# Evaluation of Two Sizes of Fingerling Smallmouth Bass Stocked into a South Carolina River

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*Abstract:* Smallmouth bass (*Micropterus dolomieu*) have been stocked intermittently into the Broad River, South Carolina, since 1984, resulting in a popular fishery. Numbers and sizes of smallmouth bass stocked vary annually depending on availability. Two sizes of fingerling smallmouth bass are stocked; however, stocking efficacy of these sizes was unknown. Therefore, contribution and relative survival of small (mean TL = 42 ± 0.3 mm) and large (mean TL = 150 ± 1.5 mm) fingerling smallmouth bass stocked during 2005–2010 into the Broad River was evaluated by differentially marking with oxytetracycline. The total contribution of stocked fish at age-1+ in the Broad River ranged from 4% to 47% among year classes and was positively correlated with mean spring (March–May) water flows. Further, relative survival of large fingerlings was 7.7 times greater than small fingerlings. Results of this study indicated that stocking smallmouth bass in the Broad River is only beneficial when mean spring water flows are average or above average, and large fingerlings should be stocked instead of small fingerlings.

*Key words*: oxytetracycline, flows, supplemental stocking, year class contribution, survival, marking efficacy

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Black bass (*Micropterus* spp.) stockings are common throughout the United States and are used to meet various management goals including: enhancement of year-class strength through supplemental stockings (Boxrucker 1986, Mesing et al. 2008, Colvin et al. 2008), reestablishing sport fisheries (Buynak et al. 1991, Porta and Long 2015), or altering the genetic composition of wild populations (Maceina et al. 1988, Gilliland 1992, Buckmeier et al. 2003, Hoffman and Bettoli 2005). To date, several studies have evaluated stocking success for largemouth bass (*M. salmoides*), reporting widely varying success (e.g., Boxrucker 1986, Hoxmeier and Wahl 2002, Mesing et al. 2008, Diana and Wahl 2009), but few published studies have evaluated the success of stocking smallmouth bass (*M. dolomieu*). In fact, the only published accounts of the contribution of stocked smallmouth bass to existing populations have occurred in streams (Larimore 1954, Brown 1961, Funk and Fleener 1974) and a large natural lake (Forney 1972), and these studies consistently concluded that supplemental stocking of smallmouth bass was not an effective management technique.

Large variation in year-class strength is common in lotic smallmouth bass populations and has been related to river discharge during the spawning and post-spawning period (Cleary 1956, Funk and Fleener 1974, Paragamian 1984, Slipke et al. 1998, Buynak and Mitchell 2002, Smith et al. 2005). Highly variable spring discharge is likely why some studies in the southeastern United States have concluded that year-class strength of lotic smallmouth bass populations is established before the end of their first year (Funk and Fleener 1974) and as early as September (Smith et al. 2005). Stocking larger smallmouth bass in the fall, after year-class strength has been established, may be an option for supplementing year classes with poor natural recruitment associated with high spring water flows.

Fish size at stocking is an important consideration for fish stocking programs. Production costs increase significantly with fish size due to a variety of factors (e.g., extended feeding, maintenance, mortality), so at any given resource level, many more smaller fish can be produced and stocked than larger fish. Larger fish are stocked with the assumption that their survival is greater due to their larger body size, but the benefit of stocking larger fish is only realized if their relative survival justifies the increased cost. The relative survival of different sized smallmouth bass stocked into a southeastern piedmont river has not been evaluated.

Smallmouth bass have been stocked intermittently into the Broad River, South Carolina, since 1984, resulting in a popular fishery that has produced trophy-size smallmouth bass (>500 mm TL). Numbers and sizes of fish stocked have varied greatly depending on availability. Both small (mean TL = 42 mm, SE = 0.3) and large (mean TL = 150 mm, SE = 1.5) fingerling smallmouth bass are typically stocked when available; however, it is not known which of these stockings has the higher survival and contribution to the fishery. Identifying which stocking size has the greater relative survival will allow hatchery managers to focus production on the size group that helps to meet the intended goals for this fishery. Thus, the objectives of this study were to: 1) estimate year-class contribution of smallmouth bass stocked as small and large fingerlings into the Broad River, 2) determine the relative survival of each stocking size, and 3) evaluate the influence of spring water flows on the contribution of stocked fish to each year class.

