

BIODIVERSITY IN THE CHATTAHOOCHEE HEADWATERS—RARE FISHES FOUND IN RECENT STUDY

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Abstract. Although many rivers in the southeastern U. S. are widely known for their aquatic biodiversity and unique freshwater habitats, little effort has been focused on documenting the occurrence and distribution of aquatic fauna in the Chattahoochee River watershed due mainly to a qualitative perception that the Chattahoochee historically supports fewer species than the “richer” adjacent river systems such as the Etowah and Conasauga. However, the recent collection of the rare Halloween darter and the belief that additional undescribed darter species may inhabit the Chattahoochee headwaters prompted the Upper Chattahoochee Riverkeeper (UCR) to initiate further research in partnership with the University of Georgia’s Institute of Ecology. To assess the aquatic biodiversity of the Chattahoochee headwaters above Lake Lanier, a review of historical records and map coverages helped to pinpoint large gaps in fish distribution data and provided the basis for the sampling plan in which ten fish species of interest were targeted based on their status as rare, endemic or state listed. Study results indicate that the Halloween darter (*Percina sp. cf. P. palmaris*) and the bluestripe shiner (*Cyprinella callitaenia*), both federal species of concern, are the most imperiled aquatic species in the basin. In addition, preliminary research suggests that the recently surveyed populations of blackbanded darters (*Percina nigrofasciata*), Tennessee shiners (*Notropis leuciodus*) and Coosa shiners (*N. xanocephalus*) may be unique to the Chattahoochee basin, indicating the need for genetic research and analyses that would explain population variation and verify the existence of unique and/or undescribed species. Additional efforts are also needed to adequately document the entire range of these fish species to continue to fill gaps in the collection database and to develop an appropriate “critical area” conservation strategy.

INTRODUCTION

The Chattahoochee headwaters, or Upper Chattahoochee River basin, is comprised of 1036 sq. miles and includes U. S. Army Corps of Engineer’s Lake Sidney Lanier and several large tributaries that provide drinking water for over 3 million Georgians as well as valuable recreation and hydropower benefits and aquatic species

habitat. Overall, population in the state of Georgia has increased 26% in the past ten years from 6.5 to 8.1 million people, while the six counties that make up the majority of the Upper Chattahoochee basin above Buford Dam have seen an average increase of 61.1% (Table 1). As a result of the unprecedented growth in the region, the Upper Chattahoochee River system is under extreme pressure from sprawl development, water supply reservoir proliferation, increased water withdrawal, increased wastewater discharge and other threats associated with urban development as metro Atlanta continues to move northward. This rapidly expanding human population growth combined with recent technological advances have led to more persistent and ecologically devastating impacts on the landscape, especially in the last 20 years (Noss and Peters 1995). In addition, the aquatic life that relies on the headwaters for its existence faces an increasing number of threats that include (1) habitat fragmentation, degradation, and loss; (2) degraded water quality from physical and chemical pollution; (3) habitat alteration and impoundment of free flowing rivers and streams and (4) the introduction of exotic (non-indigenous) species.

Historically, there hasn’t been enough scientific data collected and compiled to even begin to substantiate the existence or vulnerability of the aquatic species in the Upper Chattahoochee River basin, much less designate critical areas or implement conservation strategies. As the amount of land development in Georgia continues to increase on a daily basis, it is imperative to take immediate steps to document the current status of our aquatic resources as well as the need for any protection or restoration efforts required to sustain the health of existing populations. Once a sufficient amount of research has been completed and a thorough analysis and evaluation of the resource’s current status has been conducted, “critical” areas must be designated and prioritized for protection efforts. Creating a conservation strategy based on these critical area designations will help to ensure that steps are taken to decrease the likelihood of further decline and/or extinction of any

Table 1. Population growth from 1990-2000 in the six main counties of the Upper Chattahoochee River basin (U.S. Census Bureau 2003)

County	Population		Growth: % change
	1990	2000	1990- 2000
Dawson	9,429	15,999	69.7
Forsyth	44,083	98,407	123.2
Habersham	27,621	35,902	30.0
Hall	95,428	139,277	45.9
Lumpkin	14,573	21,016	44.2
White	13,006	19,944	53.3

species, including those currently unknown or undocumented species with limited distributions.

BACKGROUND

It is well known that the Chattahoochee and its headwater tributaries support reproducing populations of brook trout as well as non-native rainbow and brown trout, while Lake Lanier sustains populations of warm water fish species such as largemouth and striped bass. In addition, stream surveys conducted in the watershed by scientists from the University of Georgia, GA Department of Natural Resources (DNR) and the U. S. Geological Survey document the existence of a variety of fish and crayfish species including an undescribed chub (*Hybopsis sp. cf. winchelli*) and Halloween darter (*Percina sp. cf. palmaris*); however, historical records have been extremely limited overall (Straight and Freeman, 2002). The scant amount of data collected does not provide an accurate depiction of the occurrence and distribution of the aquatic biodiversity that exists within the watershed, nor is there enough information to determine what conservation strategies are needed to ensure continued viability as the area continues to grow and becomes increasingly urbanized. For these reasons the Upper Chattahoochee Riverkeeper (UCR) initiated the Headwaters Aquatic Biodiversity Assessment and Conservation Project in 2002 to gain a more comprehensive understanding of the occurrence and distribution of aquatic fauna in the Chattahoochee headwaters above Lake Lanier and provide a scientifically sound basis for the development and implementation of a conservation strategy for the watershed.

