Transactions of the Illinois State Academy of Science
(2000), Volume 93, #3, pp. 215-220

received 2/8/00
accepted 7/4/00

Early Season Basking in the Red-eared Slider, *Trachemys scripta*

Michael J. Dreslik
Illinois Natural History Survey
Center for Biodiversity
607 East Peabody Drive
Champaign, IL 61820
email - dreslik@students.uiuc.edu

Andrew R. Kuhns
Illinois State University
Department of Biological Sciences
Normal, IL 61790

ABSTRACT

We examined timing and location of early spring basking activity and perch characteristics in *Trachemys scripta*. The greatest basking activity occurred from 1300 – 1400 hrs along the shorelines with the least human habitation. Medium-sized turtles basked uniformly throughout the day, whereas small turtles exhibited a mid-day peak. Finally, smaller turtles basked on perches with smaller circumferences compared to medium-sized turtles.

INTRODUCTION

Freshwater turtles spend much of their diel activity cycle basking atmospherically using emergent perches, or basking aquatically either floating or submerged in shallow water. Basking functions in thermoregulation (Boyer 1965, Crawford et al. 1983, Schwarzkopf and Brooks 1985), drying and ectoparasite removal (Cagle 1950, Neill and Allen 1954, Boyer 1965), digestive facilitation (Moll and Legler 1971), and vitamin D synthesis (Pritchard and Greenhood 1968). Previous studies detailing emydid thermoregulatory behavior focus on *Chrysemys picta* (Sexton 1959, Boyer 1965, Ernst 1972, Lovich 1988), *Clemmys marmarota* (Bury 1972), and *Trachemys scripta* (Moll and Legler 1971, Spotila et al. 1984, 1990).

During atmospheric basking heat energy is lost through a complex of direct and indirect modes. Because of this heat loss, only subsets of microclimatic conditions occur where a turtle achieves thermoregulatory balance with its environment (climate space, Spotila et al.1990). Using energy budget analysis and climate space diagrams, Foley (1976) predicted that in early spring and late fall *T. scripta* would bask around mid-day. This is because when compared to the summer, water and turtle body temperatures are lowest and air temperatures and solar radiation levels are highest (Spotila et al. 1990, Foley

1976). Subsequent basking studies on *T. scripta* (Spotila et al. 1990) corroborated Foley's (1976) hypotheses of a mid-day peak in basking intensity in early spring and late fall and a mid-morning and early evening peak in the summer.

Another aspect of basking ecology is perch selection and use. Current research on basking ecology focuses on behavioral displays at perches (Pritchard and Greenhood 1968, Bury and Wolfheim 1973, Auth 1975, Bury et al. 1979, Pluto and Bellis 1986, Lovich 1988, Lindeman 1999). Like other basking reptiles, turtles may select specific perch characteristics, which may differ with sex, age, size, time, and habitat. Our objectives were to 1) determine the daily timing and location of spring basking activity, 2) whether basking activity was related to body size, and 3) whether perch characteristics vary with turtle body size.

MATERIALS AND METHODS

Study Site

Round Pond is a member of a chain of floodplain lakes in southeastern Gallatin County, Illinois, located approximately 4 km west of the confluence of the Ohio and Wabash rivers. During annual spring flooding, the lake connects directly, or through a system of sloughs, creeks, and field drainage ditches to the Ohio River. Small cabins and trailers occupy the western shoreline, a man-made beach encompasses the southern shore, and the remaining shoreline is bordered by floodplain forest and buttonbush, *Cephalanthus occidentalis*. Three colonies of spatterdock, *Nuphar luteum*, inhabit the waters off the southwestern, southeastern, and eastern shorelines. Turtles found in Round Pond include populations of *Pseudemys concinna, Chelydra serpentina, Sternotherus odoratus, Apalone mutica, A. spinifera, Graptemys ouachitensis, G. pseudogeographica, G. geographica, Chrysemys picta,* and *Terrapene carolina.*