## Methods

### Study Area

The Broad River basin is a major component of the Santee River drainage that originates in North Carolina and dominates the central Piedmont of South Carolina (Figure 1). Within South Carolina, the Broad River basin encompasses 9819 km$^2$, and the river flows approximately 170 km until it merges with the Saluda River, near Columbia, to form the Congaree River. During 1999–2009 average annual discharge (± SE) of the Broad River approximately 11 km downstream from the North Carolina state line at the U.S. Geological Survey (USGS) gauge (#02153200) was 43.8 ± 6.6 m$^3$ sec$^{-1}$, while average discharge (± SE) 1.6 km below Parr Reservoir (USGS gauge #02161000), near Columbia, South Carolina, was 110.8 ± 17.7 m$^3$ sec$^{-1}$. Average annual water temperature (± SE) at Carlisle, South Carolina (mid-length of the river) over the same 11-year period was 17.9° ± 0.2° C, with average annual minimum and maximum water temperatures (± SE) of 2.7° ± 0.4° C and 32.1° ± 0.5° C, respectively. The Broad River is relatively shallow with few unimpounded areas deeper than 3 m. The majority of the habitat in the river is shallow, sand-filled pools separated by bedrock shoals and gravel riffles. The river is segmented by seven hydroelectric dams with run-of-the-river impoundments ranging in size from 101 ha to 1781 ha.

The Broad River contains a typical fish community for a large southeastern piedmont river, comprising over 50 species. The most abundant sportfish species are redbreast sunfish (*Lepomis auratus*), bluegill (*L. macrochirus*), redear sunfish (*L. microlophus*), largemouth bass and smallmouth bass. Smallmouth bass were introduced into the South Carolina portion of the Broad River drainage in 1984 when 1339 large fingerlings (~150 mm TL) were stocked to increase the diversity of sport fishing opportunities. A total of 26,064 small fingerlings (~40 mm TL) and 19,258 large fingerlings (~150 mm TL) were stocked in 15 years between 1984 and 2004. In seven of those years only large fingerlings were stocked, in three years only small fingerlings were stocked, and in five years both sizes were stocked. During the study period (2005–2011) smallmouth bass in the Broad River were managed with a 10-fish creel limit with no minimum size. Beginning in 2012, smallmouth bass in the Broad River were managed with a minimum length limit of 305 mm TL and the statewide black bass creel limit which allows no more than five fish (species in aggregate) per day.

This study focused on three sections of the Broad River: 1) the 11-km section between Gaston Shoals and Cherokee Falls dams (Gaston Shoals); 2) the 23-km section between Ninety-nine Islands Dam and the impounded area of Lockhart Reservoir (Ninety-nine Islands); and 3) the 25-km section between Neal Shoals Dam and the impounded area of Parr Shoals Reservoir (Neal Shoals; Figure 1).

