DISTRIBUTION OF ENDEMIC AND IMPERILED FAUNA OF THE TALLAPOOSA RIVER SYSTEM OF GEORGIA

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Abstract. A proposal for a water supply reservoir in the Tallapoosa River system in Northwest Georgia has called attention to the potential effects of a large impoundment on the faunal resources of the system. The Tallapoosa and Little Tallapoosa Rivers and their tributaries support species assemblages found nowhere else, including five endemic fishes, two endemic crayfishes, and an endemic snail, in addition to a federally threatened mussel (*Lampsilis altilis*). We are analyzing survey data collected in 1990 and in 2002 to estimate species distributions, abundances, and changes in both of these factors relative to changes in land use. These data will be useful to the U.S. Fish and Wildlife Service and others for designing conservation strategies for the unique fauna of the Tallapoosa River system.

INTRODUCTION

The Piedmont portion of the Tallapoosa River system, located in west Georgia and east Alabama, harbors unique faunal assemblages that currently are a focus of management concerns. The upper Tallapoosa River system (i.e., from the system's headwaters in Paulding and Carroll counties, Georgia, to the Fall Line near Tallassee, Alabama) drains approximately 8540 km^2, 1813 km^2 of which are located in Georgia and include the Tallapoosa River, the Little Tallapoosa River and their tributaries. Five species of fishes, two crayfishes and one aquatic snail are known to be endemic to the upper Tallapoosa system. Because these species' ranges are restricted to the upper Tallapoosa, their existence could be jeopardized by watershed activities (e.g., land use changes, stream impoundments) that result in changes in flow regimes or aquatic habitat conditions. The upper Tallapoosa system also contains a protected mussel species, *Lampsilis altilis*, federally listed as threatened. Accordingly, plans to construct a regional water supply reservoir in the Tallapoosa system in west Georgia have focused concerns on potential effects of reservoir construction on endemic and other species of concern, and on the status of these species in general.

Our objectives are to describe the presently known distributions of aquatic species of concern in the upper Tallapoosa system, and to examine evidence of species' status, in order to provide information useful to resource management agencies. In this paper, we present new data on the distribution of *Lampsilis altilis* and summarize distributions of five endemic Tallapoosa fishes: the lipstick darter (*Etheostoma chuckwachatte*), Muscadine darter (*Percina* sp.), Tallapoosa shiner (*Cyprinella gibbsi*), Tallapoosa sculpin (*Cottus* sp.), and Tallapoosa darter (*Etheostoma tallapoosae*) in the Georgia portion of the basin. We also discuss occurrences of the stippled studfish (*Fundulus bifax*), which occurs almost exclusively in the upper Tallapoosa. All of the fishes discussed in this paper, with the exception of *Cottus* sp., are listed as protected animals of Georgia. To evaluate potential changes in aquatic communities in relation to watershed activities, we compare fish assemblage and land use data for sites sampled in both 2002 and 1990.

METHODS

Data from several upper Tallapoosa River surveys were available for estimating species distributions in Georgia. When the West Georgia Reservoir was initially proposed in the late 1980's, B. J. Freeman (Freeman 1990) and Georgia DNR biologists surveyed fishes in the Georgia portion of the Tallapoosa system. This work provided the most comprehensive coverage of fishes from the upper Tallapoosa to date. Surveys conducted during the 1990's (Irwin and Peyton 1997; Irwin et al. 1998; Pierson 1999) provided additional data for selected species of concern. C. Stringfellow

