

# **LAKE GASTON WALLEY SURVEY, 2007–2008**

## **SUMMARY REPORT**

### **PIEDMONT FISHERIES INVESTIGATIONS**

**Federal Aid in Fish Restoration  
Project F-23**

**Project Type: Survey**

**Period Covered: April 2007-April 2008**

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*Abstract.*—Electrofishing was used to assess the walleye *Sander vitreus* population at Lake Gaston. Walleye were collected during spring 2007 and 2008 to describe relative abundance, size distribution, age, sex distribution, and body condition. Catch per unit effort was 70 fish/hour in 2007 and 49 fish/hour in 2008. Size ranged from 485 mm to 647 mm in 2007 and from 467 mm to 657 mm in 2008. Age information indicated that 22% in 2007 and 60% in 2008 were from years when stocking was not done in Lake Gaston. Male walleye dominated the sex ratio comprising 89% of the sampled population in 2007 and 80% in 2008. Condition, or relative weight ( $W_r$ ), of walleye was near 90 for most size classes. Basic walleye population parameters should continue to be monitored at Lake Gaston.

Routine survey and inventory of fisheries resources is necessary for the development of management strategies. This information allows biologists to tailor management to the unique characteristics of each system and determine if current size and creel regulations are adequately protecting the fisheries. Walleye angling has been increasing in popularity at Lake Gaston, with a 1996–1997 creel survey showing no directed walleye effort (Meredith et al. 1997) whereas a 2007–2008 creel survey showed approximately 1% directed effort was by walleye anglers (Rundle et al. 2009). A recent walleye tagging study had a tagging return rate of almost 10% (Rundle et al. 2004). Walleye populations in Lake Gaston have been sampled annually using electrofishing methods since 2000 by the North Carolina Wildlife Resources Commission (NCWRC). Exceptions to this include 2003 and 2006 when flows were inadequate for sampling. Lake Gaston walleye are currently managed with an eight fish daily creel limit and no size limit. The objective of this report is to summarize stock assessment data collected for walleye in Lake Gaston during 2007 and 2008.

Walleye originally found in Lake Gaston were most likely trapped behind the Lake Gaston Dam after construction in 1963. Smith (1907) reported the presence of walleye in the Roanoke River. Little was known about the walleye population although Smith did report a commercial fishery had developed for walleye in the river. McBride (1986) reported that fishing was good for several years, and then declined until only an occasional walleye was caught. Reasons for the decline in the walleye fishery in the reservoir are unknown. Speculation centered on the fact that traditional riverine spawning habitat for the Roanoke River walleye was destroyed by dam construction and the fish failed to utilize potential lentic spawning areas in the lake.

Jones (1980) utilizing a computer simulation WALLEYE (Prentice and Clark, 1977) predicted that Gaston Reservoir was compatible with walleye habitat requirements and recommended stocking 363 walleye fry/ha for 3 years from reservoir stock to re-establish the fish in the reservoir. Walleye fry were stocked in Lake Gaston by the North Carolina Wildlife Resources Commission from 1980 through 1982. Additionally, the Virginia Department of Game and Inland Fisheries (VDGIF) stocked walleye fry or fingerlings at various levels during most years from 1978 through 2008 (Figure 1). McBride (1986), using monofilament gill nets from 1981–1984 attempted to evaluate whether the first few years of stocking had established a self-sustaining population. He concluded that gear selectivity and the brief post-stocking sampling period were not adequate to determine if a self-sustaining population had been achieved. No further attempt was made to determine if a self-sustaining population had been established, or to specifically sample the walleye population at Lake Gaston, until electrofishing surveys began in 2000. All walleye stockings were terminated after 2001 until resuming again in

2007 to provide a clear window of non-stocking years in which the level of natural reproduction, if any, could be determined.

## Study Area

Lake Gaston is an 8,215-ha reservoir on the Roanoke River, located upstream of Roanoke Rapids Lake and downstream of Kerr Lake on the Virginia-North Carolina border (Figure 2). Lake Gaston is owned and operated by Dominion Power. It was completed in 1963 and is used for hydropower production, flood control, water supply, and recreation. The lake has a maximum depth of 29 m and a mean depth of 6 m. Lake Gaston and Roanoke Rapids are subject to licensing by the Federal Energy Regulatory Commission (FERC). Both projects were recently re-licensed under FERC license number P-2009 (FERC 2005) for a period of forty years.

Lake Gaston supports a multi-species fishery consisting of walleye, largemouth bass *Micropterus salmoides*, striped bass *Morone saxatilis*, black crappie *Pomoxis nigromaculatus*, white crappie *Pomoxis annularis*, sunfish *Lepomis* spp., catfish *Ameiurus* spp. and *Ictalurus* spp., white perch *Morone americana*, and yellow perch *Perca flavescens*. Additionally, open water forage fish, species in the family Clupeidae, including alewife *Alosa pseudoharengus*, blueback herring *Alosa aestivalis*, gizzard shad *Dorosoma cepedianum*, and threadfin shad *Dorosoma petenense*, play an important role in the food web at Lake Gaston.