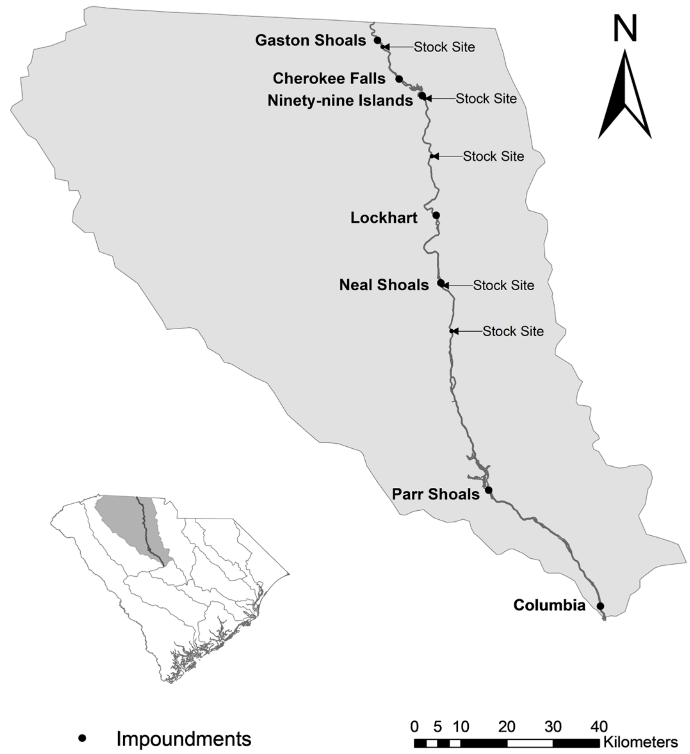


**Figure 1.** Impoundments and smallmouth bass stocking locations in the Broad River, South Carolina.

### Marking and Marking Efficacy

Small fingerling (mean TL = 42 mm, SE = 0.3 mm; range 26–63 mm TL) and large fingerling (mean TL = 150 mm, SE = 1.5 mm; range 89–234 mm TL) smallmouth bass were reared and marked with oxytetracycline (OTC) at the Cheraw State Fish Hatchery in accordance with the South Carolina Department of Natural Resources (SCDNR) protocol for immersion marking juvenile fish (SCDNR 2005). Smallmouth bass fry collected from spawning ponds were transferred to rearing ponds for 25–30 days until they reached small fingerling size and were harvested. Small fingerlings received a single OTC mark and were released at stocking locations or trained on commercial feed for 10–14 days, generally received a second OTC mark, and were then stocked into grow-out ponds where they were fed commercial feed until they reached large fingerling size. During 2007 large fingerlings did not receive their second OTC mark until their stocking date. All fish were marked in a 6-h immersion at a concentration of 500 ppm OTC.

To evaluate OTC marking efficacy, at least 30 fish from each marking event were collected before fall stocking of large fingerlings. At that time both the first and second mark were evaluated, except during 2007, when fish received their second OTC mark just before fall stocking and were therefore retained over winter to allow for growth to occur past the mark, and then reviewed for marks. Sagittal otoliths were removed from each fish, cleaned of connective tissue, dried with paper towels and placed in vials for storage. The left otolith from each fish was then placed in a mold and embedded in an epoxy resin (Araldite). A 1- to 2-mm-thick section was cut from the transverse plane of each embedded otolith with an Isomet Low Speed saw (Buehler LTD, Lake Bluff, Illinois) equipped with a diamond wafering blade. Sections were mounted with an adhesive (Crystalbond 509, Electron Microscopy Sciences) onto numbered microscope slides, sanded with 400–1500 grit sandpaper to remove saw marks, and polished on a felt pad with a 0.3-μm polishing compound. Prepared sections were examined independently by two experienced readers for fluorescent OTC marks with a Motic BA400 compound microscope (Speed Fair Co., Ltd, Hong Kong) equipped with a 100-W mercury arc light source (Jenkins et al. 2002).

### Stocking

Fish were stocked each year from 2005 to 2010; small fingerlings (single mark) were stocked in May and large fingerlings (double mark) were stocked in late October or early November. Approximately 10,000 small fingerlings were equally divided and stocked at five sites into three sections (Gaston Shoals, Ninety-nine Islands, and Neal Shoals) of the Broad River (Figure 1) at an average rate of 16.2 fish $ha^{-1}$. During October approximately 2800 large fingerlings (4.9 fish $ha^{-1}$) were stocked at the same stocking locations used for small fingerlings.

### Age-1+ Smallmouth Bass Collection and Source Identification

Boat electrofishing was used to collect smallmouth bass during late summer and early fall just prior to fall stocking of fingerlings from each Broad River section during 2006–2011. Angling was also used to collect smallmouth bass when sufficient numbers were not collected with boat electrofishing gear. All collected smallmouth bass were returned to the lab for processing. Total length (mm) and weight (g) were recorded and sagittal otoliths removed from each fish to confirm ages and evaluate OTC marking. Otoliths were prepared as in the marking efficacy evaluation and read independently by two experienced readers.

