

Behavioral Ecology of Eastern Box Turtles in the Long Island Central Pine Barrens

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Abstract

Eastern Box Turtles are the most common terrestrial turtles native to the Long Island Pine Barrens (LIPB). Box turtle behavior varies according to their environment, habitat disruption, nesting, and temperature. With box turtles being diurnal animals, weather may play a key role in their daily activity. They prefer the early morning and evening to forage when the heat is less intense. They have also been known to travel more frequently after a rain fall. Box turtles have been known to travel in areas less than four hectares, but studies show that some have traveled significant distances. A study was conducted at Brookhaven National Laboratory (BNL) to observe how the weather affects the behavior of box turtles. Each turtle that was captured was weighed, measured, and shell notched for identification. Radio telemetry equipment was used to track 6 turtles daily and using a global positioning system (GPS) each point was recorded and imported into a geographic information system (GIS). Data was collected for a total of 7 weeks, and compiled on a weekly basis. Observations showed that the turtles greatest distances traveled were when the temperature was at an average of 23.4°C and relative humidity at 58.2%. Statistics of the data collected showed that on an average of 24.4°C and higher the turtles would burrow in the leaf litter, and on an average of 21.1°C and lower is when the turtles would forage. Data from the GIS showed that female turtles travel farther distances than the male turtles which can be the result of the females needing a greater home range than the males for nesting purposes. This study furthers our understanding of eastern box turtle behavior in the LIPB.

Introduction

Eastern Box Turtles (*Terrapene carolina carolina*) are the most common terrestrial turtles found in the Long Island Central Pine Barrens (LIPB). They range in size from 15 to 18 cm. Box Turtles are omnivores and their diet consists of berries, slugs, snails, beetles, plants, and mushrooms. Box turtles are more carnivorous when they are young, and become more herbivorous as they age. They inhabit a variety of habitats such as grassy fields and forested areas. Although box turtles are not aquatic they can be found near shallow streams or ponds and have occasionally been seen swimming. Eastern box turtles have a high domed carapace and a hinged plastron that allows them to close the shell completely. Male box turtles have a concave plastron allowing mating, have orange or red eyes, and longer wider tails than the females. Female box turtles have a more flattened plastron, brown or light orange eyes, and their carapace is more highly domed than males. The shell of box turtles is brown with yellow or orange blotches that form a pattern. A box turtle's carapace is connected to the body; if it was to get injured it has the ability to reform. The scutes on the carapace continue to grow throughout the turtle's life and form growth rings that allow the turtle to be aged. Eastern box turtles hibernate from late October or early November to mid-March or early April. During the spring they begin to forage and mate. In the summer they are most active in the morning and evening. Box turtles have home ranges of generally less than four hectares but some have been known to travel significant distances. Unlike other reptiles box turtles do not exhibit territorial behavior. They show no signs of aggression. When threatened the turtle will retract its head, legs, and tail inside its shell and close completely. Eastern Box Turtle behavior varies among the individual. Certain factors such as foraging, mating, and nesting may affect the behavior of box turtles. The environment of the turtle's home range is a key factor of their behavior. Weather may also play an important factor in the daily activities of box turtles. To better understand box turtles behavior a study was conducted at Brookhaven National Laboratory (BNL). The purpose of this study was to observe the behavioral movements of box turtles in the LIPB in relation to the weather. It is expected that during the summer when the temperature is at its lowest the turtles will forage, mate, or nest, and burrow in shrubs or leaf litter when the temperature is at its highest.