ASSESSMENT PROJECT

Geographic Area of Consideration

The portion of the Chattahoochee River basin chosen for analyses included all streams draining into the Chattahoochee River at and above Lake Sidney Lanier (Figure 1). The uppermost portion of the Chattahoochee River along with all of the Chestatee and the Soque River systems are contained within the watershed. The

watershed includes land and streams in Forsyth, Gwinnett, Habersham, Hall, White and Lumpkin Counties, Georgia.

Although watershed sizes ranged from 5 - 87 km², land use patterns within the study watersheds did not greatly differ among sites. Urban land cover accounted for less than 5% of land cover types in each of the collection point watersheds. Forested land accounted for more than 50% of the land cover type in each of the collection point watersheds and the second most common land use was pasture (NARSAL 2001).

Project Objectives

The project was conducted with the following objectives: 1) establish historical distributions of native fishes and crayfishes in the Upper Chattahoochee River basin, 2) assess current distributions and abundance of native fishes and crayfishes throughout the Upper Chattahoochee River watershed and 3) prioritize critical areas of the watershed where conservation actions should be targeted.

Research Methodology

At the outset of the project, researchers from UGA's Institute of Ecology reviewed 190 historical collection records from a variety of sources, including collection records from the Georgia Museum of Natural History, Cornell, Tulane, University of Alabama, Florida Museum of Natural History, and field notes from various collectors. The majority of collections occurred from 1929 to 1998 with the largest number being made from 1957-1959 in conjunction with the 1962 Fisheries Survey of Georgia. These records were combined, entered into a GIS database system and analyzed for species occurrence and distribution. The 190 geo-spatially cataloged records corresponded to a total of 104 distinct collection sites and once mapped, helped to pinpoint gaps in fish distribution data for the watershed. Only 24 of the 104 sites had collections made at them since 1990, and two sub-watersheds, Wahoo Creek and Hazel Creek, had never been sampled at all. In addition, several of the sampled watersheds had only been sampled at a single location at a single point in time. From the results of the gap analysis, ten fish species and one crayfish species of interest (Table 2) were identified for further study.

With the exception of the blackbanded darter (*P. nigrofasciata*), these species were selected because they were endemic to the system, have some federal or state status as imperiled species, or are greatly restricted in range. The blackbanded darter was included solely because of possible historic misidentification with the

Table 2. Priority species of interest in the Upper Chattahoochee basin.

Common Name	Species	Federal Status*	State Status*
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River Chub	<i>Nocomis micropogon</i>	NL	NL
Blackbanded Darter	<i>Percina nigrofasciata</i>	NL	NL
Halloween Darter	<i>Percina sp. cf. P. palmaris</i>	SOC	NL
Bluestripe Shiner	<i>Cyprinella callitaenia</i>	SOC	T
Shoal Bass	<i>Micropterus cataractae</i>	NL	NL
Coosa Shiner	<i>Notropis xaenocephalus</i>	NL	NL
Tennessee Shiner	<i>Notropis leucoidus</i>	NL	NL
Longnose Shiner	<i>Notropis longirostrus</i>	NL	NL
Highscale Shiner	<i>Notropis hypsilepis</i>	SOC	T
Coastal Chub	<i>Hybopsis sp. cf. H. winchelli</i>	NL	NL
Chattahoochee Crayfish	<i>Cambarus howardii</i>		

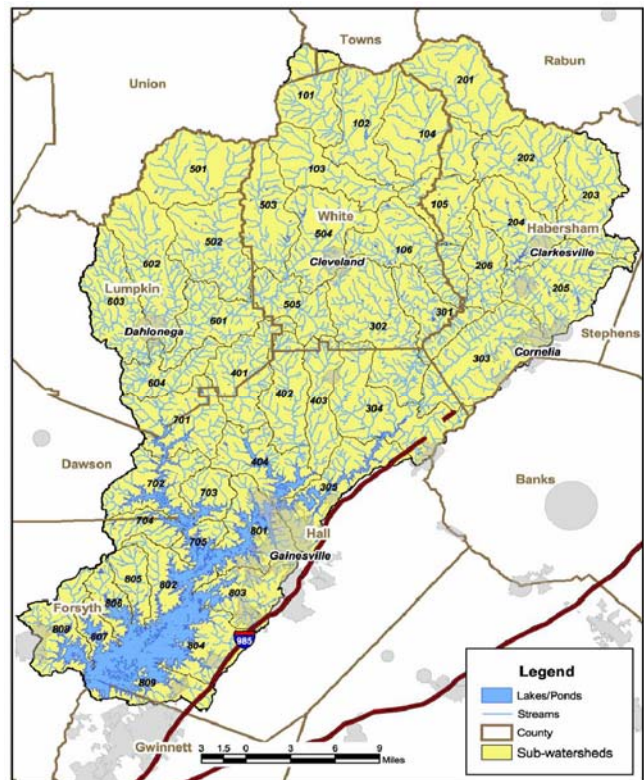
*E=endangered; T=threatened; SOC=species of concern; NL=not listed

