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OBSERVATIONS OF MOVEMENT PATTERNS AND HABITAT ASSOCIATIONS OF HATCHLING ALLIGATOR SNAPPING TURTLES (*MACROCHELYS TEMMINCKII*)

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Abstract.—**Hatchling turtles are known to be cryptic and secretive; as a result, there are few species for which habitat associations and movement patterns of hatchlings and small juveniles are well understood. Such data are important because hatchlings may experience high mortality rates, making them a sensitive life stage whose success has important impacts on overall population stability. Additionally, among species in which hatchlings and adults occupy distinctly different niches, conservation of resources for both is necessary for effective management. The aim of our study was to characterize the movement patterns, habitat use, and sources of mortality of hatchling Alligator Snapping Turtles (*Macrochelys temminckii*) in a southeastern Oklahoma, USA, stream. Movement patterns were typically characterized by an initial move away from the site of release, followed by prolonged occupancy of an area with abundant cover and shallow water. Of the 12 turtles we released, three were preyed upon by fish and seven were confirmed to be alive in mid-November, eight weeks after the study was launched. A single hatchling turtle was washed downstream during a high flow event, and we could not confirm the fate of another turtle, either because it was removed from the study area by a predator or because its transmitter failed prematurely. Surprisingly, we observed no evidence of predation by Raccoons (*Procyon lotor*), a common predator of hatchling turtles.**

Key Words.—chelonian; depredation; hatchling; reptile

INTRODUCTION

As is the case for most taxa, turtles experience varying mortality rates at different life stages, with eggs and hatchlings typically being most vulnerable and mortality rates decreasing with growth. Adults of many species enjoy > 95% annual survival (Iverson 1991; Congdon et al. 1993, 1994; Shine and Iverson 1995), but the stability of a population is contingent on adequate survival at all life stages (Congdon et al. 1994; Heppell et al. 1996; Dreslik et al. 2017). Early life stages of many turtles are difficult to monitor in the wild and calculating survival rates is challenging. For example, detecting nesting behavior and, subsequently, nests of Ornate Box Turtles (*Terrapene ornata*) was investigated using automated radio tracking to address the difficulty and time commitment required to find nests of this small, nocturnally nesting species (Tucker et al. 2014). Similarly, hatchlings of many turtle species are small and secretive, and therefore are rarely encountered. For this reason, hatchling survival rates are often inferred from other life-history parameters (Wilbur 1975; Congdon et al. 1994; Pike et al. 2008). Sea turtles offer an extreme and oft-cited example of the problems of secrecy and low-detectability in assessing hatchling life history. The ambiguity surrounding the first several years of the life of a sea turtle was so extreme that this developmental period has been termed the Lost Years (Carr 1987). Technological advancements have improved the abilities of researchers to study some variables during this early life stage, such as diet, incubation temperature effects on fitness, and movement patterns (Booth et al. 2004; Reich et al. 2007; Mansfield et al. 2014; Wood et al. 2014; Anderson et al. 2015), but natural history studies of hatchling turtles remain substantially more challenging than investigations of other life stages. As more species of turtle experience population declines and conservation measures become ever more critical, understanding the ecology and life-history parameters of early, enigmatic, life stages are pressing issues. Critical but often missing pieces of information include early dietary and habitat preferences, activity patterns, and growth and survival rates (Ernst and Lovich 2009).

Conservation actions often cannot be delayed until the entire life history of a species is known; therefore, conservation action plans are typically developed and executed based on relatively limited knowledge of only a portion of the life history of a species (Congdon et al. 1993; Semlitsch 1998, 2002). These potentially incomplete management plans are not due to a lack of effort on the part of the decision makers, but rather due to a lack of scientific evidence informing appropriate practices (Pullin and Knight 2003). Often, information is especially lacking for the life stages of species during which individuals are most cryptic or secretive, typically during the first several years. During the early stages of the lives of most aquatic turtles, individuals are small and well camouflaged. These traits impede reliable and consistent monitoring and recapture of individuals at regular intervals, which in turn increases the difficulty of detecting hatchlings in natural environments to determine habitat preferences. It is also challenging to monitor movement and dispersal patterns, and to quantify predation and mortality rates (Morafka et al. 2000; Pike et al. 2008). Due to these challenges, most studies of hatchling turtle ecology have focused on emergence and movement away from nesting sites; predation rates during dispersal from the nest to water; and sex determination during incubation (Vogt and Bull 1984; Semlitsch and Gibbons 1989; Ewert and Nelson 1991; DeGraaf and Nein 2010; Miller and Ligon 2014).

