GEOGRAPHIC DISTRIBUTION, POPULATION STRUCTURE, HABITAT, AND MOVEMENTS OF A NEWLY DISCOVERED POPULATION OF STERNOTHERUS MINOR PELTIFER (STRIPE-NECKED MUSK TURTLE) IN THE LOWER TENNESSEE RIVER DRAINAGE OF WESTERN MIDDLE TENNESSEE

SCOTT WILLIAMSON

To the Graduate Council:

I am submitting herewith a thesis written by Scott Williamson entitled "Geographic Distribution, Population Structure, Habitat, and Movements of a Newly Discovered Population of *Sternotherus minor peltifer* (Stripe-necked Musk Turtle) in the Lower Tennessee River Drainage of Western Middle Tennessee." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in biology.

A. Floyd Scott

Dr. A. F. Scott, Major Professor

We have read this thesis
and recommend its acceptance

David Snyder

Dr. David H. Snyder, Second Committee Member

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A Thesis

Presented for the

Master of Science Degree

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Scott Williamson

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ABSTRACT

Selected aspects of the life history of a recently discovered population of *Sternotherus minor peltifer* (Stripe-necked Musk Turtle) in Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee were studied from 15 September 1999 through 29 June 2001.

Objectives of the study included: 1) documenting the geographic distribution of *S. m. peltifer* in the Whiteoak Creek and adjacent drainages, 2) describing the structure of the population encountered, 3) providing a detailed description of microhabitats used, 4) tracking the movements of turtles using radio telemetry, and 5) observing and describing behavior.

Most of the turtles were captured by hand while wading, canoeing, and snorkeling the creek. Funnel traps were used, but yielded mostly individuals of other species. All captured specimens were weighed, measured, given an individual mark (notches in marginal scutes), and, whenever possible, sexed using external features. Seven adults were fitted with radio transmitters.

Six sites along a 23-km reach of Whiteoak Creek produced 49 individuals, and a site on Big Richland Creek yielded one juvenile. Females outnumbered males approximately 2 to 1 (26:15); juveniles numbered nine. Size class data were skewed toward older adults.

Thirty-one individuals were found near ledges, crevices, and boulders of deeper pools along limestone bluffs. Sixteen were taken among submerged root masses, logs,

limbs, and other organic debris not associated with bluffs. Three were collected out of water, clinging to emergent roots and limbs. Only three recaptures were recorded during this study.

Limited data from radio telemetry tracking revealed that *S. m. peltifer* tended to confine its activities to a fairly small area; movements were generally of short distances, but longer movements did occur.

One voucher specimen (APSU # 3252), photographic records of all individuals collected, and a video tape of courtship/mating behavior of a captive pair are housed in Austin Peay State University's Museum of Zoology.

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CHAPTER I

INTRODUCTION

Conant and Collins (1998) listed the geographic range of the Stripe-necked Musk Turtle, *Sternotherus minor peltifer*, as the southeastern portion of Mississippi (Pearl River Drainage), most of Alabama, extreme southwest Virginia, and much of east Tennessee (Figure 1). In the summer of 1999, three Stripe-necked Musk Turtles were captured in Whiteoak Creek near its confluence with Kentucky Lake (Tennessee River) in Houston County, Tennessee (Scott et al., 2000). This site is approximately 200 km WSW of the nearest known locality for the species in Tennessee (Iverson, 1992), and about 120 km N of the closest Alabama population (Mount, 1975). The discovery of these turtles in a drainage so far from their published range prompted this study.

The Study Animal

Etymology and Synonymy of Scientific Name

The currently accepted scientific name for the Stripe-necked Musk Turtle is *Sternotherus minor peltifer* (Crother, 2000). The derivation of this trinomial is as follows: *sternon* (Greek) = "breastbone," *thero* (Greek) = "a wild beast," *minor* (Latin) = "less" (in reference to the size of this species relative to *S. carinatus*), *pelta* (Latin) = "a shield," and *-fer* (Latin) = "to bear" (Mitchell, 1994). Other names that have been used to refer to this animal include: *Sternotherus peltifer* (Smith and Glass, 1947), *Sternotherus carinatus*

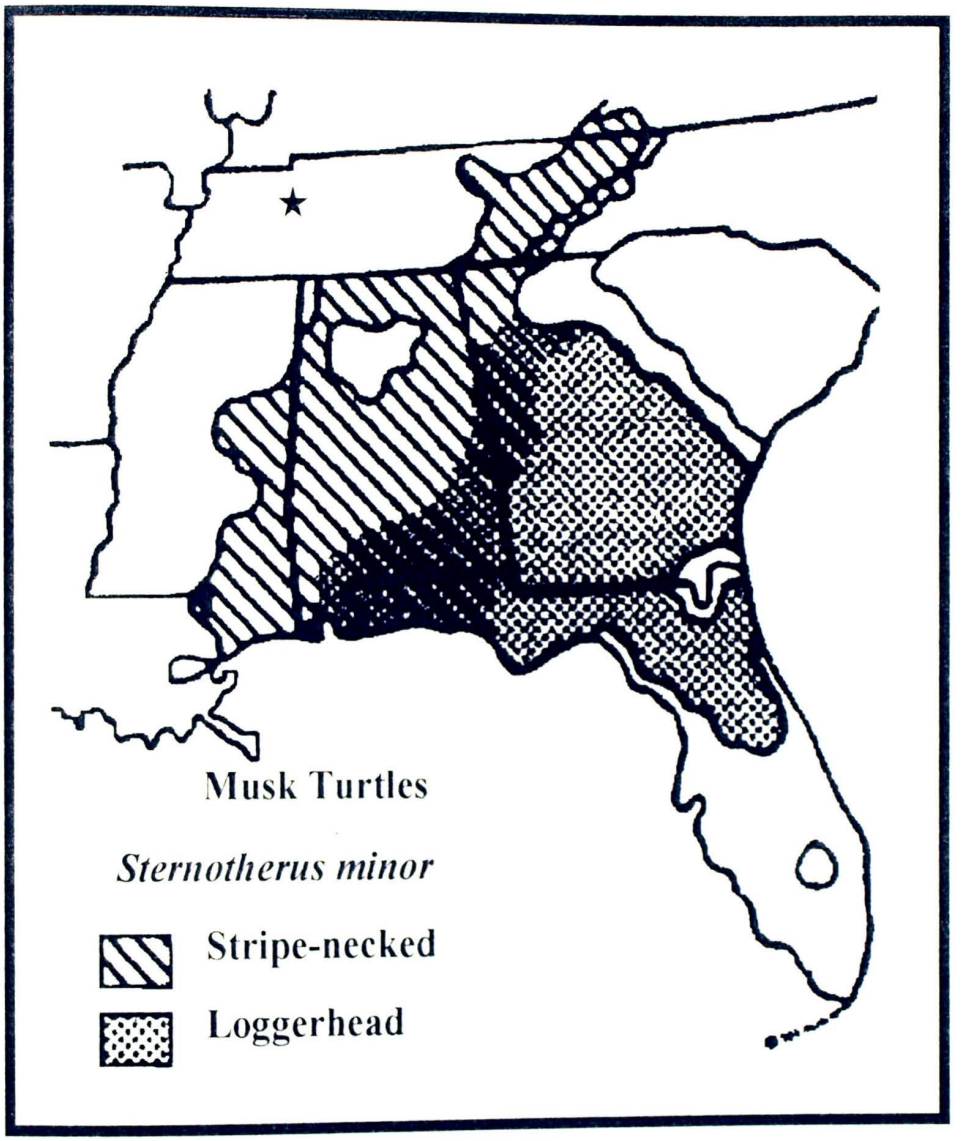

Figure 1. Geographic range of *Sternotherus minor peltifer* showing (with ★) the approximate location of the population discovered by Scott et al. (2000) in Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee. (Map modified from Conant and Collins, 1991)

peltifer (Carr, 1952), and *Sternothaerus minor peltifer* (Tinkle, 1958a). Some authors (e.g. Ernst et al., 1988; Ernst and Barbour, 1989; Iverson, 1992) have even labeled the species as *Kinosternon minor*, relegating *Sternotherus* to subgeneric status.

Description and Life History

Sternotherus minor peltifer is a small, almost entirely aquatic member of the *Sternotherus* complex, a group of three closely related species in the family Kinosternidae. Other members of the group include *S. carinatus* (Razor-backed Musk Turtle), *S. depressus* (Flattened Musk Turtle), and *S. minor minor* (Loggerhead Musk Turtle). The latter is considered *S. m. peltifer*'s closest relative (Tinkle, 1958a).

Physical features of *S. m. peltifer* include a brown, oval carapace with darker seams between the scutes. The weakly hinged plastron is pink to yellow, and normally unmarked. The head is comparatively large, and it and the neck are striped with black and yellow pigment, giving the turtle its vernacular name. The protruding snout is sharply tapered, and the upper jaw is slightly hooked over the lower jaw. The chin bears two barbels (Ernst and Barbour, 1989).

Sternotherus minor peltifer is a bottom dweller and feeds on a variety of prey during the course of its life. Juveniles are primarily insectivores, but as development progresses, they switch to a diet dominated by mollusks, especially snails (Folkerts, 1968; Tinkle, 1958a).

Sexual maturity is achieved at an average age of four years for males and eight years for females. The species is sexually dimorphic; males have longer, more massive,

spine-tipped tails, and rough, scaly patches of skin behind the knee of each rear leg. Studies on *S. minor* in north Florida report that breeding can occur throughout most of the year. Typically, 2-3 small clutches (1-5 eggs) are laid, often at the base of a tree or beside a log (Ernst and Barbour, 1989). Iverson (1978) states that nesting takes place from at least October through June. No information is available concerning reproduction of the species in Tennessee. The incubation period varies from 61-119 days. Hatchlings have a nearly circular carapace (22-27 mm in length) and exhibit the characteristic head/neck striping (Ernst et al., 1994).

Hibernation takes place from December through February in a soft substrate or submerged rock crevice. These turtles prefer moderately shallow (0.5-1.5 m), clear, flowing water with some form of cover such as rocks, roots, or snags nearby (Ernst et al., 1994).

Distribution

The bulk of the range of *S. m. peltifer* is in Alabama, but there are published accounts from other states. Specimens are known from the Clinch, Holston, and Powell River systems in Lee and Scott counties, Virginia (Mitchell, 1994). Palmer and Braswell (1995) reported five specimens and a partial skeleton from three streams (Shuler Creek, backwaters of the Hiwassee River, and French Broad River) in Cherokee and Madison counties in extreme western North Carolina. Iverson (1974) examined 19 specimens from three counties (Blount, Meigs, and Sullivan) in Tennessee; fourteen of these were collected in Great Smoky Mountains National Park. In 1993 Jones et al. published a range

extension for the species from Tishomingo County, Mississippi. This represented the first record from the Tennessee River drainage of northeastern Mississippi (50 km SW of nearest record from this river system in Alabama).

Additional References

Other important references listed by topic include: distribution- Tinkle (1959), Redmond et al. (1990); food/foraging- Marion et al. (1991), Hensley (1995); reproduction- Tinkle (1958b), Iverson (1978); behavior- Jackson (1969); carapace erosion- Jackson (1965); morphology- Seidel et al. (1981), Seidel and Lucchino (1981), Ernst et al. (1988); population dynamics- Sexton (1959), Cox (1990), Guyer and Herndon (1992); and phylogeography- Walker and Avise (1998).