### Statistical Analyses

The composition of each year class (i.e., small-fingerling or large-fingerling stocked fish or naturally-produced fish, hereafter "wild") was calculated by dividing the number of otoliths from each category (i.e., one OTC mark, two marks, or no mark) by the total number collected. Pearson correlation (SAS Institute 2011) was used to investigate the relationship between the total (small and large fingerlings pooled) contribution of stocked smallmouth bass and mean water discharge ($m^3\ sec^{-1}$) during spring (March–May) of each stocking year. Mean discharge was calculated from the USGS gauge (#021564493) near Carlisle, South Carolina (approximate midpoint of the river).

Relative survival between fish stocked at different sizes has been evaluated by comparing the ratios of the number stocked to those recaptured by year class (Heidinger et al. 1985, Brooks et al. 2002). In this study, multinomial logistic regression (SAS Institute 2011) was used to model the recapture probabilities (a measure of relative survival) of small and large fingerlings at age-1+. The dependent variables were small-recaptured/small-stocked and large-recaptured/large-stocked. The independent variables were river section, collection year, standardized mean discharge in each river section during spring (March–May) of each stocking year, and the interaction between size of smallmouth bass stocked (small or large) and standardized mean spring discharge during each stocking year. Mean spring discharge was calculated from daily average discharges collected from USGS gauges in each river section; Gaston Shoals (USGS #02153200), Ninety-nine Islands (USGS #02153551) and Neal Shoals (USGS #021564493). Standardized mean discharge was used to account for the natural longitudinal increase in river discharge across the 90-km study reach and was calculated for each section by subtracting the overall mean spring discharge during the study period from the observed mean spring discharge for each year class stocked and dividing that value by the standard deviation of mean spring discharges during the study period. To investigate the relationship between mean spring discharges and recapture probabilities of small- and large-fingerling stocked smallmouth bass a reduced regression model was used that included only the significant effects. Mean lengths of recaptured fish at age-1+ were used to compare growth of the two sizes at stocking and wild fish. Differences in mean length of age-1+ fish were investigated with ANOVA. Statistical tests were significant at $P \leq 0.05$.

## Results

Otoliths from at least 30 fish from each marking event were reviewed to evaluate marking efficacy during 2005–2010. Only three otoliths of the 413 otoliths reviewed were not properly marked (i.e., all other otoliths contained the appropriate number of OTC marks). Three otoliths from the 2007 year class were missing their second mark, but marking efficacy for that year class was still more than 97% and therefore no adjustments for marking efficacy were made to percent contribution for this year class.

**Table 1.** The number of small and large fingerling smallmouth bass stocked each year, the number of otoliths collected from age-1+ smallmouth bass the following year and reviewed for OTC marks (*n*), percent contribution of each size stocking at age-1+, and the total contribution of stocked fish in the Broad River, South Carolina.

| | Number stocked | | | Percent contribution | | |
|---|---|---|---|---|---|---|
| Year class | Small | Large | *n* | Small | Large | Total |
| 2005 | 8200 | 2800 | 55 | 4 | 44 | 47 |
| 2006 | 11,340 | 2000 | 160 | 3 | 1 | 4 |
| 2007 | 12,000 | 3226 | 193 | 5 | 3 | 8 |
| 2008 | 8500 | 3500 | 97 | 1 | 4 | 5 |
| 2009 | 10,000 | 3500 | 39 | 15 | 31 | 46 |
| 2010 | 9000 | 2100 | 84 | 10 | 18 | 27 |

**Table 2.** Multinomial logistic regression results for the probability of recapturing smallmouth bass stocked at two sizes into three Broad River sections during 2005–2010.

| | Effect | DF | Estimate | SE | Wald $X^2$ | *P* |
|---|---|---|---|---|---|---|
| Full model | Section | 2 | | | 5.88 | 0.0553 |
| | Year | 5 | | | 7.38 | 0.1938 |
| | Size | 1 | 1.72 | 0.26 | 45.34 | <0.0001 |
| | Standardized mean flow | 1 | | | 2.26 | 0.1326 |
| | Standardized mean flow*Size | 1 | 0.83 | 0.30 | 7.50 | 0.0062 |
| Reduced model | Section | 2 | | | 5.88 | 0.0529 |
| | Size | 1 | 1.72 | 0.26 | 49.55 | <0.0001 |
| | Standardized mean flow | 1 | | | 0.59 | 0.4430 |
| | Standardized mean flow*Size | 1 | 0.69 | 0.26 | 7.03 | 0.0080 |

