yadkin River by providing the results of this study to the public through outreach (newspaper and magazine articles, posters, etc.).

2) Sample the fishery at 5-year intervals to monitor gamefish populations as well as the possible expansion of flathead catfish upstream of Idols Dam. The 120 pps and 15 pps electrofishing settings should be used to provide a representative sample of ictalurids.

3) Explore options for creating angling opportunities, possibly by stocking a large gamefish (i.e. tiger muskellunge) that might be able to utilize the high density of catostomids in the river as a food source.

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TABLE 1.—Catch rates (fish/hr) of gamefish and ictalurids collected using the 120 pps electrofishing setting from the Yadkin River, 2001 and 2005.

	Yadkin River									
	W. K. Scott Tailrace	Wilkesboro	Ronda		Elkin		Shallowford	Donnoha	Concord Church	
Species	2005	2001	2005	2001	2005	2001	2001	2005	2005	2001
Smallmouth Bass	1.9	4.8	8.7	11.7	12.1	0.0	2.2	1.8	0.0	0.0
Spotted Bass	**57.2**	**52.8**	**5.2**	**18.8**	**19.7**	**33.2**	**42.3**	**7.0**	**18.0**	**32.1**
Largemouth Bass	18.8	4.8	0.0	2.3	3.0	0.0	6.7	0.0	5.4	0.0
Redear Sunfish	**0.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**4.5**	**0.0**
Bluegill	11.3	2.4	0.0	0.0	1.5	0.0	6.7	0.0	35.9	22.3
Pumpkinseed	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.9**	**0.0**
Redbreast Sunfish	6.6	21.6	22.7	24.7	51.4	66.5	53.4	5.8	0.0	2.9
Warmouth	**0.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.9**
Rock Bass	0.9	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9
White Perch	**1.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.8**	**8.7**
White Bass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Black Crappie	**3.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**
Chain Pickerel	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Channel Catfish	**2.8**	**0.0**	**0.0**	**1.2**	**0.0**	**0.0**	**2.2**	**0.0**	**35.9**	**11.7**
Flathead Catfish	0.0	0.0	0.0	0.0	1.5	0.0	0.0	2.9	13.5	10.7
White Catfish	**10.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Bullheads[a]	6.5	2.4	0.0	1.2	16.6	28.1	20.0	25.7	0.0	0.0
Time Sampled (s)	3840	1500	2066	3065	2381	1408	1618	6164	4011	3705

[a] includes flat and snail bullheads

TABLE 2.—Catch rates (fish/hr) of ictalurids collected using the 15 pps electrofishing setting from the Yadkin River, 2005.

	Yadkin River			
Species	W. K. Scott Tailrace	Ronda	Elkin	Concord Church
Channel Catfish	0.0	0.0	0.0	3.6
Flathead Catfish	**0.0**	**0.0**	**0.0**	**16.0**
White Catfish	0.0	0.0	0.0	0.0
Bullheads [a]	**180.9**	**286.7**	**118.7**	**0.0**
Time Sampled (s)	179	565	2124	4033

[a] includes flat and snail bullheads

TABLE 3.—Nongame fish collected from the Yadkin River, 2005.

Family/Species	Common Name	Yadkin River				
		W. Kerr Scott Tailrace	Ronda	Elkin	Donnoha	Concord Church
Cyprinidae						
Nocomis leptocephalus	Bluehead Chub	X			X	
Cyprinus carpio	Common Carp					X
Catostomidae						
Carpiodes sp.	"Quillback"			X		
Scartomyzon n. sp.	"Brassy Jumprock"	X	X	X	X	
Moxostoma rupiscartes	Striped Jumprock	X	X			
Hypentelium nigricans	Northern Hog Sucker				X	
Moxostoma pappillosum	V-lip Redhorse		X	X	X	
Moxostoma collapsum	Notchlip Redhorse	X	X	X	X	
Catostomus commersonii	White Sucker	X	X			
Minytrema melanops	Spotted Sucker					X
Lepisosteidae						
Lepisosteus osseus	Longnose Gar					X
Clupeidae						
Dorosoma cepedianum	Gizzard Shad					X

X = species present.