Objectives

The major objectives of this study were to: 1) document the geographic distribution of *S. m. peltifer* in the Whiteoak Creek and adjacent drainages, 2) describe the structure of the population encountered, 3) provide a detailed description of microhabitats used, 4) track the movements of turtles by using radio telemetry, and 5) observe and describe behavior.

CHAPTER II

STUDY AREA

General Setting

The streams in which this study was carried out flow through Houston and Humphreys counties in western Middle Tennessee (Figure 2). This area is within the Western Highland Rim subsection of the Highland Rim section in the Interior Low Plateaus Province (Quarterman and Powell, 1978). The region "consists of maturely dissected upland ridges and numerous minor stream valleys." The valleys are of moderate grade, and the clear waters in the streams flow over substrates ranging from sand and coarse chert gravel, to occasional areas of exposed bedrock. The soils, which overlay Mississippian-age limestone, chert, and shale, are acidic and have low to moderate fertility (Griffith et al. 1997). Soil types within Whiteoak and Big Richland basins include: Baxter, Brandon, Dickson, Ennis, Hawthorne, Mountview, Saffell, and Sulphura(Wildermuth and Odom, 1958; Welles et al., 1946). The area, mostly deforested in the mid to late 1800s, is now heavily vegetated with hardwood forests (oak-hickory) and mixed grasses used primarily for production of hay and as pasture for livestock (Griffith et al. 1997).

Whiteoak and Big Richland Creeks

Whiteoak Creek was the primary stream in this study. It is a third order stream, approximately 40-km long, and flows through portions of both Houston and Humphreys counties (Figure 3). Ron Harrison, District Conservationist for Houston County,

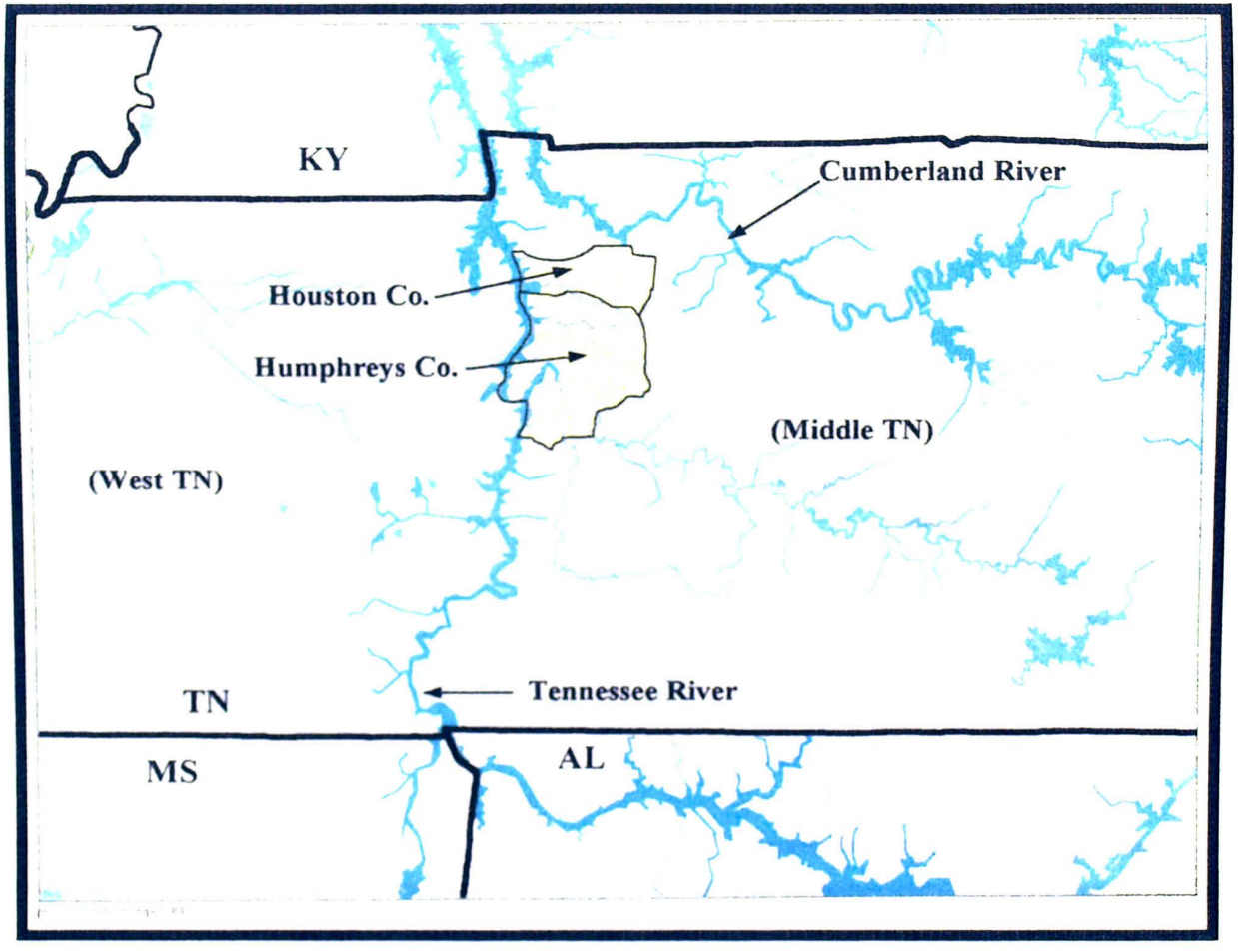

Figure 2. Location of Houston and Humphreys counties in western Middle Tennessee.

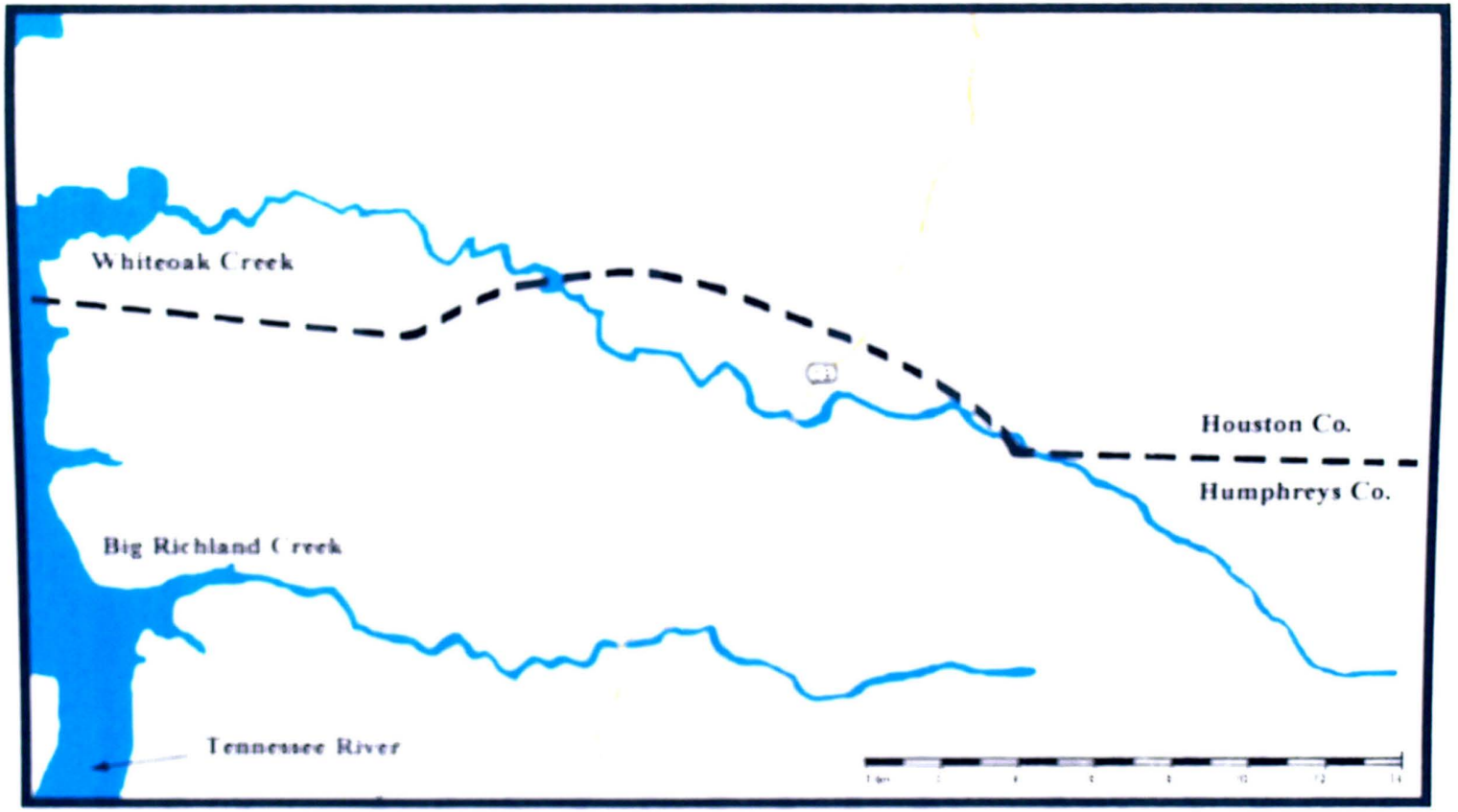

Figure 3 Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee

provided the following information on the drainage. The creek drains a basin of approximately 24,500 hectares, and empties into the Tennessee River (Kentucky Lake). Approximately 75% the land within the Whiteoak Creek basin is forested, with oaks, hickories, and yellow poplar dominating. Approximately 20% of the watershed is covered in cool-season grasses such as fescue and orchard grass. Only about 5% of the land is used for crop production. The creek is considered "fairly pristine," with little impact from agricultural or other human activities.

Big Richland Creek (ca 23-km long), located just south of Whiteoak Creek and entirely within Humphreys County, was the other stream in which I found *Sternotherus minor peltifer* (Figure 3). Although it drains a smaller area (ca 13,600 ha), it is similar in character to Whiteoak Creek, and its basin has nearly identical vegetative cover and land use (Odell Poyner, District Conservationist, Humphreys county, personal communication).

Much of the water in Whiteoak and Big Richland creeks comes from runoff, but numerous springs scattered along their lengths contribute to the volume of water they carry. Both of these are permanent streams, but water levels fluctuate according to season and, along their lower reaches, in response to manipulation of water levels in Kentucky Lake.

Both drainages have a warm-temperate, humid climate characterized by hot summers and no distinct dry season. Annual precipitation averages 127 cm (50 inches). Annual mean temperature is 15.1 °C (59.1 °F). The difference between average summer and winter temperatures is 2.8 °C (37 °F). The period from April 12 through October 19 is typically frost-free (Wildermuth and Odom, 1958; Welles et al., 1946).

A limited amount of time was also spent searching for *S. m. peltifer* in other streams (Hurricane, Sulphur, and Harmon creeks) in the region, but none was found in any of them.

