Habitats and Movements of Adult Alligator Snapping Turtles in Northeast Louisiana

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Abstract: Home range, habitat use, and daily movements of 11 adult alligator snapping turtles (*Macroclemys temmincki*) were studied with telemetry in Black Bayou Lake and Bayou Desiard, Ouachita Parish, Louisiana, from 8 August 1984 to 6 November 1985. Six turtles were native to the study area, and 5 were introduced. No difference ($P > 0.05$) was found between the mean daily distances traveled by introduced turtles and those traveled by native turtles. Minimum home range sizes were not different ($P > 0.05$) between introduced and native turtles. Turtles in Black Bayou Lake used shallow, heavily vegetated waters, not in proportion to availability. Bayou Desiard turtles used deep channels in proportion to availability.

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The alligator snapping turtle has historically been an important part of Louisiana's culture, and a common inhabitant of its wetlands. Previous studies have documented reproduction and growth (Dobie 1971), natural history (Allen and Neill 1950), and luring behavior while in captivity (Drummond and Gordon 1979).

The turtle ranges in the Mississippi Valley from Kansas, Iowa, and Illinois, south to the Gulf of Mexico, and on the coastal plain from eastern Texas to northern Florida and western Georgia (Drummond and Gordon 1979). The turtle's major habitats include: (1) freshwater lakes, (2) rivers, (3) canals, and (4) bayous. Swamps are also suitable habitat, provided permanent water is available.

Data on the movements of alligator snappers are scarce. Wickham (1922) reported upstream movement of 1 adult in an Oklahoma river as 9.6 km in 3 years. Pritchard (1983) also studied adult upstream movement in an Oklahoma river but reported the event as 28 km in 3 years. Pritchard believed that the alligator snapper is an "habitual upstream wanderer," and that "certain alligator snappers may wan-

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der upstream for decades, ultimately arriving in the uppermost reaches of the Mississippi river system by which time they are very large, old, and scarce." Ernst and Barbour (1972) suggested the turtles are sedentary by nature, also that they seldom swim for any distance, and instead "creep" along the bottom.

The objectives of this study were to monitor daily activities of individual turtles, determine minimum home range and habitat use within freshwater lake and bayou habitat, and determine variations in habitat use.

Methods

Investigations were carried out in northeast Louisiana on Black Bayou Lake and Bayou Desiard. Black Bayou Lake is 610 ha, with mean elevation of 21 m above sea level, average depth of 2 m, and an annual fluctuation of 0.6 m (Taylor et al. 1976). Approximately 366 ha of the lake is open water. Flotant, densely vegetated floating mats of detritus, make up 122 ha. The major species found on mats are: alligator weed (*Alteranthera philoxeroides*), water hyacinth (*Eichhornia crassipes*), water pennywort (*Hydrocotyle spp.*), water hyssop (*Bacopa caroliniana*), common frogbit (*Limnobium spongia*), bur-marigold (*Bidens laevis*), and cattail (*Typha latifolia*). In places, mats are thick enough to support sapling black willow (*Salix nigra*), bald cypress (*Taxodium distichium*), and tupelo gum (*Nyssa aquatica*). Stands of cypress in water occupy 61 ha. The remaining 61 ha consists of black willow and buttonbush (*Cephalanthus occidentalis*), with scattered cypress, and associated aquatics. These areas are associated with sloughs which enter the lake's east side. Aquatics here consist of white water lily (*Nymphaea odorata*), water shield (*Brasenia shreberi*), mosquito fern (*Azolla caroliniana*), duckweed (*Lemna spp.*), bladderwort (*Utricularia sp.*), watermilfoil (*Myriophyllum spicatum*), fanwort (*Cabomba caroliniana*), coontail (*Ceratophyllum demersum*), and water hyacinth. Much of the open water areas of the lake is shallow, and thus support vast stands of American lotus (*Nelumbo lutea*) during warm months (Chabreck and Condrey 1979).

A 16-km inpounded stretch (mean width of 70 m) of Bayou Desiard in the study area is adjacent to, and seasonally delivers or receives water from, Black Bayou Lake via Hanna's Run, a 300 m cut-off bayou. Culverts, 1.5 m in diameter, allow water to flow freely between lake and bayou. Mean depth of Bayou Desiard is 2 m with an annual fluctuation of approximately 1.8 m. Principle vegetation on the bayou is bald cypress. Duckweed and mosquito fern are prevalent during the summer months. Limited areas are shallow enough to allow mats of alligator weed to form.