## Methods

### *Field Collections*

Walleye were collected from riverine stretches of Lake Gaston just below Kerr Dam (beginning at dusk and finishing after dark) during early spring in 2007 and 2008 using a Smith Root 7.5 GPP boat electrofisher. Flow releases during sampling were adjusted to approximately 10,000 cfs from Kerr Dam by the US Army Corp of Engineers. Fish collected were measured (mm) and weighed (g). Otoliths were removed from all fish sampled for age and growth calculations.

### *Data Assessment*

The walleye population was assessed by evaluating several parameters: 1) Relative Abundance; 2) Size Structure; 3) Age Structure; 4) Growth; and 5) Body Condition. Information from these parameters was used to develop management recommendations to maintain and improve the walleye fishery.

*Relative Abundance.*—Relative abundance was indexed using catch-per-unit-effort (CPUE) and was expressed as fish/h for all fish sampled. High catch rates might indicate overcrowding, meaning there may be too many fish for the lake to support. Low catch rates might indicate high harvest (removal) rates or poor survival of young fish (recruitment). However, high or low catch rates could be due to sample bias. Because sampling is conducted to coincide with walleye spawning migrations, catch rates can vary depending on fish movement, water temperature, flows, and the density of fish within the area of electrofishing.

*Size Structure.*—The size structure of the walleye population represents the percentage of small, medium, and large size fish in the population. Length frequency distributions were calculated as CPUE for 25-mm size groups. Gablehouse (1984) suggested walleye greater than or equal to 250 mm as stock size, greater than or equal to 380 mm as quality size, greater than or equal to 510 mm as preferred size, greater than or equal to 630 mm as memorable size, and greater than or equal to 760 mm as trophy size. Because sampling is conducted during spawning migrations, the size structure most likely is biased to larger, mature fish.

*Age Structure.*—Age structure of the Lake Gaston walleye population was used to determine the occurrence and percentage of fish from natural reproduction during years when stocking was not conducted.

*Growth.*—Growth was evaluated by examining mean length at age at time of capture. Fast growth might be due to high harvest rates, poor recruitment, or the ability of the reservoir to support more fish. Slow growth might indicate overcrowding or an insufficient food supply.

*Body Condition.*—Relative weight ( $W_r$ ) is a parameter that provides an indication of body condition compared to a national average; a value of 100 is considered ideal. Low relative weight values mean fish are skinnier than average and high values indicate that fish are heavier than average. Relative weight values, calculated using the standard weight equation developed by Murphy et al. (1990), were used to assess walleye body condition for all fish sampled. Trends in relative weight as a function of walleye size were determined by calculating the average relative weight of all fish sampled by 25-mm length intervals.

## Results

*Relative Abundance.*—A total of 70 walleye were collected from Lake Gaston in 2007, while 75 were collected in 2008. The overall CPUE for walleye was 70 fish/hour of electrofishing in 2007 and 49 fish/hour in 2008.

*Size Structure.*—All of the walleye collected in 2007 and 2008 were greater than stock or quality size. Additionally, approximately 90% in 2007 and 93% in 2008 were greater than preferred size, while very few fish sampled were greater than memorable size and no trophy size walleye were sampled. Length distributions for both years showed the majority of fish ranging from 500 mm to just under 600 mm (Figure 3).

*Age Structure.*—The majority of fish sampled in 2007 and 2008 were age 6 and age 7 (Figure 4). Approximately 22% of the fish sampled in 2007 were from years when walleye were not stocked in Lake Gaston, while 60% of the fish sampled in 2008 were from non-stocking years.

*Growth.*—Growth data indicated that walleye averaged approximately 530 mm by age 5 for both sample years and grew to approximately 560 mm by age 7 after which growth slowed considerably (Figure 5).

*Body Condition.*—Relative weights for walleye were greatest for smaller and larger fish during both sample years. Fish in the best condition had values in the mid 90's in 2007 and near or above 100 in 2008, while fish in the poorest condition for both years had values in the mid 80's (Figure 6).

## Discussion

Catch rates for Lake Gaston walleye in 2007 were higher than in 2008, yet lower than values obtained in 2005, which shows an overall trend in declining catch rates. However, CPUE in 2005 was the greatest value since electrofishing for walleye began in Lake Gaston with values obtained in 2007 and 2008 comparable to most sample years (Table 1).