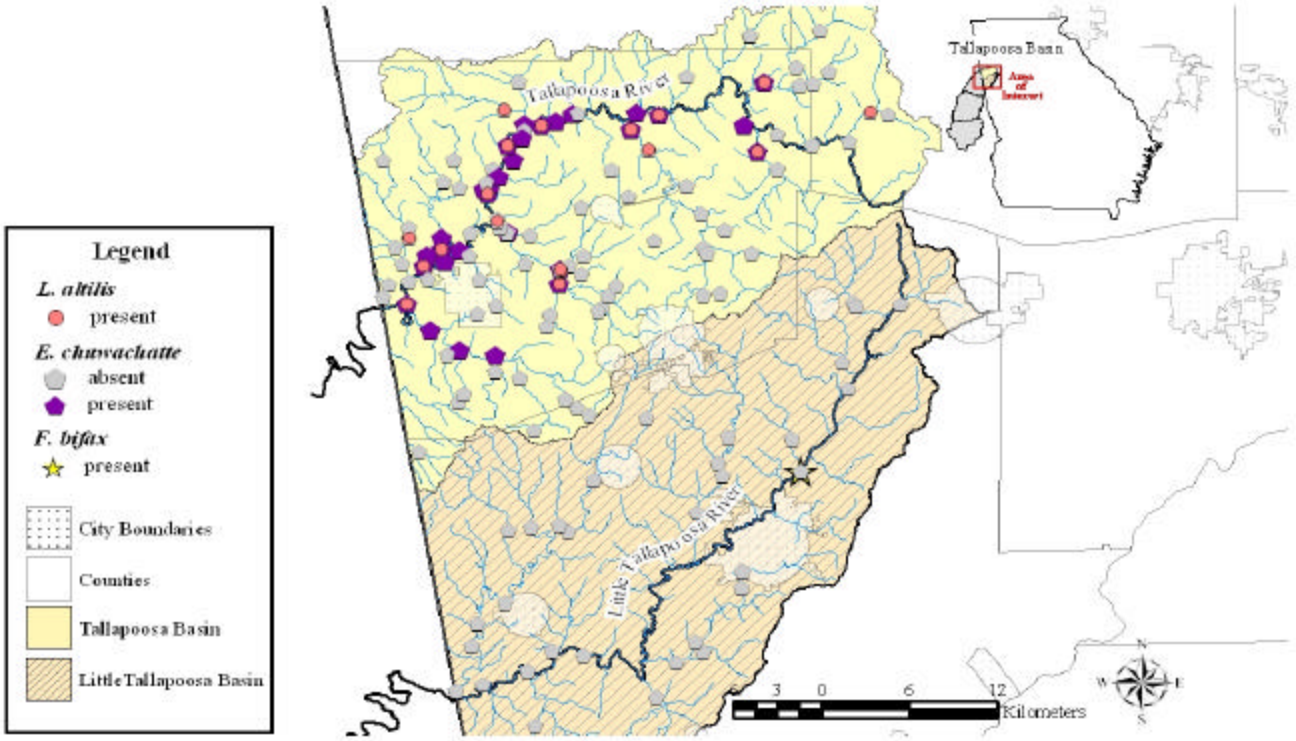

Figure 1. Known distribution of *Etheostoma chuckwachatte* and *Lampsilis altilis* (based on live specimens) in the Tallapoosa River system, GA. The location of a *Fundulus bifax* record from 1990 is also shown.

and J. Zuiderveen (unpublished data) surveyed for mussels at selected Georgia locales during 2001. We used data from these surveys, along with data collected during the present study, to describe the distributions of target species in Georgia.

Aquatic surveys were conducted in autumn 2001 and summer 2002 in streams ranging from first to fifth order (drainage area <1 to > 700 km^2). Sites included a subset of the locales sampled in 1990 (Freeman 1990), to provide comparative data for assessing changes in fish assemblages relative to changes in land cover. For this comparison, we chose 22 sites from the 1990 survey, distributed across the system, and resampled these site in summer 2002 using similar sampling protocols. Most sites were accessed at road crossings. We employed backpack electrofishers, seines and dipnets to sample fishes in all available habitats at each site (as was done in 1990), typically covering approximately 20 times wetted stream width or two riffle-pool sequences. All captured fishes were identified and measured; most were returned to the stream. Voucher specimens and those of uncertain identification were anesthetized with Tricaine Methanesulfonate, preserved in 10% formalin, and returned to the University of Georgia for identification. Mussel surveys entailed visual searches using view buckets, and by snorkeling. Live native mussels were photographed, measured and returned to the stream. Relict shell material was collected and returned to the University of Georgia for identification.

Locales for all sites were plotted at 1:24,000 scale using ArcView GIS. Land use data in the catchments upstream from the 22, 1990 locales resampled in 2002 were examined for amount of change between 1992 and 1998. Land use was estimated from coverages provided by the UGA Natural Resources Spatial Analysis Laboratory, based on 1992 and 1998 Landsat thematic mapper imagery (NARSAL, 2001 and Dr. E. Kramer, UGA, unpublished data). To evaluate changes in fish assemblages, we tested whether significantly more sites had higher observed richness of (1) all species or (2) stream-dependent species, in 1990 (compared to 2002) than expected by chance, using a chi-square test. We also tested whether any of the target fish taxa were observed at significantly more sites in only 1990 or 2002 than expected by chance.

RESULTS

Three of the endemic Tallapoosa fishes were found throughout the Georgia portion of the upper Tallapoosa River system. Populations of *Etheostoma tallapoosae*, *Cottus sp*. and *Cyprinella gibbsi* occurred in over half the collection sites sampled, in streams ranging from first- (*E. tallapoosae* and *Cottus* sp.) or second- (*C. gibbsi*) to fifth-order streams. *Percina sp*. was also

found in both the upper Tallapoosa and Little Tallapoosa systems, in third- to fifth-order streams. In contrast, *Etheostoma chuckwachatte* was collected exclusively in the upper Tallapoosa River system, i.e., with no occurrences in the Little Tallapoosa portion of the drainage (Figure 1), in third to fifth order streams. We did not collect *Fundulus bifax* in Georgia during this study. The only recent record of the stippled studfish in Georgia is Freeman's 1990 collection of the species in the Little Tallapoosa River (Figure 1).