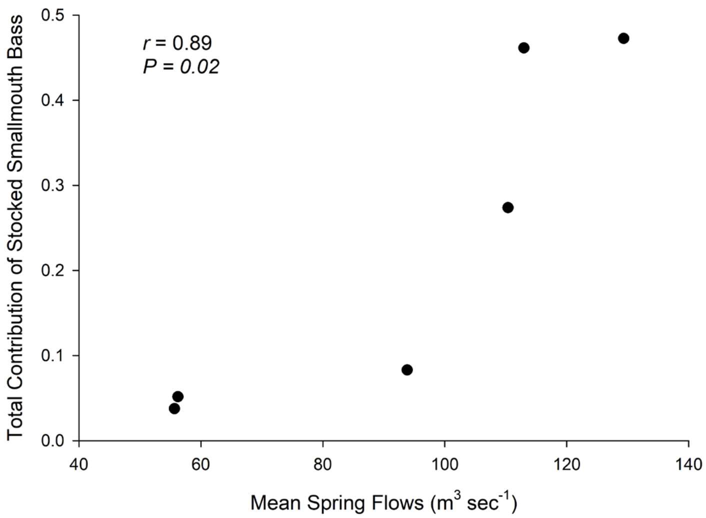


**Figure 2.** Total contribution of stocked smallmouth bass at age-1+ versus mean flows (m$^3$ sec$^{-1}$) during spring (March-May) of each stocking year 2005–2010 in the Broad River, South Carolina.

From 2005 to 2010, 8200 to 12,000 small and 2000 to 3500 large fingerlings were divided equally among sites and stocked into the Broad River annually (Table 1). Between 39 and 193 age-1+ smallmouth bass were collected each year beginning in 2006 and examined for OTC marks. Reader agreement of OTC marks was excellent. The two readers independently agreed on 98% ($n = 628$) of the otoliths they reviewed. Between 2005 and 2010 the contribution of small-fingerling fish at age-1+ averaged 6% (SE = 2%; range = 1%-15%) while that of large fingerling-stocked fish averaged 17% (SE = 7%, range= 1%–44%; Table 1). The total age-1+ contribution (both sizes combined) ranged from 4% to 47% and averaged 23% (SE = 8%). There was a strong positive correlation between total contribution of stocked smallmouth bass and mean spring flows ($r = 0.89$, $P = 0.017$; Figure 2). Stocked smallmouth bass (both sizes combined) made a small contribution (<9%) to each year class in years when flows were below 99.1 m$^3$ sec$^{-1}$; whereas, higher flows (>107.6 m$^3$ sec$^{-1}$) resulted in larger contributions (≥27%) of stocked smallmouth bass.

Although collection year and standardized mean spring discharge did not influence recapture probabilities of small and large fingerlings ($P \geq 0.05$), river section approached significance ($P = 0.055$). Stocking size was the main factor determining recapture probabilities of fingerlings, and this factor had an interaction with standardized mean spring discharge ($P \leq 0.05$; Table 2). To investigate the relationship between spring discharge and recapture probabilities of small and large fingerlings a reduced regression model was used that included only the significant effects, including river section (Table 2). Recapture probabilities were low (≤0.01) for both stocking sizes in all river sections, especially at lower flows, and were positively related to standardized mean discharge (Figure 3). As flow increased, recapture probability of large fingerlings increased dramatically while that of small fingerlings remained low. For example, in the river section below Neal Shoals during low spring discharges (standardized mean flow = -1.3) large fingerling recapture rates were 2.3-fold greater than small fingerling recapture rates, but during high spring discharge (standardized mean flow = 1.2) large fingerling recapture rates were 12.9-fold greater than small fingerling recapture rates (Figure 3). Using the full model, the overall odds of recapturing a large fingerling were 7.7-fold greater (Wald 95% CL = 4.9–11.9) than recapturing a small fingerling. Mean TLs at age-1+ of recaptured small fingerling (234 mm, SE = 4.2 mm), large fingerling (235 mm, SE = 3.0 mm), and wild (229 mm, SE = 1.2 mm) smallmouth bass were similar ($F = 1.37$; df = 2; $P = 0.26$; Figure 4).

