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Population Sampling of Chelonians in an Urban Lake in Jonesboro, Craighead County, Arkansas

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Running Title: Population Survey of Turtles

Abstract

We conducted a mark-recapture survey for aquatic turtles in Craighead Forest Lake in Jonesboro (Craighead County, Arkansas). From July 2, 2015 to October 14, 2015, we set six hoop nets, baited with fish parts, at specific shoreline locations around the lake. Traps were set twice a week and checked 12 hours after they were set. Carapace length, carapace width, plastron length, and plastron width were measured for each individual. Each turtle was identified to species and its sex was recorded. We also placed a notch in one or more of its marginal scutes to aid in future identification. Finally, a photo was taken of each individual's carapace and plastron. A total of six species were captured with Red-eared Sliders (*Trachemys scripta elegans*) being the most common. A single female Razor-backed Musk Turtle (*Sternotherus carinatus*) was found, which represented a new county record and the first documentation for this species above the 35°N parallel in Arkansas. The only recaptures were Red-eared Sliders. Using the Schnabel Index, we estimated there to be 171 Red-eared Sliders in Craighead Forest Lake. Our findings indicate a diverse chelonian community with a thriving Red-eared Slider population. Future studies should continue to examine the effect of urbanization on turtle population demographics.

Introduction

Urban sprawl has reduced the amount of available natural habitat for many animals (McKinney 2002). However, less natural habitat does not always directly correlate with population decline. A study in Australia, for example, found that the annual survival rate for freshwater turtles is not significantly different between suburbs and nature reserves (Rees et al., 2009). Likewise, adult survivorship was high (>84%) for two species of freshwater turtles in an urban Virginia lake (Mitchell 1988). For comparison,

western chicken turtles (*Deirochelys reticularia miaria*) exhibited a 70% survival rate in an 11.4-ha floodplain wetland in central Arkansas, a rate considered low for chelonians (Dinkelacker and Hilzinger 2014). Another urban lake in Indiana contained six species of turtles with the Red-eared Slider (*Trachemys scripta elegans*) being the most abundant (Conner et al. 2005). Urban streams also support large populations of turtles and provide natural refugia from an ever-increasing wave of urbanization (Spinks et al. 2003, Plummer and Mills 2015).

This study investigated the chelonian composition of an urban lake in Jonesboro, Craighead County, Arkansas. A previous study surveyed the surrounding ditches in Jonesboro and found six turtle species with a composite Simpson's Index of Diversity value of 0.26 (Simpson 1949, Elston et al. 2016).

Materials and Methods

This study occurred at Craighead Forest Lake (24.3 hectares; 35.77894°N, 90.70923°W; WGS 84) in Jonesboro (pop. 71,551; 2010 Census) Craighead County, Arkansas. This public lake was initially constructed by the Young Men's Civic Club in 1937 and is owned by the city. It is regularly stocked with fish by the Arkansas Game and Fish Commission and is located within Craighead Forest Park. Picnic tables, a campground, and playgrounds surround the lake, but there is a 365 m forest buffer between the lake and nearest city road.

To survey for chelonians three-ring hoop nets, 1.07 m in diameter, were baited with fish parts and placed in inlets scattered around the lake (Fig. 1). Six traps were set 19 times between 2 Jul 2015 and 14 Oct 2015 for a total of 114 trap nights. Traps were checked around 12 hours after they were set. Turtles were removed from the traps and the following measurements were recorded (in mm) using plastic calipers and a tape measure: straight carapace length, carapace width, plastron length, and plastron width. Sex of the

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individual was also recorded. Then, a triangular file was used to put notches in the marginal scutes of the turtle following the marking system of Cagle (1939). Finally, a photo was taken of each individual's carapace and plastron as a secondary method of identification.

Catch per unit effort (CPUE) was calculated for each species and all turtles as a whole (Gulland 1964). CPUE is calculated as the number of turtles divided by the number of trap nights for each species and then for all turtles as a whole. A Simpson's Index of Diversity (Simpson 1949) was calculated for the entire lake. Diverse communities are characterized as having a large number of species present along with an even distribution of the number of individuals per species. Finally, a Schnabel Index following Tanner (1978) was used to estimate the population size of species with recaptures.