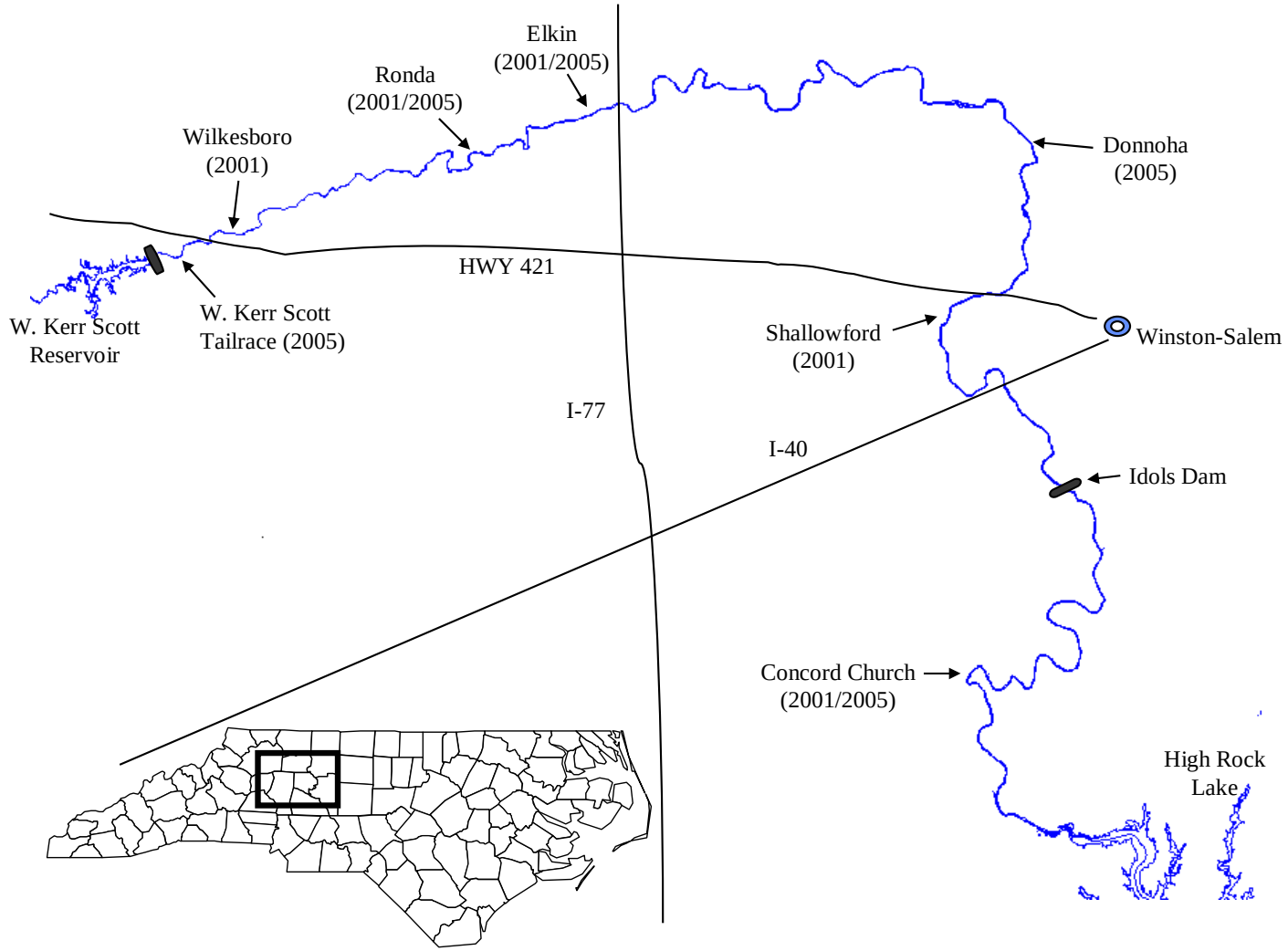

FIGURE 1.—Map of the Yadkin River between W. Kerr Scott Reservoir and High Rock Lake, detailing location of sample sites, the year they were sampled, major towns, and roads.