Length frequency distributions showed the majority of walleye sampled in the 500 to 600 mm range, with few smaller fish sampled. However, the lack of smaller fish is most likely caused by sampling walleye during their spawning run, which is dominated by mature fish, and not a true representation of the overall walleye population at Lake Gaston. According to Lake Gaston age data, male walleye appear to begin spawning at age 4, while females appear to begin spawning at age 5. Additionally, age data shows that walleye are reproducing naturally in Lake Gaston with more than half of the age classes sampled in 2008 from non-stocking years. It is not possible with current stocking methods to determine the level of natural reproduction versus stocked fish from years when stocking is conducted. Kerr Reservoir does have a small population of walleye which spawn in the Staunton River. Some of the walleye collected from Lake Gaston could have been escapees from Kerr Reservoir, although this is not likely. Very few walleye have been collected in gill nets set for striped bass, while none have been collected in rotenone samples conducted on Kerr Reservoir or sampled in the most recent creel survey by the VDGIF (personal communication, Dan Michaelson, VDGIF). Growth rates for Lake Gaston walleye were similar between years and greater than walleye sampled in Lake James in 2004 but less than walleye sampled in Lake Rhodhiss in 2006 (Rash 2007).

Mean relative weight values were similar from 2007 to 2008, with fish in the mid-size ranges having the lowest values. Some of these lower values were below 90 and tended to correspond with length groups having modal peaks, or high CPUE values. Anderson and Neumann (1996) stated that low relative weight values for a specific size group could provide evidence of competition, either within or between species, and could be influencing growth. It is possible that some of the fish sampled with the lowest mean relative weight values, experienced a density-dependent competition mechanism. However, due to logistics, sampling conducted in 2007 and in 2008 occurred slightly later in the spring than ideal (early April versus March) and the lower relative weight values may very well be indicative of fish sampled after the peak spawning period and not an indication of excessive competition or lack of forage. Relative weight values tended to average slightly higher for the 2005 walleye sample which was conducted in mid-March. Although mean relative weights for most size groups were less than the target range of  $100 \pm 5$  recommended by Anderson (1980), they were all sufficiently close enough to this target to negate any concerns of overcrowding.

## Summary

Lake Gaston supports a quality walleye fishery and is the only true walleye fishery east of the mountain region in North Carolina. It appears that the popularity of the walleye fishery at Lake Gaston is growing and that a combination of natural reproduction

and stocking of fish is sufficient to meet the current demand. Current regulations are adequately protecting the walleye fishery at Lake Gaston.

### **Recommendations**

1. Lake Gaston walleye continue to be managed under the current regulation of no length limit and a creel limit of eight fish per day.
2. NCWRC personnel continue to sample Lake Gaston walleye on an annual basis to analyze any changes in the dynamics of the walleye population.
3. Address stocking consistency, regarding frequency and stocking levels with VDGIF.

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TABLE 1.—Catch per unit effort (CPUE, fish/h), number sampled, and percent male walleye sampled by electrofishing since 2000 during the spring at Lake Gaston.

<b>Year</b>	<b>CPUE</b>	<b>Number</b>	<b>Percent Males</b>
2000	87	192	85
2001	47	148	75
2002	90	223	85
2004	54	535	85
2005	120	106	90
2007	70	70	89
2008	50	75	80