CHAPTER III

METHODS AND MATERIALS

An examination of maps of the area and direct observations while driving roads within the drainage basins were used to locate sites accessible for study. A canoe was used to explore the sites and to look for turtles. Netting and hand capture while wading, snorkeling, and canoeing were the primary methods yielding turtles. Traps also were used, with little success. Latitude and longitude (Lat/Long) readings were taken with a global positioning system unit (Garmin GPS™ 175) at each location where turtles were captured. Capture sites were assigned names based on nearby well-known landmarks (Table 1).

Capture and Processing

Most turtles were captured by hand, but a long-handled dip net proved useful in deeper water. Traps were baited with sardines and/or fresh fish. Turtles captured in 1999 were taken back to the laboratory and weighed, measured, marked, sexed, and photographed. Weighing was done on an Ohaus Dial-O-Gram Scale (1600g capacity). Measurements (to the nearest mm) were taken of the carapace length and width, plastron length and width, and shell height using vernier calipers (155-mm capacity, accuracy to 0.05 mm). When the study resumed in January 2000, the acquisition of additional equipment allowed for all processing to be carried out in the field. Individuals were placed in a small nylon bag and weighed using a Pesola® Micro-Line # 40300 spring scale (300-g capacity, 2-g increments, ± 0.3%). The marking system used involved notching

Table 1. Names and latitude/longitude coordinates of sites along Whiteoak and Big Richland creeks (Houston and Humphreys counties, Tennessee) where specimens of *S. m. peltifer* were taken during this study between 15 September 1999 and 29 June 2001).

Site name	Latitude & Longitude
Parker's Bend	36° 15' 30"N - 87° 52' 30"W
Magnolia Bridge	36° 15' 35"N - 87° 52' 15"W
Spout Spring Bluffs	36° 15' 12"N - 87° 48' 15"W
Rushing Bluffs	36° 15' 54"N - 87° 48' 42"W
Gander Branch Road Bridge	36° 13' 33"N - 87° 46' 20"W
Slaughter Road	36° 12' 29"N - 87° 43' 15"W
Lockhart Road Bridge*	36° 09' 12"N - 87° 48' 25" W

* The only site on Big Richland Creek yielding specimens.

the marginal scutes in a fashion similar to that described by Cagle (1939). This involved cutting V-shaped notches in the scutes using a small triangular file. Photographs (now on file in the Austin Peay State University Museum of Zoology) of each captured individual were taken using a Minolta X-370 35-mm camera equipped with a Prospec® 28-70 mm auto-zoom, macro lens. Whenever possible the sex of the turtle was determined using external features (mature males have larger, more massive tails as well as rough patches of skin on their hind legs). Any unusual physical features were also noted. After processing, the turtles were returned to their original capture site and released. Observations of the behavior and movements of the released turtle were recorded in a field notebook.

Selected abiotic factors (water depth, air and water temperature, substrate type, availability and type of nearby cover, presence of sun/shade, and velocity of current) of the microhabitat were recorded at the time of each capture. All raw data were recorded on data sheets designed especially for this study.

Radio Telemetry

Radiotelemetry was used to study the movements of turtles in Whiteoak Creek only. Seven individuals were fitted with radio-transmitters (model: SM1-H), and tracked using a LA12-DS portable telemetry receiver connected to a M-Yagi handheld fish antenna. All equipment was obtained from AVM Instrument Company, Ltd., PO Box 1898, 1213 South Auburn St., Colfax, CA, 95713. The transmitters were attached to the

carapace using a two-part marine epoxy (PC-7®), and silicon sealant/adhesive as outlined in instructions provided by AVM.

The SM1-H transmitter was selected for use because of its small size (~ 40 mm x 20 mm x 8 mm), weight (~ 5.5 g), and expected battery life (3-5 months). The dimensions, rather than the weight of the unit, determined the minimum size (carapace length > 100 mm) of turtles it could be used on. As turtles of suitable size were captured, they were brought to the lab for attachment of transmitters.

The surface features of the carapace determined the actual position where the transmitter was mounted. The carapace of most adult turtles was somewhat irregular in shape, with elevated and depressed areas. This necessitated moving the transmitter around on the carapace to find the spot that resulted in the most streamlined silhouette. Usually, this was an area low and to the rear of the carapace (Figure 4).

The spot chosen for the transmitter was then scrubbed with a stiff-bristled brush (fingernail or tooth brush) to remove dirt and algae. It was wiped down with isopropyl alcohol and allowed to dry completely. The transmitter was held in place and an outline was drawn on the carapace with a marking pen. Silicon adhesive/sealant was applied to the perimeter and seams within the outlined area. This was done to prevent gaps between the carapace and transmitter which might allow the transmitter to snag on submerged material. The seams were coated to confine the epoxy to a single scute (if epoxy spanned a seam, it could interfere with growth). A small amount of epoxy was applied to the chosen scute and the transmitter was then pressed into place. Strips of duct tape were used to hold the transmitter in place until the adhesives completely cured (overnight).

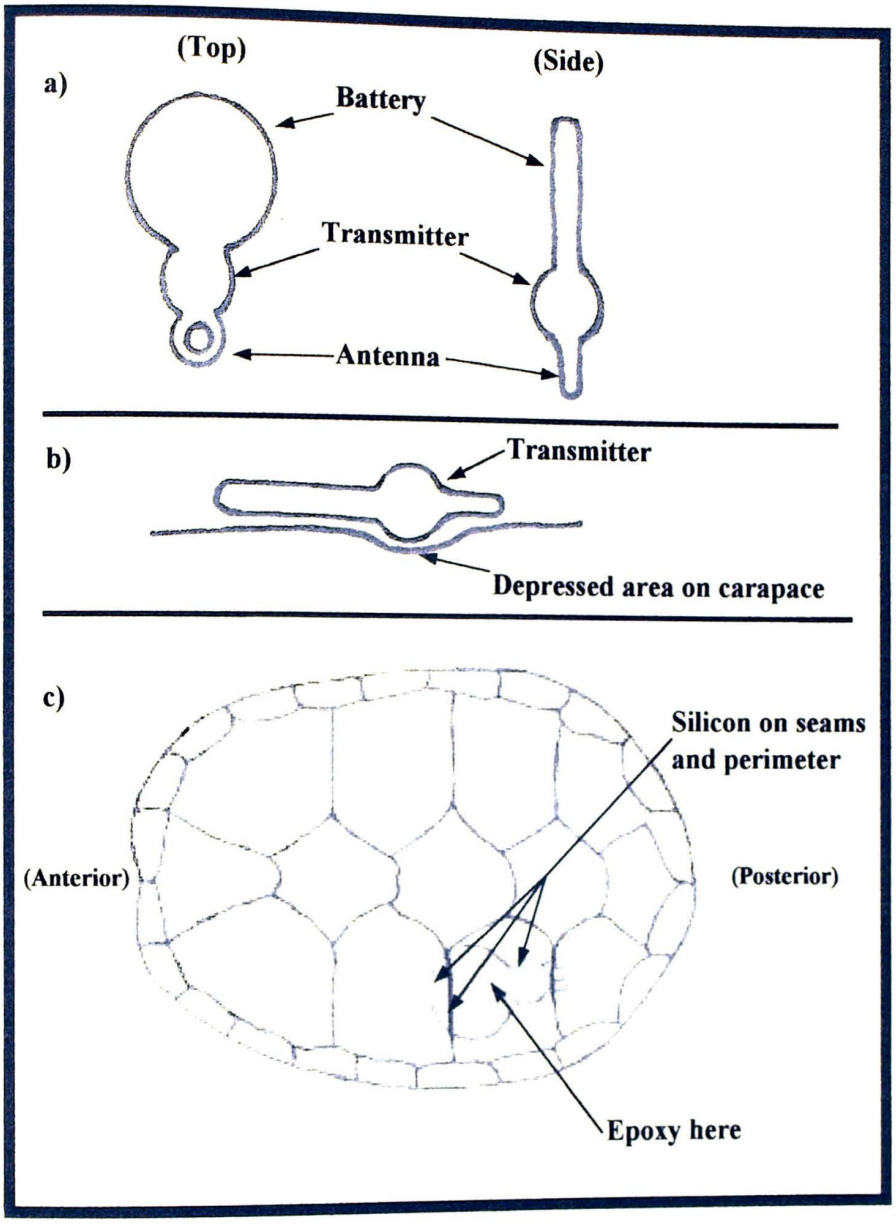

Figure 4. Diagram showing: a) top and side views of SM1-H transmitter, b) how transmitters were placed in depressions on carapace, and c) how adhesives were applied to carapace. Shaded area represents outline of transmitter. (Drawing not to scale)

The transmitters were checked before and after mounting to ensure they were operating, and to determine and record the specific frequency it was transmitting (Figure 5). Transmitter frequencies were far enough apart so that signals of individuals in the same area could be distinguished from one another. Turtles were returned to the creek as soon as possible (2-5 days) and released at their original capture site.

Trips to the creek for the purpose of tracking turtle movements were made about every 5-10 days. A turtle's position could usually be determined to within 1-2-m. Records of movement between last position and current position were recorded.

Videotaping

Two turtles (male and female) being held in the lab began to display courtship behavior and were transferred to a 30-gallon aquarium and kept for observation. During this period, two matings were recorded on video tape.

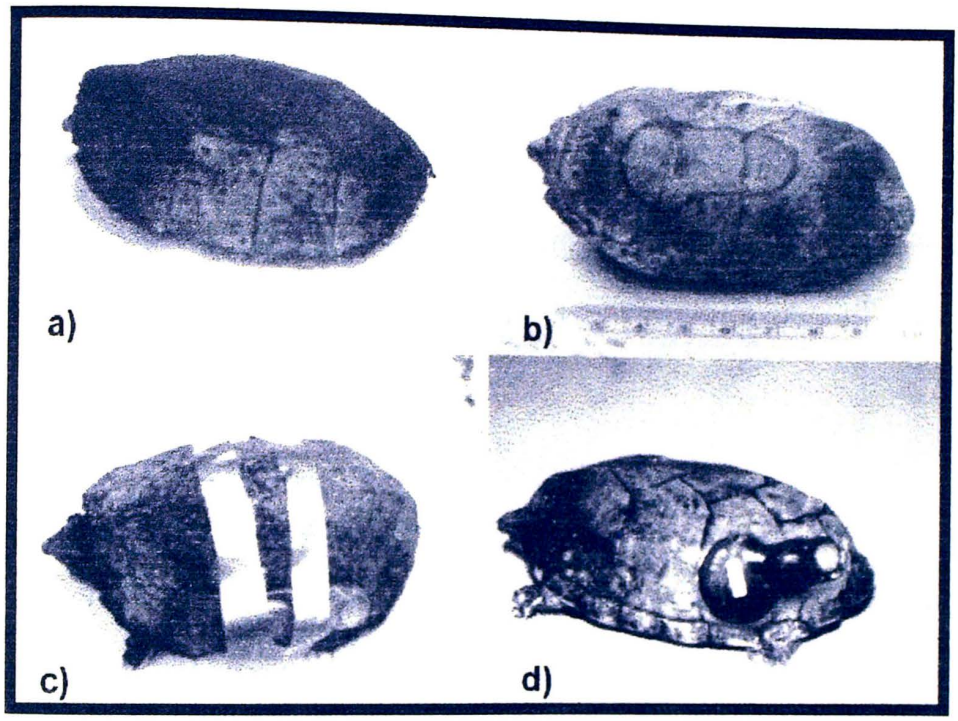

Figure 5. Photos of major steps involved in mounting radio transmitter to turtle's carapace: a) scrub algae from selected area of carapace, b) outline where transmitter will be mounted on carapace, c) tape transmitter in place after applying epoxy and silicon, d) remove tape after adhesives cure.

