

Body Condition of Eastern Copperheads and Recurrence in a Kentucky Campsite

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Introduction

Copperheads are predominantly characterized to be sit and wait predators but have been noted to use active foraging behaviors to pursue cicadas as they emerge from the ground and climb into trees¹. This is a significant change in behavior not only because sit and wait predation is thought to be more energetically efficient but also because the sites where the cicadas emerge are not suited to the copperhead's protective coloration². These two ideas can be seen as potential risks or deterrents from participating in active foraging. But, populations of copperheads do nonetheless, so there would have to be a logical advantage to active foraging in this area.

This study aimed to identify a possible advantage to active foraging by determining if there was a relationship between the health of the individual and how often it recurred in the site where the cicadas emerged. The measure of health used was body condition. My hypothesis was that as recurrence increased, body condition would increase and so the individuals that recurred in the site more often would be healthier.

Methods

At the field site, Koomer Ridge in the Daniel Boone National Forest, a PIT tagging & mark-recapture system had already been implemented. This made identification of the snake and continuous tracking of when, and in what condition the individual was in when it recurred in the site possible. Its tag number would be recorded every time it was found in the site and its mass, snout-vent length (SVL), and sex would be recorded at least at once per season. Over the years, many snakes recurred to the campsite and therefore had multiple measurements. Body condition was calculated for each measurement event.

Mass and SVL are the two factors that contribute to the scoring of body condition. First, a linear relationship is found between the log transformed data of SVL and Mass with SVL being the independent variable. The linear relationship for our population of copperheads was $0.302 * SVL + 1.110$. Then, the difference between an individual's mass and what the individual's mass was predicted to be based off its SVL was taken and back transformed into that measurement event's body condition. The equation is below:

$$BC = 10^{(0.302 * \text{Log}(\text{ExperimentalSVL}) + 1.110) - \text{Log}(\text{ExperimentalMass})}$$

Recurrence was the total number of times the individual was found in the campsite. Day of the year for each measurement event was also recorded to merge yearly data into seasonal data. Data used was collected by ECU, 2015– 2019.

Results

An interesting finding was that over the years of 2015 to 2018, no significant increase in average body condition was found but an increase in variation in body conditions was found (Fig. 1).

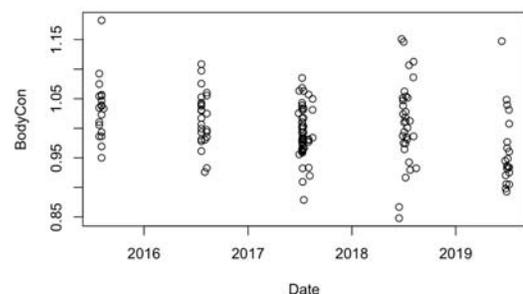


Fig 1. Relationship between date & body condition
Males recurred about twice as often in the

field site as females (12.14 ± 8.27 vs. 6.91 ± 3.74). Females occur in the campsite earlier and occur later in the year. Males are occurring around mid June to mid August while females are occurring from early June to late August, around 25 days more than the males (\square Day 155 to \square Day 240 vs.

□Day 170 to □Day 230).

We found no significant relationship between change in body condition and recurrence, although more individuals experienced an increase in body condition than a decrease (Fig 2.)

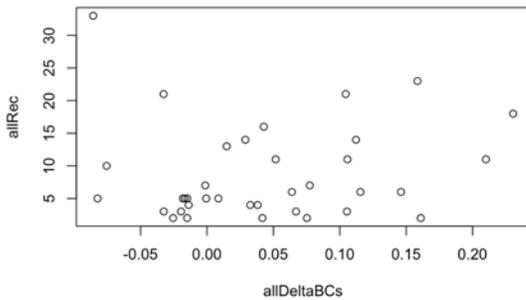


Fig. 2. Relationship between change in body condition and recurrence

There was no significant relationship between male body condition and recurrence. However, there was a significant negative relationship between female body condition and recurrence of $-16.66x + 22.028$ (Fig. 3).

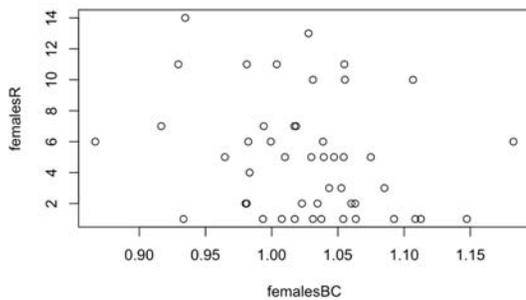


Figure 3. Relationship between female body condition and recurrence

Females in better body condition were at the campsite less often. Our data suggest that the campsite is not more or less productive for males but is potentially less productive for females.

Conclusions

Instead of finding a direct relationship between body condition and recurrence, we instead found more sex differences that can most likely be attributed to the time females spend gravid or preparing for gravidity. Females during the breeding season have the additional priority of harboring and developing young and they require specific requirements for temperature and rest that active foraging in the campsite seems not to fulfill.

Because no significant advantage or disadvantage to hunting in the campsite for males

was found, the perceived risk of predation and energy inefficiency of active foraging in the clear field site may not be true. This is supported by the finding that over the years, there was an overall increase in body condition.

The increase in range of body conditions over the years may be contributed to by weather conditions, which would be a potential relationship to explore further. Additionally, since the original study was established before and separately from my objective, the data set used for this study was not optimized to get as many individual measurements and therefore body condition scores as would be preferred. A passive maintenance and surveillance approach was taken in the original study but increasing the amount of measurements taken for the individual each season would provide more data going into a future project and hopefully more definitive results.

References

- ¹ Blair, P., Richter, S.C. 2017. Effect of Cicada Emergence on Copperhead (*Agkistrodon contortrix*) Density in the Koomer Ridge Campground.
 - ² Farallo V.R., Forstner M.R.J. (2012) Predation & the Maintenance of Color Polymorphism in a Habitat Specialist Squamate. PLoS ONE 7(1): e30316.
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