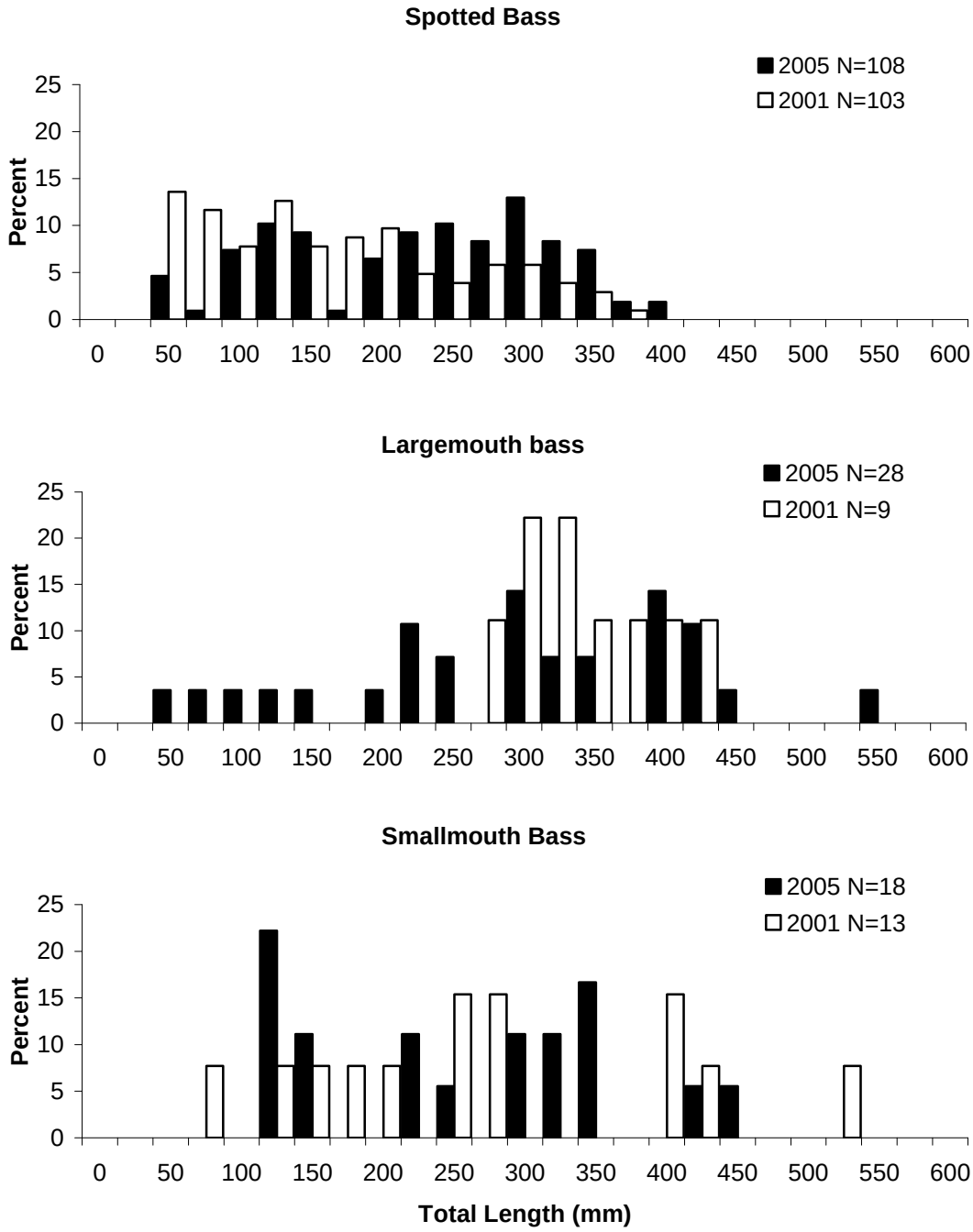

FIGURE 2.—Length distribution of black bass captured from the Yadkin River, 2001 and 2005.