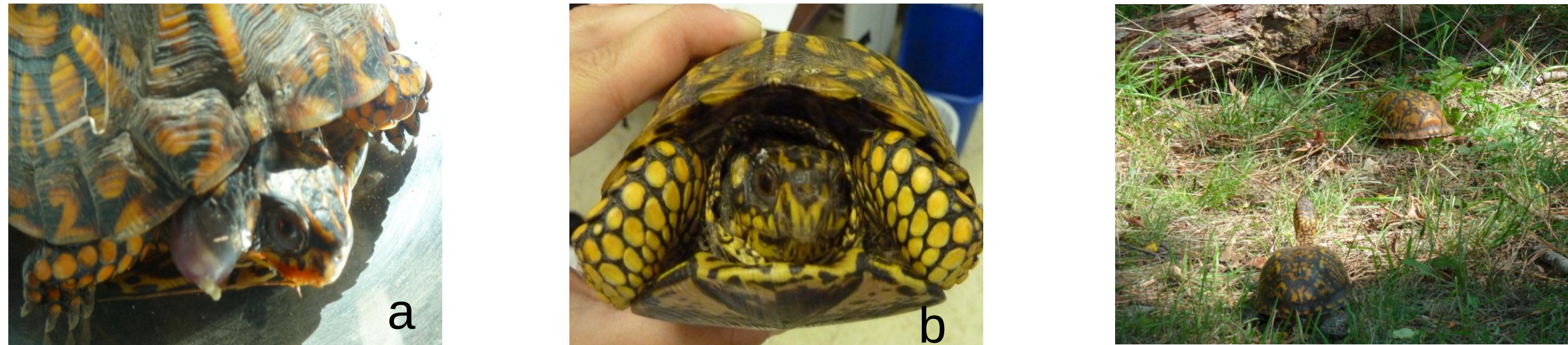
Materials and Methods

Searches along multiple transects were conducted in the forest along the East Fire Break and South Boundary Path to capture the turtles. Some turtles were captured on incidental encounters. Once captured each turtle was assigned an ID number from the master database so it can be individually identified. Box turtles have 22 marginal scutes and 2 supracaudal scutes on the edge of the carapace. Using a metal triangular file the scutes were notched according to the assigned ID number. The turtles were then weighed by placing them in an open Ziploc bag attached to a Pesola spring scale. The width and length of each turtle's carapace and plastron were measured with calipers. They were sexed based on factors that distinguish the males from the females, such as iris color and shape of plastron. Each turtle's age was estimated by counting the growth rings on the second central scute on the carapace. Radio transmitters were attached to the fourth central scute of each turtle using epoxy glue. The transmitters have a 2 year span so the turtles can be tracked for up to two years. Radio telemetry equipment was used to track each turtle daily. A handheld Yagi antennae was used to triangulate the turtle's location, and then a smaller antennae was used to pin point each turtle's location. A global positioning system (GPS) was used to record each location point. Date, time, and coordinates were recorded and then imported into a geographic information system (GIS) using ESRI Arc GIS 9.2. Weather data was collected with a Kestrel 4000 and by a Campbell Scientific Inc. 21X data logger and written to files using a Labview program. The percentage of relative humidity was recorded; temperature was recorded in Celsius, and the wind speed in miles per hour.