CHAPTER IV

RESULTS

Distribution

Ninety visits to Whiteoak and Big Richland creeks yielded 50 specimens of *S. m. peltifer* from seven sites. Parker's Bend, the downstream-most site on Whiteoak Creek, is approximately 2.5 km from the mouth of the stream. Slaughter Road (ca 23 km from the mouth), is the upstream-most site. Lockhart Road Bridge is approximately 7 km from the mouth of Big Richland Creek (Figure 6).

Population Structure

Of the 50 individuals captured, 41 (82%) were adults and nine (18%) were juveniles (Table 2). Among the adults, 26 were females and 15 were males, a sex ratio approaching 2:1. The smallest turtle collected, a hatchling, weighed only 3 g and had a nearly circular carapace (25 mm L x 23 mm W). Unfortunately, this individual also was the only known fatality that occurred during the study (APSU # 3252). The largest *S. m. peltifer* collected weighed 267 g and its carapace measured 124 mm L x 80 mm W (Figures 7 and 8). Eighteen percent of adult males, and 24 % of adult females were estimated to be 20 years of age or more (Cox et al., 1991). Shell heights ranged from 13 mm-47 mm; the modal value was 34 mm (Figure 9). Descriptive statistics of measurements taken on the individuals collected are listed in Table 3.

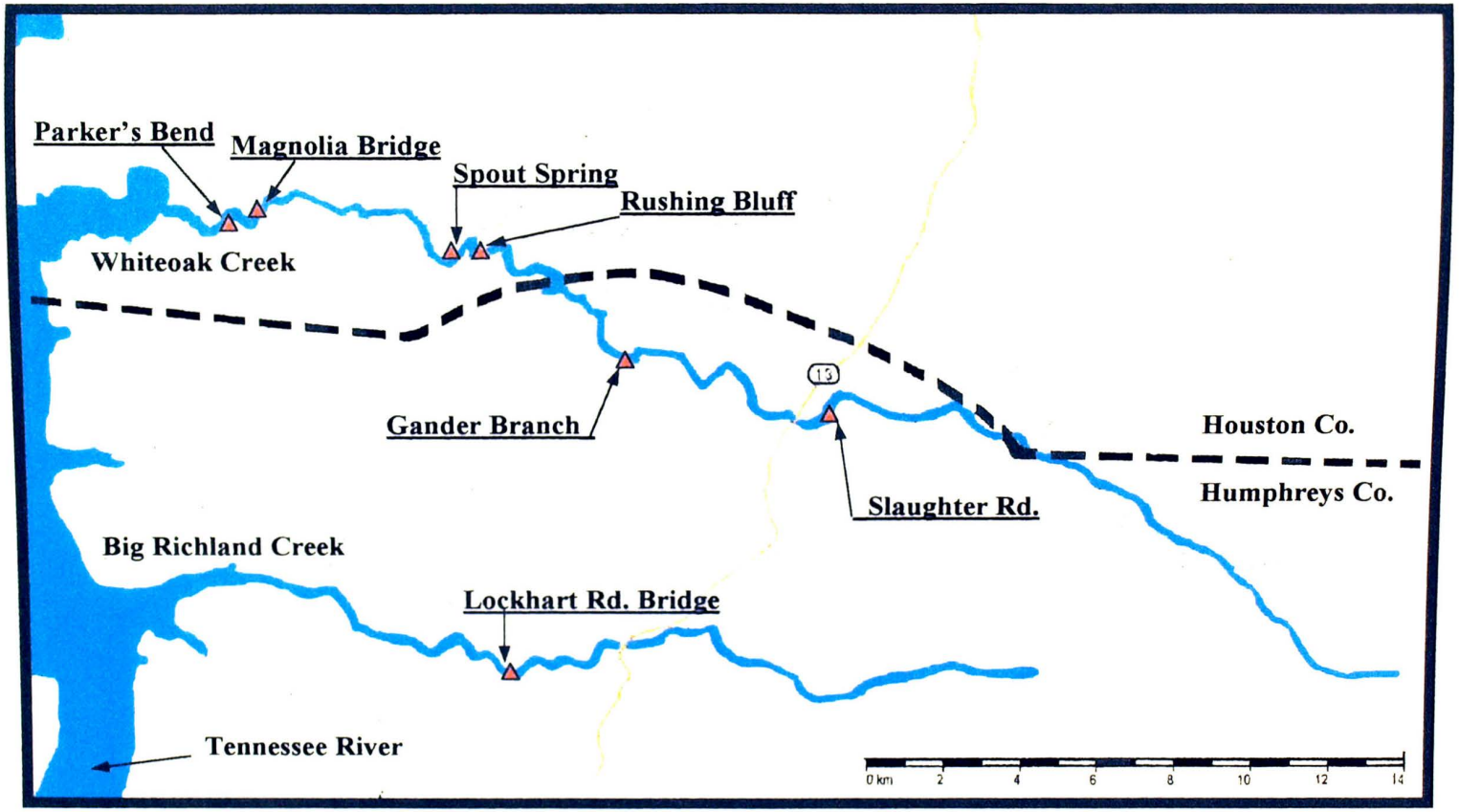

Figure 6. Locations of study sites on Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee.

Table 2. Number, life stage, and sex of *S. m. peltifer* collected at each site in Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee between 15 September 1999 and 29 June 2001.

Site	Male	Female	Juvenile	Total
Parker's Bend	2	0	0	2
Magnolia Bridge	0	1	0	1
Spout Spring Bluffs	5	8	2	15
Rushing Bluffs	5	6	2	13
Gander Branch Road	3	10	4	17
Slaughter Road	0	1	0	1
Lockhart Road*	0	0	1	1
Total	15	26	9	50

* Lockhart Road bridge on Big Richland Creek.

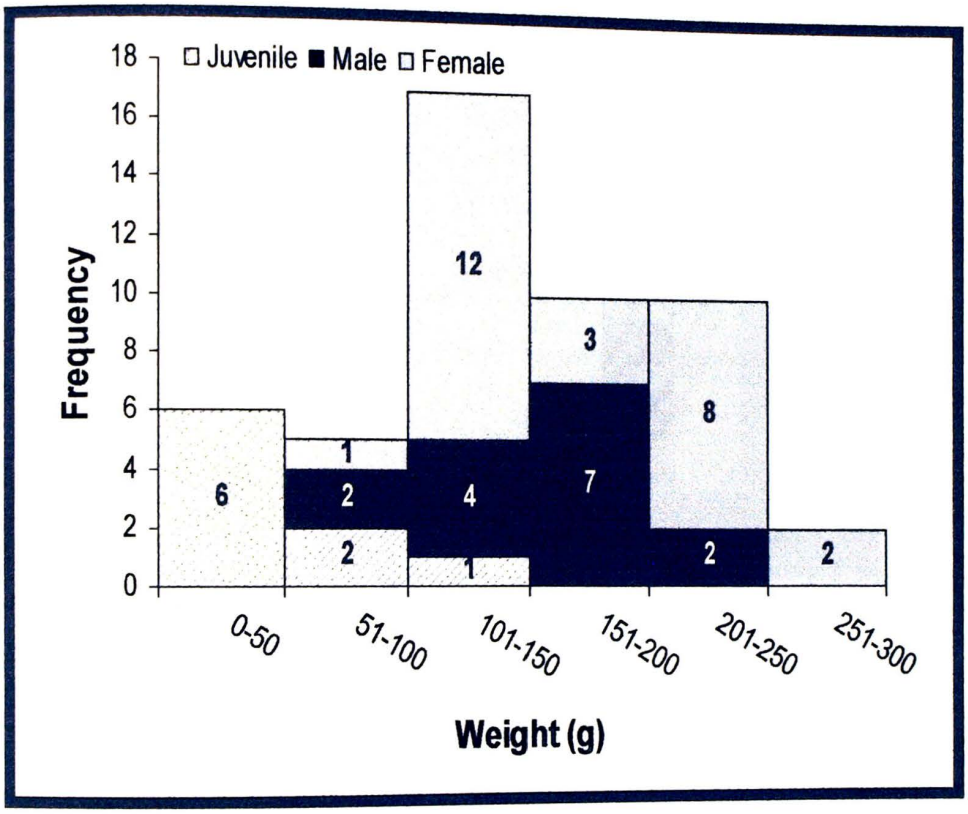

Figure 7. Distribution of weight classes for 50 *S. m. peltifer* collected in Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee between 15 September 1999 and 29 June 2001.

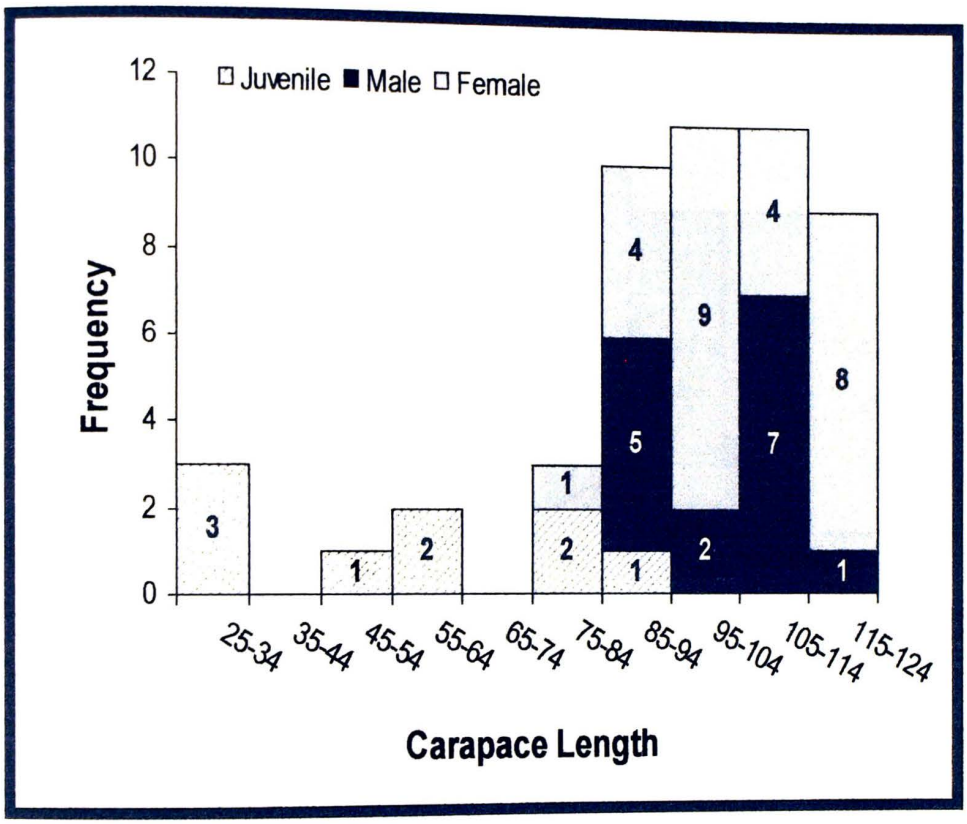

Figure 8. Size class distribution for carapace length measurments of 50 *S. m. peltifer* collected in Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee between 15 September 1999 and 29 June 2001. Carapace length taken as straight-line measurement at carapace midline.