The Alligator Snapping Turtle (*Macrochelys temminckii*) is an aquatic turtle species that, due to declining numbers, is a species of conservation concern and the focus of reintroduction efforts. It is also a species for which there are many gaps in what is known of hatchling and juvenile life history and ecology. The ramifications of these gaps in our understanding of the life history of the species were highlighted by policy makers when it was denied protection under the U.S. Endangered Species Act (1973) in part because of insufficient information regarding its life history (Riedle et al. 2008). With the declines of Alligator Snapping Turtle populations that have occurred across their range over the past several decades, it has become imperative to improve our understanding of the life history of this species so that future species status assessments are accurate (Reed et al. 2002).

Alligator Snapping Turtles are long-lived and iteroparous, and populations are sensitive to the removal of just a few adults (Congdon et al. 1993, 1994; Reed et al. 2002). Population viability assessment models demonstrate that reduction in adult females by as little as 2% annually can cause rapid declines (Reed et al. 2002). Alligator Snapping Turtles reach reproductive maturity at 11–21 y of age (Dobie 1971; Tucker and Sloan 1997); as such, there is more than a decade during which these animals are sexually immature. While there have been many studies of adult Alligator Snapping Turtles, and a small subset that include subadults, the first few years remain little studied. While the protection of reproductively mature adults is critical to the future success of the species, it is also critical to ensure that the needs of the most vulnerable early life stages are also addressed.

Home range and movement patterns of Alligator Snapping Turtle hatchlings were previously studied in northern Louisiana (Bass 2007). That project is one of the few field studies that has been conducted on hatchling Alligator Snapping Turtles, and it provides useful insights into the ecology and life history of this age class. Alligator Snapping Turtles, however, inhabit a range that spans almost 6.5° latitude; studies across the range are necessary to accurately characterize within-species variation (Dreslik et al. 2017).

The objectives of our study were to assess movement patterns, habitat selection, and survival of hatchling Alligator Snapping Turtles in a natural setting, from emergence out of the egg until mid-winter (September-January), when activity presumably decreases significantly. This period is crucial, as hatchlings are likely highly susceptible to predation due to lack of experience in their habitat, as well as their diminutive size. This is also a time during which hatchlings are likely learning the locations of resources (e.g., food, refugia), and thus must choose suitable habitat characteristics for survival.

Materials and Methods

Study site.—Our study site was located in Pennington Creek, a spring-fed tributary of the Washita River in southeastern Oklahoma, USA. The portion of the creek that we used was a segment (about 345 linear meters) near the upper portion of the drainage. It was characterized by a slow flowing pool (about 780 m^2) bordered both upstream and downstream by a series of cascades (Fig. 1). Structures throughout the pool included submerged and partially submerged logs, overhanging trees, piles of organic debris, boulders, beaver lodges, and deeply undercut banks. The substrate in the creek was spatially heterogeneous and included areas dominated by silt, mud, sand, gravel, boulders, bedrock, and densely compacted clay. The depth along the midline of the pool ranged from 0.25–2.60 m, although much shallower conditions occurred along some edges and embankments within the creek. Vegetation in the creek was primarily Yellow Pond Lily (*Nuphar lutea*). There was not an abundance of emergent vegetation, but Lizard's Tail (*Saururus cernuus*) and green algae (*Spirogyra* spp.) occurred in varying amounts over the duration of our study. The surrounding landscape vegetation is regionally characterized as cross-timbers and was predominately