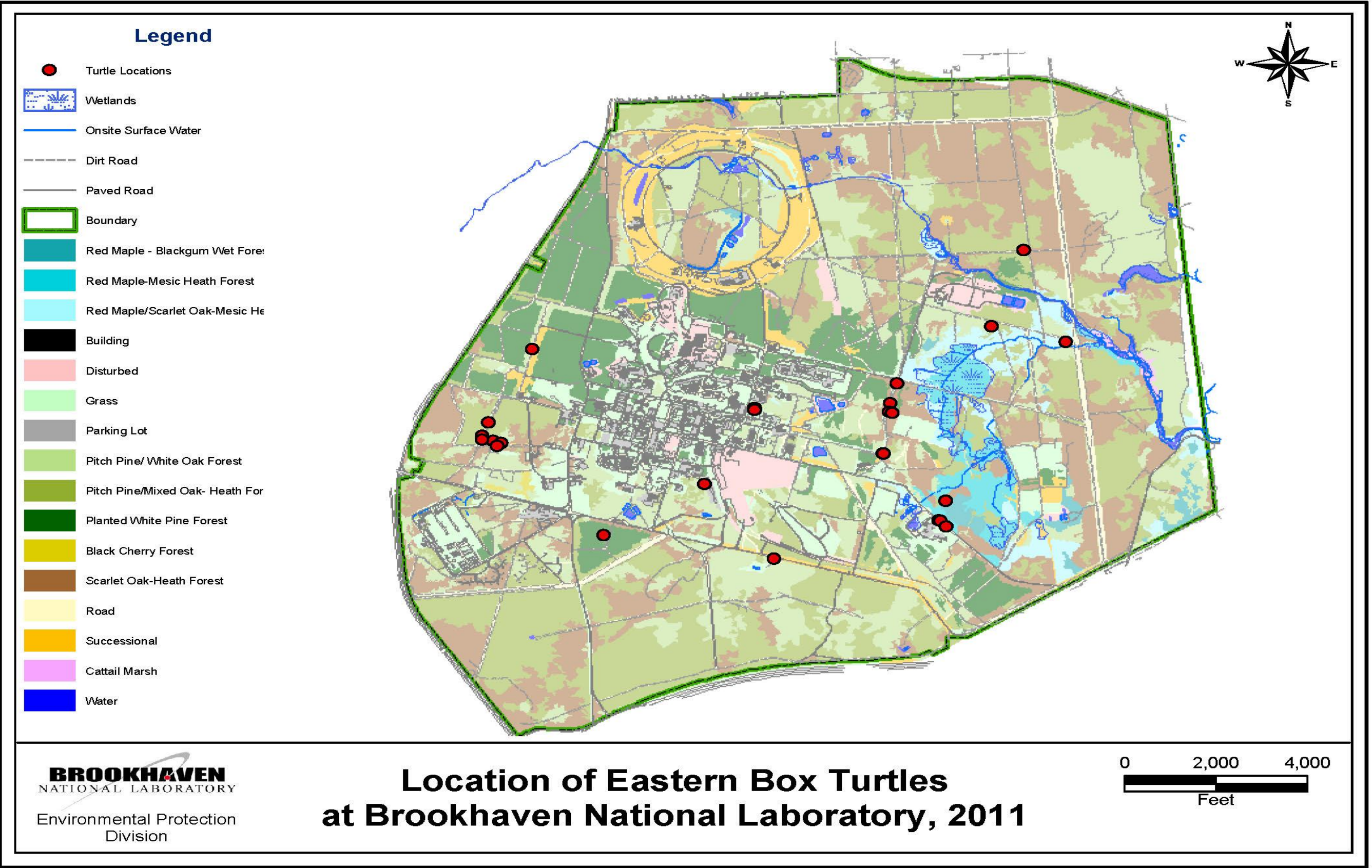


Results

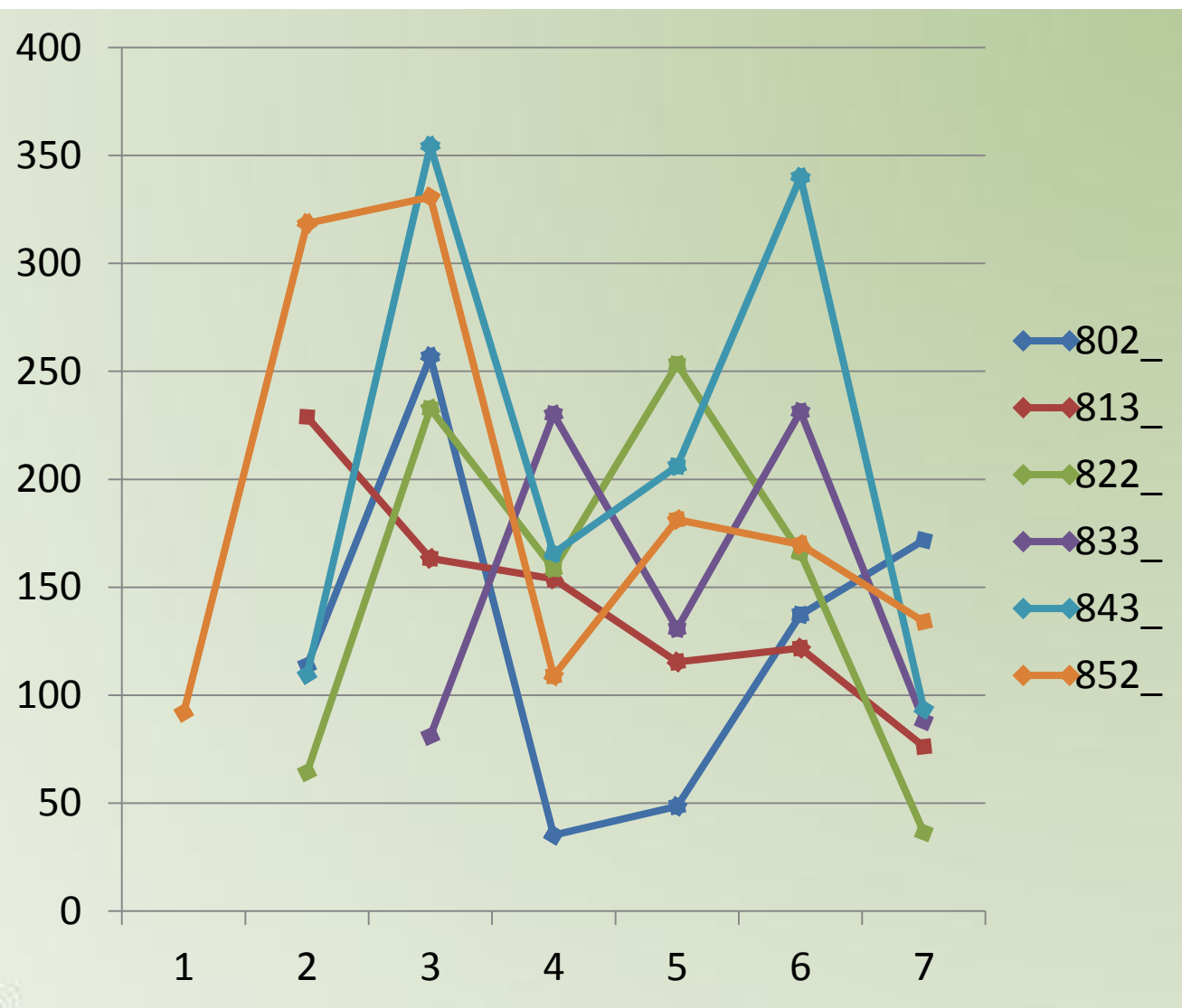
A total of 27 turtles were captured, but only 6 turtles were chosen for tracking. Among the six turtles there were 4 females and 2 males. Each turtle was identified by their transmitter numbers which were: (F1)149.802-female, (F2) 149.813-female, (F3) 149.822-female, (F4) 149.833-female, (F5) 149.843-male, and (F6) 149.852-male. Data of the turtle's movements was collected with the GPS and imported into the GIS. The data was compiled on a weekly basis over 7 weeks. The turtle's longest movements were: T802- 256.8m, T813- 228.9m, T822- 253.2m, T833- 230.1m, T843- 354.5m, and T852- 330.8m. Their shortest movements were: T802- 35.2m, T813- 76.1m, T822- 36.4m, T833- 81.1m, T843- 81.1m, and T852- 92m. Turtles 802, 813, 843, and 853 greatest distances traveled were for the month of June when the total rainfall was 4.33". Turtles 822 and 833 greatest distances traveled were for July when the total rainfall was 2.34". The length each turtle traveled each week and the mean temperature and relative humidity for each week can be found on table 1. The temperature and relative humidity are averaged per week. Each week shows the distance each turtles traveled. Tracking started on the week of 6/19 for the following turtles: 802, 813, 822, and 843. Tracking for 833 started the week of 6/26, and tracking for 852 started the week of 6/17. Turtle 843 had the greatest distance of 354.5m when the temperature was 22.3°C and relative humidity at 71.8%. The turtle 833 is distinct from the rest of the group because it had an ear infection. The turtle was found on the road in the morning when the temperature was 20.6°C. It wasn't able to withdraw into or close its shell all the way due to an enlarged abscess. It was sent to a wildlife rehabilitator for treatment and returned for release 2 weeks later. As we tracked the turtle we observed that its health continued to improve, without a recurrence of the inflammation. The first week of tracking this turtle it traveled 81.1m with the temperature at 22.3°C and relative humidity at 71.8%. The second week of tracking she traveled 230.1m.