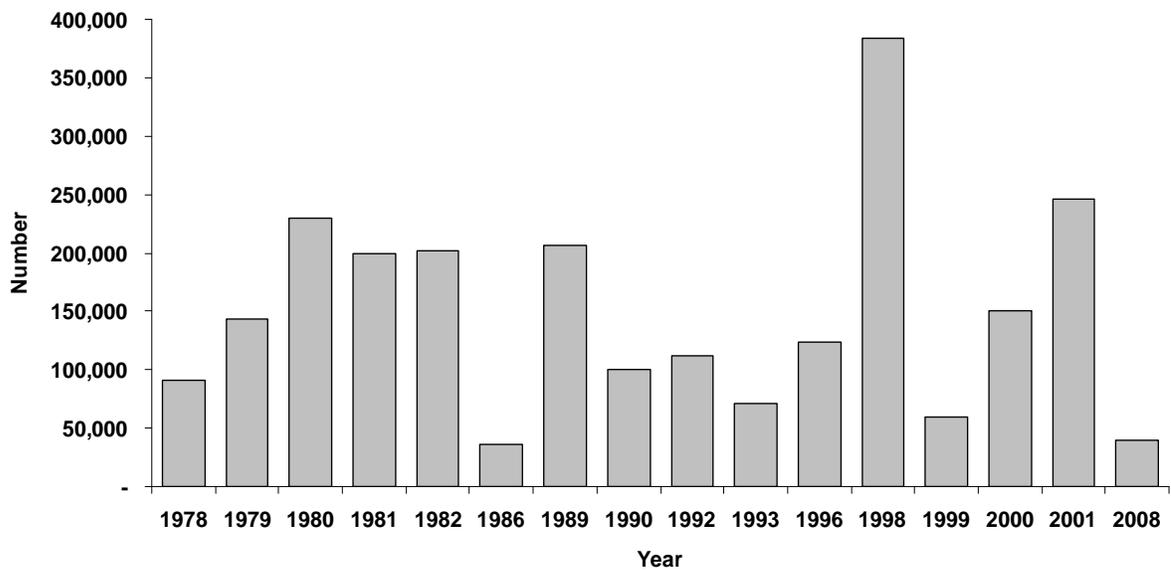
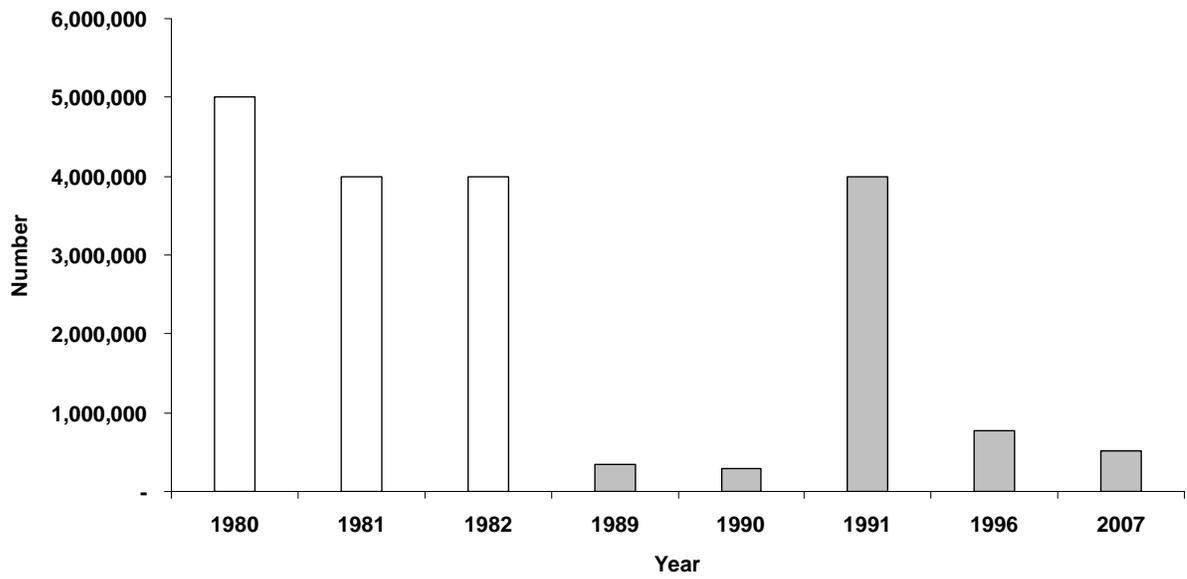


FIGURE 1.—Stocking records of walleye stocked into Lake Gaston, with NCWRC stockings indicated by white bars, while all others were stocked by VDGIF.