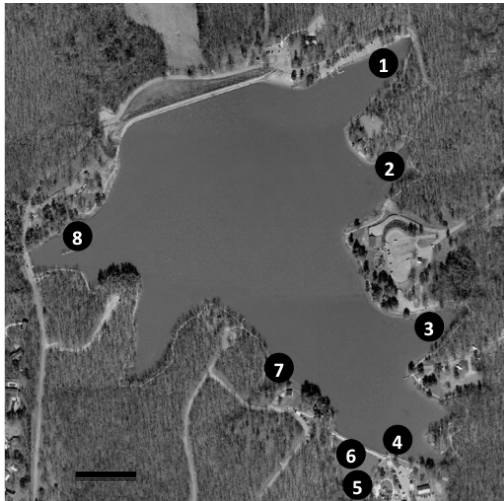


Figure 1. Map of Craighead Forest Lake with trap sites numbered. Bar = 100 m.

Results

A total of six species were captured: Spiny Softshell (*Apalone spinifera*), Snapping Turtle (*Chelydra serpentina*), River Cooter (*Pseudemys concinna*), Razor-backed Musk Turtle (*Sternotherus carinatus*), Eastern Musk Turtle (*Sternotherus odoratus*), and Red-eared Slider (*T. s. elegans*; Fig. 2). The most abundant species was *T. s. elegans* with a CPUE of nearly 0.5 (Table 1).

Species captured differed among months (Fig. 3). Likewise, species captures were not distributed evenly among trap sites (Fig. 4). A single female *S. carinatus* was sampled and represented a new county record (Arkansas State University Museum of Zoology

33368) and the first published record for this species above the 35°N parallel in Arkansas (Trauth et al., 2004).

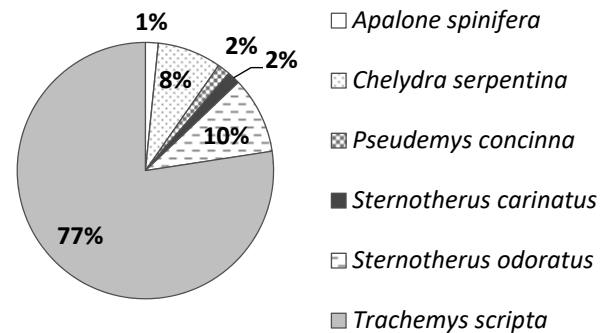


Figure 2. Overall capture percentages for each turtle species.

Table 1. Catch per unit effort (CPUE) for each turtle species.

All Turtle Species	0.54
<i>Apalone spinifera</i>	0.01
<i>Chelydra serpentina</i>	0.04
<i>Pseudemys concinna</i>	0.01
<i>Sternotherus carinatus</i>	0.01
<i>Sternotherus odoratus</i>	0.05
<i>Trachemys scripta elegans</i>	0.42

The Simpson's Index of Diversity was 0.39. The only recaptures were of *T. s. elegans*. Using the Schnabel Index, the *T. s. elegans* population was estimated to be 171 individuals. Movement between trap sites was not very extensive as the only major movement recorded was between sites 1 and 2. All other movements were between sites 5 and 6 or at the same site. Finally, *T. s. elegans* had a sex ratio that heavily favored females (0.64:1).

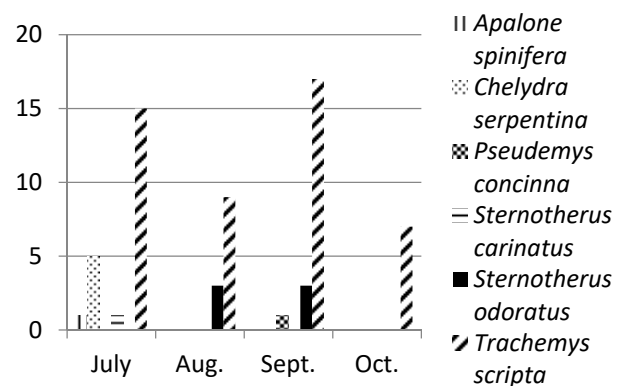


Figure 3. Frequency of each turtle species per month.