## Discussion

The OTC marking protocols used in this study resulted in highly readable marks, with 100% marking efficacy in five of six years,

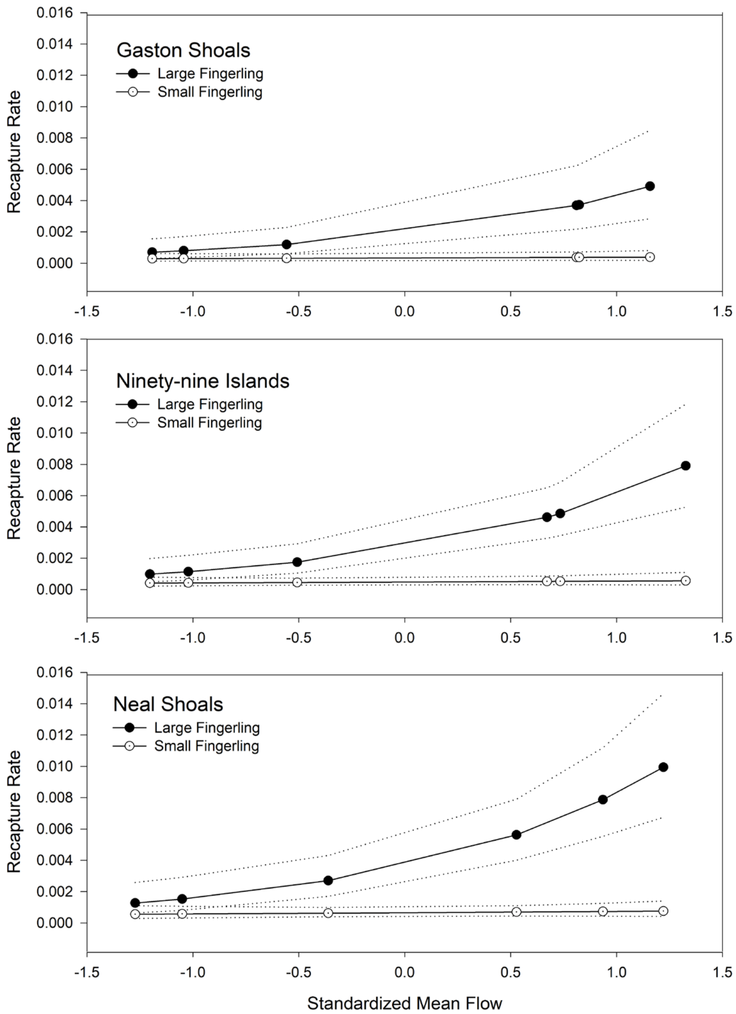


**Figure 3.** Recapture probabilities, and associated 95% confidence limits, at age-1+ for small and large fingerling smallmouth bass stocked into three sections of the Broad River, South Carolina during 2005–2010 versus standardized mean flow during spring (March-May) of each stocking year.