Beginning in June 1984, adult alligator snapping turtles were captured in baited hoop nets and by "polling" as described by Dobie (1971). Telemetry transmitters were attached with frequencies of 150 to 151 MHz designed originally for use on American alligators (*Alligator mississippiensis*). Methods of capture (i.e. nets and "polling") caused no physical harm to any of the turtles captured. Stress from handling was kept to a minimum by transporting introduced turtles in wet

Table 1. Sex, weight (kg), capture site, total radio days, total locations, average daily distance traveled (m), and minimum home range (ha) of 11 adult alligator snapping turtles (*Macroclemys temmincki*) in Bayou Desiard and Black Bayou Lake, Ouachita Parish, Louisiana, from 8 August 1984 to 6 November 1985.

Turtle	Sex	Weight (kg)	Capture site	Release site	Total radio days	Total locations	Avg. daily dist. traveled (m)	Minimum home range (ha)
1	–	18.9	Bayou Desiard	Bayou Desiard	457	180	42.4	30.7
2[a]	–	10.8	Red River[b] Oxbow	Bayou Desiard	286	99	70.0	124.1
3[a]	M	45.0	Ouachita[c] River	Bayou Desiard	387	165	46.1	130.5
4[a]	M	34.7	Red River[b] Oxbow	Black Bayou Lake	224	109	111.5	122.1
5[a]	–	16.7	Red River[b] Oxbow	Black Bayou Lake	312	151	115.5	247.0
6[a]	F	11.3	Red River[b] Oxbow	Black Bayou Lake	191	83	40.0	35.8
7	M	19.4	Black Bayou Lake	Black Bayou Lake	152	80	52.0	178.5
8	F	13.0	Black Bayou Lake	Black Bayou Lake	128	66	44.0	195.8
9	F	14.9	Black Bayou Lake	Black Bayou Lake	128	66	29.0	98.4
10	F	15.3	Black Bayou Lake	Black Bayou Lake	128	66	27.8	18.0
11	M	31.1	Black Bayou Lake	Black Bayou Lake	128	67	109.2	147.0

[a]Represents introduced animal.
[b]Two km west of Hwy. 71 and 35 km south of Bossier City, La.
[c]Five km south of Monroe, La.

burlap bags, or in large containers filled with water, and by limiting the elapsed time of transportation to the study area to no more than 24 hours. Whenever possible, weights and measurements were taken on each turtle before transmitters were attached (Table 1). Sex was determined based on relative pre-anal lengths (Dobie 1971). Sex was not determined for turtles 1, 2, and 5 because the technique was then unknown. Transmitters were attached by drilling 6.4 mm holes (2–4) and bolting the transmitter collar to the carapace edge using brass bolts and self-locking nuts. Transmitters were situated diagonally across the dorsal surface of the carapace. The configuration of the ventral surface of the carapace, just above the limbs, permitted drilling completely through the carapace without contacting flesh. This method of collar attachment also proved useful in handling and recapturing.

Turtle activity was monitored daily, weather permitting, with the use of airboats and outboard boats. Twenty-four hour monitoring was also employed monthly to detect nocturnal movements. The turtles occupying Black Bayou Lake were checked by airboat with no apparent disturbance to the animal, even in very shallow water. This was of concern until it was apparent that the animals could be approached without disturbance by engine noise. Four element, hand-held, directional

antennas were used to pinpoint a turtle's exact location. Water depth, vegetation type, and distance moved since the previous reading were recorded upon location and plotted on a topographic map.

Habitat types in Bayou Desiard were separated into 3 categories: (A) open water with limited vegetation and no deep channel, 1.8 to 2.9 m in depth, (B) cypress bordered channel, 1.8 to 2.9 m in depth, and (C) buttonbush with cypress and associated aquatics, less than 1.8 m in depth. Three additional categories described the diverse depth and habitat types of Black Bayou Lake, including: (D) flotant with cypress or buttonbush, less than 1.8 m in depth, (E) aquatics and emergents, less than 1.8 m in depth, and (F) cypress and aquatics, 1.8 to 2.9 m in depth.

Results and Discussion

Movements

Movement data for 11 adult alligator snapping turtles instrumented during 1984 and 1985 were obtained from 1,132 radio fixes (Table 1). Turtles 3, 4, and 5 (introduced) used culverts connecting the 2 study areas to travel back and forth, and spent some time in each. Turtles 4 and 5 were released into Black Bayou Lake, but traveled through the culverts into Bayou Desiard for the remainder of the study. Turtles 1 (native) and 2 (introduced) spent the entire study in Bayou Desiard. Turtles 6 (introduced), 7, 8, 9, and 10 (native) spent the entire study within their original release site, Black Bayou Lake. Turtle 11 was intentionally released in Bayou Desiard to determine alligator snapper homing abilities. Within 3 days this turtle had successfully returned to within 1 km of its original capture site, and within 3 months had returned to within 400 m of its original capture site.

Turtle 3 was released in Bayou Desiard within 200 m from access by water to Black Bayou Lake. This animal spent the entire winter after release in Hanna's Run, which connects the 2 water bodies. Then, it ventured into the lake for several long distance journeys, always returning to the bayou. The longest of these journeys took 6 days and covered approximately 6.8 km (one way). Turtle 5 showed more movement than any of the other turtles. It displayed the greatest mean daily distance traveled (Table 1).