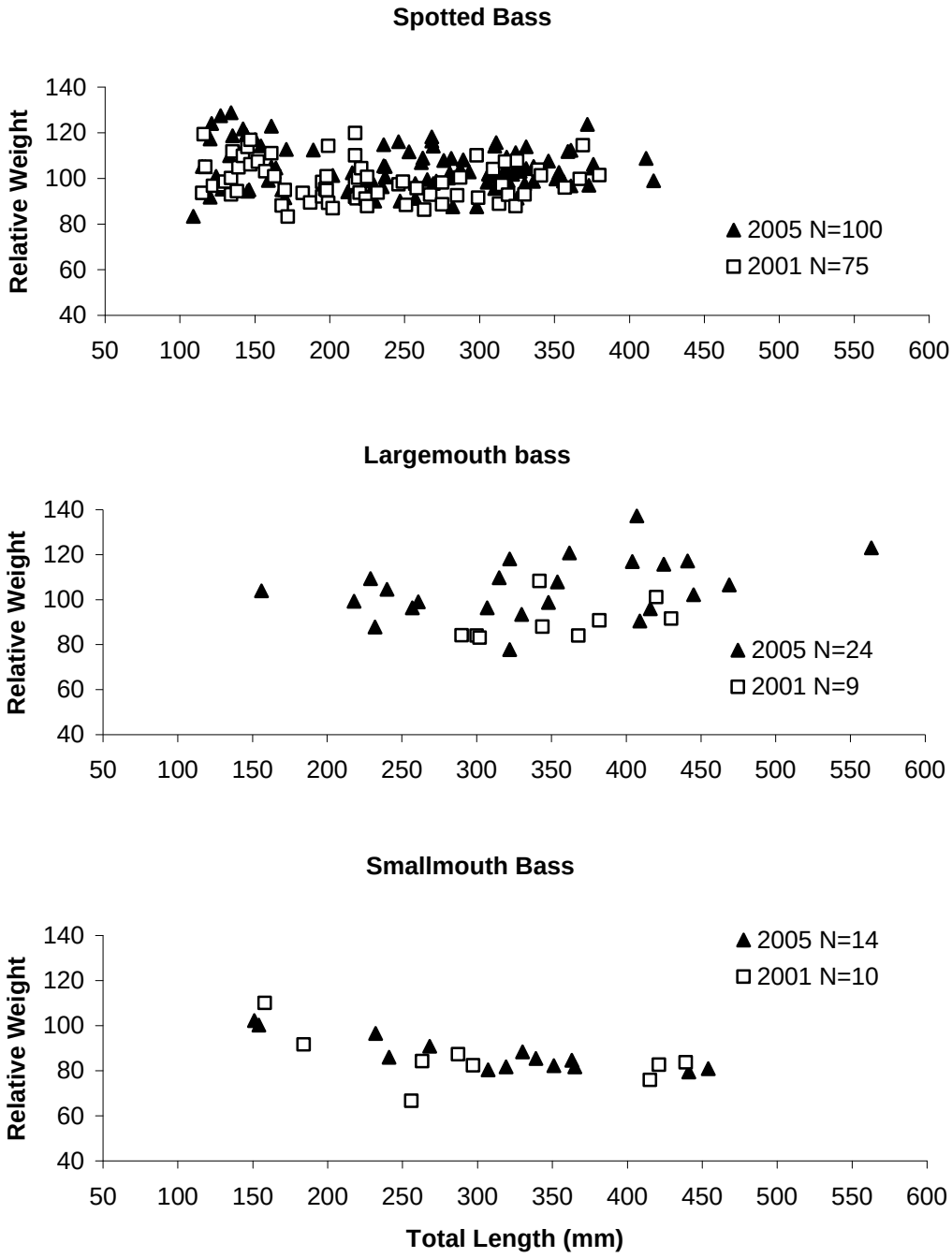

FIGURE 3.—Relative weight of black bass captured from the Yadkin River, 2001 and 2005.