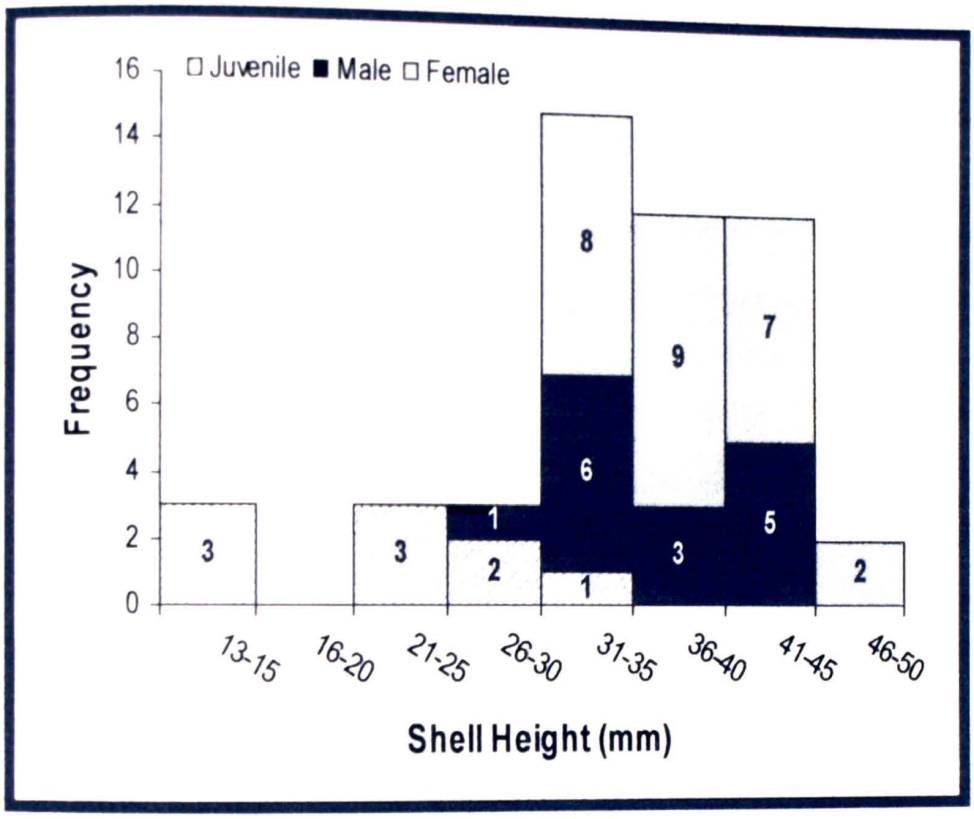

Figure 9. Distribution of shell height classes for 50 *S. m. peltifer* collected in Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee between 15 September 1999 and 29 June 2001.

Table 3. Descriptive statistics for weight (in g) and various shell measurements (in mm) of 50 *S. m. peltifer* collected in Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee between 15 September 1999 and 29 June 2001.

	Range (min-max)	Mean	Median	Mode	Variance	Std. dev.	Std. error
WT	264 (3-267)	143.14	133	115	4974.98	70.53	9.97
CL	99 (25-124)	95.00	98	120	547.80	23.40	3.31
CW	57 (23-80)	64.56	68	65	164.46	12.82	1.81
PL	73 (18-91)	66.46	70	73	300.46	17.33	2.45
PW	48 (16-64)	50.12	52	49	119.41	10.93	1.54
SH	34 (13-47)	34.90	36	34	59.36	7.70	1.09

WT= weight, CL= carapace length, CW= carapace width, PL= plastron length, PW= plastron width, SH= shell height

Microhabtat

Most turtles were found either in pools with gravel substrates under limestone bluffs (31 captures), or on substrates of sand and/or mud near logs, root masses, and other submerged vegetation (17 captures). Five individuals were taken from areas with no cover nearby. Approximately 75% of the turtles collected came from shaded areas with slow to moderate current flow (Table 4). Almost 80% of the turtles were captured at depths ranging from 0.5 m - 1.9 m, with 1.0 m the most common depth. Three individuals were found out of the water clinging to woody vegetation (Figure 10).

Capture Methods

Hand captures accounted for nearly all of the *S. m. peltifer* collected; wading, netting, and snorkeling produced 25, 15, and 11 turtles respectively. Forty turtles were captured in traps, but only two were *S. m. peltifer* (Table 5).

I recaptured only three *S. m. peltifer* individuals. Two were recaptured less than two weeks after their release, and in the case of the third, more than five months elapsed before recapture (Table 6).

Radio Telemetry

Movements of seven turtles at three sites in Whiteoak Creek were tracked from 20 April to 21 November 2000. The length of time each turtle was tracked varied greatly.

Table 4. Characteristics of microhabitats of 53 *S. m. peltifer* collected in Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee between 15 September 1999 and 29 June 2001. (Data from recaptured individuals are included).

Microhabitat characteristic	Number (%) of turtles
Cover type	
Crevice/boulder	31 (58)
Vegetation	17 (32)
None	5 (9)*
Current flow	
None/very slow	8 (15)
Slow/moderate	38 (72)
Moderate	4 (7)
Moderate/swift	3 (5)
Substrate type	
Emergent vegetation	3 (5)
Submerged vegetation	2 (3)
Mud/sand	3 (5)
Ledge/bedrock	4 (7)
Gravel	38 (72)
Boulder	3 (5)
Sun/shade	
Sun	12 (23)
Shade	39 (73)
No data recorded	2 (3)**

* Three of these turtles were clinging to emergent vegetation, out of water.
** Turtles collected by other individuals who did not record this data.

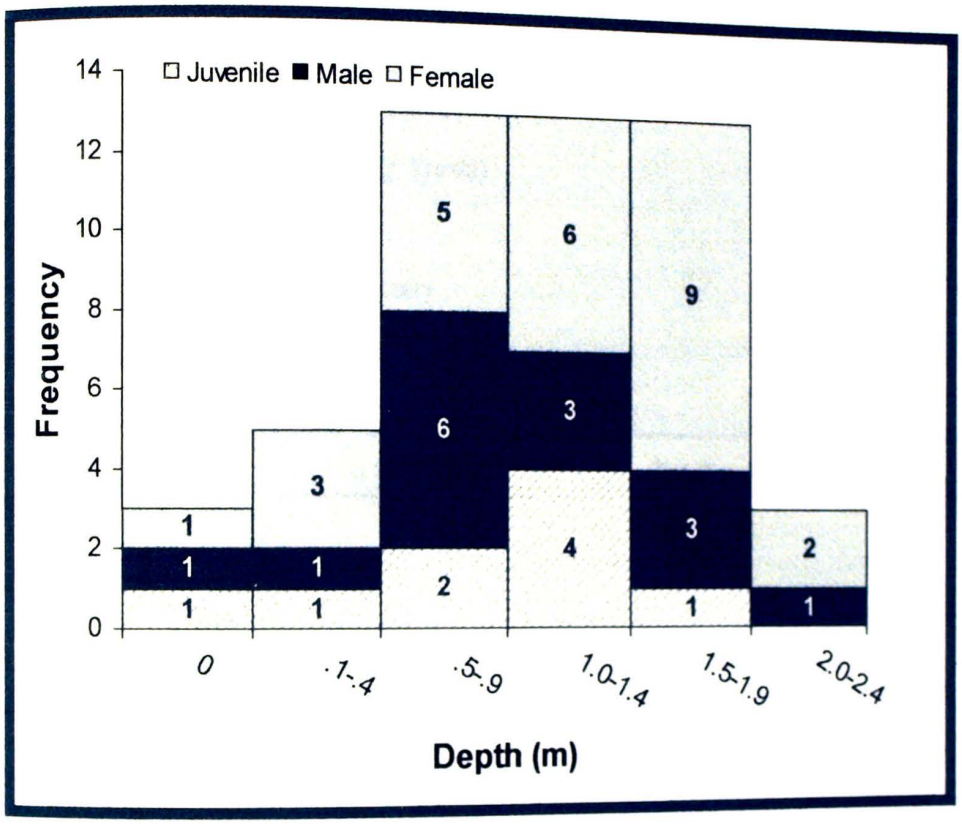

Figure 10. Depth at time of capture of 50 *S. m. peltifer* collected between 15 September 1999 and 29 June 2001 in Whiteoak and Big Richland creeks, Houston and Humphreys counties, Tennessee.

Table 5. Number of individuals of each turtle species captured while trapping for *S. m. peltifer* between 4 and 29 June 2001 in Whiteoak Creek, Houston and Humphreys counties, Tennessee.

Species	Number trapped
Apalone spinifera (Spiny Softshell)	17
Chelydra serpentina (Snapping Turtle)	10
Graptemys geographica (N. Map Turtle)	5
S. odoratus (Stinkpot)	3
Pseudemys concinna (River Cooter)	2
S. m. peltifer (Stripe-necked Musk Turtle)	2
G. ouachitensis (Ouachita Map Turtle)	1
	Total = 40

Table 6. Selected data (including time elapsed, and distance and direction of movement, between date of release and date of recapture) for three *S. m. peltifer* recaptured during study in Whiteoak Creek, Houston and Humphreys counties, Tennessee between 15 September 1999 and 29 June 2001.

Turtle #	Days between release/recapture	Distance/direction of movement
15	2	6 m downstream
17	164	10 m upstream
33	11	30 m upstream

Two were monitored for over four months (full battery life expectancy); one was never relocated after its release (Table 7). Over 80% of movements documented were of less than 25 m. The longest movement recorded was approximately 500 m, and occurred over a 12-day period (Figure 11). No transmitter-fitted turtles were recaptured.

Behavioral Observations

The behavior of turtles upon first detection was as follows: three were basking on emergent vegetation (two in shaded areas, one in sunlight), one was swimming, and 46 were walking or sitting on the bottom or on a submerged object (rock, ledge, limb, stump, etc.). None was observed actively feeding. Twice, two individuals were observed chasing each other. Upon release, turtles either headed immediately for cover or remained still for a period and then moved in a start/stop manner towards deeper water or cover (for more on this see discussion section).

The courtship and mating that was videotaped took place between 30 October and 2 November 2000. The behavior observed was very similar to that described for the species by Ernst et al. (1994). In each case, the male made several futile attempts at mounting before successful intromission was achieved. Copulation lasted approximately 2 minutes.

Physical Condition of Individuals

Unusual physical features were noted on several turtles. Twenty-three individuals displayed abnormal carapace features including notches or chips missing

Table 7. Selected radio telemetry data for six *S. m. peltifer* tracked in Whiteoak Creek, Houston and Humphreys counties, Tennessee between 20 April and 21 November 2000.