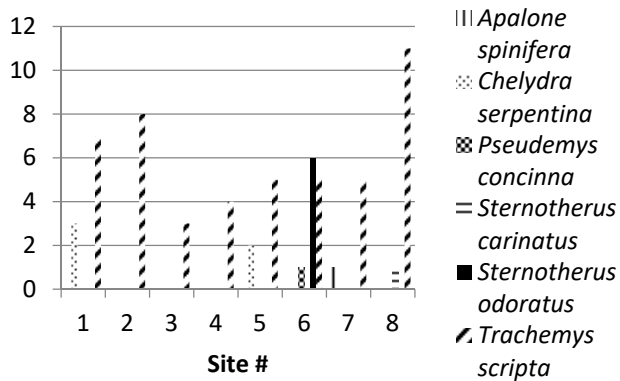


Figure 4. Frequency of each turtle species per trap site.

Discussion

Trachemys s. elegans was the most abundant species found in Craighead Forest Lake. This generalist is widespread throughout Arkansas and the entire southeastern United States and has been found in densities of up to 88 turtles per ha (Trauth et al. 2004). Similar percentages of *T. s. elegans* have been found in population surveys in both Indiana (Conner et al. 2005) and ditches around Jonesboro (Elston et al. 2016).

Many *P. concinna* were observed, but very few were captured, a fact corroborated by other studies (Trauth and Siegel 2016, Elston et al. 2016). Interestingly, the Simpson's Index of Diversity was slightly greater for Craighead Forest Lake than the surrounding ditches (0.39 vs. 0.26); yet, total abundance in both sites was dominated by *T. s. elegans* (77% and 85%, respectively; Elston et al., 2016). The increased diversity in Craighead Forest Lake was likely due to its larger surface area and variability in water depth compared to the ditches.

Only one *A. spinifera* was captured; however, there could be more individuals in Craighead Forest Lake than indicated by this sampling. While Plummer and Mills (2008) found large numbers of *A. spinifera* in an urban stream before and after channelization, other studies have reported very low numbers for this species. Only 8 turtles (2.8%) of 283 captured were *A. spinifera* in an Indiana lake (Smith et al. 2006), whereas in a 296-km section of the Missouri River a paltry 11 (0.4%) of 2,201 turtles sampled w *A. spinifera* (Bodie et al. 2000). Finally, this species made up only 12.9% (14 individuals) of all turtle captures in an Illinois pond (Dreslik et al. 2005).

No map turtles were found; however, there are multiple records for Mississippi Map Turtles (*Graptemys pseudogeographica kohnii*) and one record

for Ouachita Map Turtles (*Graptemys ouachitensis ouachitensis*) in Craighead County (Trauth et al. 2004; Elston et al. 2016). These records were from drainage ditches and the St. Francis River, none of which connects with Craighead Forest Lake.

The lone *S. carinatus* sampled presents a puzzling challenge. All other published records are below the 35°N parallel. Humans could have transplanted the individual, perhaps as an unwanted pet; however, there are unpublished records for this species in adjacent Jackson and Lawrence counties and nearby Woodruff County, which suggests northeast Arkansas could house a viable population.

Sternotherus odoratus was found in Craighead Forest Lake and has previously been found in Craighead County; yet, they were not found in the surrounding ditches (Elston et al. 2016). The lack of ditch captures may be due to trap shyness, as Eastern Musk Turtles prefer still water such as those found in ditches.

Chelydra serpentina commonly migrates over land and a single female can colonize a body of water because of their ability to retain viable sperm for several years (Trauth et al. 2004). This may be the case with Craighead Forest Lake as it has a sizeable *C. serpentina* population, yet is isolated from other bodies of water.

Overall, this study adds to the idea that chelonians can do very well in urban environments. Future studies should continue to contribute to our knowledge of the effect of urbanization on turtle population demographics.

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