Sizable Differences in Eastern Box Turtle (*Terrapene carolina carolina*) Measurements

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Introduction

Morphometric measuring techniques vary in published protocols and studies on Eastern Box Turtles.

For example, some studies report how caliper measurements were taken (Dodd 1997, Patton & Messinger 2003), while some do not (Stickel 1989, Nichols 1939). Shell height (SH) may be measured at the hinge (Legler et al. 1960, Somers & Matthews 2006) or at maximum height (Brown 1971, Patton & Messinger 2003).

We've noticed that calipers of differing jaw lengths are being used and wondered if there were differences in data collected with calipers of different jaw lengths. We also tested experienced researchers and novices to see if the data collected differed between these two groups.

Photo by Jane Wyche

Discussion

This study reveals a potential discrepancy in the measurements of Eastern Box Turtles taken with long vs. short jawed calipers. Some experienced researchers in our study refused to measure with short jawed calipers finding them wholly inadequate.

The research guide, *The Box Turtle Connection* (Somers and Matthews 2006), is being revised and will recommend a minimum caliper jaw length of 6.35 cm (2.5 in) and will standardize other aspects of data collection such as how turtles are oriented when measurements are taken (Figure 5).

Measuring experience does not affect the quality of data collected, hence citizen scientists can provide a reliable resource for collecting accurate data.

The findings of this study should be considered when establishing protocols for box turtle studies throughout their range as well as in other turtle research.

Methods

Measurements were taken during the Fourth Box Turtle Conservation Workshop in 2013 at the NC Zoo and later at UNCG in 2015. Each participant took three measurements, min and max carapace length (CL) and SH, three times with short jawed (3.81cm, 1.5 in) and long jawed (6.35cm, 2.5 in) calipers using the same Eastern Box Turtle shell. Subjects reported measuring experience as either ≤ a dozen or ≥ a hundred box turtles. T-tests and descriptive statistics (means and standard errors) were used to examine differences.

Fig 4. The calipers and box turtle shell used in this study

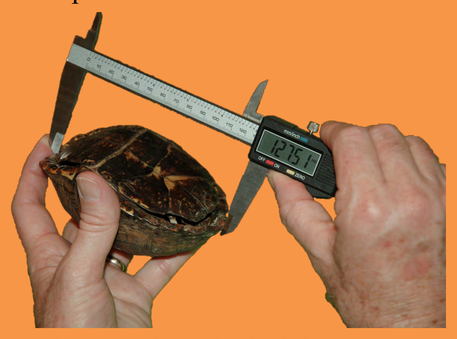

Fig 5. Ventral measuring of min SCL. Photo: Jodi Owen

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Results

The measurements taken with short and long jawed calipers differed significantly with the exception of min SCL (Table 1). Figures 1 and 2 show the average difference in the measurements. There was no significant difference between measurements taken by experienced and inexperience data collectors.

Table 1. T-test assuming unequal variance results for each measuring variable between short and long jawed calipers. Significant values were marked in red. SCL= Straight carapace length

	T Stat	Two-Tailed P-Value	Degrees Freedom
Min SCL	-1.68	0.096	68
Max SCL	-2.48	0.016	75
Shell Height	-2.67	0.01	61

Photo by Nicole Crider

Fig 1. Citizens measure the same quality of data as experienced researchers.

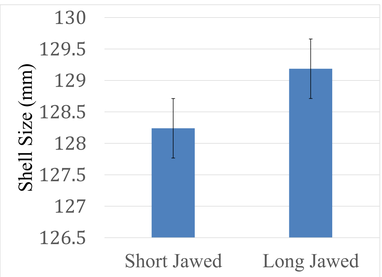

Fig 2. The mean measurement of max SCL using short and long jawed calipers.

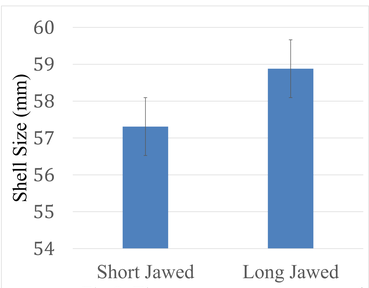

Fig 3. The average measurement of shell height using short and long jawed calipers.

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