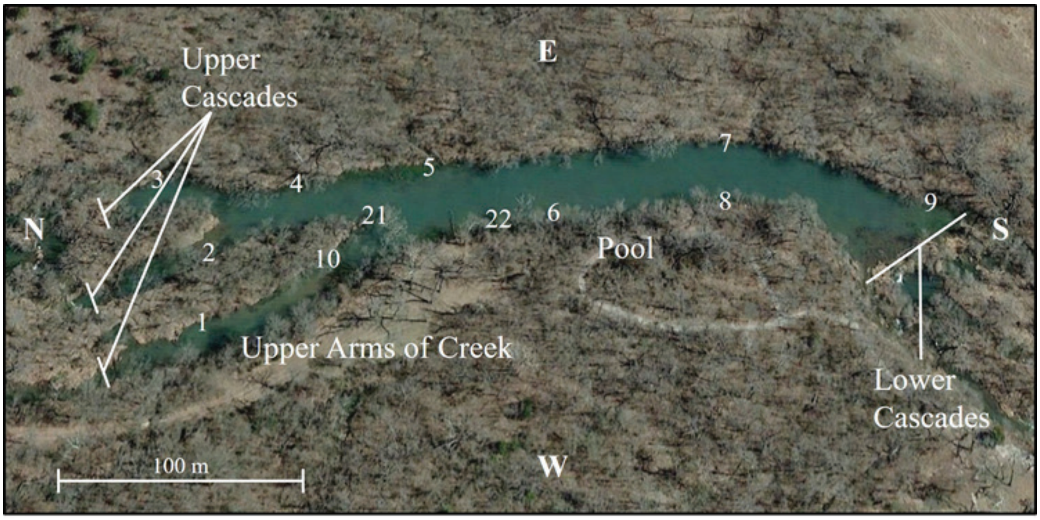

Figure 1. Aerial image of an approximately 345-m stretch of Pennington Creek in southeastern Oklahoma, USA, into which hatchling Alligator Snapping Turtles (*Macrochelys temminckii*) equipped with radio transmitters were released. Numbers indicated release locations, with numbers corresponding to the identification of hatchlings (see text). (Image taken from Google Earth Pro).

defined by oaks (*Quercus* spp.), elms (*Ulmus* spp.), and Eastern Red Cedar (Juniperus virginiana), along with a variety of understory species, including Buckbrush (*Symphoriocarpus orbiculatus*) and invasive Multiflora Rose (*Rosa multiflora*).

Field methods.—We selected 12 hatchling Alligator Snapping Turtles for release and subsequent monitoring in Pennington Creek. The hatchlings were from five clutches produced in 2015 by a captive population of adult Alligator Snapping Turtles at Tishomingo National Fish Hatchery. Prior to release, we measured straight carapace length, plastron length, and mass of hatchlings before attaching a transmitter (Table 1). Each transmitter weighed 1.9 g, was 11 mm long with a 10-cm long whip antenna, and had a nominal battery life of 60–90 d (L.L. Electronics, Mahomet, Illinois, USA; Holohil Corporation, Carp, Ontario, Canada). We sourced radio transmitters from two companies after experiencing high transmitter failure rates from one company early in our study. We attached transmitters to the carapace between the midline vertebral ridge and the right or left lateral ridges with waterproof epoxy (Marine Epoxy; Loctite, Westlake, Ohio, USA). We released each hatchling at a different location on the banks of the pool. We relocated hatchlings daily after release (with exceptions, see Results) following their release on either 13 September 2015 (n = 10) or 5 October 2015 (n = 2), using a radio receiver (model R-1000, Communication Specialists, Inc., Orange, California, USA) and directional antenna (model RA-23, Telonics, Mesa, Arizona, USA). We conducted these daily relocations until the end of October, when activity began to decrease as water temperatures declined. We then tracked the hatchlings monthly until either their transmitter failed, or they moved out of the study site and could not be relocated. We concluded all radio tracking in February 2016.

Table 1. Straight carapace length, plastron length, and mass of hatchling Alligator Snapping Turtles (*Macrochelys temminckii*) from southeastern Oklahoma, USA, collected prior to release on 12 September (1–10) and 5 October (21, 22) 2015.