Habitat Use

Habitat use is expressed as the amount of time (radio days) spent in a particular habitat type by percent (Table 2). Habitat types available in Bayou Desiard are: (1) open water (5%), (2) buttonbush with cypress (5%), and aquatics, and (3) cypress bordered channel (90%). Habitat types available in Black Bayou Lake are: (1) open water (60%), (2) flotant (20%), (3) cypress bordered channel (5%), (4) cypress and aquatics (5%), (5) buttonbush with cypress (5%), and (6) aquatics and emergent (5%). Total habitat types available for Black Bayou Lake and Bayou Desiard combined are: (1) open water (52%), (2) cypress bordered channel (18%), (3) flotant (17%), (4) buttonbush with cypress (5%), (5) aquatics and emergents (4%), and (6) cypress and aquatics (4%).

Table 2. Percent of time spent in each habitat type for 11 adult alligator snapping turtles (*Macroclemys temmincki*) in Bayou Desiard and Black Bayou Lake in northeast Louisiana from 8 August 1984 to 6 November 1985.

	Habitat Types in Bayou Desiard			Habitat Types in Black Bayou Lake		
Turtle	Open water, no channel 1.8 to 2.9 m	Cypress bordered channel 1.8 to >2.9 m	Buttonbush with cypress & aquatics >1.8 m	Flotant with cypress or buttonbush >1.8 m	Aquatics & emergents >1.8 m	Cypress & aquatics 1.8 to 2.9 m
	Spent entire study in Bayou Desiard					
1	7.9	86.0	6.1	—	—	—
2	33.9	63.3	2.8	—	—	—
	Used both Bayou Desiard and Black Bayou Lake					
3	46.8	37.5	8.5	5.4	1.8	—
4	7.2	83.4	—	—	9.4	—
5	10.6	48.4	9.9	5.2	15.7	10.2
	Spent entire study in Black Bayou Lake					
6	—	—	20.4	54.9	24.7	—
7	—	—	7.8	83.6	—	8.6
8	—	11.7	—	88.3	—	—
9	—	11.7	—	51.6	—	36.7
10	—	—	7.8	92.2	—	—
11	—	—	—	90.6	—	9.4

Turtles 1 and 2 spent an average of 74.6% of the monitoring period in cypress bordered channel habitat. This was the most available habitat in Bayou Desiard. Habitat use for these 2 turtles was in close proportion to habitat availability.

Turtles 3, 4, and 5 used both Black Bayou Lake and Bayou Desiard. These turtles spent an average of 56.4% of the monitoring period in cypress bordered channel habitat. In lake and bayou combined, 18% of total available habitat was cypress bordered channel, while the most available habitat was open water. Use of cypress bordered channel by these turtles was 3 times greater than its availability. Use of channel habitat by turtles 3, 4, and 5 could be related to their introduction from areas of deep river habitat, similar to the channel habitat used during the monitoring period. Turtle 5 (introduced) used more diverse habitats than any of the other turtles. It also displayed the greatest mean home range size (Table 1). This turtle used every available habitat in the bayou and lake (Table 2).

Turtles 6, 7, 8, 9, 10, and 11 spent an average of 76.8% of the study in flotant with cypress or buttonbush habitat. In Black Bayou Lake, this habitat type comprised only 20% of total habitat and use was more than 3 times greater than its availability. Although the most available habitat was open water (60%), lake turtles used primarily those areas that provided the most cover, using none of the most available habitat during the monitoring period. Apparently, they sought the seclusion of densely vegetated waters where those waters were available. These turtles frequently used areas beneath the shade of cypress trees where an opening was present in the flotant.

Use of specific "core" areas was exhibited by all turtles. These areas varied

greatly in vegetation and water depth. Journeys were made from these areas, but were usually short in distance and duration.

Mortality

One 10.8-kg turtle (sex undetermined) was reported dead 19 May 1985 by a fisherman on Bayou Desiard. When found, the shot turtle had decomposed to bone, with the transmitter still attached and functioning. A 34.7 kg male was found in Bayou Desiard drowned in an abandoned monofilament net 10 August 1985, with transmitter still functioning.

Conclusions

No difference (t-test, unequal sample size; $P > 0.05$) was found between mean daily distance traveled by introduced turtles and those traveled by native turtles. Minimum home range of native turtles was not different ($P > 0.05$) from introduced turtles.

Habitats used by turtles occupying Bayou Desiard were in close proportion to availability. Turtles that occupied both lake and bayou habitat during the monitoring period used primarily cypress bordered channel, not in proportion to its availability. Turtles occupying Black Bayou Lake used primarily shallow, thickly vegetated waters, not in proportion to availability. No nesting by adult female turtles was observed.

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