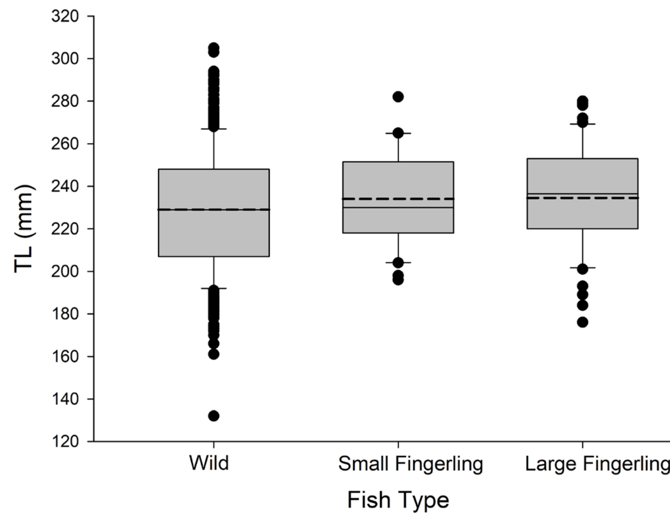


**Figure 4.** Box-plot of smallmouth bass total length (mm) collected from the Broad River, South Carolina in the fall of their second year (age-1+) for wild and hatchery stocked fingerlings. Lower and upper box boundaries 25th and 75th percentile, solid line inside box median, dashed line inside box mean, lower and upper error lines 10th and 90th percentile, solid circles data falling outside the 10th and 90th percentile.

and 97% efficiency in one year. During that year, fish received a single mark before stocking into growout ponds for large fingerling production and thus received their second mark right before fall stocking. These fish were retained overwinter to evaluate marking efficacy but did not grow during that time; most of the otoliths had their second mark at or near the margin, making detection problematic. Previous studies have found that insufficient fish growth after marking can result in incomplete marks (Unkenholz et al. 1997) and that the likelihood of mark detection increases with the distance of the mark from the otolith margin (Brown et al. 2002). Future studies need to consider the duration fish are held post-marking as well as water temperature to ensure sufficient fish growth occurs for mark evaluation.

Contribution of stocked fish in the Broad River (4%–47%) was considerably higher than those observed by most other studies. In Oneida Lake, New York, about 10,000 smallmouth bass fingerlings (~50 mm) were released into the same 3.2-km shoreline section for three consecutive years (Forney 1972). While the high stocking rate resulted in a 6% contribution of stocked fish to that shoreline section three years after the final stocking, the overall conclusion was that stocking effort would have to be unrealistically massive to substantially increase the population density. Return rates of hatchery-stocked smallmouth bass to anglers' creel in previous studies have been below 10% (Brown 1961, Funk and Fleener 1974). The high contributions of stocked smallmouth bass to some year classes in the Broad River are atypical for supplemental black bass stockings, which generally have poor contributions to each year class (Ryan et al. 1996, Hoffman and Bettoli 2005), although some studies have found moderate (Mesing et al. 2008) and high contributions of stocked fish (Porta and Long 2015).

There was considerable annual variation in the contribution of stocked fish to each year class in the Broad River during the six-year study which appeared to be due, in part, to varying levels of river discharge. During 2005 and 2009 the Broad River experienced slightly below average spring water levels with a wet summer during 2005. When spring discharge approached the long-term average, stocked fish, particularly large fingerlings, made a substantial contribution to their respective year classes. However, during years when river discharge was well below average for most of the year, contribution of stocked fish was poor for both size stockings, and wild-spawned fish comprised a greater proportion of the year class, suggesting that natural reproduction was greater during low water years.

Large variation in year-class strength is common in lotic smallmouth bass populations and has been frequently related to river discharge (Cleary 1956, Funk and Fleener 1974, Paragamian 1984, Slipke et al. 1998, Buynak and Mitchell 2002, Smith et al. 2005). Typically, high flows have been associated with poor year classes, often resulting in year-class failures (Buynak and Mitchell 2002, Smith et al. 2005). A year-class failure of smallmouth bass was observed in the Broad River during 2003, when mean spring flows exceeded the 74-year period of record by 223% (Bettinger 2013). During this study, despite annual sampling during 2005–2011 that resulted in the collection and aging of 1579 smallmouth bass from 14 year classes (1997–2011), no fish from the 2003 year class were collected. In the Broad River it appeared that low spring flows produce stronger smallmouth bass year classes whereas average and presumably above average spring flows result in weaker year classes. Results from this study indicate that stocking may be an effective tool to fill in the gaps created by poor natural reproduction success, thus providing more fish for anglers.