Turtle Identification	Straight Carapace Length (mm)	Plastron Length (mm)	Mass (g)
1	38.82	29.83	18.0
2	38.15	29.16	17.7
3	38.06	28.65	17.5
4	37.99	29.81	18.3
5	38.08	29.86	17.2
6	39.73	29.70	18.2
7	38.12	30.03	17.5
8	39.84	29.84	18.3
9	38.68	29.12	16.9
10	36.73	30.50	17.7
21	37.03	27.91	17.0
22	37.93	29.01	17.0

Upon locating each hatchling, we recorded the location, distance from the last location, water temperature at the top and bottom of the water column, overstory canopy cover, and water depth. We initially recorded distance to the nearest bank and substrate composition, but consistently interpreting these variables proved impossible because hatchlings were frequently in undercuts beneath banks and substrates of hard clay was indiscernible from bedrock or cobble when water became turbid. Therefore, we did not include these variables in analyses. Habitat measurements we obtained at the locations of hatchlings were paired with comparable measurements at random locations. Random locations were selected using a digital watch and a random number generator. The distance from the location of a hatchling was from 0–59 m as the seconds indicated the distance to move. The percentage of the creek width to be moved across the creek was determined by a random number generator ranging from 1–100%, and whether we went up or downstream was based upon the minute displayed on the digital watch, with odd numbers dictating that we move downstream and even numbers upstream. We periodically located and recaptured hatchlings for transmitter replacement at approximately day 60 due to transmitter battery life ranging from 60–90 days. Epoxy cured overnight before we released animals at the location of recapture. The water depth, overstory canopy cover, and temperature that we measured at the locations of turtles and paired random points were compared using the Mann-Whitney Wilcoxon test. We used R version 1.1.463 for all statistical analyses (R Core Team, 2020), with a significance threshold of α = 0.05 for all tests.

Results

We collectively located hatchling Alligator Snapping Turtles 328 times from September 2015 to February 2016. The number of times we located each hatchling varied due to differences in release date, timing of transmitter failures, failure to successfully relocate individuals, and predation. Hatchlings exhibited selection for shallower water than was randomly available: at locations of hatchlings, median water depth = 12 cm, range, 1–245 cm; at random locations, median water depth = 112 cm, range, 3–261 cm (W = 8,788, df = 327, $P < 0.001$). On average, we located hatchlings in areas with more canopy cover than at random locations: at locations of hatchlings, median canopy cover = 47.5%, range, 0–96%; at random locations, median canopy cover = 16%, range, 0–96% (W = 73,923, df = 326, $P < 0.001$). Structural cover was used by 100% of the hatchlings in this study, with 92% using undercut banks. There was no significant difference in water temperatures selected by hatchlings and water temperatures at random locations: at locations of hatchlings, median water temperature = 19° C; at random locations, median water temperature = 19° C (W = 51,860, df = 323, P = 0.880).

Of the 12 hatchlings we radio-tagged, three (25%) were lost to predation. The predation events occurred within 14 d of release. Fish were the likely predators in each event because of the erratic, quickly attenuating signal from transmitters that indicated a pattern consistent with rapid changes in water depth. We tracked each hatchling (n = 12) on 7–41 occasions, with the number affected in five cases by transmitters failing before they were scheduled to be replaced, predation, or movement out of the study area associated with high water flow events. Overall, hatchlings did not change locations between consecutive tracking events 51% of the time, and individuals remained at the previous location the next day 13–75% of the time. When movements did occur between relocation efforts, most movements were < 1 m; movements > 5 m were rare (Fig. 2). When hatchlings did change locations between tracking events, they moved a median of 2.76–19 m (Table 2).

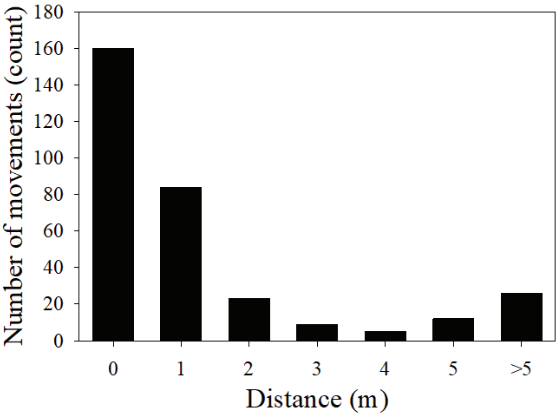

Figure 2. Frequency distribution of distances moved between successive relocations of hatchling Alligator Snapping Turtles (*Macrochelys temminckii*) during the autumn and winter following hatching and subsequent release into Pennington Creek in southeastern Oklahoma, USA.