closely related Halloween darter. It was not considered a species of interest in and of itself. The river chub was originally included as a species of interest but was later removed from the list when a closer examination by researchers revealed the species was actually a subspecies of bluehead chub (Lachner and Wiley, 1971) and was being misidentified due to an unreliable character listed in current literature, including Freshwater Fishes of Virginia (Jenkins and Burkhead, 1994). In addition to the fish, one species of crayfish, *Cambarus howardii*, is endemic to the Upper Chattahoochee and was also considered to be a species of interest for this study.

Using the GIS system, sampling sites were chosen by sub-watersheds that either had historical records of the fish species of interest or that lacked any records but were near watersheds that harbored species of interest. Originally, 23 sample locations throughout the watershed were identified using this method, however 10 sites were eliminated during the site evaluation process because permission for access either could not be obtained or was denied by the landowner, or because the site was heavily impacted by ongoing farming practices. At the time of the field sampling, two other sites on the Chattahoochee and Chestatee Rivers were unable to be sampled due to high water levels resulting from an unusually wet spring and summer in 2003. The fish samples were collected at the remaining 11 sites located primarily in Lumpkin and White Counties during November 2002 and May through August 2003. Species of stream-dwelling crayfish were collected at each of the 11 sites along with the fish samples. Fish and crayfish samples were collected based on the Georgia Department of Natural Resources (DNR) protocols for electrofishing with the addition of seine-hauls and kick-seining to increase sampling effectiveness for benthic species.

Crayfish were present at all 11 sites and representative specimens were taken back to the lab and identified by

Figure 1. Upper Chattahoochee basin above Buford Dam at Lake Sidney Lanier



a DNR employee. A total of four species were collected, however the Chattahoochee Crayfish (*Cambarus howardii*) was collected at only one of the eleven sites.

Preserved fish and Crayfish samples were accessioned into the Georgia Museum of Natural History at UGA and the data has been added to the collection database for analyses and future reference. Once updated, the database was used to generate new species distribution maps for the entire watershed and compared with land use data.

Prioritization of Critical Areas The final component of this three-part project involved the prioritization of critical areas of the watershed by staff from UGA's Institute of Ecology and River Basin Science and Policy Center. Prioritization was performed at the scale of 12-digit HUCs (Hydrologic Unit Codes) and utilized a methodology based on an approach used in the adjacent Etowah basin which has subsequently been accepted by the U.S. Fish and Wildlife Service and serves as a guide when designating locations for stream mitigation projects (Freeman and Wenger 2000). The prioritization was also based on factors such as: 1) distribution of target species, 2) federal and state status 3) land cover and 4) number of road crossings.

Watersheds that support the Halloween darter and the bluestripe shiner were given high priority, as they are considered to be the two most imperiled species in the

Upper Chattahoochee basin. Watersheds supporting other target species were scored according to the number of other species present. Watersheds upstream of those supporting target species were also weighted highly, because they provide connectivity between the populations and because protecting these areas will help protect habitat downstream.

CONCLUSIONS

The thorough evaluation of museum specimens revealed the river chub (*Nocomis micropogon*) was erroneously identified in historic collections. Subsequently, this species is not known to have ever occurred in the Upper Chattahoochee, and therefore it was removed from the list of species of interest. Two rare fishes discovered in the headwaters during this study, the Coosa shiner and Tennessee shiner, were previously thought to be extirpated from the Chattahoochee Basin. Researchers also collected the Halloween darter for the first time in White County's Sautee Creek. In addition, scientists have postulated that two more undescribed species of darters may also exist in the Chattahoochee headwaters. These discoveries suggest that the biodiversity in the Chattahoochee watershed is greater than was originally believed and underscores the need to identify and protect these unique aquatic resources now before these species are further imperiled or even eliminated from the basin.

Sampling results also emphasized a connection between high quality waters and biodiversity. The darters and shiners were found in the most pristine streams in the watershed while the shiners were notably absent from the headwaters streams that have been degraded by poorly managed development and land use practices. This correlation between high quality waters and sensitive fish species emphasizes the need for immediate action.

DISCUSSION/RECOMMENDATIONS

Although findings from this study have increased our level of knowledge and understanding of biodiversity in the watershed, additional efforts are needed to continue to fill in the gaps in our knowledge of the existence and distribution of fish species throughout the Upper Chattahoochee basin. This watershed is rapidly urbanizing and without appropriate evaluation and documentation of existing biodiversity, there is the potential for unknown species with limited distributions to decline or even become extinct.

Recommendations for future research include:

- Continue collecting data on the species of interest to document historical trends.
- Determine the status of the Coosa shiner, Tennessee shiner and blackbanded darter in the

system because they may be distinct species and are not currently afforded any special consideration by state or federal officials.

- Update the GIS database with the acquisition of additional geospatially referenced data.
- Refine the prioritization method and conservation strategy.

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