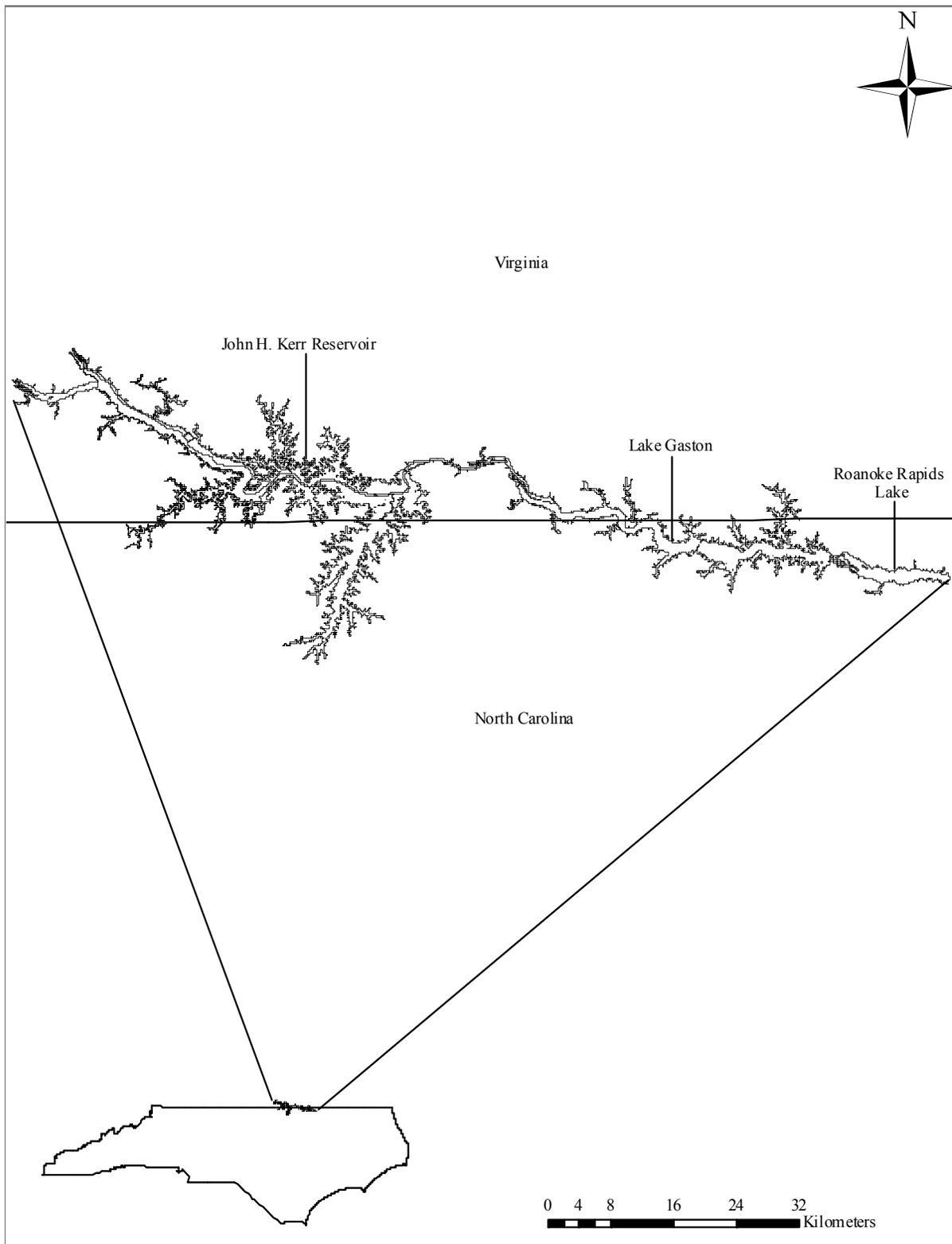


FIGURE 2.—Location of Lake Gaston in relation to the North Carolina and Virginia border with John H. Kerr Reservoir and Roanoke Rapids Lake also pictured.

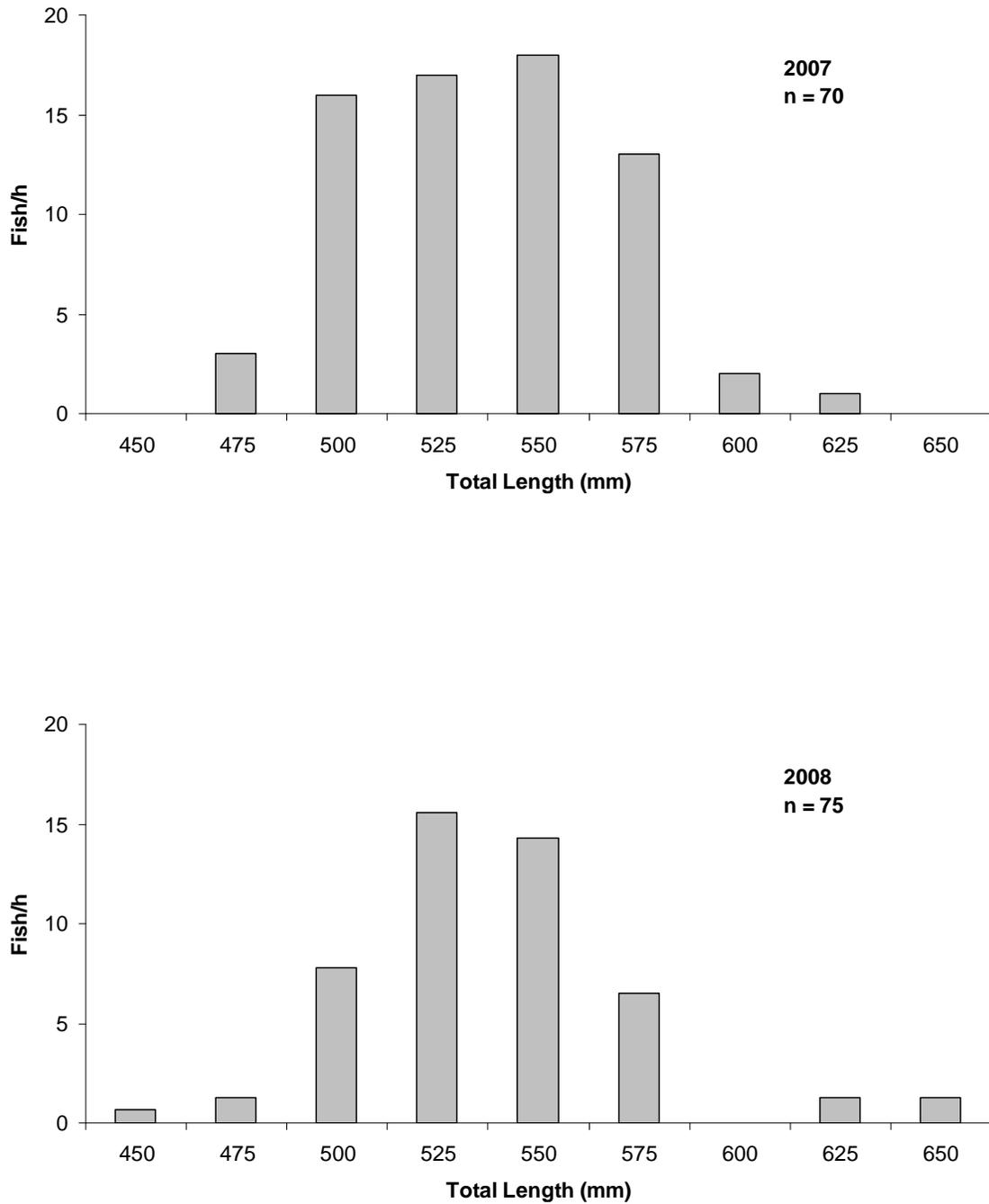


FIGURE 3.—Length distributions of walleye collected during spring 2007 and spring 2008 electrofishing at Lake Gaston.