a. Ear Infected; b. After Treatment

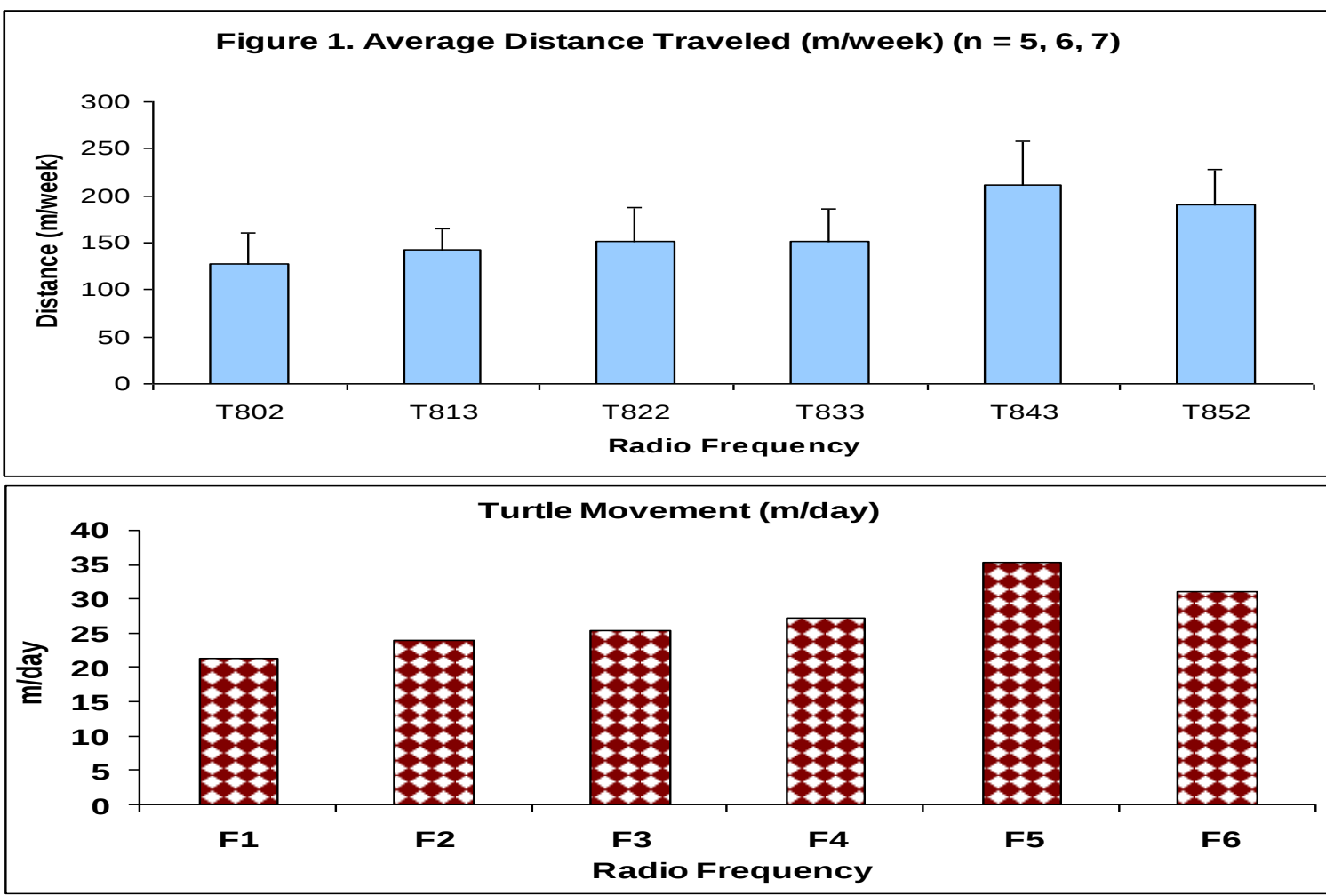


Week	RH %	Temp °C	802	813	822	833	843	852
6/17	82.3	20.1						92
6/19	80.2	20.7	113.7	228.9	64.3		109.5	318.6
6/26	71.8	22.3	256.8	163.4	232.8	81.1	354.5	330.8
7/3	75.6	24.5	35.2	153.8	158.5	230.1	165.8	108.9
7/10	67.3	24.4	48.5	115.4	253.2	130.8	206.1	181.3
7/17	73.5	26.3	137.2	121.8	165.9	231.3	340.0	169.8
7/24	58.1	23.1	171.7	76.1	36.4	87.9	93.4	134.0



Discussion & Conclusion

Weather is an important factor in the daily activity of eastern box turtles. We observed that the turtles moved mostly in the morning, but on occasion some would travel a great distance around noon. On days with temperatures 26°C and higher turtles would burrow in the leaf litter. On days when it was raining the turtles were out moving. On those days we also found new turtles on the roads. Although weather is a key factor in turtle behavior we observed additional factors influencing our turtle movements. Turtle 843 was being tracked on the west side of BNL which seems to have a more dense population of turtles. We found 5 turtles in the area including a juvenile in addition to 6 turtle nests. Turtle 843 had the greatest movements. It is possible that its movements were related to searching for a mate. Turtle 852 being tracked in the forest along Sewage Treatment Plant Path was being disturbed by well drilling in the area. There was a significant amount ground disturbance near a tree where we found it burrowing multiple times. A study in West Virginia that focused on box turtles behavior suggested seasonal changes had an influence on home range size and distance travel. Results from the study showed that during the summer, when the temperature was at a mean of 26°C, the turtles traveled a mean straight line distance between 4 and 6 meters. It also showed that males had a smaller home range than females.



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