We often observed hatchlings in undercuts, beneath organic cover structures, or hidden under floating debris. As examples of this, at the time of release, we observed Hatchling 1 crawling into an undercut in the bank (Fig. 4), while 10 d after its release, we could see the posterior edge of the carapace of Hatchling 2 sticking out from under a muddy bank (Fig. 4). Hatchling 8 was seen after a lengthy movement with a single submerged leaf covering it and as it subsequently continued to move downstream, we again saw that it was under a small quantity of floating algae.

While some cover structures were used for a single day before the next detection at a new location, some hatchlings stayed at specific locations and under cover for extended periods of time. Hatchling 4 moved to a half-submerged log oriented horizontally in the water with one end against the bank (Fig. 4) and stayed there for the next 23 d, where we repeatedly saw it. Hatchling 8 made a series of large movements (> 10 m) and then ended its movements under a small boulder in an eddy (Fig. 4) where it remained for the next 17 d, and where we saw it multiple times. Hatchling 10 continually

Table 2. Movements of hatchling Alligator Snapping Turtles (*Macrochelys temminckii*) from September 2015 to January 2016, in Pennington Creek in southeastern Oklahoma, USA. The heading 1-Median Distance Moved is restricted to days with non-zero distance movements, while 2-Median Distance Moved was calculated from the full data set that included radio tracking events where no movement was observed.

Turtle ID	No. of Days Tracked	% of Days with No Movement	1-Median Distance Moved (m)	2-Median Distance Moved (m)	Maximum Distance Between Locations (m)	Total Distance Moved (m)
1	41	71	3.60	0.00	18.5	139.0
2	8	13	5.00	3.35	9.00	26.03
3	35	54	0.78	0.00	4.16	26.12
4	40	43	1.30	0.33	12.0	100.9
5	13	46	1.37	0.59	4.07	52.56
6	40	75	2.67	0.00	5.00	46.75
7	7	57	14.0	0.00	5.00	108.0
8	32	56	1.70	0.00	19.0	124.5
9	39	38	1.20	0.50	16.0	66.52
10	38	37	0.70	0.37	10.0	46.16
21	25	36	0.65	0.30	2.76	14.29
22	9	22	0.50	0.50	5.00	12.70

moved around a small emergent grass tussock that formed a tiny island at the tip of a peninsula (Fig. 4) and was regularly seen in small undercuts, at the base of Spatterdock (*Nuphar adyena*), and buried in roots, for 13 d.

There were instances during the study, however, when we completely lost the signal from a transmitter or when we believed predation occurred. Seventeen d after the release of Hatchling 2, the transmitter rapidly moved large distances upstream and downstream within the pool. As a result, we were unable to pinpoint a location. The same pattern occurred for 3 d, and then the transmitter remained at a depth of > 1 m for the rest of the life of the transmitter. Our interpretation is that the hatchling was preyed upon by a fish, which swam with the transmitter in its gut for several days, and then eventually defecated the transmitter onto the creek bottom. A similar pattern occurred during tracking of both Hatchling 5 and Hatchling 7, and they too were presumed eaten.

The potential failure of transmitters or movement of hatchlings out of the portion of the creek to which we had access were the ultimate reasons behind our inability to continue tracking hatchlings for the entirety of a year. There were only two occurrences of hatchlings moving up or downstream at greater distances than anticipated, although we have little doubt that if the transmitters had lasted longer or access to the