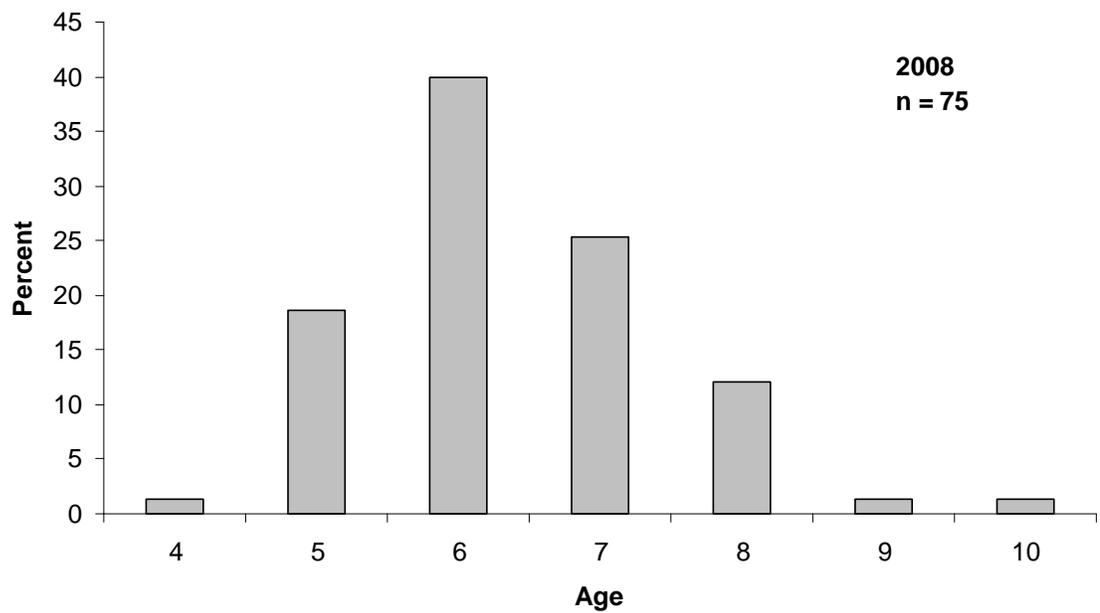
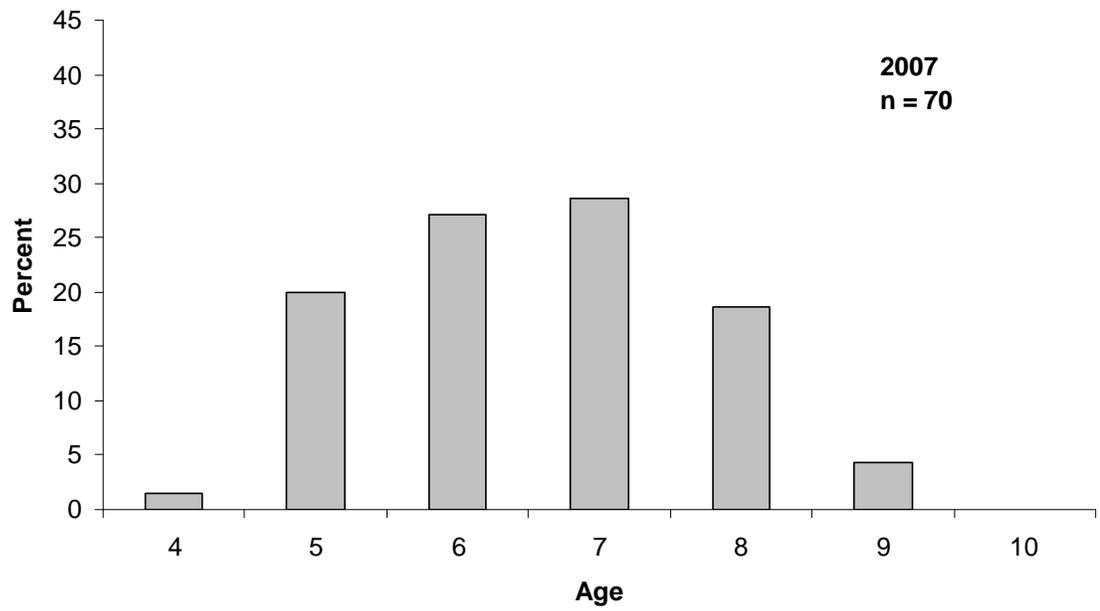


FIGURE 4.—Age distributions of walleye collected during spring 2007 and spring 2008 electrofishing at Lake Gaston.