General Procedures

We conducted all research after the recession of the Ohio River. We located basking turtles using binoculars during daily three-hour shoreline patrols between 0900 and 1600 hrs CST from 25 May 1998 to 2 June 1998. We kept the sampling period short to isolate the early basking season. When the time limit did not allow for a complete patrol of the shoreline, we began the following day where the previous patrol ended. We staggered the patrol's starting times to sample evenly throughout the day and we sampled each shoreline at least once per day. We estimated turtle sizes and placed them into three classes, small (< 100 mm in carapace length), medium (100 to 160 mm in carapace length), and large (> 160 mm carapace length). For each basking turtle, we measured perch height above the water's surface (PH), perch circumference (PC), and water depth at the perch (WD) to the nearest mm with a tape measure. We took measurements from the boat after the turtles retreated into the water. We noted the shoreline closest to the perch (N, NE, E, SE, S, SW, W, and NW) and time of day. For both pooled and size partitioned data, we tested deviations from equality in time of day and location of basking activity using χ^2 goodness-of-fit tests. To determine if perch variables differed by turtle size, we used Mann-Whitney U tests. We set our nominal alpha level at 0.05.

RESULTS

Large turtles are not represented in our analysis because they retreated before we could make a proper species identification and perch location. We observed 35 small turtles and 21 medium-sized turtles basking. Sample sizes were too small to analyze a time effect by shoreline and turtle size. Medium and small-sized turtles basked in equal numbers ($\chi^2 = 3.50$, d.f. = 1, $p < 0.061$). The analysis of the pooled data reveals that turtles preferred basking between 1300–1400 hrs ($\chi^2 = 17.1$, d.f. = 4, $p = 0.002$) along the eastern and southeastern shorelines ($\chi^2 = 39.4$, d.f. = 6, $p < 0.001$). Medium-sized turtles basked uniformly regarding shoreline ($\chi^2 = 4.71$, d.f. = 3, $p < 0.194$) and time of day ($\chi^2 = 0.524$, d.f. = 3, $p < 0.914$), whereas small turtles, basked along the eastern and southeastern shorelines ($\chi^2 = 23.2$, d.f. = 6, $p = 0.007$) shortly after mid-day ($\chi^2 = 16.0$, d.f. = 4, $p = 0.003$; Figure 1).

Neither PH (medium $\bar{x}$ = 26.79 cm, SE = 13.78, n = 21; small $\bar{x}$ = 10.96 cm, SE = 1.655, n = 35; U = 271, n = 56, $p = 0.102$), nor WD (medium $\bar{x}$ = 78.22 cm, SE = 4.408, n = 16; small $\bar{x}$ = 75.94 cm, SE = 2.993, n = 26; U = 183, n = 42, $p = 0.517$), differed among turtle size classes. Small turtles basked on perches with a smaller PC compared to medium turtles (medium $\bar{x}$ = 76.83 cm, SE = 10.91, n = 21; small $\bar{x}$ = 36.03 cm, SE = 3.821, n = 35; U = 168.0, n = 56, $p < 0.001$).

DISCUSSION

The time of greatest basking activity in the early spring at Round Pond was mid-day. This was also the case for a normothermic area of Par Pond, North Carolina (Spotila et al. 1984). In Florida, daily basking activity was bimodal in the summer and unimodal in the fall (Auth 1975), whereas in Panama, *T. scripta* basked uniformly throughout the day (Moll and Legler 1971). Basking activity in Panama was more associated with the number of previously cloudy and sunny days and intensified in the later rainy season when sunny days were fewer (Moll and Legler 1971).

At Round Pond the greatest basking activity occurred along the eastern and southeastern shorelines, opposite the human inhabited shoreline. Although the human inhabited shoreline possessed several tree-falls, we cannot determine whether the difference occurred because of perch availability or human presence. To test for a difference we would need to calculate the number of available perches for each shoreline; however, we are unable to directly test if the impact was due to human occupancy.

Medium-sized turtles basked opportunistically with respect to shoreline and time of day, which may be related to factors such as foraging activity, heat loss and gain, activity cycles, or even low sample size. Small turtles, however, support Foley's (1976) hypothesis by basking around mid-day. Since water acts as a heat sink, and smaller organisms gain and lose heat faster than larger bodied organisms, smaller turtles may exhibit this trend because they are trying to maintain a higher core body temperature. Interestingly, small turtles preferred the eastern shoreline (differential habitat use discussed below).

Only perch circumference differed between turtle size categories. This was not predicted because we expected small turtles to use perches of all dimensions with no upper limit. However smaller turtles at Round Pond only basked on perches with smaller circumfer-

ences. One explanation is that larger perches are lacking in the smaller turtle's habitat. To substantiate this we would need to determine if small turtles occupy a different habitat, and if so, determine if large perches are equally available in that habitat. Social interactions may offer an alternative explanation. Several studies indicated that during aggressive behavioral displays larger turtles often displace smaller ones (Pritchard and Greenhood 1968, Bury and Wolfheim 1973, Auth 1975, Bury et al. 1979, Pluto and Bellis 1986, Lovich 1988, Lindeman, 1999). The displacement may cause smaller turtles to seek perch sites that exclude larger turtles (i.e., logs with smaller circumferences), or reduce the amount of social interaction.