Fish assemblages in the Little Tallapoosa system were also distinguished from those in the upper Tallapoosa by the occurrence of four fish species that likely reflect historical contact with the Chattahoochee River system. Within the upper Tallapoosa River system, *Percina nigrofasciata*, the blackbanded darter, is only found within the Little Tallapoosa portion of the drainage. *Luxilus zonistius*, the bandfin shiner, shows a similar pattern, occurring in the Little Tallapoosa but not in the upper Tallapoosa above the Little Tallapoosa-Tallapoosa junction. In this study we also found in the Little Tallapoosa system two taxa previously unknown from the Tallapoosa drainage, *Campostoma pauciradii* (the bluefin stoneroller) and a bullhead catfish (*Ameiurus* sp.) related to *A. brunneus. Campostoma pauciradii* and *A. brunneus*, as well as *P. nigrofasciata* and *L. zonistius* are common in the Chattahoochee system, which lies adjacent to the Little Tallapoosa system.

Lampsilis altilis was only collected in the upper Tallapoosa River system (Figure 1). Live specimens were encountered in 2002 in the Tallapoosa mainstem, Little River, Beach Creek, Brooks Creek and Watermill Creek. In 2001, Stringfellow and Zuiderveen (unpublished data) observed live *L. altilis* in the Tallapoosa mainstem and Little Creek. Irwin et al. (1998) found live specimens in McClendon Creek and Big Creek.

Comparison of data for 22 sites collected in 1990 and 2002 did not show large-scale changes in either fish assemblages or land cover. Thirteen sites had higher richness in 1990 (12 including only stream-dependent species), which is not significantly different from 50% of sites as expected by chance (chi-square test, $p>0.1$). None of the five endemic fishes occurred at significantly more sites only in 1990 than only in 2002. *C. gibbsi*, *E. tallapoosae*, *Percina* sp. and *Cottus* sp. occurred at 17-19 sites in both years; we located *E. chuckwachatte* at 4 more sites in 2002 than in 1990. Overall, these data do not provide evidence of large changes in fish assemblages or distributions of the target taxa across the 22 sites. Land cover data also showed relatively little change in the watersheds above these sites. Urban land cover in 1998 ranged from 0.1 to 4% in the 22 watersheds, and increased by a maximum of 1.1% from 1992. Deciduous and mixed forest ranged from 31 to 48% in 1998, and had decreased by a maximum of 11%.

DISCUSSION

The Tallapoosa River system in Georgia is biologically unique, having a suite of endemic aquatic species, and assemblages comprising species combinations, that occur nowhere else. The five known endemic fishes in the upper Tallapoosa compose about 8% of the native fish fauna, a rate of endemism that is actually higher than other recognized faunal hotspots in the Mobile Basin (e.g., 4.4 % in the Etowah; Burkhead et al. 1997). Aquatic fauna differ not only across systems, such as among branches of the Mobile Basin, but also within systems, and understanding faunal patterns within systems is necessary for successful conservation. Within the upper Tallapoosa drainage, assemblages differ between the Little Tallapoosa and Tallapoosa headwaters. *Etheostoma chuckwachatte* occurs only in the Tallapoosa mainstem and tributaries, a pattern that persists through Alabama (Freeman 1990; Mettee et al. 1996). *Fundulus bifax* has only been collected in Georgia from the Little Tallapoosa system; the species also occurs in the Tallapoosa mainstem and tributaries below the Tallapoosa-Little Tallapoosa junction (Mettee et al. 1996; E. R. Irwin, unpublished data). Cashner et al. (1988) noted that *F. bifax* is relatively widespread but locally rare. Low population sizes and almost total restriction to the upper Tallapoosa system render the species vulnerable to extirpation or extinction, similar to the apparent extirpation of a closely related species (*F. stellifer*) in the Cahaba River AL (Cashner et al. 1988, Mettee et al. 1996).

The Little Tallapoosa system is also distinguished by the occurrence of species unknown elsewhere in the drainage (e.g., *Campostoma pauciradii*, as reported here). Genetic diversification within drainages also contributes to faunal diversity. In fact, Dr. Leos Kral and colleagues (State University of West Georgia, Carrollton, Georgia; personal communication to MCF) have discovered genetic differences between populations of *E. tallapoosae* and *C. gibbsi* in different portions of the system. Thus, even though these two endemic species are widespread within the upper Tallapoosa, populations effectively form at least two, geographically separated, taxonomic units.

Studies from other basins in Georgia (Schleiger 2000, Walters 2002) and elsewhere in North America (Paul and Meyer 2001) have related changes in stream fish assemblages coincident with landscape urbanization. Assemblage shifts in urbanizing watersheds typically include declines of sensitive species and increasing domination by widespread, habitat generalists (e.g., *Lepomis* spp.). We have not found strong evidence of similar faunal changes in the Tallapoosa system; however, the watersheds in our study did not experience large land cover changes over the study period. Conservation strategies for Tallapoosa aquatic fauna, if implemented soon, thus have an enhanced probability of success.

Management concerns in the upper Tallapoosa system include habitat degradation as a result of upland development, stream impoundment and hydrologic alteration. The occurrence of *Lampsilis altilis* and *Etheostoma chuckwachatte* primarily in the upper Tallapoosa mainstem and its larger tributaries elevates the importance of protecting habitat and flow regimes in these portions of the system. Effective faunal conservation will also require strategies for protecting sufficient smaller-stream habitat to ensure persistence of populations of endemic species across their ranges and to protect unique assemblage types.

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