Painted Turtle Growth in Correlation with the pH of their Environment

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Introduction

Painted turtles, *Chrysemys picta*, have been captured and measured sporadically within the five local ponds of Black Rock Forest over the past decade. Previous research noted the abundances of turtles within each pond. A correlation between pond health, indicated by pH, and turtle abundance was found. I decided to research whether or not a correlation existed between growth rate and pond health as well.

Water normally has a pH hovering between 6 and 7. Ponds may be naturally more acidic due to rocks and minerals within their environment, but pH is often lowered in bodies of water due to acid rain. Black Rock Forest experiences relatively acidic rainfall with an average pH of 4.3. Multiple studies have shown that a low pH negatively affects the growth rate, health, and lifespan of many aquatic organisms.

With this experiment, I addressed the question 'how is the growth rate of the painted turtle affected by pond health, as indicated by pH?' I hypothesize that, like its affect on abundance, a low pH will negatively affect the growth rate of painted turtles. I expect to see a higher growth rate and bigger sizes among turtles from the more pH-neutral Aleck Meadow rather than from the more acidic Sutherland Pond. Because female turtles are generally larger than males, I also expect females to have a faster growth rate than males.

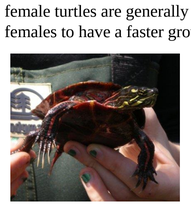


Figure 1. Painted Turtle, *Chrysemys picta*

Materials and methods

Between late June and late July of 2009, I trapped once to several times a week at Aleck Meadow Reservoir (relatively neutral pH of 6.0) and Sutherland Pond (relatively acidic pH of 5.3). I captured turtles using hoop nets and cat food as bait. Of turtles that have been previously caught, I recorded the sex, age, weight, carapace length, width, and height, and plastron length of each turtle.

I examined data collected from the past ten to fifteen years and analyzed growth rate patterns of weight over different time periods. I analyzed the data according to categories of turtles based on sex and pond. I used analysis of variance to test for significant differences in growth between the two ponds. My study does not directly test the impact of pond acidity, and thus will only tests correlations of pH with growth rates.

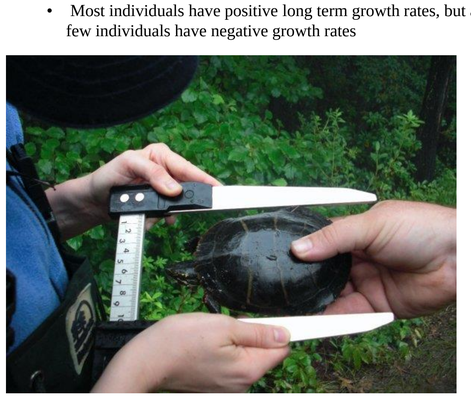
Figure 2. A hoop net being set up at Aleck Meadow Reservoir

Results

During my experiment, 45 tagged painted turtles were caught a total of 79 times. Of these 45 turtles, 40 were found in Aleck Meadow while only 5 were collected from Sutherland Pond. To be able to work with more data from Sutherland, several turtles that were not captured this summer, but that did have several previous recaptures, were also used in the data analysis.

Results overview:

- The mean growth rate of turtles at Aleck Meadow is much faster than the average growth rate of turtles at Sutherland Pond
- Females grew faster than males at Aleck Meadow, while males had a faster growth rate than females at Sutherland
- Males of both ponds have very similar growth rates
- Mean growth rate for females in Sutherland was negative, rather than positive
- While the data is statistically significant, the growth rates from Sutherland Pond are likely to be a bad representation of the entire population. This is due to a scarcity of data.
- Most individuals have positive long term growth rates, but a few individuals have negative growth rates



Location	Mean	Std. Error
Aleck Meadow (ALM)	0.15090672	0.12993946
ALM Females	0.25617147	0.21693424
ALM Males	0.04564197	0.04294467
Sutherland (SUT)	0.01350036	0.02219062
SUT Females	-0.0036712	0.00842185
SUT Males	0.03067192	0.03595939