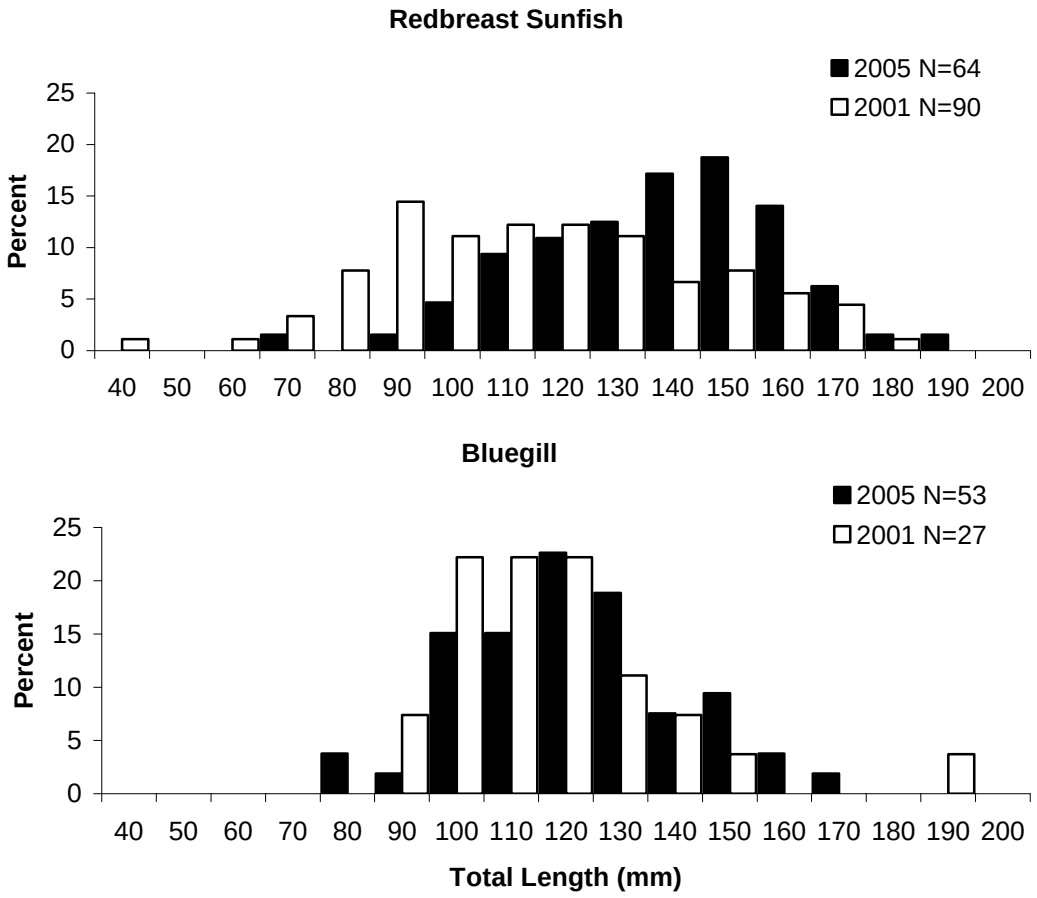

FIGURE 4.—Length distribution of redbreast sunfish and bluegill captured from the Yadkin River, 2001 and 2005.