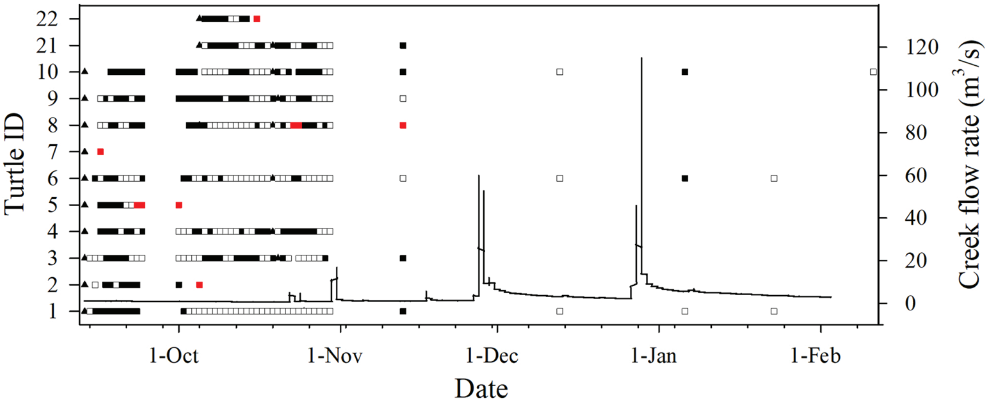

Figure 3. Tracking events for all hatchling Alligator Snapping Turtles (*Macrochelys temminckii*) with water flow from 13 September 2015 to 11 February 2016, Pennington Creek, Oklahoma, USA. Symbol designations are triangles = releases, closed squares = movement from previous tracking event, open squares = no movement from previous tracking event, and red squares = noteworthy events.

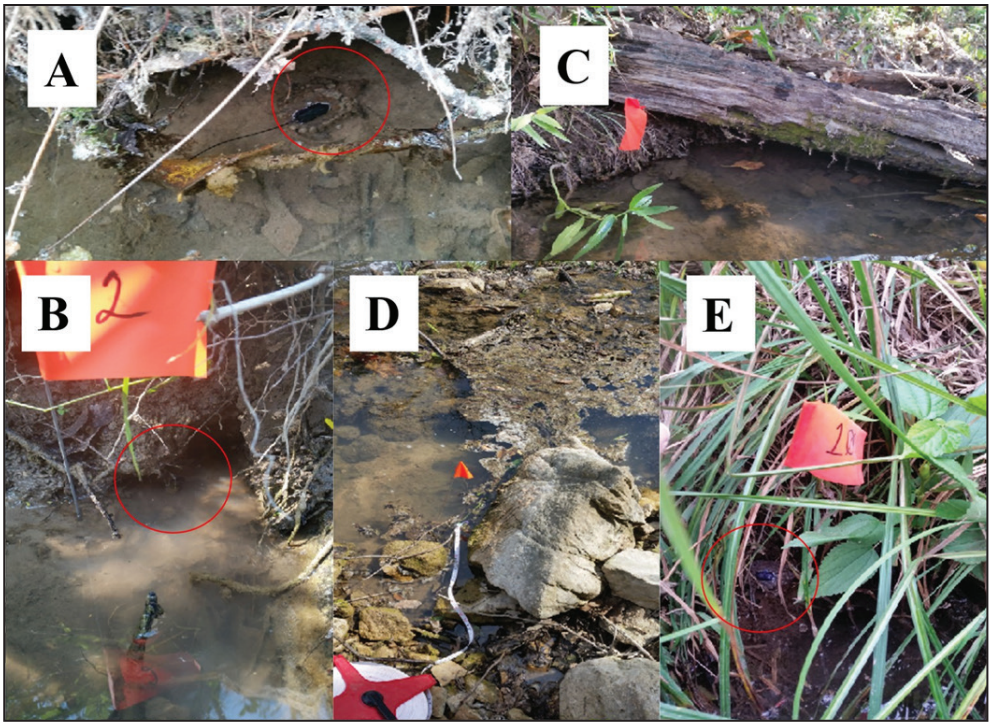

Figure 4. Select microhabitats of hatchling Alligator Snapping Turtles (*Macrochelys temminckii*) that were released into Pennington Creek in southeastern Oklahoma, USA. (A) undercut bank, (B) a cavity in a muddy bank, (C) a shallow space under a partially submerged log, (D) a small boulder with a cavity under it, and (E) a grass tussock. Red circles are included to indicate the locations of hatchlings when they were visible (A, B, E); the locations of hatchlings were often confirmed by touch when they were not visible (C, D). (Photographed by S. Jane Spangler).