Turtle #	Sex	Location	Dates tracked	Duration (days)
23	F	Rushing Bluff	4/20/00 - 8/22/00	125
24	F	Spout Spring	4/20/00 - 8/22/00	125
39	M	Gander Branch	8/11/00 - 8/31/00	12
40	F	Gander Branch	8/17/00 - 9/21/00	36
41	F	Gander Branch	9/21/00 - 11/21/00	62
42	M	Gander Branch	9/28/00 - 11/21/00	55

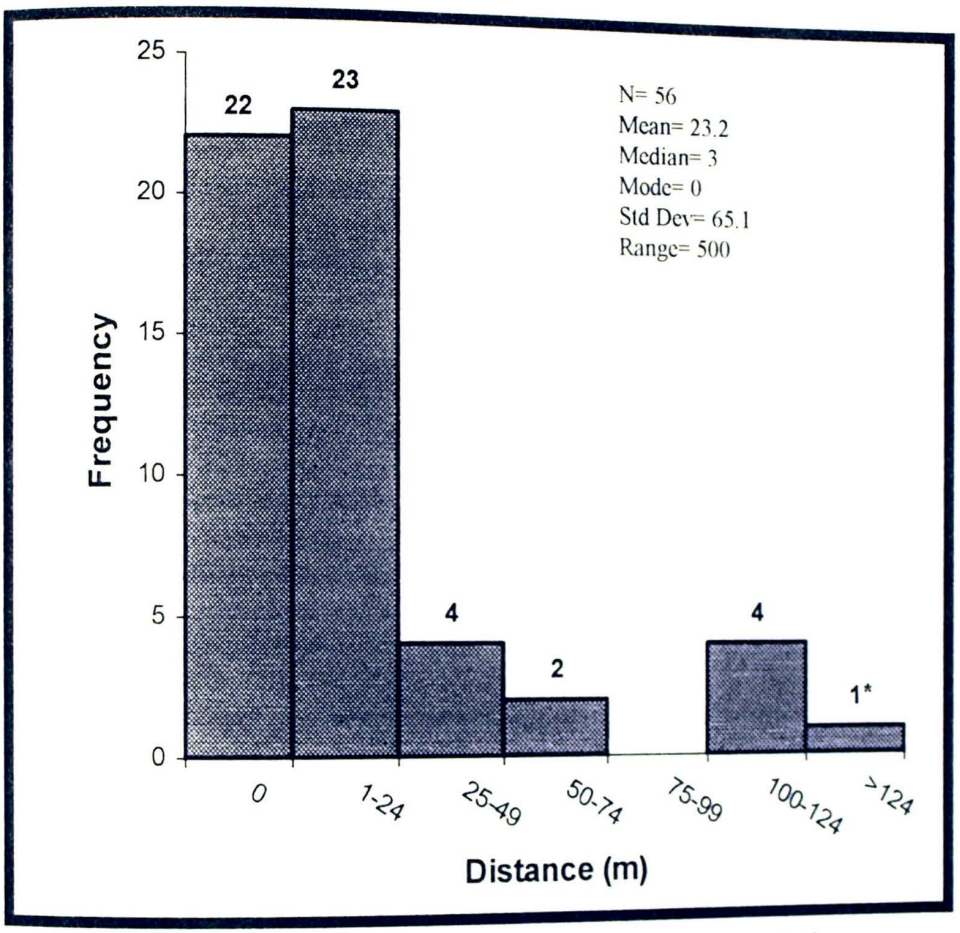

Figure 11. Distance between sequential relocation points of *S. m. peltifer* tracked using radio telemetry in Whiteoak Creek, Houston and Humphreys counties, Tennessee between 20 April and 29 November 2000.
* One individual moved ~ 500 m upstream in 12 days.

from the marginal scutes, and pitting or erosion of carapace and/or plastron scutes. Six had extremely deformed carapaces (i.e. greatly raised or depressed areas on the carapace). Two turtles had deformed mandibles. Two individuals possessed deformed limbs: one had two clawless blunt digits on the left rear foot, another had an extra appendage protruding from the heel of the left rear foot. Four turtles had leeches attached to the carapace or limbs. Density of algal growth on the carapace varied greatly; seven had no algal growth, eleven had slight growth, seventeen had moderate growth, and five had heavy algal growth.

CHAPTER V

DISCUSSION

Distribution

The six sites along Whiteoak Creek where *S. m. peltifer* was documented span approximately the lower half of the drainage (ca 23 km). Some sites originally selected for sampling were not examined because property owners were unwilling to grant access. In all likelihood, the species was present in suitable habitat throughout the stretch of stream below Slaughter Road. The reaches upstream of Slaughter Road were generally much shallower (depth < 1 m), and lacked the type of microhabitat *S. m. peltifer* seems to prefer. Despite attempts to find the animal in this region, none was found.

The bulk of the study was conducted on Whiteoak Creek. Periodically, trips were made to other nearby streams where likely areas were examined for the presence of *S. m. peltifer*. Such a trip resulted in their discovery in Big Richland Creek. It should be noted that little time was spent searching other streams with characteristics (i.e. a fairly large drainage, clear, flowing water, with deeper pools and sufficient cover) similar to those of Whiteoak and Big Richland creeks. More study is needed in streams that empty into Kentucky Lake above and below the area covered in this study to clarify the extent of the distribution of *S. m. peltifer* in this region.

Whiteoak and Big Richland creeks are located along the lower reaches of the Tennessee River drainage basin. *Sternotherus minor peltifer*'s presence is well documented in the middle and upper reaches of this river system. Iverson (1977)

proposed probable routes of dispersal from ancestral *S. minor* stock to several river drainages in the southeastern United States. The lower reaches of the Tennessee River system are included in the potential distribution limits for *S. m. peltifer*. The Tennessee River drainage was a very different ecosystem before the Tennessee Valley Authority (TVA) began building dams on it in the 1930s and 1940s. The river was more "stream-like" in character (i.e. shallower water, with alternations of riffles and pools, and a rocky substratum- cobble, boulders, etc.). Today, the Tennessee River system is strongly regulated by dams, channels, and levees (Benke, 1993). River conditions prior to these projects were much closer in character to the preferred habitat of *S. m. peltifer*. Not only the dams themselves, but also the large stretches of still to slow-flowing water created between them, may be acting as barriers to the movements of this lotic-loving turtle, and creating isolated colonies in occupied streams along the east side of Kentucky Lake.

Two possible explanations for the presence of *S. m. peltifer* in Whiteoak and Big Richland creeks present themselves: 1) these populations have always been there and have simply been overlooked in previous surveys of the lower Tennessee River drainage; or 2) they were introduced recently, and have since established themselves in these two creeks. Some tributaries of Whiteoak and Big Richland creeks lie near each other. Although not known for frequent overland travel, it is possible individuals from one of the creeks could have traversed overland to colonize the other creek.

Tinkle (1958a) suggested that further investigation of the western half of Tennessee would "likely add significant knowledge concerning the natural ranges of the species" (i.e. the *Sternotherus minor* complex). This study is a contribution to that effort.

Population Structure

All age groups (hatchling to old adult) were represented in the sample of *S. m. peltifer* obtained in Whiteoak Creek. Using the growth model for a population of *S. minor* developed by Cox et al. (1991), the Whiteoak Creek sample breaks down to 18% juveniles and 82% adults (middle-aged, 40 %; old-very old, 42 %). This is somewhat skewed towards older animals, compared to other studies on *Sternotherus* which have shown higher juvenile percentages: 33.4 % for *S. m. minor* (Cox et al.,1991), and 24.5 % for *S. depressus* (Dodd et al., 1988). The haphazard methods I used to collect *S. m. peltifer* in Whiteoak Creek may explain, in part, the low proportion of juveniles in the sample. They inhabit areas of thick emergent vegetation (e.g. weed beds), and their small size makes them inherently harder to see. The juvenile *S. m. peltifer* found in Big Richland Creek (two observed, one collected) suggests that there is a breeding population in this drainage as well.

The sex ratio of my sample displays a marked bias towards females (1:1.7, M:F), but the deviation from 1M:1F is not known to be significant. Sample size was small (N = 50), and collecting techniques may have been biased in favor of females. Dodd (1989) discussed several possible causes for unbalanced sex ratios, including: sampling bias; differences between the sexes in activity patterns, habitat selection, and movements; and environmental sex determination.

Trapping

I found trapping to be an inefficient method for capturing *S. m. peltifer*. Although

tried at the beginning of the study, no *S. m. peltifer* were captured. Since other methods (wading, snorkeling, and canoeing) were productive, trapping was abandoned early in the study. It was reinstituted late in the study in a final effort to obtain recaptures for a determination of population density. Traps baited with canned sardines and/or fresh fish were set at the Gander Branch site and checked daily for 20 days in June 2001. Only two juvenile *S. m. peltifer* were captured, and neither was a recapture. This is somewhat puzzling as trapping has been used effectively in other studies (Cox et al., 1991; Dodd, 1988, 1989; Tinkle, 1958a). Dodd et al. (1988) discussed two problems with trapping he encountered during his study of *S. depressus*: 1) traps were ineffective in drawing turtles to them (on more than one occasion a turtle by-passed baited traps), and 2) traps sometimes failed to retain turtles once inside (two turtles left in a trap overnight were gone the next morning). A problem I encountered was fresh bait being stolen from traps. On several occasions I found traps empty and fresh fish carcasses gone from the traps. On 20 June 2001, while checking traps, I observed a family of minks (two adults and three juveniles) moving along the creek bank about 1.5 m from one of the traps. Very probably, they were responsible for the disappearance of the bait. When I switched from fresh fish to canned sardines I had no more problems with bait being stolen.

Radio Telemetry

I intended to track movements of *S. m peltifer* for at least two seasons, three if possible. This proved to be more difficult than I had anticipated. Although two of the seven radio transmitters performed flawlessly, others did not.

Turtles 23 (female, CL 99 mm) and 24 (female, CL 100 mm) were tracked for over four months (23 April to 31 August 2000). Turtle 24 moved ca 500 m upstream from its capture site to the area where turtle 23 was captured and released . This site consisted of a large pile of submerged boulders that were near a deeply undercut bank (which I believe was the remnants of an old beaver lodge). Both of these individuals remained in this area, often very close to each other. On 2 June 2000, I located both turtles ca 100 m downstream from the submerged boulders, in an area near the bank shaded by low overhanging branches. This was the only time I was able to recapture transmitter-fitted turtles; no ill effects from the transmitter attachment were noted on either individual. The transmitters were still firmly attached and the turtles were active and appeared healthy. A subsequent visit on 11 June 2000 found both turtles back at the pile of submerged boulders, where they remained until the batteries expired sometime between 22-31 August, 2000.

The signals from three transmitters (turtles 39, 40, and 43) were lost prematurely. Tracking durations for these individuals varied from 1-36 days. In each case, when I returned to the creek, I could not detect the transmitter's signal, even after searching several hundred meters up and down stream from each individual's last known location. The normal range of the transmitter signal was 60-80 m, and the creek never exceeded 30 m in width. I never located these transmitter-fitted turtles again. Possible causes for this could be that the turtles moved (beyond the scope of my searching forays), were removed (human?, predator?) from the area, or that the transmitters failed prematurely for some unknown reason. I suspect the latter. The turtle's secretive nature makes it seem

unlikely that someone could have found and removed three of them from the area. Although *Macroclemys temminckii* (Alligator Snapping Turtle) is a potential natural predator of adult *S. m. peltifer*, and it's presence has been documented in Whiteoak Creek (Scott et al., 2000), it has never been reported as far upstream as the Gander Branch site.