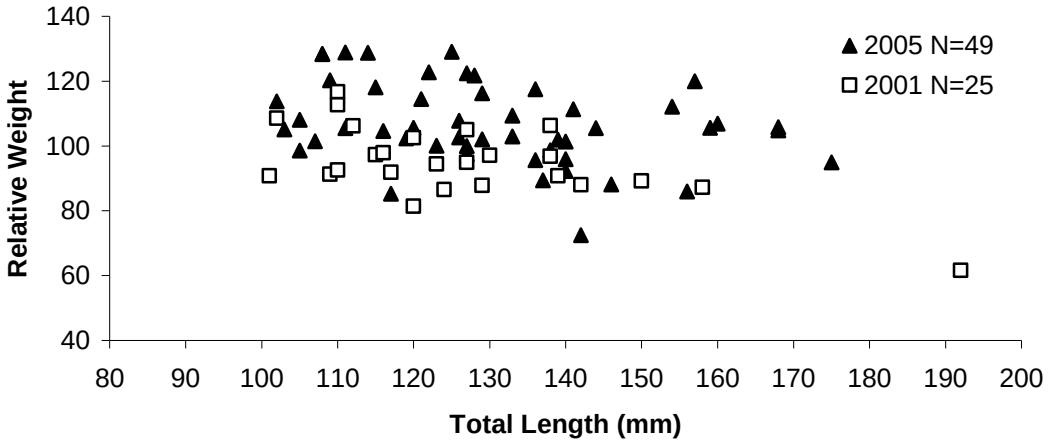

FIGURE 5.—Relative weight of bluegill captured from the Yadkin River, 2001 and 2005.

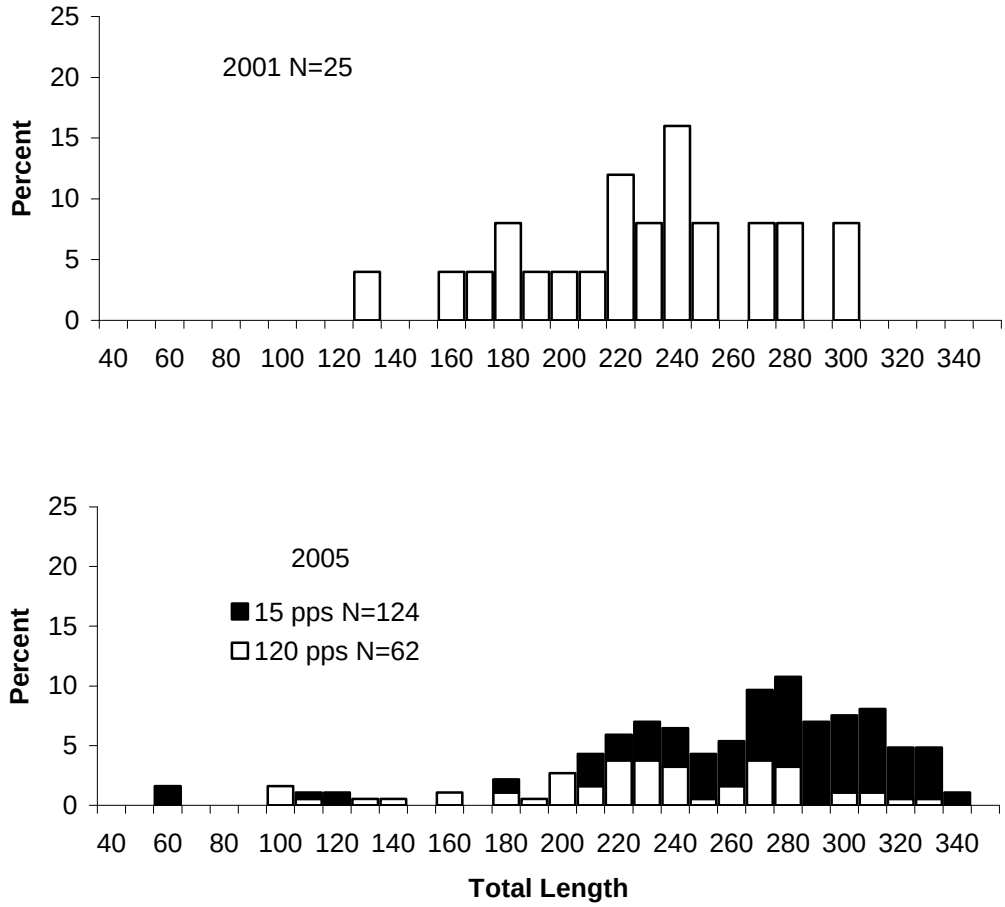

FIGURE 6.—Length distribution of bullhead catfishes (snail and flat bullheads combined) captured from the Yadkin River using 120 pps electrofishing settings in 2001, and using 120 pps and 15 pps electrofishing settings in 2005.