creek sections been granted, that we would have seen more instances of long-distance dispersals. Hatchling 1 moved 79 m upstream, navigating over two low waterfalls, where it was observed beneath an undercut bank. This hatchling potentially continued moving upstream; however, the transmitter became dislodged, possibly during our attempt to retrieve the hatchling for transmitter replacement and so its fate remained unknown. Hatchling 8 moved > 300 m downstream from its location after a heavy rainfall event (> 12 cm in 24 h), and while it was observed at that time, we subsequently were not able to locate it even after kayaking downstream from our primary study area.

Discussion

Our results indicate that hatchling Alligator Snapping Turtles prefer habitats with shallow water and canopy cover, which is consistent with habitat preferences that have been reported for other age classes of this species. Juvenile and subadult Alligator Snapping Turtles in Louisiana and Oklahoma reportedly also exhibit a preference for increased canopy cover, association with structure, and shallow water (Harrel et al. 1996; Moore et al. 2014). Adults in Oklahoma also exhibited a preference for increased cover, and were typically located in shallower water, although a shift occurred during late summer when they moved to deeper water, possibly to avoid the high-water temperatures that can occur above the thermocline (Riedle et al. 2006).

Although hatchling Alligator Snapping Turtles in our study ultimately experienced a variety of fates, there were some commonalities among individuals. First, the hatchlings released into Pennington Creek tended to follow the same initial dispersal pattern of movement, in which they moved away from the site of release to a location with increased cover and shallow water, and then remained in that area for an extended period. The type of cover that turtles elected to associate with varied widely; therefore, we had to rely on qualitative descriptions to characterize them. Nonetheless, the high frequency with which individual turtles were found associated with structure or cover of some sort, including a diverse assortment of undercut banks, leaves, logs, boulders, tree root wads, spatterdock roots, and algae masses, highlights its general importance regardless of form. The extensive undercut banks on this stream appeared to be particularly favored, with nine of our 12 subjects occupying them for at least a portion of the study. Of the 319 times that we located individual turtles, there were just 23 instances (7%) in which a hatchling was found fully or mostly exposed in shallow water; however, in these instances turtles never remained exposed long-term, preferring instead to move to other locations. Of the 12 hatchlings we tracked, eight moved to a location of increased cover and stayed in that location for 17 or more days, often even after a recapture and release for transmitter replacements. These hatchlings were found in undercuts or beneath structures that included a log, a boulder, and a root wad.

Our sample size decreased over the duration of our study due to several factors, including one hatchling that was lost to transmitter failure before recapture. Eight of the original 12 hatchlings were successfully radio-tracked, however, from the end of September to the end of October, and of those hatchlings, we recaptured six again in November. After November, the number of successful locations decreased until February, when we were able to locate just one hatchling. The decrease in the number of trackable animals corresponded with reduced frequency of radio tracking efforts, and could have resulted from transmitter failures, predation, or moving out of the portion of the creek to which we had to access.

We were able to confirm that one hatchling washed downstream during a high-flow event. Interestingly, none of the other hatchlings were swept from their refugia during the high flow, and these different fates likely stemmed from the location of individual turtles when flooding occurred. Whereas most hatchlings were located under cover along edges of the creek where turbulent flow patterns reduce the stream velocity and create eddies, the turtle that washed downstream occupied a shallow space mid-stream under a boulder where the current was strong and directional. To our knowledge, this is the first study to report the fate of hatchling turtles during flooding; however, studies of adults suggest that turtles have some capacity to resist being washed downstream and are capable of at least short-range homing on occasions when they are displaced by flood events (Ligon and Peterson 2002; Jones and Sievert 2009; Jergenson et al. 2014).

