

Melanism in the pond slider (*Trachemys scripta*) in northern Indiana, USA

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INTRODUCTION

Melanism in turtles is generally rare among species, but can be extremely common in some species and subspecies. Pond Sliders (*Trachemys scripta*) show ontogenetic melanism with larger, and presumably older, individuals often showing melanism of the plastron and other body parts (Lovich et al., 1990).

Previous studies of melanism in *T. scripta* have found that the proportion of melanistic individuals can vary among populations. For example, some populations from Oklahoma show 100% melanism for both adult males and females, whereas other populations from that state show percentages of melanistic adults ranging from 44% to 75% (McCoy, 1967; Hays & McBee, 2009). In southeastern Missouri, 81% of adult males were melanistic (Glorioso et al., 2010), and in southern Illinois, approximately 18.7% of adult male *T. scripta* were melanistic (Reehl et al., 2006). Some authors have argued the observed variation in the proportion of melanistic *T. scripta* does not appear to be related to geographic parameters, such as latitude (see McCoy, 1967), but Cahn (1937) suggested that melanism was more frequent in *T. scripta* from southern Illinois than those from northern Illinois. However, relatively few populations have been examined to quantify melanism, especially northern populations. Here we report on melanism in a population of *T. scripta* at the northeastern extreme of the range of the species in the Wabash River drainage in Indiana (see Seidel & Ernst, 2006 for distribution). This population is believed to be natural, although supplementation by pet trade releases over many decades cannot be ruled out.

MATERIALS AND METHODS

As part of a larger investigation of the turtle community, we captured *T. scripta elegans* from Dewart Lake, Kosciusko Co., Indiana, USA (41°22'03.31"N, 46°18.22"W) nearly annually for 35 years (1979 – 2014) using fyke nets, wire traps, basking traps, and by hand (see Smith et al., 2006 for details about turtle sampling). Turtles were individually marked using notches in the carapace. In addition, we noted melanistic males and females. We used straightline carapace length (CL) of melanistic individuals to estimate the size at the first observation of melanism in the individual (i.e., Stage 2, Tucker et al., 1995).

RESULTS AND DISCUSSION

We examined a total of 161 individual *T. scripta*. Of these 161 turtles only 18 (11.2%) were melanistic. In males 12 of 86 (14.0%) were melanistic, and in females 6 of 75 (8.0%) were melanistic. The observed incidence of melanism did not differ between males and females ($\chi^2_1 = 1.43$, $P = 0.23$). The proportion of melanistic individuals in our population (11.2%) was lower than any other previously reported value (see above). It is interesting to note that the two lowest proportions of melanistic sliders were in the two most northern populations (Indiana [this study] and Illinois [Reehl et al., 2006]). This is also consistent with Cahn's (1937) observation that melanistic *T. scripta* were more frequent in southern Illinois than in northern Illinois. These observations suggest that there may indeed be an inverse correlation between the proportion of melanistic *T. scripta* and latitude.

The smallest melanistic male *T. scripta* we captured in our northern Indiana population was 190 mm CL (mean CL \pm SE of melanistic males = 212.8 \pm 4.8 mm), and the smallest melanistic female was 220 mm (mean CL \pm SE of melanistic females = 237.7 \pm 7.8 mm). The size threshold for melanism ranges from 114 to 156 mm plastron length (PL; estimated CL = 122 to 168 mm) within Oklahoma (Hays and McBee, 2009), and from 100-140 mm PL (estimated CL = 107 to 150 mm) in populations from Texas, South Carolina, and Alabama (Cagle, 1950; Lovich et al., 1990; Garstka et al., 1991). The smallest melanistic male sliders in southeast Missouri (Glorioso et al., 2010) and in Illinois (Cahn, 1937) were 172 mm CL. Thus, for our population in northern Indiana, the size at which melanism was expressed was larger than all previous observations, which may reflect trends in maximum body size variation across the range, which have not been analyzed.

Taken together, our observations suggest that our understanding of geographical variation in melanism in at least *T. scripta* needs further evaluation. More data from northern populations in North America, as well as from introduced populations in other regions of the world are needed, especially to test the latitudinal variation hypothesis, and to evaluate potential environmental causes of that variation (e.g., Etchberger et al., 1993; Rowe et al., 2006, 2009).

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REFERENCES

- Cagle, F.R. (1950). The life history of the Slider Turtle, *Pseudemys scripta troostii* (Holbrook). *Ecological Monographs* 20: 33-54.
- Cahn, A.R. (1937). The turtles of Illinois. *Illinois Biological Monographs* 16: 1-218.
- Etchberger, C.R., Ewert, M.A., Phillips, J.B., Nelson, C.E. & Prange, H.D. (1993). Environmental and maternal influences on embryonic pigmentation in a turtle (*Trachemys scripta elegans*). *Journal of Zoology* 230: 529-539.
- Garstka, W.R., Cooper, W.E. Jr., Wasmund, K.W. & Lovich, J.E. (1991). Male sex steroids and hormonal control of male courtship behaviour in the yellow-bellied slider turtles, *Trachemys scripta*. *Comparative Biochemistry and Physiology* 98A: 271-280.
- Glorioso, B.M., Vaughn, A.J. & Waddle, J.H. (2010). The aquatic turtle assemblage inhabiting a highly altered landscape in southeast Missouri. *Journal of Fish and Wildlife Management* 1(2): 161-168.
- Hays, K.A. & McBee, K. (2009). Ontogenetic melanism in three populations of Red-eared Slider Turtles (*Trachemys scripta*) in Oklahoma. *Southwestern Naturalist* 54: 82-85.
- Lovich, J.E., McCoy, C.J. & Garstka, W.R. (1990). The development and significance of melanism in the Slider Turtle. In *Life History and Ecology of the Slider Turtle*, pp. 233-254. Gibbons, J.W. (Ed.). Washington, D.C.: Smithsonian Institution Press.
- McCoy, C.J. (1967). The development of melanism in Oklahoma population of *Chrysemys scripta elegans* (Reptilia: Testudinidae). *Proceedings of the Oklahoma Academy of Science* 47: 84-87.
- Reehl, M., Thompson, J. & Tucker, J.K. (2006). A three year survey of aquatic turtles in a riverside pond. *Transactions of the Illinois State Academy of Science* 99: 145-152.
- Rowe, J.W., Clark, D.L., Price, M. & Tucker, J.K. (2009). Reversible melanization following substrate colour reversal in Midland Painted Turtles (*Chrysemys picta marginata*) and Red-eared Sliders (*Trachemys scripta elegans*). *Journal of Herpetology* 43: 402-408.
- Rowe, J.W., Clark, D.L., Ryan, C. & Tucker, J.K. (2006). Effect of substrate color on pigmentation in Midland Painted Turtles (*Chrysemys picta marginata*) and Red-eared Sliders (*Trachemys scripta elegans*). *Journal of Herpetology* 40: 358-364.
- Seidel, M.E. & Ernst, C.H. (2006). *Trachemys scripta*. Catalogue of American Amphibians and Reptiles 831: 1-94.
- Smith, G.R., Iverson, J.B. & Rettig, J.E. (2006). Changes in a turtle community from a northern Indiana lake: a long-term study. *Journal of Herpetology* 40: 180-185.
- Tucker, J.K., Maher, R.J. & Theiling, C.H. (1995). Melanism in the red-eared slider (*Trachemys scripta elegans*). *Journal of Herpetology* 29: 291-296.

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