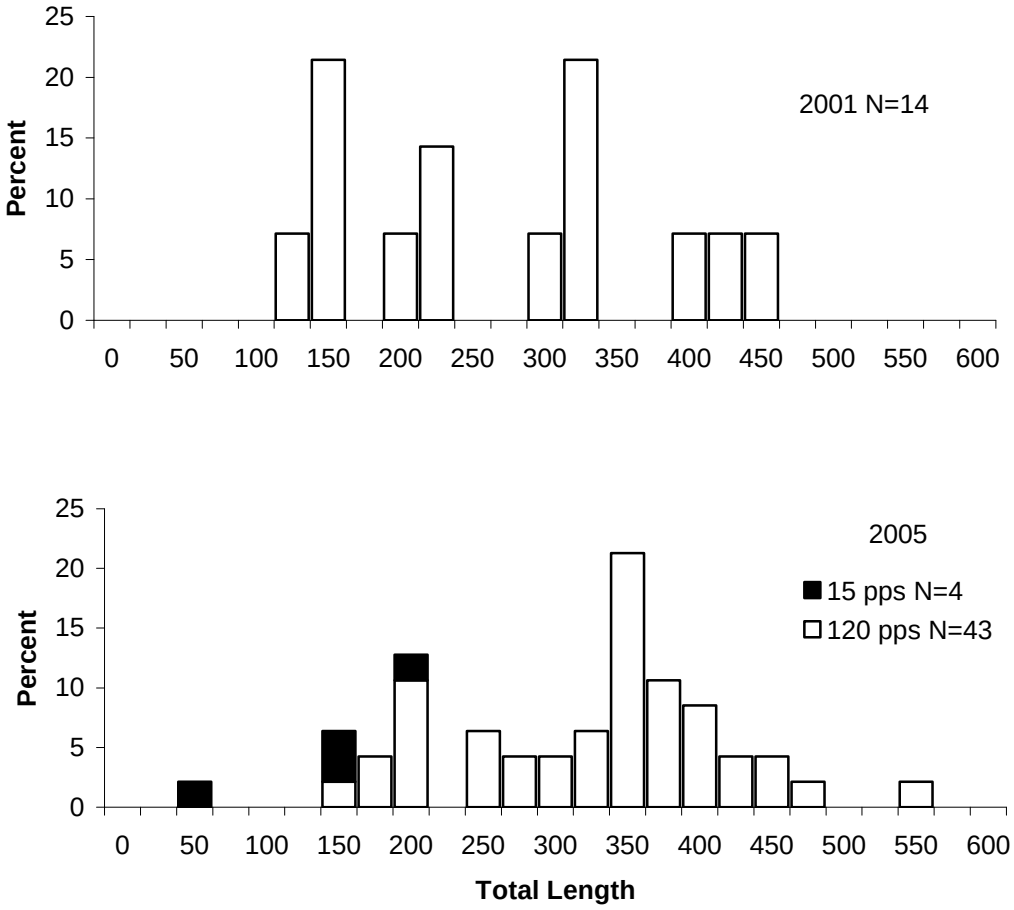

FIGURE 7.—Length distribution of channel catfish captured from the Yadkin River using 120 pps electrofishing settings in 2001, and 120 pps and 15 pps electrofishing settings in 2005.