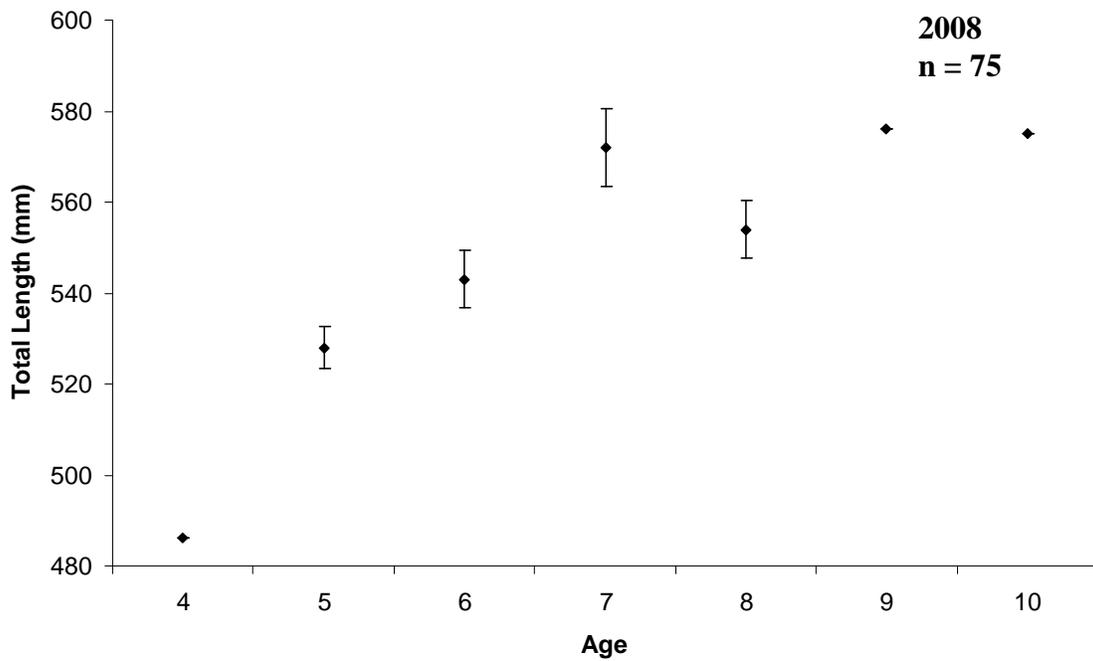
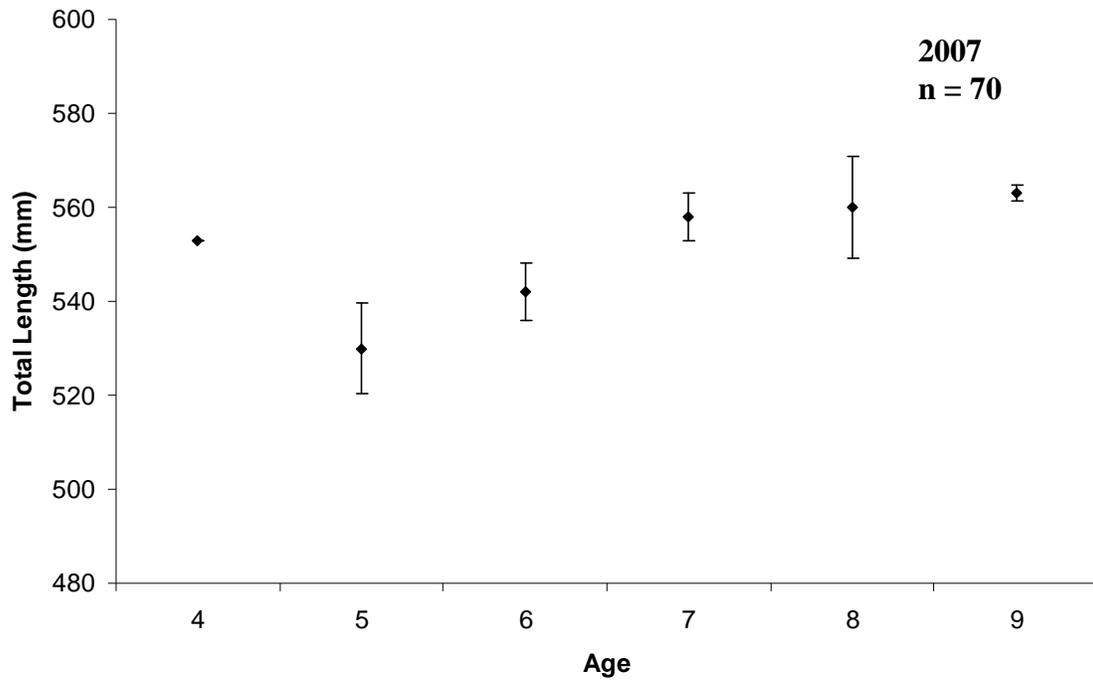


FIGURE 5.—Mean length at age for walleye collected during spring 2007 and spring 2008 electrofishing at Lake Gaston. Bars indicate  $\pm 1$  standard error.

