

Roanoke Logperch (*Percina rex*) Population Structure and Habitat Use

Final Report

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INTRODUCTION

The Roanoke logperch (*Percina rex*) is a large darter that occurs only within the Roanoke and Chowan drainages of Virginia (Jenkins and Burkhead 1993). Within the Roanoke drainage, logperch can be found in the upper Roanoke, Pigg, and Smith rivers and some of their larger tributaries. Within the Chowan drainage, logperch are distributed along the fall zone between the piedmont and coastal plain physiographic provinces in the Nottoway River and its largest tributary, Stoney Creek. The greatest population densities of Roanoke logperch are in the upper Roanoke River (Burkhead 1983, Jenkins and Burkhead 1993) and in the Nottoway River drainage (see below; Objective 3). Based on its limited distribution and the vulnerability of its largest population centers to urban and industrial stresses, Roanoke logperch have been placed on the federal endangered species list (Federal Register Vol. No. 159).

Some general aspects of life history, habitat use, and behavior of Roanoke logperch are summarized in previous research (Jenkins 1977, Burkhead 1983, Jenkins and Burkhead 1993, Ensign 1995); however, most of this information is based in the upper Roanoke River during warm months. Adult logperch in the Roanoke River are typically found in deep, high velocity riffle and run habitats, while young and juveniles have been observed in slow runs and pools, where they are frequently observed over clean sand bottoms. Spawning of logperch typically occurs in scoured, deep riffles and runs (Burkhead 1983). The eggs are adhesive and demersal, and larvae are thought to drift to calm water areas after hatching (Burkhead 1983). Because standard electrofishing techniques collect very small logperch inefficiently, Burkhead (1983) only observed two young-of-year (YOY) over the duration of his two-year study. Both were observed in shallow, sandy pool margins. Roanoke logperch of all age classes seem intolerant of moderately to heavily silted substrates in the Roanoke River, possibly due to their feeding

behavior unique to the subgenus *Percina*. Logperch use their conical snout to flip gravel and feed on exposed invertebrates. This exploits prey sheltered beneath rocks that may be unavailable to other benthic fishes; however, this feeding behavior relies on the availability of loosely embedded substrate.

Major gaps in our knowledge of Roanoke logperch habitat use and life history include seasonal and ontogenetic habitat use, movement by individual fishes, and differences in age structure and demographics among populations. Further, outside of the Roanoke River, habitat use by other populations of logperch is largely unknown. Differences in habitat availability between these rivers may influence patterns of habitat use. This basic information will be critical to making recovery efforts effective and will enhance managers' understanding of factors that limit logperch distribution and abundance relevant to the long-term viability of logperch populations.

Purpose and objectives of study

The purpose of this project is to supplement and collect information on the biology of the endangered *Percina rex* (Roanoke logperch). The following are the primary objectives: 1) compare habitat use by logperch between summer and winter, 2) compare habitat use by logperch among the upper Roanoke, Pigg, and Nottoway river systems, 3) compare demographics of logperch populations among the upper Roanoke, Pigg, and Nottoway river systems, and 4) document the extent of logperch movement between seasons and years. The basic information contained in this report significantly advances our limited understanding of environmental needs and limitations of Roanoke logperch and will contribute to guiding strategies for recovery. The reach of the Roanoke River targeted for this study extends 10 river km downstream of the confluence of the North and South Forks; for the Pigg River we targeted

the reach downstream the Town of Rocky Mount and upstream of the river's confluence with Leesville Lake (Appendix I). We sampled sites along the fall zone between the Piedmont and Coastal Plain physiographic provinces in the Nottoway River (Appendix I). The period of time covered by this report is from August 1999 to March 2002.

OBJECTIVE 1: SEASONAL HABITAT USE BY ROANOKE LOGPERCH

In the summer of 1999, a reachwide inventory of 10km of the Roanoke River was conducted using the Basinwide Visual Estimation Technique described in Dolloff et al. (1993). Eight riffle:run:pool series were systematically selected from these reachwide inventories for summer quantitative underwater observation using line transect snorkeling methods (Appendix I). Winter protocols for sampling in the Roanoke River included strip transect methods outlined in Ensign et al. (1999). This method met with limited success in 1998-1999. New methods were used in the Roanoke River for the winters of 1999 and 2000.