Two turtles (41 and 42) were fitted with transmitters 21 and 28 September 2000 respectively, and tracked until 21 November 2000. Both showed little or no movement after 10 October 2000, and it seems plausible to assume that by that date they were entering hibernation (water temperature on 10 October was 13 °C). Both transmitters were working well on my last visit to the creek on 21 November 2000.

Habitat

The two microhabitats (i.e. rocky substrates or areas around submerged vegetation) where turtles were collected are consistent with those reported in previous publications (Tinkle, 1958a; Iverson, 1977; Ernst et al, 1994; Mitchell, 1994; Conant and Collins, 1998). Although more turtles were collected from the rocky areas, this probably was because more time was spent looking in those areas, and the turtles were easier to see in that type of setting. Most were found near deeper "scour-holes" beneath limestone bluffs. More than half of the turtles were collected at depths < 1.5 m; it was easier to spot and capture them at these shallower depths. Some of the "scour-holes" were 5-6 m deep and on at least two occasions, turtles were observed at greater depths, but could not be reached even with a long-handled dip net.

Behavior

Behavior was difficult to observe in the field. Usually, the turtles would quickly become aware of my presence and move immediately toward the nearest cover. It was also often difficult to maintain the canoe in one place to observe them. On two occasions, I observed a pair of turtles chasing each other. Both times the turtles were moving in a circular pattern, rapidly crawling around underwater obstacles (submerged boulders in the first instance and a log with accompanying root mass in the second). Each time I was in the canoe and had difficulty maintaining my position without creating a disturbance. I drifted downstream, beached the canoe and returned to the spot, but the turtles had disappeared. I snorkeled the areas, but was unsuccessful in locating them. My activity while searching for them at the second site stirred up silt and visibility was soon nil. The problem of disturbing the silt and ruining visibility was most apparent in areas of submerged vegetation and root masses. This may partially account for the greater number of turtles (31:17) collected from rocky substrate microhabitats.

Three *S. m. peltifer* were observed basking, clinging tightly to an emergent root or limb. All were in an unresponsive state, totally unaware of my presence until I pried them loose from their perch. One had a few small leeches attached near a rear leg, but none appeared ill. All three quickly became active and alert as soon as they were captured. Although this behavior is considered fairly uncommon for the species, it has been observed and discussed in much greater detail in reports on *S. depressus*, a close relative of *S. m. peltifer* (Dodd, 1988; Dodd et al., 1988).

Upon release, nearly all the turtles moved toward the nearest available cover or

deeper water. But, individuals that had been absent from the creek for extended periods of 2-5 days (e.g. those being fitted with radio transmitters and those collected at the beginning of the project), when released, often took several minutes, moving in a "start/stop" manner, to reach cover or deeper water. Turtles that were processed (i.e. weighed, measured, marked, etc.) on site were usually out of the water less than 30 minutes. They, when returned to the capture site, seemed to quickly recognize their surroundings and usually moved immediately to cover.

From the outset, every effort was made to minimize trauma to the turtles encountered during the course of this study. The decision to process the turtles in the field was made not only for convenience, but to reduce stress and possible injury to the turtles as well. The unfortunate death of a hatchling in the lab prompted me to forgo marking others that I thought might be too small to tolerate the procedure. I hope this study will lay the groundwork for future research on *Sternotherus minor peltifer* in the lower Tennessee River system and its tributaries.

Conclusions

The results of this study suggest the following about the distribution, population structure, habitat, and movements of *Sternotherus minor peltifer* in drainages flowing out of the Western Highland Rim of Middle Tennessee into Kentucky Lake (impounded Tennessee River):

1) Breeding populations of *S. m. peltifer* are present in Whiteoak and Big Richland creeks.

2) The sample of the population in Whiteoak Creek was skewed towards females and older adults: it is not known if these skewed samples represent a bias, or reflect real population parameters.

3) *S. m. peltifer* was found in two distinct aquatic microhabitat types: 1) rocky substrates along limestone bluffs, and 2) vegetative cover (e g root masses, and debris piles).

4) Limited radio-telemetry data suggests that movements are typically for short distances, but long distance movements do occur

5) More study is needed in the lower Tennessee River drainage to fully document the distribution of *S. m. peltifer* in this region, and to establish important details of the life cycle of these populations

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APPENDIX

Appendix A-1. Raw data of all *Sternotherus minor peltifer* collected in lower Tennessee River drainage in western Middle Tennessee between 15 September 1999 and 29 June 2001.