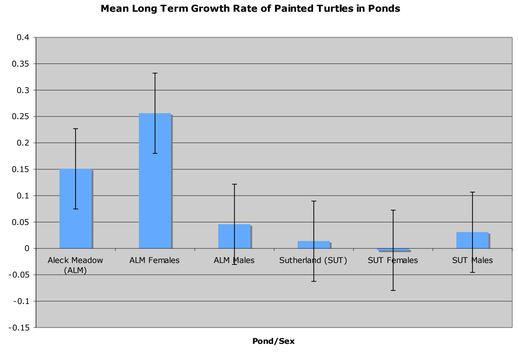


Table 1. Mean long term growth rate of painted turtles in Aleck Meadow and Sutherland Pond (percent mass change per year)
Figure 3. Bar graph of mean long term growth rate of painted turtles, including standard error bars (percent mass change per year)

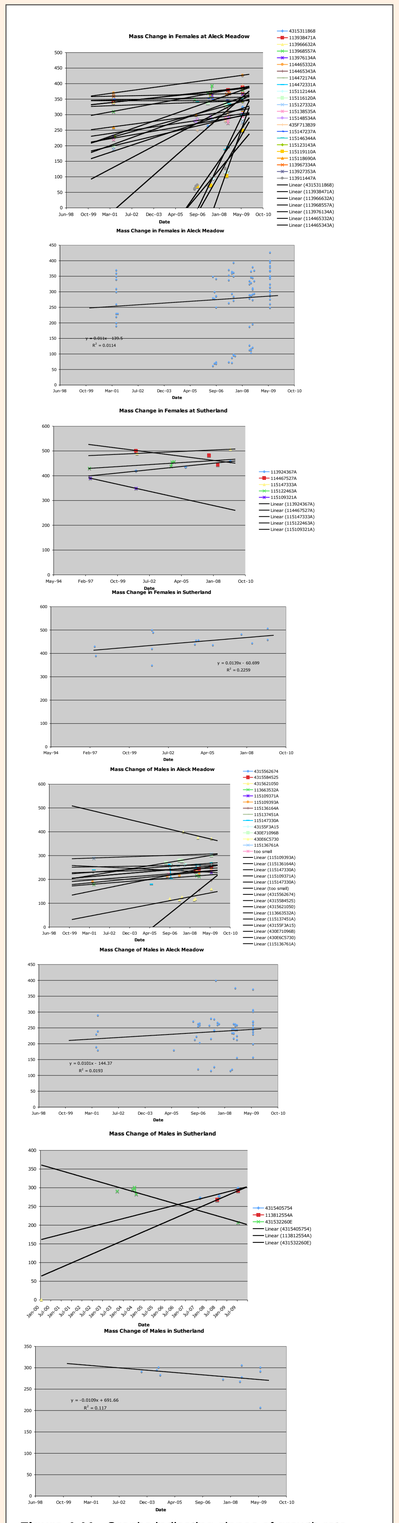


Figure 4-11. Graphs indicating slopes of growth rate for each individual captured as well as populations of turtles as a whole

Conclusions

Several individuals had negative long term growth patterns. This most likely signifies that a turtle is slowly dying, potentially from sickness or old age. Short term declines or spikes in mass can be attributed to human or technical error, food availability, time spent basking, temperature, or in the case of females, reproductive cycles.

According to my data, painted turtles are not well suited for acidic environments. A low pH habitat negatively affects growth rate as well as abundance. It appears that females are more sensitive to acidic conditions than males. Smaller females can potentially lead to smaller and fewer eggs produced during nesting. Turtles with stunted growth rates may have a harder time competing against others as well as become a more enticing snack for their predators. This may further diminish the abundance of painted turtles. Since the start of the industrial revolution, habitats are becoming ever more acidic and polluted. Although abundant presently, we may start to see painted turtle populations decline in the future.

The validity of this data is uncertain due to a lack of data. It would be valuable if trapping continued at least once a week during the growing season for the next three or more years. Sutherland especially needs more turtles to be tagged and trapped to get an accurate idea of the affects of acidic conditions on the growth rate of painted turtles. This would give us valuable insights as to the future of the painted turtle.

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For further information

Please contact *emily.spokowski@gmail.com*. More information on this and related projects can be obtained at *www.blackrockforest.org*