Summer sampling methods

Summer survey observations for each riffle:run:pool series were made via line-transect snorkeling methods described in Ensign et al. (1995). One to three parallel lines oriented with river flow were marked with yellow line on the day of sampling. Spacing between lines was a minimum of 1.5 times maximum underwater visibility on the day of sampling. The length of the lines was based on the length of the habitat units but did not exceed 50m per unit (150m per site). Visibility was determined by suspending a Secchi disk in the water column in front of a snorkeler. The snorkeler moved away from the disk until the black patterns on the disk were no longer distinguishable from the water. The distance between the snorkeler and the disk was

measured and served as the maximum visibility for that day. Surveys were not conducted if maximum visibility was less than 1.5 meters (from Leftwich et al. 1997).

To minimize effects of disturbance and allow fish to settle, snorkelers did not begin sampling until at least one hour after placement of the transect lines. Snorkelers entered the water downstream of the area to be sampled and moved slowly upstream along the lines, keeping the center of the body over the line. Each observer scanned the stream bottom, mid-water, and upper-water column directly in front and to both sides of the line of travel. When a logperch was sighted, a numbered weighted marker was placed on the stream bottom precisely where the fish was first spotted. The number-code of markers and age class (adult or subadult) were recorded on dive slates. Double counting of logperch was avoided by simultaneously sampling all three transect lines with snorkelers staying even with each other while moving upstream. Continuous communication between snorkelers also minimized double counting. After the pool:riffle:run sequence was sampled, snorkelers returned to the base of transects to count markers and collect habitat data.

Microhabitat data included water depth, bottom and mean water velocities, and point substrate size (9-category Wentworth scale). We also recorded substrate characteristics within a 1-m² area around the marker, including dominant and subdominant substrate size, embeddedness (5 categories: 1 ≥ 95% embedded, 2 = 50-94%, 3 = 25-49%, 4 = 5-24%, 5 = 0-5%, i.e. exposed), and silt cover (5 categories: 1 = 76-100% cover, 2 = 51-75%, 3 = 26-50%, 4 = 1-25%, 5 = 0%). To record microhabitat availability, we placed horizontal transects along the wetted width of the river at 10-meter intervals along the length of the site within 24 hours of the snorkeling run. Every three meters on the horizontal transects, depth, mean and bottom water velocities, silt cover, dominant and subdominant substrates within a 1-m² area were recorded.

Winter sampling methods

Sampling methods for the winters of 1998-1999 in the Roanoke River followed methods outlined by Ensign et al. (1999). Previous work indicated that logperch are quiescent in winter, residing in interstitial spaces between boulders and cobbles (Burkhead 1983, Ensign et al. 1999). To sample for logperch, a team of three divers swam along a 50-m longitudinal transect along the deepest part of the channel and along 10-m perpendicular transects centered at the 5-, 15-, 25-, 35-, and 45-m locations on the longitudinal transect. One of the divers turned over cobbles and boulders within a 15-cm wide strip along these transects to search for logperch, while the other divers flanked the first diver, recorded data on dive slates, and set underwater markers where logperch were observed. For each site, attempts were made to sample a riffle and pool. Habitat availability was measured at 5-m intervals along the 45-m transect and the five perpendicular transects. Habitat data included depth, mean and bottom velocities, substrate size (5-category Wentworth scale), and silt cover. This sampling protocol was time-intensive; each set of transects took about 7 hours to census completely and covered only 13.5 m² of the stream bottom.

Limited success in the winters of 1998 and 1999 led to the development of alternative winter sampling methods for Roanoke logperch. These methods allowed the sampling of a greater variety of habitat types, and, unlike the strip transect method, did not restrict divers to the thalweg of the river. It also allowed all three divers to search for logperch, rather than a single diver. A team of three snorkelers moved up a previously delineated riffle, run, pool sequence in a zigzag fashion, turning all lightly embedded cobbles, boulders, and deadfall substrate in a shoulder-wide (~50cm) strip to count logperch. Divers concentrated on sampling a variety of habitats. When a logperch was observed, a weighted marker was placed at the site of