Predation by Raccoons (*Procyon lotor*) of turtle eggs, hatchlings, and even adults of many species is commonly reported in studies of turtle populations (Seigel 1980; Christiansen and Gallaway 1984; Kolbe and Janzen 2002; Engeman et al. 2005; Buzuleciu et al. 2016). Furthermore, a recent study that was conducted at three geographically disparate sites found that Raccoons were consistently the primary predator of juvenile Alligator Snapping Turtles, and it was concluded that the tendency of young turtles to remain in shallow water near the shoreline likely increased their detection and predation by raccoons (Dreslik et al. 2017). Raccoons were common at our study site, and so it was surprising that we found no evidence of Raccoon predation of hatchling Alligator Snapping Turtles. We lost track of many of hatchlings due to losing the radio signals from the transmitters, and it is conceivable that some of these individuals were preyed upon by Racoons. In previous studies documenting predation by terrestrial predators, however, radio transmitters have remained functional and trackable following predation (Ligon and Reasor 2007; Dreslik et al. 2017). Therefore, we suspect that at least the majority of the lost radio signals in this study are more parsimoniously attributed to factors other than predation by Racoons. Furthermore, although hatchlings in our study were usually located in shallow water near shore, it was almost always difficult to access them via the shoreline because the banks were steep, heavily vegetated, and often had deep undercuts that would have been inaccessible to Raccoons. Additionally, the creek bottom dropped off steeply throughout much of the study site; these characteristics would have made patrolling the shoreline difficult for Raccoons. This could have important implications for reintroduction efforts for this and other turtle species; selecting release sites that have shorelines that are difficult for Raccoons to patrol could improve survival rates of hatchlings and juveniles.

Despite the lack of predation by Raccoons, four of the hatchlings released into Pennington Creek were likely preyed upon by fish. The documented cases all occurred within two weeks after release when exposure to large fish might have been high during this initial period when hatchlings were moving to locate preferred habitat. We concluded that fish predation occurred based on the movements of the transmitter signal during tracking. The signal for predated hatchlings would become erratic, repeatedly producing a strong reading near the water's surface that would quickly attenuate, a pattern consistent with rapid changes in water depth. Interestingly, experimental studies of fish predation of hatchling turtles have suggested that predation risk is low (Semlitsch and Gibbons 1989). In one study, aposematically colored hatchling Pond Sliders (*Trachemys scripta*) and Painted Turtles (*Chrysemys picta*) were readily consumed by Largemouth Bass (*Micropterus salmoides*) when the turtles were anesthetized but were egested or ignored when the turtles were awake and active. Furthermore, cryptically colored hatchling Common Snapping Turtles (*Chelydra serpentina*) were difficult for Largemouth Bass to swallow and were frequently egested (Briston 1998). These results suggest that Largemouth Bass may not commonly prey upon turtles. Given that Alligator Snapping Turtle hatchlings are larger than the hatchlings of other sympatric turtle species, it appears unlikely that Largemouth Bass were responsible for the predation events that we observed. Predation patterns of other fish species on hatchling freshwater turtles have not been conducted; however, several other large-bodied carnivorous fish species were present in our study system, including Channel Catfish (*Ictalurus punctatus*) and Flathead Catfish (*Pylodictis olivaris*; pers. obs.), and may have been responsible for the predation events that occurred. Smallmouth Bass (*Micropterus dolomieu*) and Spotted Bass (*Micropterus punctulatus*) were present as well, but we expect that their small gape relative to that of Largemouth Bass excludes them from consuming hatchling Alligator Snapping Turtles.

Although our study represents a time-limited investigation of the first several months of post-embryonic life following emergence from the nest, understanding the ecology of turtles during this period is critical because it likely represents a time during which turtles are most at risk. Furthermore, the observation that stream bank morphology might have important implications for predation risk could prove important in reintroduction efforts for this and other aquatic turtle species. Expanding this study into the first full activity season for hatchling Alligator Snapping Turtles would provide important additional insights into annual mortality and growth rates, as well as possible seasonal variation in habitat preferences and activity patterns. Our efforts to do so were stymied by frequent loss of radio transmitter signals and the challenges of recapturing hatchlings to replace radio transmitters. Finally, additional studies of fish predation patterns on hatchling turtles are necessary to fully assess the overall impact that fish might have on young freshwater turtles.

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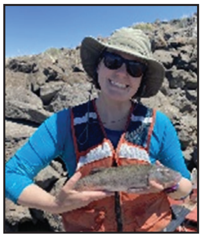

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