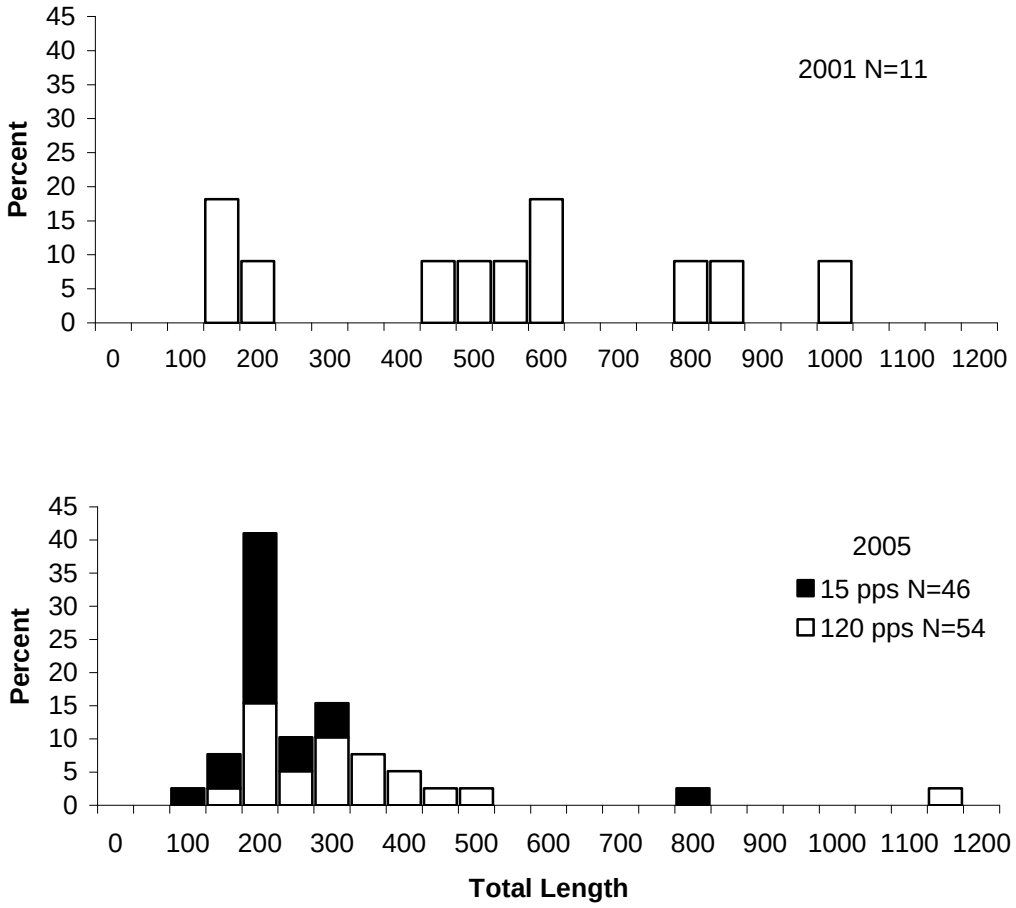

FIGURE 8.—Length distribution of flathead catfish captured from the Yadkin River using 120 pps electrofishing settings in 2001, and 120 pps and 15 pps electrofishing settings in 2005.

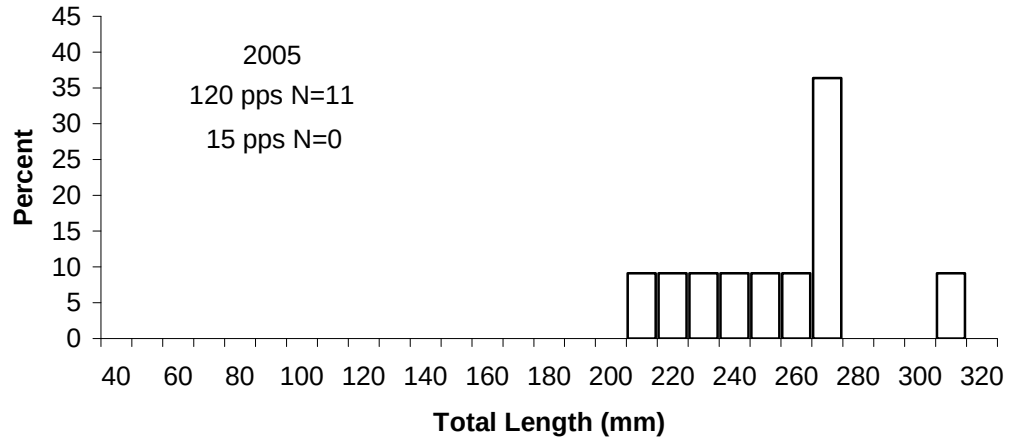

FIGURE 9.—Length distribution of white catfish captured from the Yadkin River using 120 pps and 15 pps electrofishing settings in 2005.