ACKNOWLEDGMENTS

Funding was provided by the Illinois Department of Natural Resources (IDNR) nongame fund, IDNR Endangered Species Protection Board, and the Illinois Natural History Survey. We would like to thank E. L. Bryant for allowing us access to his property and boat, and C. A. Phillips, L. M. Page, J. D. Litzgus, D. Shepard, and three anonymous reviewers for their comments on improving the manuscript.

LITERATURE CITED

Auth, D. L. 1975. Behavioral ecology of basking in the yellow-bellied turtle (*Chrysemys scripta* Schoepff). Bull. Florida State Mus. Biol. Sci. 20:1-45.

Boyer, D. R. 1965. Ecology of the basking habitat in turtles. Ecology 46:99-118.

Bury, R. B. 1972. Habits and home range of the pacific pond turtle, *Clemmys marmorata*, in a stream community. Ph.D. Dissertation, University of California, Berkeley.

Bury, R. B., and J. H. Wolfheim. 1973. Aggression in free-living pond turtles (*Clemmys marmorota*). BioScience 23:659-662.

Bury, R. B., J. H. Wolfheim, and R. A. Luckinbach. 1979. Agnostic behavior in free-living painted turtles (*Chrysemys picta belli*). Biol. Behav. 1979:227-239.

Cagle, F. R. 1950. The life history of the slider turtle, *Pseudemys scripta troostii*, (Holbrook). Ecol. Mongr. 20:31-54.

Crawford, K. M., J. R. Spotila, and E. A. Standora. 1983. Operative environmental temperature and basking behavior in the turtle, *Pseudemys scripta*. Ecology 64:989-999.

Ernst, C. H. 1972. Temperature-activity relationships in the painted turtle, *Chrysemys picta*. Ecology 49:399-409.

Foley, R. E. 1976. Energy budgets and a climate space diagram for the turtle *Chrysemys scripta*. M.A. Thesis, State University College, Buffalo, New York.

Lindeman, P. V. 1999. Aggressive interactions during basking among four species of emydid turtles. J. Herpetol. 33:214-219.

Lovich, J. 1988. Aggressive basking behavior in eastern painted turtles (*Chrysemys picta picta*). Herpetologica 44:197-202.

Moll, E. O., and J. M. Legler. 1971. Life history of a neotropical slider turtle, *Pseudemys scripta* (Schoepff), in Panama. Bull. Los Angeles Co. Mus. Nat. Hist. 11:1-102.

Neill, W. T., and E. R. Allen. 1954. Algae on turtles: some additional considerations. Ecology 35:581-584.

Pluto, T. G., and E. D. Bellis. 1986. Habitat utilization by the turtle *Graptemys geographica*, along a river. J. Herpetol. 20:22-31.

Pritchard, P. C. H., and W. F. Greenhood. 1968. The sun and the turtle. Int. Turtle and Tortoise Soc. J. 2:20-25.

Schwarzkopf, L., and R. J. Brooks. 1985. Application of operative environmental temperatures to analysis of basking behavior in *Chrysemys picta*. Herpetologica 41:206-212.

Sexton, O. J. 1959. Spatial and temporal movements of a population of the painted turtle, *Chrysemys picta marginata* (Agassiz). Ecol. Monogr. 29:113-140.

Spotila, J. R., R. E. Foley, and E. A. Standora. 1990. Thermoregulation and climate space of the slider turtle. pp. 288-298. in J. W. Gibbons (ed.). Life history and ecology of the slider turtle. Smithsonian Institution Press, Washington D.C.

Spotila, J. R., R. E. Foley, J. P. Schubauer, R. D. Semlitsch, K. M. Crawford, E. A.
Standora, and J. W. Gibbons. 1984. Opportunistic behavioral thermoregulation of turtles, *Pseudemys scripta*, in response to microclimatology of a nuclear reactor cooling reservoir. Herpetologica 40:299-308.

Figure 1. Number of *Trachemys scripta* basking regarding shoreline and time at Round Pond, Gallatin County, Illinois.