State fish agencies have experimented with stocking various sizes of fish to increase returns for a variety of species (e.g., Dorazio et al. 1991, Szendrey and Wahl 1996, Brooks et al. 2002), but this is less common for black bass. Recapture probability of stocked smallmouth bass in the Broad River was higher for large fingerlings. Recruitment to age 3 by stocked shoal bass (*Micropterus cataractae*) was related to size at stocking, with large fingerlings (65 mm TL) contributing more to the adult population than small fingerlings (30 mm TL; Porta and Long 2015). Brown (1961) likewise noted that small size classes of stocked smallmouth bass had significantly lower returns to the creel than larger fish. Diana and Wahl (2009) evaluated the survival of largemouth bass stocked at four sizes and found small fingerling (55 mm TL) survival was essentially nil, but there was no difference in survival of three larger size classes. Conversely, Colvin et al. (2008) did not detect a difference in the contribution of small (~50 mm TL) and large (~100 mm TL) largemouth bass stocked into backwaters of the Arkansas River; however, the small fish were stocked at five times the rate of large fish indicating the latter had greater relative survival. Thus, if the goal of a stocking program is to reach a specific contribution level to a year class, in some cases this may be achieved with small or large fish, but considerably more small fish would likely have to be stocked to attain a given contribution level.

Small fish in the Broad River never made a significant contribution in any year of this study, and contribution of large fish appeared to be mediated by annual discharge patterns as described above. This may have been due in part to the relative timing of stocking of each cohort. Small fingerlings stocked in May were subjected to the same flow conditions as wild fish during spring-summer and whatever mechanisms (e.g., reduced foraging success and reduced habitat availability) resulted in poor natural year classes likely negatively impacted small fingerlings stocked in the spring as well (Cleary 1956, Slipke et al. 1998, Buynak and Mitchell 2002, Smith et al. 2005). Fish stocked in the fall were not subjected to high spring flow conditions during their early development, which likely led to their increased survival and year class contribution. Because year-class strength of lotic smallmouth bass populations in the southeastern U.S. are established in the fall (Funk and Fleener 1974, Smith et al. 2005), large fingerlings may have been stocked into the population after the year-class strength of wild fish was already set, thus supplementing year class in years when natural recruitment was low.

Mean length of age-1+ fish was similar among both size groups of stocked and wild smallmouth bass in the Broad River. Larimore (1954) found only slight differences in growth of four stockings of smallmouth bass in a stream during their first year and noted that the growth of stocked fish was similar to wild fish a year after stocking. Multiple studies of largemouth bass have found that growth of wild and stocked fish was similar one year after stocking, and growth was not different for fish stocked at different sizes (Buckmeier and Betsill 2002, Colvin et al. 2008, Diana and Wahl 2009).

## Management Recomendations

In the Broad River the overall recapture rate of large fingerlings was 7.7-fold greater than small fingerlings and those recapture rates were significantly higher in four of the six study years. In three of those years stocked fish made a significant contribution (>25%) to the year class. If SCDNR smallmouth bass production costs are similar to the national average ($1.40/small fingerling and $5.41/large fingerling—Southwick and Loftus 2017) then large fingerlings should be stocked instead of small fingerlings. Based on the results of this study stocked smallmouth bass only make a significant contribution during years with average or above average water discharge during spring; smallmouth bass stocking should be discontinued during low water years when average spring flows are less than 99 $m^3\ sec^{-1}$ at the Carlisle USGS gauge.

Not knowing until June whether fish are needed for stocking, long after spawning and fry rearing occurs, unfortunately creates a logistical problem for hatchery production. Hatchery and fishery managers could consider two alternatives for distributing the annual smallmouth bass production. One would be to produce only what is needed for Lake Jocassee (the only other water body annually stocked with smallmouth bass in South Carolina) and during average or above average discharge years divert some of that production to the Broad River. The other would be to maintain hatchery production at current levels to support both the Broad River and Lake Jocassee, during low water years the excess production could be stocked into two other South Carolina reservoirs (Lake Keowee and Lake Robinson) that are periodically supplemented with smallmouth bass or the fish can be offered to other state agencies seeking smallmouth bass.

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