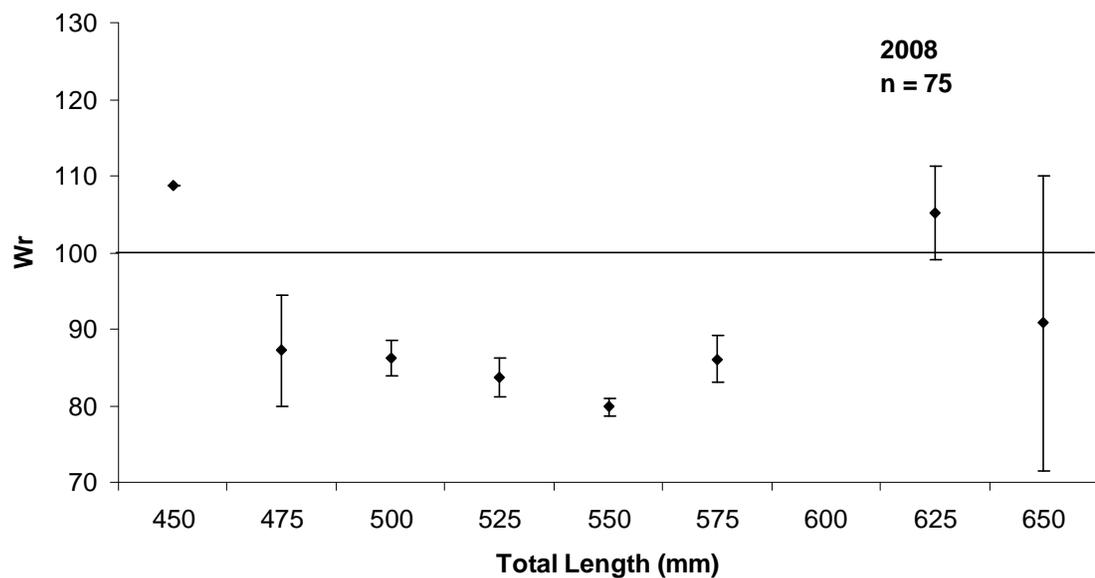
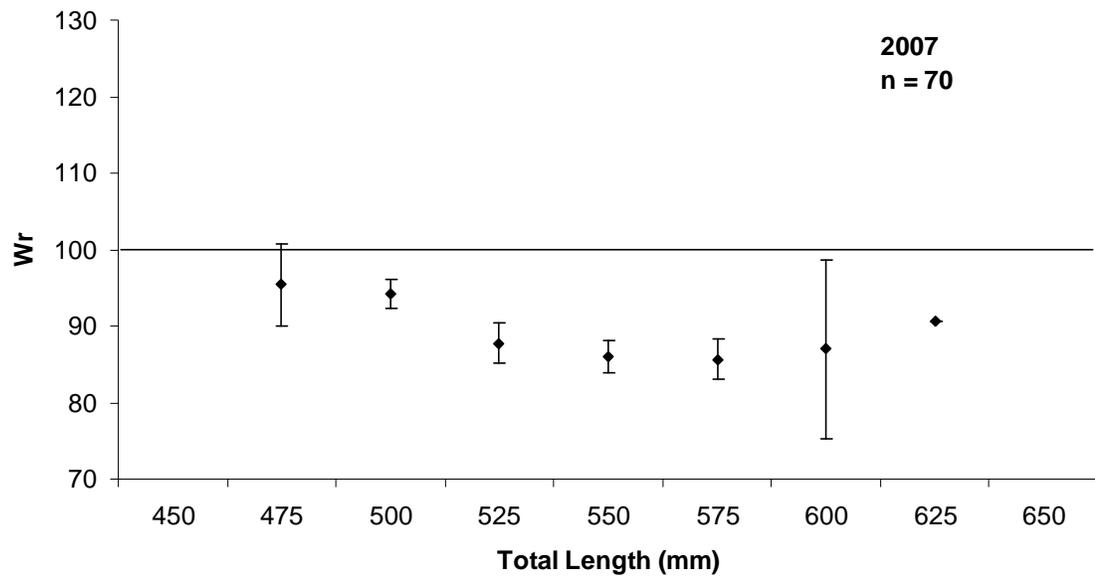


FIGURE 6.—Mean relative weights ( $W_r$ ) related to total length of walleye collected during spring 2007 and spring 2008 electrofishing at Lake Gaston. Bars indicate  $\pm 1$  standard error. Horizontal line indicates ideal relative weight of 100.