Turtle	Date	Area	Lat/Long	Air	Water	Capture	Sex	Mark	CL	CW	PL	PW	SH	WT	DH	Substrate	Cover	Current	Orientatin	Remarks
1	8/11/1999	Whiteoak/Parkers Bend	36-15'30"N 87-52'30"W	0	0	Hand/dipnet	M	1-0	105	69	67	51	40	174	1.5	Firm Mud	Snags/rootmass	Slow/moderate	Bottom/walking	Kept In Tank at Austin Peay from 11jun-29sep 1999
2	9/25/1999	Whiteoak/Magnolia Bridge	36-15'35"N 87-52'15"W	0	20	Hand/snorkel	F	0-9	121	79	88	62	47	228	1.5	Gravel	Rootmass	Moderate	Bottom/walking/shade	Used Previous Mark/notch on Right Scute#9
3	10/2/1999	Whiteoak/Spout Spring	36-15'12"N 87-48'53"W	0	19	Hand/net	F	3-0	98	70	74	55	36	111	1.5	Gravel	Nearby Crevices	Slow/moderate	Bottom/sitting Still/shade	Moderate Algal Growth on Carapace
4	10/2/1999	Whiteoak/Spout Spring	36-15'12"N 87-48'53"W	0	19	Hand/net	J	3-1	76	55	54	42	28	61	1.5	Gravel	Nearby Crevices	Slow/moderate	Bottom/sitting Still/shade	Moderate Algal Growth, Found 20-30' Dnstrm from #3
5	10/3/1999	Whiteoak/Spout Spring	36-15'12"N 87-48'53"W	0	19	Hand/snorkel	M	2-0	112	71	75	53	41	189	1.5	Gravel	Submerged Rocks	Slow/moderate	Bottom/under Log/shade	Heavy Algal Growth rocks&rootmass Nearby
6	10/3/1999	Whiteoak/Spout Spring	36-15'12"N 87-48'53"W	0	19	Hand/net	F	7-0	92	63	68	50	34	115	1.5	Gravel	Nearby Crevices	Slow/moderate	Bottom/sitting Still/shade	Slight Algal Growth
7	10/11/1999	Whiteoak/Spout Spring	36-15'12"N 87-48'53"W	0	18	Hand/net	F	3-0	89	61	64	49	31	105	1.5	Gravel	Nearby Crevices	Slow	Bottom/sitting Still/shade	Slight Algal Growth
8	10/11/1999	Whiteoak/Spout Spring	36-15'12"N 87-48'53"W	0	18	Hand/net	M	5-0	104	67	68	52	34	158	1.0	Rock Ledge	Crevices	Slow	On Steep Slope/ledge/sunlight	Slight/moderate Algal Growth
9	10/16/1999	Whiteoak/Gander Branch	36-13'33"N 87-46'20"W	25	17	Hand/wading	F	6-0	93	65	67	50	36	120	0.4	Gravel	Rootmass/brush	Slight/moderate	Bottom/sitting Still/shade	~30' from Brushpile/~150m Dnstrm from Bluffs
10	10/16/1999	Whiteoak/Gander Branch	36-13'33"N 87-46'20"W	25	17	Hand/wading	F	8-0	97	64	70	49	33	128	1.0	Gravel	Ledges/lg Rocks	Slow/moderate	Bottom/sitting Still/shade	Left Rear Foot Deformed/carapace Scarred
11	10/16/1999	Whiteoak/Gander Branch	36-13'33"N 87-46'20"W	25	17	Hand/wading	F	9-0	98	69	73	52	34	134	1.2	Gravel	Ledges/lg Rocks	Slight/moderate	Bottom/sitting Still/shade	Moderate/heavy Algal Growth
12	10/16/1999	Whiteoak/Gander Branch	36-13'33"N 87-46'20"W	25	17	Hand/wading	F	10-0	97	68	73	53	34	129	1.2	Gravel	Ledges/lg Rocks	Slight	Bottom/sitting Still/shade	Moderate Algal Growth
13	10/16/1999	Whiteoak/Gander Branch	36-13'33"N 87-46'20"W	25	17	Hand/wading	F	11-0	93	64	70	51	33	123	0.5	Gravel	Ledges/lg Rocks	Slow	Bottom/sitting Still/shade	Slight Algal Growth
14	10/16/1999	Whiteoak/Gander Branch	36-13'33"N 87-46'20"W	25	17	Hand/wading	J	NONE	25	23	18	16	13	3	0.2	Gravel/sand	Vegetation	Slow	Bottom/sitting Still/sunlight	Died in Lab/preserved as Apsu Museum Specimen
15	10/20/1999	Whiteoak/Spout Springs	36-15'12"N 87-48'53"W			Hand	M	0-3	111	68	72	52	40	200	0.5	Gravel	Sunken Log/veg	Slow	Bottom/sitting Still/sun	Moderate Algal/carapace Deformed W/depressions
16	10/22/1999	Whiteoak/Slaughter Rd	36-12'29"N 87-43'15"W	18	14	Hand	F	0-1	124	80	91	62	44	267	0.5	Solid Rock	Near Sunken Log	None/backwater	Bottom/sitting Still/shade	Turtle Had Old Marks on Marginal Scutes(see Notes)
17	10/27/1999	Whiteoak/Rushing Bluffs	36-14'54"N 87-48'42"W	23	15	Hand/net	F	0-2	95	65	68	50	38	110	1.5	Gravel	Rocks/crevices	Slow/moderate	Bottom/sitting Still/shade	Withdrawn into Shell/partially Buried in Gravel
18	10/27/1999	Whiteoak/Rushing Bluff	36-14'54"N 87-48'42"W	23	15	Hand/net	F	0-4	100	68	73	54	36	132	2.0	Gravel	Rocks/crevices	Slow/moderate	Bottom/walking/shade	Moving at Slow/steady Pace at Base of Bluffs
19	10/27/1999	Whiteoak/Rushing Bluff	36-15'54"N 87-48'42"W	23	15	Hand/net	M	0-5	111	73	75	53	42	204	0.5	Gravel/sand	Rocks/sticks	Very Slow	Bottom/walking/shade	Photo of Habitat(bank) Taken
20	10/29/1999	Whiteoak/Spout Springs	36-15'54"N 87-48'42"W	24	15	Hand/net	M	0-6	106	71	71	54	41	177	1.0	Gravel	Rocks	Slow	Bottom/sitting Still/shade	Ken Davenport Spotted this Turtle
15	10/29/1999	Whiteoak/Spout Spring	36-14'54"N 87-48'42"W		15	Hand	M	0-3	111	68	72	52	40	200	0.5	Gravel	Sunken Log	Slow	Bottom/sitting Still/shade	Recapture/turtle Originally Released 27/oct/99
21	11/12/1999	Whiteoak/Parker's Bend	36-15'33"N 87-52'45"W			Hand	M	0-7	109	69	70	53	41	177	1.5	Cobble/bould	Large Rocks	Slow	Bottom/sitting Still/shade	Scott Sutton Collected this Turtle
22	3/1/2000	Whiteoak/Spout Spring	36-15'10"N 87-48'50"W	20	14	Hand/net	F	0-8	120	80	82	64	41	247	1.0	Gravel	Sunken Limb	Moderate	Bottom/sitting Still/sunlight	Turtle Partially Hidden under Sunken Limb~3" Dia
23	4/19/2000	Whiteoak/Rushing Bluff	36-15'05"N 87-48'45"W		16	Hand/snorkel	F	0-10	99	70	75	55	34	143	1.5	Gravel	Sunken Limbs	Very Slow/eddy	Bottom/sitting Still/shade	Fitted W/transmitter#60740/freq-49.4261//20/apr/00
24	4/19/2000	Whiteoak/Spout Spring	36-15'10"N 87-48'54"W		16	Hand/snorkel	F	0-11	100	70	75	56	36	159	1.5	Gravel	Nearby Rocks	Slow-moderate	Bottom/sitting Still/shade	Fitted W/transmitter#60739/freq-49.4001//20/apr/00
25	4/22/2000	Whiteoak/Rushing Bluff	36-14'54"N 87-48'42"W	21	17	Hand/net	J	1-1	88	63	63	49	34	106	1.0	Large Rock	Nearby Rocks	Slow	On Top of Boulder/still/shade	Top of Boulder~1m-surrounding Water ~2-3m Deep
26	4/23/2000	Whiteoak/Spout Spring	36-15'15"N 87-48'48"W			Hand/net	F	1-2	118	77	79	59	44	244	1.0	Log Jam/sand	Logs/limbs	Slow	On Top of Submerged Log Jam	Sitting Still/shade//lower Jaw W/hole-wound
27	5/7/2000	Whiteoak/btwn Spout/Rush	36-15'14"N 87-48'45"W	28	18	Hand/wading	F	1-3	113	76	80	58	40	211	0.0	Tree Root	Rootmass	None	Clinging to Emergent Treeroot	Out of Water on Bank/in Sunlight
17	5/11/2000	Whiteoak/Rushing Bluff	36-14'54"N 87-48'42"W			Hand/snorkel	F	0-2	94	65	68	50	37	118	1.0	Rocks	Rocks	Moderate-swift	Bottom/sitting Still/shade	Recapture/originally Released 29/oct/99
28	5/11/2000	Whiteoak/Rushing Bluff	36-14'54"N 87-48'42"W			Hand/wading	F	1-4	120	77	86	60	46	266	0.3	Mud/rocks	Nearby Plants	Slow-moderate	Bottom/sitting Still/sunlight	Slightly Ustrm from Bluff/btwn Bluff&cattle Fence
29	5/17/2000	Whiteoak/Rushing Bluff	36-15'05"N 87-48'45"W	23	22	Hand/snorkel	M	1-6	87	58	58	46	30	102	0.5	Gravel/sand	Rootmass/limbs	Slow	Bottom/sitting Still/sunlight	Actual Capture Site Was 42m Ustrm from Lat/long
30	5/21/2000	Whiteoak/Spout Spring	36-15'13"N 87-48'49"W	20	18	Dipnet/canoe	F	1-5	105	71	79	57	37	170	1.5	Gravel	None Immediate	Slow	Bottom/sitting Still/sunlight	Nearest Cover Bluffs/crevices ~8-10m Away
31	6/2/2000	Whiteoak/Rushing Bluff	36-15'11"N 87-48'44"W	28	23	Hand/wading	F	1-7	120	77	86	62	42	228	0.6	Gravel	None Immediate	Slow	Bottom/walking/shade	Actual Capture Site 82m Dnstrm from Lat/long
32	6/3/2000	Whiteoak/Rushing Bluff	36-15'11"N 87-48'44"W	23	25	Hand/snorkel	M	1-8	86	56	58	45	32	91	0.6	Gravel	Log/roots	Moderate	Botom/sitting Still/shade	Withdrawn in Shell,hiding under Sunken Log
33	6/11/2000	Whiteoak/Rushing Bluff	36-15'01"N 87-48'32"W		25	Hand/wading	M	1-9	95	63	63	50	32	114	0.9	Solid Rock	Ledges/crevices	Very Slow	Bottom/sitting Still/shade	Upstrm from Bluffs,past Barbed Wire Fence
34	6/11/2000	Whiteoak/Rushing Bluff	36-15'01"N 87-48'32"W		25	Hand/wading	F	1-10	98	65	72	52	33	134	0.9	Rock Ledge	Ledge/crevices	Very Slow	Bottom/sitting Still/shade	Under Ledge with Head Sticking out
35	6/11/2000	Whiteoak/Rushing Bluff	36-15'11"N 87-48'44"W		25	Hand/wading	M	1-11	86	60	58	47	32	91	0.9	Sand/gravel	Nearby Ledges	Slow	Bottom/sitting Still/shade	Upstrm from Bluffs, ~10m from Lat/long Reading
33	6/22/2000	Whiteoak/Rushing Bluff	36-15'01"N 87-48'32"W		26	Hand/wading	M	1-9	95	63	63	50	32	114	1.0	Sand/gravel	Nearby Ledges	Slow	Botom/walking/shade	Recapture, ~30m Upstrm from Original Capture Site
36	6/23/2000	Whiteoak/Gander Branch	36-13'32"N 87-46'18"W	26	23	Hand/wading	F	2-1	120	77	83	63	42	240	1.0	Gravel/sand	Nearby Ledges	Slow/moderate	Bottom/walking/shade	Deformed Left Rear Foot/heel
37	7/6/2000	Whiteoak/Rushing Bluff	36-14'55"N 87-48'43"W	31	27	Hand/snorkel	J	2-2	59	44	39	31	24	29	1.0	Gravel	Nearby Ledges	Slow/moderate	Bottom/sitting Still/shade	Fitted W/transmitter#60741,freq-49.4430 11/aug/00
38	7/15/2000	Whiteoak/Spout Spring	N/A DATA FM L.SNYDER			Hand	J	11-11	33	32	20	20	15	6	0.5	Loose,muddy	Not Much	Very Slow		Turtle Captured&data Provided by Logan Snyder
39	8/11/2000	Whiteoak/Gander Branch	36-13'29"N 87-46'13"W	25	23	Hand/wading	M	2-3	93	61	59	49	34	115	1.0	Gravel	Nearby Ledges	Moderate/swift	Bottom/sitting Still/shade	Fitted W/transmitter#60741,freq-49.4430/ 12 Aug 00
40	8/13/2000	Whiteoak/Gander Branch	36-13'29"N 87-46'13"W	32	24	Hand/wading	F	2-4	108	73	80	59	39	185	0.3	Gravel	Nearby Ledges	Moderate/swift	Bottom/sitting Still/sunlight	Fitted W/transmitter#61352,freq-49.7920/14 Aug 00
41	9/19/2000	Whiteoak/Gander Branch	36-13'42"N 87-46'30"W	29	20	Hand/wading	F	2-5	111	74	81	57	41	210	0.5	Gravel	None Immediate	Slow	Bottom/sitting Still/shade	Fitted W/trans#61353,freq-49.709/ 20 Sep 2000
42	9/21/2000	Whiteoak/Gander Branch	36-13'41"N 87-46'10"W	32	20	Hand/canoe	M	2-6	118	76	78	59	39	222	0.0	Emergent Veg	Nearby Roots	Slow	Clinging to Emergent Limb/~0.3	Meters above Water/ Extreme Pitting/erosion/shade
43	10/24/2000	Whiteoak/Gander Branch	36-13'41"N 87-46'28"W	28	17	Hand/snorkel	F	2-7	118	78	88	61	45	237	1.5	Gravel	Submerged Rocks	Slow	Walking on Bottom/sunlight	Trans#61350/freq49.800 Mounted 10/06/00
44	10/24/2000	Whiteoak Cr-gander Branch	36-13'29"N 87-46'14"W	28	17	Hand/wade	M	2-8	109	71	73	61	41	180	0.2	Gravel	Submerged Rocks	Slow	Sitting Still/withdrawn/bottom	Shade
45	4/28/2001	Big Richland/Lockhart Rd	36-09'12"N 87-48'25"W	29	17	Hand/wading	J	2-9	51	45	38	34	23	26	0.7	Gravel	Submerged Roots	Slow	Swimming Towards Cover/bank	Probably Scared Turtle up from Bottom/sunlight
46	6/4/2001	Whiteoak/Gander Branch	36-13'41"N 87-46'29"W	25	20	Hand/wade	J	NONE	30	29	18	18	15	4	0.0	Treelimb	None Immediate	Very Slow	Out of Water/clinging to Limb	Turtle Too Small to Safely Mark/shade
47	6/5/2001	Whiteoak/Gander Branch	36-13'31"N 87-46'20"W	24	20	Hand/snorkel	F	2-10	84	62	59	44	36	100	2.0	Gravel	Cracks/crevices	Moderate	Clinging to Stump on Bottom	Large Leech Attached to Left,rear Leg/sunlight
48	6/6/2001	Whiteoak/Spout Spring	36-15'11"N 87-48'50"W	23	20	Hand/snorkel	M	2-11	92	65	60	51	31	121	2.0	Logjam	Submerged Limbs	Slow	On Bottom among Limbs/debris	Shade
49	6/24/2001	Whiteoak/Gander Branch	36-13'30"N 87-46'19"W	22	21	Trap/hoopnet	J	3-2	75	53	48	40	28	62	1.0	Gravel	Ledges/bluff	Slow	Shade	Trap Was Set next to Bluff/ledges
50	6/24/2001	Whiteoak/Gander Branch	36-13'30"N 87-46'19"W	22	21	Trap/hoopnet	J	3-3	58	43	36	34	23	27	1.0	Gravel	Ledges/bluff	Slow		Trap Set next to Bluff

VITA

Scott Paulson Williamson was born in Baumholder, Germany on July 19, 1954 one of four children of Lt. Colonel Raymond and Fay Williamson. As the son of a career military officer, he attended several elementary schools in the United States and abroad. He graduated from Jackson Central Merry High School in Jackson, Tennessee in June, 1972. After an extended period of working at several jobs, he entered Jackson State Community College, Jackson, Tennessee in August, 1995 and graduated with an Associate of Science Degree in May, 1997. He entered Austin Peay State University, Clarksville, Tennessee in August, 1997 and received a Bachelor of Science Degree in May, 1999. He subsequently enrolled as a graduate student in the Department of Biology of that same university. He received his Master of Science Degree in biology in December, 2001.

He began working as research assistant for the Center for Field Biology at Austin Peay State University in August, 1997 and continued in that capacity until June, 2001. He plans to pursue a career in field biology.